Questions Galore!

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STUDY GUIDE: EXPLORERS

THE VIKINGS: One of the first groups of sailors to sail into the Atlantic Ocean from Europe (Norse Countries--Denmark, Sweden, and Norway). They explored the islands of Iceland and Greenland, and in the year 1000, a group of Vikings, led by LEIF ERICSON, settled on the coast of North America, calling their land Vinland, which is now Newfoundland, Canada. They were the first Europeans to explore and settle in North America.

PORTUGUESE EXPLORERS: Led the search for an all-water route to Asia.

1. Prince Henry--Called "The Navigator". He built a navigation school in Southwestern Portugal to train Portuguese sailors, and sent many ships to explore the west coast of Africa in hopes of finding the water route to Asia.

2. Batholomew Dias (1487) --First to sail around the tip of Africa, which became known as the CAPE OF GOOD HOPE.

3. Vasco Da Gama (1498)--Followed Dias's route around the Cape of Good Hope and was the first to reach India by traveling across the Indian Ocean. He returned to Portugal with spices, silks, and jewels.

4. Pedro Cabral (1500)--Discovered Brazil when a storm blew his fleet off-course, and he claimed this land for Portugal.

5. Amerigo Vespucci (1499)-- Sailed first for the Portuguese and then for the Spanish. He followed Columbus to the Americas, and was the man for whom America was named.

SPANISH EXPLORERS:

1. Christopher Columbus (1492)--An Italian sailor who believed that the Earth was round, and that he could reach Asia (the East) by sailing west. His journeys were sponsored by King Ferdinand and Queen Isabella of Spain. He

discovered the island of SAN SALVADOR (one of the Bahama Islands just southeast of Florida) on Oct. 12, 1492. He then sailed to Cuba, and then to Hispaniola, which is presently the countries of Haiti and the Dominican Republic. He made a total of four trips to the New World before his death in 1506.

2. Ponce de Leon (1508)--Discovered and explored Florida. While searching for the "Fountain of Youth," he claimed this land for Spain.

3. Vasco Nunez de Balboa (1513)--The first European to see the Pacific Ocean. He traveled across what is today the Isthmus of Panama in Central America to the Pacific Ocean, which he named the South Sea, and claimed for Spain.

4. Ferdinand Magellan (1519 to 1522)-- His five ships sailed west around South America, and across the Pacific Ocean to the Philippine Islands, where most of ships were wrecked and where he was killed. His crewmen brought the one remaining ship, THE VICTORIA, through the Indian Ocean and around Africa to Europe, thus CIRCUMNAVIGATING the globe, by sailing around the world. The Strait of Magellan at the tip of South America, is named for this explorer.

5. Hernando Cortez (1521)--Discovered the Aztec city of Tenochtitlan in Mexico. He imprisoned the Aztec ruler, Montezuma, and conquered the Aztec empire, claiming this land in Mexico for Spain.

6. Francisco Pizarro (1531)--He conquered the Inca Empire in Peru, and established a settlement on the coast of Peru, which is present-day Lima, for the Spanish.

7. Hernando de Soto (1539)--He traveled north through Florida and explored much of the southeastern part of the United States, and the southern area around the Mississippi River, thus claiming the entire Gulf area and the Mississippi River Valley for Spain. His body was buried in the Mississippi River.

8. Estevanico (1528)-- He was the first Spanish explorer to search for Cibola, "The Seven Cities of Gold", which were supposedly located north of Mexico. He did not find the golden cities, but explored the southwestern land for Spain, and was a fore-runner of other Spanish explorers, who also searched for these cities.

9. Francisco Vasquez de Coronado (1540)--He traveled through the areas that are now Arizona, New Mexico, Texas, Oklahoma, and Kansas in search of the "Seven Cities of Cibola," which were supposedly cities made of gold. He discovered the Grand Canyon and claimed this southwestern area for Spain.

ENGLISH EXPLORERS:

1. John Cabot (1497)--He searched for a Northwest Passage to Asia, and explored the land and islands on the eastern coast of Canada, thus claiming this land for England.

2. Henry Hudson (1610)--He searched for a Northwest Passage in his ship, THE DISCOVERY, and found a large body of water, now called Hudson Bay. This area was claimed by England.

FRENCH EXPLORERS:

1. Giovanni da Verrazano (1523)-- He was hired by King Francis I to find a Northwest Passage through North America. He was the first explorer from France to search for this passage and traveled as far as New York Harbor.

2. Jacques Cartier (kahr-TYAY) (1535)--He sailed west in hopes of finding a waterway that might cut through the continent. He discovered the St. Lawrence River and followed it to the present-day site of Montreal, where he encountered a large Indian village.

3. Samuel de Champlain (1603 to 1608)--He sailed west to North America and founded a fur-trading post on the St. Lawrence River at Quebec. He later explored inward and discovered Lake Champlain in New York, and explored the upper Great Lake area.

4. Father Jacques Marquette and Louis Joliet (1673)-- They explored the Mississippi River as far south as its junction with the Arkansas River. They returned to the Lake Michigan area by way of the Illinois River, and claimed this land for France.

5. Robert de La Salle (1682)-- He sailed all the way down the Mississippi River to the Gulf of Mexico. He claimed this land, which he called Louisiana, for France.

6. Jean Baptiste Pointe du Sable (1779)-- He was a well-known black French explorer who set up a fur-trading post on the Chicago River, at what is now the city of Chicago, Illinois.

DUTCH EXPLORERS:

1. Henry Hudson (1609)--He was hired by the Dutch East India Company to search for the legendary Northwest Passage through North America. He sailed his ship, THE HALF MOON, along the coast of North America, and discovered the Hudson River, which he claimed for the Dutch.

In 1610, Henry Hudson again returned to North America. This time he was sponsored by England, and his ship was named THE DISCOVERY. He found a great body of water, which he called Hudson Bay, and claimed this area for England.

THE MOST FAMOUS PIRATE:

SIR FRANCIS DRAKE (1558 to 1568)--He was an English pirate, called a Sea Dog. He attacked, captured, and raided many Spanish vessels, as well as raiding many Spanish towns. He later became the second explorer to cirucumnavigate the world in his ship called THE GOLDEN HIND.

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STUDY GUIDE:
WORLD RECORDS

LIVING ORGANISMS:

Largest Marine Mammal: Blue Whale
Largest Land Mammal: African Bush Elephant
Tallest Mammal: Giraffe
Largest Reptile: Saltwater Crocodile
Longest Snake: Reticulated Python
Heaviest Snake: Reticulated Python
Heaviest Snake: Anaconda
Largest Fish: Whale Shark
Largest Bird: Ostrich
Fastest Marine Mammal: Blue Whale
Fastest Land Mammal: Cheetah
Fastest Fish: Sailfish
Fastest Bird: Peregrine Falcon
Fastest Insect: Dragonfly
Smallest Mammal: Pygmy Shrew
Smallest Fish: Dwarf Goby
Smallest Bird: Male Bee Hummingbird
Smallest Snakes: Thread Snake and Brahminy Blind Snake
Smallest Lizard: Jaragua Lizard
Smallest Insect : Fairy Fly
Smallest Frog: Brazilian Frog

ANIMALS HAVING THE LONGEST AVERAGE LIFE SPANS:

1. Box turtle: 100 years
2. Human: 75 years
3. Asian elephant: 40 years
4. Grizzly bear: 25 years
5. Horse: 20 years

BUILDINGS AND STRUCTURES

1. Taipei 101, Taipei (1,670 ft.)
2. Petronas Towers 1 and 2, Kuala Lumpur (1,483 ft.)
3. Sears Tower, Chicago, Illinois (1,450 ft.)
4. Jin Mao Building, Shanghai, China (1,380)
5. Two International Finance Center, Hong Kong

TOP 10 ENERGY PRODUCING COUNTRIES:

1. United States
2. Russia
3. China
4. Saudi Arabia
5. Canada
6. Great Britain
7. Iran
8. Norway
9. India
10. Mexico

TOP 10 ENERGY CONSUMING COUNTRIES:

1. United States
2. China
3. Russia
4. Japan
5. Germany
6. Canada
7. India
8. France
9. Great Britain
10. Brazil

BODIES OF WATER:

1. Pacific Ocean: 64,186,300 sq. miles, 12,925 feet deep.
2. Atlantic Ocean: 33,420,000 sq. miles, 11,730 feet deep.
3. Indian Ocean: 28,350,500 sq. miles, 12,598 feet deep.
4. Arctic Ocean: 5,105,700 sq. miles, 3,407 feet deep.

Longest River: the Nile, Egypt and Sudan
Highest Waterfall: Angel Falls, Venezuela
Deepest lake: Lake Baykal, Asia
Biggest Lake: Caspian Sea, Europe and Asia

Deepest part of any ocean: Marianas Trench- in the Pacific Ocean, west of the Philippines.
Saltiest Sea: Dead Sea

OTHER GEOGRAPHICAL WONDERS:

Biggest Desert: Sahara, Africa
Largest Island: Greenland
Tallest Mountain: Mt. Everest, Tibet and Nepal

MOST POPULOUS COUNTRIES, 2004, FROM LARGEST TO SMALLEST:

1. China
2. India
3. United States
4. Indonesia
5. Brazil

LEAST POPULOUR COUNTRIES, 2004, FROM SMALLEST TO LARGEST:

1. Vatican City
2. Tubalu
3. Nauru
4. Palau
5. San Marino

MOST POPULOUS CITIES IN THE WORLD, 2004, FROM MOST HEAVILY POPULATED TO LEAST POPULATED:

1. Shanghai, China
2. Bombay, India
3. Karachi, Pakistan
4. Buenos Aires, Argentina
5. Delhi, India
6. Manila, Philippines
7. Moscow, Russia
8. Soul, Korea
9. Sao Paulo, Brazil
10. Istanbul, Turkey

LARGEST CITIES IN THE U.S. ACCORDING TO POPULATION (2004 Census)

1. New York City, NY
2. Los Angeles, CA
3. Chicago. IL
4. Houston, TX
5. Philadelphia, PA
6. Phoenix, AZ
7. San Diego, CA
8. San Antonio, TX
9. Dallas, TX
10. San Jose, CA

MOST POPULOUS U.S. STATES:

1. California
2. Texas
3. New York
4. Florida
5. Illinois

COUNTRIES FROM WHICH THE MOST IMMIGRANTS COME:

1. Mexico
2. China
3. Philippines
4. India
5. Vietnam

STATES IN WHICH THE MOST IMMIGRANTS SETTLE:

1. California
2. New York
3. Florida
4. Texas
5. New Jersey
6. Illinois

U.S. STATE RECORD BREAKERS: GEOGRAPHY

Largest state: Alaska
Smallest State: Rhode Island

Longest river system: Mississippi-Missouri-Red Rock
Deepest lake: Crater Lake, Oregon
Highest U.S. mountain: Mt. McKinley, Alaska
Lowest U.S. elevation: Death Valley, CA
Tallest building: Sears Tower, Chicago
Longest bridge: Verrazano, Narrows Bridge, NY
Highest bridge: Royal Gorge, CO
First National Park: Yellowstone (Wyoming, Montana, and Idaho)
Largest National Park: Wrangell, St. Elias, AL
Coldest state: Alaska
Largest land gorge in the world: Grand Canyon, AZ
Only diamond mine in the U.S.: Arkansas
World's largest flat-topped mountain: Grand Mesa, CO
Oldest permanent European settlement in the U.S.: St. Augustine, FL
Most heavily wooded state: Georgia
Largest active volcano in the United States: Mauna Loa, HI
Home of the world's first skyscraper: Chicago, IL
Largest cave system in the world: Mammoth Caves, KY
The busiest port in the United States: New Orleans, LA
Highest tides in the United States: Maine
Narrowest state in the United States: Maryland (only 1 mile wide at one point)
Largest Great Lake located entirely within the United States: Lake Michigan
Largest shopping mall in the United States: Mall of America, MN
The tallest free-standing structure in the United States:Gateway Arch, MO
Driest state (least precipitation): Nevada
Windiest spot on Earth: Mount Washington, NH
Oldest state capital city in the U.S.: Sante Fe, NM
Site of the first airplane ride: Kitty Hawk, NC
Country music capital of the world: Nashville, TN
Largest of the contiguous states: Texas
Largest lake, outside of the Great Lakes, in America: Great Salt Lake, UT
World's largest concrete dam: Grand Coulee, Columbia River, WA

U.S. STATE AGRICULTURAL AND MINING LEADERS:

Citrus fruits: Florida
Potatoes: Idaho
Soybeans: Illinois
Wheat: Kansas and North Dakota
Timber: Oregon
Beef cattle: Texas
Dairy cattle: California
Sheep: Texas
Maple syrup and granite: Vermont
Apples: Washington

Corn: Iowa
Rice: Arkansas
Cranberries: Massachusetts
Biggest Mining State: Alaska

SOLAR SYSTEM:

Largest planet: Jupiter
Smallest Planet: Pluto
Planet closest to the sun: Mercury
Planet closest to Earth: Venus
Fastest moving planet: Mercury
Slowest planet: Pluto
Hottest planet: Venus
Coldest planet: Pluto
Planet with the tallest mountain: Mars
Densest planet: Earth
Least dense planet: Saturn
Brightest planet: Venus
The Red Planet: mars
Highest peak in the solar system: Olympus Mons (Mars)
Largest moon in the solar system: Ganymede (Jupiter)
Planet with the most moons: Saturn

OTHER SPACE FACTS:

First human to orbit Earth: Yuri Gagarin
First American in Space: Alan B. Shepard Jr.
First American to orbit Earth: John H. Glenn
First woman in Space: Valentina V. Tereshkova
First person to walk on the moon: Neil Armstrong

AMUSEMENT PARKS RECORD BREAKERS:

World's largest amusement park: Walt Disney World, Lake Buena Vista, Florida

Amusement park with the world's most roller coasters: Six Flags Magic Mountain, Valencia, CA

World's Fastest Roller Coasters:
Dodonpa: Gotemba City, Japan
Superman: The Escape, Valencia, CA

Steel Dragon 2000: Mie, Japan
Millennium Force: Sandusky, OH
Goliath: Valencia, California – tied with Titan: Arlington, TX

World's Longest roller Coasters:
Steel Dragon 2002: Mie, Japan
The Ultimate: North Yorkshire, England
The Beast: Cincinnati, OH
Son of Beast: Cincinnati, OH
Millennium Force: Sandusky, OH

World's Tallest Roller Coasters
Superman: The Escape, Valencia, CA
Tower of Terror: Gold Coast, Australia
Steel Dragon 2000: Mie, Japan
Fujiyama: Yamanashi, Japan
Millennium Force: Sandusky, OH

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STUDY GUIDE:
ACRONYMS AND ABBREVIATIONS

ACRONYMS

AA	Alcoholics Anonymous
AARP	American Association of Retired Persons
AC	Alternating Current
ACT	American College Test
ADD	Attention Deficit Disorder
AFL	American Federation of Labor
AFL-CIO	American Federation of Labor and Congress of Industrial Organizations
AIDS	Acquired Immune Deficiency Syndrome
ALCOA	Aluminum Company of America
AM	Amplitude Modulation
AP	Associated Press
APB	All Points Bulletin
ASAP	As Soon as Possible
ATM	Automated Teller Machine
AWOL	Absent Without Official Leave
BASIC	Beginner's All-Purpose Symbolic Instruction Code (computer language)
B.S.A.	Boy Scouts of America
CAT	(scan) Computerized Axial Tomography
CD	Certificate of Deposit; Compact Disc
CFC	Chlorofluorocarbon

CIA	Central Intelligence Agency
COD	Cash on Delivery; Collect on Delivery
CPA	Certified Public Accountant
CPR	Cardio Pulmonary Resuscitation
CRT	Cathode Ray Tube
CST	Central Standard Time
DA	District Attorney
DC	Direct Current; District of Columbia
DDS	Doctor of Dental Surgery
DDT	Dichlorodiphenl Trichloroethane
DNA	Deoxyribonucleic Acid
DST	Daylight Savings Time
DVD	Digital Video Disc; Digital Versatile Disc
ECG or EKG	Electrocardiogram
EEG	Electroencephalogram
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
ERA	Earned Run Average; Equal Rights Amendment
ESP	Extrasensory Perception
EST	Eastern Standard Time
FAX	Facsimile
FBI	Federal Bureau of Investigation
FCC	Federal Communications Commission
FDA	Food and Drug Administration
FDIC	Federal Deposit Insurance Corporation
FFA	Future Farmers of America
FHA	Future Homemakers of America; Federal Housing Administration
FM	Frequency Modulation
FTC	Federal Trade Commission
GNP	Gross National Product
GOP	Grand Old Party
GPA	Grade Point Average
HMO	Health Maintenance Organization
HUD	Housing and Urban Development (Department of)
IBM	International Business Machines
ICC	Interstate Commerce Commission
IQ	Intelligence Quotient
IRA	Individual Retirement Account
IRS	International Trade Organization

IV	Intravenous
KKK	Klu Klux Klan
LASER	Light Amplification by Stimulated Emission of Radiation
LED	Light Emitting Diode
LPN	Licensed Practical Nurse
MADD	Mothers Against Drunk Driving
MASH	Mobile Army Surgical Unit
MB	Megabyte
MC	Master of Ceremonies
MIA	Missing in Action
MPH	Miles Per Hour
MRI	Magnetic Resonance Imaging
MS	Multiple Sclerosis
NAACP	National Association for the Advancement of Colored People
NAFTA	North American Free Trade Association
NASA	National Aeronautics and Space Administration
NASCAR	National Association of Sports Car Racing
NASDAQ	National Association of Securities Dealers Automated Quotation System
NATO	North Atlantic Treaty Organization
NBS	National Broadcasting Service
NCAA	National College (Collegiate) Athletic Association
NFL	National Football League
NHL	National Hockey League
NLRB	National Labor Relations Board
NOW	National Organization for Women
OPEC	Organization of Petroleum Exporting Countries
PBS	Public Broadcasting Service
PA	Public Address
PC	Personal Computer
PGA	Professional Golf Association
PIN	Personal Identification Number; Police Information Network
PLO	Palestine (Palestinian) Liberation Organization
POW	Prisoner of War
PST	Pacific Standard Time
PTA	Parent Teacher Association
PVC	Polyvinyl Choloride
RADAR	Radio Detecting and Ranging
RAM	Random-Access Memory
RFD	Rural Free Delivery

R.I.P	Requiescat in pace (Latin, rest in peace)
RN	Registered Nurse
ROM	Read-Only Memory
ROTC	Reserve Officers' Training Corps
RPM	Revolutions Per Minute
RR	Railroad
RSVP	Please Reply (repondez, s'il vous plait)
SADD	Students Against Drunk Driving
SAT	Scholastic Assessment Test
SBA	Small Business Administration
SCUBA	Self-Contained Underwater Breathing Apparatus
SOS	Save Our Ship
SPF	Sun Protection Factor
TVA	Tennessee Valley Authority
TWA	Trans World Airlines
UFO	Unidentified Flying Object
UHF	Ultra High Frequency
UN	United Nations
UNESCO	United Nations Educational, Social, and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund (now United Nations Children's Fund)
UPS	United Parcel Service
USAF	United States Air Force
USDA	United States Department of Agriculture
UV	Ultraviolet
VA	Veterans Administration
VFW	Veterans of Foreign Wars
VHS	Video Home System
WAC	Women's Army Corps
Y.M.C.A	Young Men's Christian Association
Y.W.C.A	Young Women's Christian Association
ZIP	Zone Improvement Plan (United States Post Office Zip Code)
3M	Minnesota Mining and Manufacturing

ABBREVIATIONS

adj.	Adjective
adv.	Adverb
Adm.	Admiral
A.M.	ante meridiem (Latin, before noon)
Amb.	Ambassador
anon.	Anonymous
Atty.	Attorney
Ave.	Avenue
B.C.	Before Christ
Bldg.	Building
Blvd.	Boulevard
bu.	Bushel
C	Celsius, Centigrade
Capt.	Captain
cm	Centimeter (s)
Co.	County or Company
Col.	Colonel
cont.	Continued
Corp.	Corporation
cu.	Cubic
dept.	Department
Dist.	District
doz.	Dozen
Dr.	Doctor
Dr.	Drive
e.g.	exempli gratia (Latin, for example)
Ens.	Ensign
etc.	and the others; and so forth (et cetera)
ex.	Example
Expy.	Expressway
F.	Fahrenheit
fl. oz.	Fluid ounce
ft.	Foot; Feet
Ft.	Fort
g	Gram (s)
gal.	Gallon (s)
Gen.	General
Gov.	Governor

hdqs.	Headquarters
Hon.	Honorable
HP	Horsepower
hr.	Hour
Hwy.	Highway
ibid.	in the same place (ibidem)
in.	Inch (es)
Inc.	Incorporated
Is.	Island
Jr.	Junior
kg	Kilogram (s)
K	Kelvin
km	Kilometer (s)
L	Liter
lb.	Pound (s)
loc. cit.	Loco citato (Latin for: in the place cited)
Lt.	Lieutenant
M	meter (s)
Maj.	Major
M.D.	Doctor of Medicine
Messrs.	(Plural of Mrs. And Mme.)
mgr.	Manager
mi.	mile (s)
misc.	miscellaneous
mm	millimeter (s)
Mme.	Madame
Mmes.	(plural of Mrs. and Mme.)
Mr.	Mister
Mrs.	Madame
Ms.	Social title for a single or married woman
Mt.	Mountain or Mount
Natl.	National
no.	Number
op. cit.	In the work cited (opere citato)
oz.	Ounce (s)
pd.	Paid
Pen.	Peninsula
pH.	Measure of acidity or alkalinity
Ph.D.	Doctor of Philosophy
pk.	Peck

Pk.	Park, Peak
Pkwy.	Parkway
pl.	Plural
P.M.	Afternoon (post meridiem)
ppm	parts per million
prep.	Preposition
Pres.	President
Prof.	Professor
pron.	Pronoun
pt.	Pint (s); part
Pt.	Point
Pvt.	Private
qt.	Quart (s)
Rd.	Road
Rep.	Representative
Rev.	Reverend
R.R.	Rural Route
Rte.	Route
Sec.	Secretary or second (s)
Sen.	Senator
sq.	Square
Sr.	Senior
Sgt.	Sergeant
St.	Street
Supt.	Superintendent
syn.	Synonymous
Terr.	Territory
Treas.	Treasurer
tbsp.	Tablespoon (s)
tsp.	Teaspoon (s)
U.K.	United Kingdom
Univ.	University
Xmas	Christmas
yd.	Yard (s)
yr.	Year

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STUDY GUIDE: COOKING

Basic Cooking Terms

Bake	To cook in an oven.
Bake Blind	To bake a pastry shell without any filling.
Baste	To moisten foods while they are cooking by brushing them with butter, juice from the meat, or other sauces.
Beat	To stir quickly with an electric mixer, spoon, or whisk, thus creating a fluffier mixture due to the air that is added.
Blanch	Food is dropped first into boiling water, and then plunged into cold water.
Blend	To thoroughly mix ingredients with a whisk or a blender.
Boil	To heat a liquid to approximately 212 degrees until bubbles come to the surface.
Bone	To remove the bones from a piece of meat.
Braise	Meat is browned, and then cooked slowly in a small portion of liquid in a covered pan.
Bread	Food is dipped into a sticky liquid, such as eggs, and then coated with cracker crumbs, breading, or flour.
Broil	To cook under direct heat from a broiler.
Butterfly	To cut a food partially down the center, but not all the way through, so it can be spread outward like the wings of a butterfly.
Carmelize	To put sugar on top of a dish, and then melt it using high heat.
Churn	Cream is separated into solids and liquids by agitating it, resulting in butter.
Combine	To stir two ingredients together until they are blended.
Core	To remove the central pit or seeds from fruit.
Cream	To beat a substance such as butter or sugar until it is smooth and fluffy.
Crimp	To create finger indentations on the outer edge of a piecrust, thus sealing the upper and the lower crusts together.
Cube	To cut foods, such as meat or cheese, into small squares.
Curdle	This is a process that's used to separate milk into curd (a solid) and whey (a liquid). It can be done by adding vinegar or lemon juice to the milk, or by just boiling the milk.
Cure	A method of food preservation that involves smoking or salting the food.

Cut In	To add a solid ingredient, such as butter, to a dry mixture until they combine.
Degrease	To skim off the fat from the surface of a liquid.
Dice	To chop into pieces measuring about $^1/_8$ or $^1/_4$ inch.
Dollop	To drop a spoonful of soft food, such as whip cream, onto another food.
Drizzle	To pour a slow stream of liquid over food.
Dust	To lightly sprinkle with a substance such as sugar or flour.
Fillet	To remove the bones from a piece of meat.
Flute	To make indentations in food, such as a piecrust, for decoration.
Fold In	To combine a light fluffy substance with a thick mixture by lifting the mixture up and over repeatedly.
Fry	To cook in hot fat.
Garnish	To make a dish more attractive by adding an accent, such as parsley, to the plate.
Glaze	To coat food with a shiny substance.
Grate	To shred a substance by rubbing it against a sharp, serrated metal object.
Grill	To cook over direct heat, as on a barbecue.
Hull	To remove the husks or stems from fruits and vegetables.
Julienne	To cut foods into slender matchstick-sized pieces.
Knead	To work dough with the hands.
Marinade	To soak meat in a seasoned mixture to flavor and tenderize it.
Mince	To cut up into miniscule pieces.
Parboil	To partially cook food by boiling it for a short time.
Pare	To cut away the outer skin of a fruit or vegetable.
Peel	To remove the skin or rind of a fruit or vegetable.
Pit	To remove the seeds from fruits or vegetables.
Poach	To cook in a simmering liquid.
Punch Down	To remove the air trapped within dough by pushing the dough downward.
Puree	To make food smooth by using a food processor.
Sauté	To cook over high heat in fat.
Score	To cut slits in meat or other food to make it cook faster and appear more attractive.
Sear	To quickly brown the sides of a piece of meat on high heat, thus sealing in the juices.
Shuck	Often referring to oyster shells or corn husks, this means to remove the outer covering.
Sift	To pass dry ingredients, such as flour, through a strainer to remove lumps.
Simmer	To cook slowly in a liquid that's close to boiling.
Skim	To remove the fat from a liquid's surface.
Steam	To cook above boiling water, using the vapor to cook the food.
Steep	To soak in a liquid, such as soaking tea leaves in hot water.
Stir-fry	To cook small bits of food quickly over high heat in some fat.
Strain	To use a colander to separate solids from liquids.
Truss	To tie or pin the wings and legs to the body of a piece of poultry.
Whip	To beat quickly with a mixer or whisk, thus adding air and enhancing the volume.
Whisk	To beat with a hand-held wire whip.

Other Terms You Should Know

A la mode	Pie served with ice cream; served in a stylish fashion.
Amandine	A French term given to dishes that contain almonds.
Ambrosia	Chilled oranges and bananas with coconut.
Au Gratin	A casserole dish topped with cheese, butter, or bread crumbs.
Au Lait	In French, this translates as "with milk."
Baking Powder	A leavening agent that causes a rising action.
Baking Soda	A leavening agent that causes a rising agent. It also eliminates food odors in a refrigerator.
Batter	The uncooked mixture that is the base for most baked goods.
Bisque	A creamy soup made from seafood.
Borscht	This dish comes from Russia and Poland and is a hot or cold soup consisting of beef, beets, or other meats and vegetables. It is usually topped with sour cream.
Bouillabaisse	A French stew served over French Bread. Ingredients include fish, shellfish, onions, tomatoes, white wine, garlic, and other spices.
Bouillon	A flavorful broth that occurs when vegetables or meats are cooked in water. Bouillon forms a basis for many soups.
Broccoflower	This fun word refers to a hybrid vegetable halfway between a cauliflower and a broccoli.
Broth	This synonym for stock, refers to the liquid in which meats or vegetables are cooked.
Cacao	The tree from which seeds are harvested for chocolate and cocoa.
Caesar Salad	This salad actually originated in Mexico! It includes romaine lettuce, croutons, garlic, olive oil, lemon juice, anchovies, eggs, and Worcestershire sauce.
Cajun	Any spicy French Southern-style food typical of the Deep South.
Canola Oil	A Canadian oil that is low in saturated fats and is one of the healthier cooking oils.
Caviar	The eggs (roe) of the sturgeon fish.
Chives	A flavorful herb with long hollow leaves that smell like onions.
Chowder	Any chunky soup, and not just clam chowder.
Clarified Butter	This is butter from which the milk solids have been removed. It's made by melting butter, and then skimming off the solids.
Cobbler	Fruit covered with biscuits or piecrust and then baked.
Coleslaw	Chopped up cabbage (red or white) that's mixed with either mayonnaise or vinaigrette. Other vegetables, such as carrots, celery, peppers, or onions are sometimes added.
Compote	A fruit dessert that has been chilled after being cooked in syrup.
Cream of Tartar	This is a powdery, acidic substance found lining wine barrels. It is used to add cream to frosting and volume to egg whites before beating them.
Dough	A firm thick mixture of flour and other ingredients that can be kneaded into baked goods.
Fermentation	A chemical change that occurs during the production of cheese, wine, or yogurt.
Fiber	The part of plant food that cannot be digested by the human body.
Florentine	A French term that refers to dishes containing spinach.

Garbanzo beans	Also known as chickpeas, these large peas are indigenous to the Mediterranean area, India, and the Middle East.
Giblets	The neck, liver, gizzard, and heart of poultry.
Horseradish	A hot, white condiment used primarily on meat and fish.
Meringue	Stiff, foamy egg whites that have been beaten with sugar and put above the pudding portion of a soft pie.
Roux	Melted fat and flour that is used to thicken sauces or soups.
Shortening	A solid fat made from whipped, partially hydrogenated vegetable oil. Crisco is the best-selling shortening on today's market.
Tabasco Sauce	A very spicy sauce made from Tabasco pepper, salt, and vinegar.
Thyme	A minty, lemony herb used to spice vegetables, meats, and soups.
Unleavened	Any baked goods that contain no leavening products such as yeast, baking powder, or baking soda.
Vanilla	A bean that comes from orchids and is used to flavor sweets.
Veal	Meat from any calf younger than three months of age.
Vichyssoise	A creamy soup made from potatoes and leeks that is typically topped with chives and served cold.
Vinaigrette	A salad dressing made from oil and vinegar.
Yeast	A fungus that helps ferment foods.
Zwieback	This German bread is twice-baked, and therefore easier to digest.

Words and Foods We've Borrowed

Asian

Dim sum	Small portions of Chinese food such as steamed dumplings, rice balls, or chicken.
Kimchi	A type of fermented vegetable, consisting of cabbage or radishes, that is standard at any Korean meal.
Tempura	Deep fried fish or vegetables in Japanese cuisine.
Tofu	This popular Asian food is also popular among vegetarians! It is bean curd made from curdled soy milk.
Wasabi	This green condiment is the Japanese version of horseradish.
Won Ton	This is a Chinese appetizer. It is a dumpling stuffed with meat, vegetables, or seafood, and is then fried, steamed, or boiled.

Italian

Al Dente	Literally, "to the tooth," this describes the elasticity of pasta.
Alfredo	This sauce made from butter, cream, parmesan, and pepper, is often served over fettuccini and other pastas.
Angel Hair	Very thin strands of pasta.
Bruschette	Originally, this referred to toast dipped in oil and garlic. Now it sometimes features additional toppings such as tomatoes or mushrooms.
Calzone	A turnover made from pizza dough, folded over itself, and then baked or fried. It is often stuffed with tomatoes, mozzarella or fresh ricotta, and salami.
Cannelloni	This type of pasta is large and hollow and usually stuffed.
Cappuccino	An Italian espresso coffee drink containing steamed milk foam.

Fettuccini	Flat, wide noodles; a type of pasta.
Focaccia	A round, flat bread that is slathered in olive oil, salt, and herbs and then baked.
Marinara	A popular pasta sauce made from tomatoes, onions, garlic, and oregano.
Ravioli	Square-shaped pasta stuffed with meat or cheese.
Ricotta	An Italian cheese resembling cottage cheese that is used in lasagna, manicotti, or other stuffed pastas.
Tortellini	Round pasta stuffed with meat, cheese, and other spices.
Zuppa	The Italian word for soup.

Mexican

Arroz	In Spanish, this word means rice.
Burrito	A large flour tortilla wrapped around a filling.
Caliente	The Spanish word for food that is hot.
Carne	This Spanish word for meat typically refers to beef. Chili con carne is chili that contains beef.
Enchilada	A corn tortilla dipped in red chili sauce, rolled around a filling, and topped with sauce and cheese.
Fajitas	This dish comes from Mexico and consists of meat strips that are fried with peppers and onions. It is served alongside tortillas with guacamole, sour cream, and lettuce or other vegetables.
Frijoles	The Mexican word for beans.
Gazpacho	Tomato and vegetable soup served cold.
Guacamole	An avocado mixture used as a condiment in Tex-Mex dishes.
Jalapeno	The most commonly used "hot" pepper in Tex-Mex cooking.
Pollo	A Spanish word that refers to chicken.
Quesadilla	Grilled cheese inside a folded tortilla.
Tortilla	A flat bread made from corn or wheat flour.
Tostada	A fried corn tortilla topped with beans, shredded beef or chicken, lettuce, tomatoes, cheese, avocado and salsa.

Cooking Utensils and Tools

Casseroles	Baking dishes used for main entrees that are cooked in the oven.
Colander	A bowl with holes and legs that is used to strain or drain foods.
Crockpot	Also known as a "slow-cooker," this is an electric-operated pot that cooks foods for a long time period at a lower temperature so the chef can leave the cuisine unattended.
Double Boiler	One saucepan set inside another, so the bottom can be filled with water and the top pan can be filled with the food.
Frying Pan	A low-sided skillet used for frying, sautéing, and pan broiling.
Griddle	A flat pan used for grilling sandwiches or pancakes.
Ladles	Deep dippers used to dip up soup or stew.
Loaf pan	A rectangular pan used for baking a loaf of bread or a meatloaf.
Paring Knife	A small, sharp knife used for cutting and peeling vegetables.
Pastry cloth	A piece of plastic or canvas that's placed on a countertop or table and dusted with flour before the dough is rolled onto it.
Rolling pin	A round wooden tool used to flatten dough.

Sauce pans	Pans with handles that hold from one to four quarts and are used when cooking food on top of the stove.
Skewers	Stainless steel, wood, or bamboo sticks used to hold together small pieces of food when grilling.
Spatula	A rubber tool used to scrape or fold ingredients. Also, a metal or plastic tool used to flip hamburgers and other foods while cooking.
Stockpots	Tall, deep pots with tight-fitting lids that are used for cooking stews, soups, pasta, and vegetables.
Tube pan	A round, deep pan with a tube in the middle, that's used for baking an angel food cake.
Wok	This is used for cooking Asian foods, such as stir-fry, or for deep fried foods.

Serving styles, terms, and accessories

Buffet	A meal in which all the food is placed in serving bowls on one large table and the diners serve themselves.
Centerpiece	A decoration placed in the center of a table.
Family Style	A meal in which diners sit around a table, and the food is passed in serving bowls from diner to diner.
Flatware	The knives, forks, and spoons used for eating.
Gratuity	A tip given to a server in a restaurant or café for good service.
Manners	The way you behave around other people; rules for proper dining.
Menu	The list of foods offered by a restaurant or eating establishment.
Place Setting	The arrangement of the tableware for each diner.
Table Service	Restaurant service where servers bring the food to the table.
Smorgasbord	A buffet that was originally introduced in America by the Swedish settlers.

Cooking Conversions

1 dash = approximately $^{1}/_{16}$ a teaspoon, but isn't formally measured.
1 Tbs. = 3 tsp. (or 16 mL)
2 Tbs. = 1 fl. oz.
16 Tbs. = 1 cup
1 cup = 8 fl. oz.(or 225 mL)
2 cups = 1 pint (or 450 mL)
4 cups = 1 quart
16 cups = 1 gallon
1 oz. = 28.4 g
1 lb. = 454 g
1 kg = 2.2 lbs.

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STUDY GUIDE: INDUSTRIAL ARTS: CARPENTRY AND WOODWORKING

Specialized Fields of Carpentry

1. Rough Carpenters: These skilled tradesmen construct the framework for buildings. They work from architectural blueprints and also make repairs and additions to homes and other buildings.

Rough carpenters also assist in the construction of highways, dams, and bridges. They provide the molds for the poured concrete, the scaffolding used when building tall structures and other temporary buildings used at construction sites. They also work on docks and railroad trestles.

2. Finish Carpenters: These craftspeople specialize in the installation of millwork. Millwork consists of the interior parts of buildings such as doors, moldings, casings, cabinets, and the hardware that accompanies them. They add the finishing touches to a building, such as laying the hardwood floors and applying weather stripping to door frames and windows for airtight and watertight seams.

3. Maintenance Carpenters: These carpenters perform both rough and finish work. They keep buildings and equipment in good condition. They also perform small carpentry jobs, such as building benches, counters, or small tool sheds.

4. Ship Carpenters (Shipwrights): These skilled workers construct the foundations for large ships. They lay the deck and complete the interior work to finish the ship. They also work on smaller pleasure boats. Some ship carpenters repair damaged vessels.

5. Cabinetmakers: These craftspeople create artistic masterpieces in furniture and household cabinets. They design, shape, and assemble these items. Some specialize in cutting, fitting, and joining wood to make stairs, tabletops, and other items. They are called joiners. Some work for furniture manufacturers, and others work for companies who make millwork such as doors, windows, and moldings.

Carpentry Skill Levels

Apprentice: This person learns a trade by working under the supervision and guidance of a professional. Apprenticeships usually include on-the-job training as well as classroom training. There are apprenticeship programs at technical and vocational schools. An apprentice receives periodic wage increases and evaluations of their progress. A good knowledge of math, reading, and basic science is necessary to complete an apprenticeship program.

Journeyman: At the completion of apprenticeship training, an individual is certified as a journeyman or skilled carpenter.

Tools

Nails: Nails come in a variety of sizes and shapes that are each designed for a specific purpose.

1. **Common Wire Nail**: A steel nail with a flat head used for general work.
2. **Box Nail**: This nail has a smaller diameter than the common nail and is less likely to cause wood to split.
3. **Finishing Nail**: This nail is made from a finer wire and has a smaller head. It is driven just below the surface of finish work and cabinetry work. A small finishing nail is called a wire brad.
4. **Casing Nail**: This nail has a larger head than the finish nail. Although it's more obvious, it holds the wood more firmly.
5. **Galvanized Nail**: This zinc coated nail resists rusting, and is used for outdoor construction.
6. **Scaffold or Form Nail**: This nail has two heads that enable it to be pulled out easier once it has served its purpose.
7. **Roofing Nails**: These shorter nails with wider heads are made to endure long periods of exposure to weather.

Bolts: Bolts are often confused with screws since they also have ridges called threads. However, the bottom area of a bolt is flat instead of pointed, and bolts are often heavier and more durable. They are used with nuts to hold or connect two pieces of wood or other material. There are different styles and sizes of bolts, including the carriage, machine, and stove bolts. The expansion bolt is used in a wall. A shield expands when the bolt is driven into a wall to provide a secure base.

Measuring and Layout Tools: These tools help the carpenter prepare wood for cutting and construction before the actual work is done.

1. **Steel Tape Measure**: This metal tape measure is usually marked in feet and inches, and it is used for measuring distance. The metal tape, called the blade, retracts into a steel casing when not in use.

2. **Combination Square**: This is a flat, metal ruler and a handle with a built-in level. The adjustable handle can be used to mark 90° and 45° angles.

3. **Chalk Line**: This white string is coated with chalk. It is stretched tightly between two points. The line is then snapped against the surface and leaves a straight line of chalk to guide the carpenter. A chalk line can be used on the ground, floors, walls, or roofs.

4. **Tracing Tape (Layout Line)**: Tracing tape is cotton tape wound on a stick. It's used to lay out long excavation or foundation lines.

5. **Carpenter's Level**: This rectangular metal device contains cylinders of liquid. A bubble within the liquid indicates how level a surface is. If the surface is level, the bubble will appear in the center of the transparent cylinder.

6. **Straight Edge**: A straight edge resembles a ruler. It is used when drawing a straight line, or it is placed is on the work itself to test if the surface is level.

7. **Line Level**: This device is suspended from a line and contains a moving bubble in liquid. The bubble must be in the center to determine if the surface is level.

8. **Framing Square**: This metal tool is shaped like an upside-down "L" and is used to lay out 90° angles.

9. **T-bevel**: This device has a metal blade attached to a wooden handle by an adjusting screw. It is used to measure an angle. The angle measurements are then transferred to a piece of wood to be cut to fit the angle.

10. **Multiple Folding Rule**: This six-foot, measuring device is a long-hinged ruler that can be folded for easy storage.

11. **Scratch Awl**: This sharp, pointed object with a spherical handle is used to scratch a fine line or design on a piece of wood. The carpenter then follows this line when cutting.

Saws: Saws are tools that are used for cutting wood and metal. The metal cutting portion of any saw is called the blade.

1. **Handsaw**: This saw has a long, tapered, steel blade with a handle at one end. The narrow end of the blade is called the point or toe. The end of the blade closest to the handle is called the heel.

2. **Crosscut Saw**: This saw has a blade with sharp, pointed teeth and is used for cutting against the grain of wood.

3. **Ripsaw**: This bladed saw has angled teeth for cutting along the grain of wood.

4. **Keyhole Saw**: This narrow-bladed saw is used to enter holes as small as ¼-inch.

5. **Coping Saw**: The thin, flexible blade on this saw is designed to cut curves. The blade is held tight by a C-shaped, spring frame with adjusting pins and can be replaced when it is dull.

6. **Plumber's Saw**: This saw has a heavy blade with fine teeth and is used to cut through nails or soft metals.

7. **Hacksaw**: This rectangular saw has interchangeable blades used for cutting harder metals such as brass, steel, and cast iron.

8. **Circular Saw**: This power tool is used for creating fast, straight cuts in wood. Special-purpose blades allow the saw to cut metal, plaster, and concrete. A locking base plate moves to adjust the blade depth and also rotates for bevel cuts.

9. **Jig Saw**: This handheld power tool is good for cutting curves in wood. This tool has different styles of blades for cutting different materials.

Hammers

1. **Claw Hammer**: The hammer has a steel head on top of a wooden handle and is used to drive nails. It has a curved claw at one end of the head used to pull out nails. The flat "face" is at the other end of the head. The 16-ounce, curved claw hammer is the most frequently used hammer.

2. **Bell-faced Hammer**: This hammer is similar to the claw hammer except the "face" is rounded, allowing the hammer to drive a nail flush with its surface without leaving a hammer mark.

3. **Tack Hammer**: This hammer has a small, thin, magnetic head and is used to drive nails or tacks that are too small to hold.

4. **Mallet**: This tool has a plastic or rubber head and is used to drive wood chisels.

5. **Nail Set**: This tool is used to push a nail head just below the surface. The tip of the nail set is placed on the nail head and then struck with a hammer until the nail is below the surface. When this is done, a carpenter can then conceal the nail and hole with putty.

Prying Tools: Most pry bars have a curved claw at one end and a chisel-shaped tip at the other end. The claw is used to pull out nails, and the tip is used for prying work.

Wrecking Bar (Crowbar): This strong, metal bar is curved slightly at both ends and is used for demolition and heavy prying work.

Files and Rasps: These scraping tools are made of steel bars and covered with tiny teeth used to shape and smooth wood. The teeth grate against the wood and leave a smooth finish.

Files are long, steel bars with rows of fine teeth.
Rasps are long, steel bars with spaced teeth.

Planes and Chisels

Plane: This is a flat, cutting blade that is housed in a steel base and is used to smooth rough surfaces. It can also be used to shave wood to reduce the width or length of a piece. The blade is set at an angle so that the depth of the cut can be varied by changing the distance the blade protrudes from the plane. A smoothing plane is 9 inches long.

A jack plane is 14 inches long. The jointer plane is 20 to 24 inches long. The block plane is the shortest.

Wood Chisel: A wood chisel is a tool with a wooden or plastic handle and a flat steel cutting blade. It cuts with light hand pressure or by tapping the end of the handle with a mallet. There are different types, shapes, weights, and thicknesses depending on the job they need to perform. Some common types include the socket firmer chisel, tang paring chisel, mortising chisel, and butt chisel.

Drills and Bits

1. **Power Drill**: This electrical device is used for cutting holes in surfaces. Different sized bits are placed in the drill chuck to create holes.

2. **Hand Drill**: This manually powered drill is used for fine woodworking or when electricity is not available. There are two types of hand drills, the eggbeater and the spiral ratchet.

3. **Twist Drill Bit**: This bit is made from high-speed or carbon steel that is fluted and then twisted. It can be used to drill both wood and metal.

4. **Spade Drill Bit**: This bit has a sharp point at the end that extends into a flat-edged cutter. It is used to cut wood holes quickly and accurately.

5. **Extractor Drill Bit**: This bit is used to remove a screw with a worn or broken head.

6. **Bit Brace**: This tool holds auger bits and is also used to drill holes. At the top is the head, the middle is the handle and the end is the chuck where the bits are placed. The brace may be positioned vertically or horizontally while the handle is turned.

Screwdrivers and Screws

Screwdriver: This basic tool is used to twist a screw into a surface. A screwdriver has three main parts: the handle, the shank, and the blade. The handle is what the carpenter grips. The shank is the steel part that extends from the handle. The blade is the end that fits into the screw head. Screwdrivers range in length from 2 ½ to 12 inches.

1. **Stubby Screwdriver**: It has a very short handle. The shank and blade are used for cramped spaces.

2. **Cordless Power Screwdriver**: It has exchangeable bits for slot and Phillips screw heads and saves time and effort.

3. **Slotted Head Screwdriver**: This is the standard screwdriver.

4. **Phillips Screwdriver**: A pointed, grooved blade made to fit a Phillips screw.

Screws: Screws are usually made from iron or brass, and they are categorized by length, slot style, head shape, and thickness. The most common are the round, flat, and oval head screws. Some screws may have a slotted head, and others may have the Phillips head, which has a cross-shaped slot.

Vices and Clamps: Both of these devices are used for holding materials in place while performing a woodworking operation.

1. **Carpenter's Vise (Woodworker's Vise)**: It has long, wide jaws and is attached permanently to a workbench. It is used to hold material for cutting, shaping, or sanding.

2. **C-clamp (Carriage Clamp)**: This metal tool is shaped like a "C," and it is used to hold a piece of wood flat against a surface, or to hold two pieces of wood together.

3. **Three-way Clamp**: This is a metal tool with three thumbscrews that are used to hold materials.

4. **Pipe or Bar Clamp**: These clamps have two jaws on either side of a long pipe or bar that can easily slide towards one another to hold objects together. They are used for connecting larger pieces of wood.

Sanding: Sandpaper and belt sanders are used to smooth and shape wood. Belt sanders are usually used for larger pieces needing the fast removal of material. Sandpaper used manually or wrapped around a sanding block is used for a finer finish.

Router: This high-speed power tool is used to cut decorative shapes, make grooves, and trim laminates by using interchangeable bits. Bits usually have a round pilot at the end, which rests along the edge of an object to control the movement of the cut. The following are some common router bits.

1. **Corner Rounding Bit**: Creates simple curved edges on furniture and wooden moldings.

2. **Ogee Bit**: Makes a decorative cut in wood and is used for wood moldings and for shaping the edges of furniture pieces.

3. **Rabbet Bit**: Cuts step-like edges and is used for woodworking joints and picture frame moldings.

4. **Straight Bit**: Creates a square groove and is used for woodworking joints or for free-hand routing.

5. **Dovetail Bit**: Makes a wedge-shaped groove that is used to make connecting joints for furniture and cabinetwork.

6. **Veining bit** – Cuts a curved groove and is used for free-hand, decorative carving and lettering.

Electric Stud Finder: This great tool locates studs inside walls and identifies both edges of the stud. The stud finder is slid across a wall, and a red light appears when the stud is located.

Pliers: These tools are used for cutting as well as for holding and gripping objects. Some common types of pliers include round-nosed, long-nosed, short-nosed, side-cutting, duck-billed, combination-jaw, diagonal, and curved-needle nosed.

Terminology

Carpentry and woodworking have a language all their own. The following is a list of some common terms used in the carpentry field.

Anchor: A specifically formed piece of metal used to fasten together pieces of wood.

Backing: The groove on the top edge of a hip rafter, which aids in a tight fit between the roofing board and the rafter.

Balloon Frame: A continuous line of studs and corner posts reaching from the first-floor line to the roof plate; this is also the most cost-effective type of construction.

Balustrade: A row of small pillars or columns connected by a rail used for porches and balconies.

Band: A molding that is flat and low.

Base: The area where the walls and floor meet.

Batten Board: A temporary framework that helps to locate the corners when laying a foundation.

Board: Wood that is less than two inches thick.

Braces: Devices attached to the angle of two pieces of wood in order to strengthen that angle.

Bracket: A metal support piece for a shelf.

Break Joints: The arrangement of joints so they do not overlap or go under adjoining shingles or siding.

Carriages: The supports for the steps and risers of a flight of stairs.

Casement: The part of the window where the glass framework opens with hinges.

Casing: Door or window trim; the finished wood around a post or beam.

Center-hung Sash: The glass framework of a window that is hinged in the center in order for the window to swing open horizontally.

Checks: The cracks in a board, usually caused by seasoning.

Clamp: A tool used to hold two or more items together.

Concrete: A mixture of cement and sand with gravel that is used as a building material.

Deadening: Construction materials that are used to soundproof an area.

Flashing: A material or process used to prevent water from leaking through roof intersections or other exposed areas on the outside of a house.

Flue: An opening in a chimney that allows smoke to escape.

Flush: A term that describes two adjacent surfaces that are even.

Footing: An extended area at the bottom of a wall or column that is used to support the load.

Foundation: The part of a building or wall that supports the entire structure.

Frame: The wood skeleton of a building; the surrounding woodwork of windows or doors.

Gable: The triangular area at the end of a building from the eaves to the top of the roof.

Girder: A piece of wood used as a support for wall beams.

Headroom: An open area between the ceiling and the floor, such as in a stairway.

Jamb: The side piece of an opening, such as the side portion of a doorframe.

Joint-butt: Two square ends of material that come together.

Joists: Pieces of wood that support the floorboards.

Kerf: Any cut in wood that has been made by a saw.

Laths: Thin pieces of wood used to support plaster.

Lattice: A criss-crossed design made from wood, bars, or iron plates.

Miter: A joint that is formed by two pieces of wood meeting and fitting together at an angle.

Pitch: A steady rise or slope, such as in stairs or roofs.

Plaster: A combination of lime, cement, and sand used to coat the outside and inside of walls.

Plow: The process of cutting a groove in a piece of wood parallel to the grain.

Post: A long, vertical piece of wood used as a support.

Riser: The vertical board between two stairs.

Sash: The part of the window framework that holds the glass.

Scab: A short piece of wood used to splice or hold two other pieces.

Scaffold: A temporary platform workmen use to reach high places on buildings.

Sheathing: The boards for walls or roofs; thin boards laid on the roof with spaces in between depending on the length of the shingles.

Sizing: Cutting materials to a specific size; or a layer of glue or shellac added to a surface to prepare it for painting or finishing.

Specifications: Instructions outlining the details of a building.

Stucco: A textured plaster used for interior decoration or for the outside of a building.

Stud: A vertical beam in the framework of a building.

Subfloor: A layer of wood between the floor joists and the finished floor.

Threshold: A beveled piece on the floor that a door swings over.

Tongue and Groove: The process of cutting the ends of boards in order to connect to other boards, similar to puzzle pieces.

Tread: The part of a step that is walked on.

Trim: Trim refers to the finished woodwork around doors, walls, windows, etc.

Vestibule: An enclosed entrance to a house.

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Artists, Actors, and Musicians

Allen, Woody
He is a famous comedian, actor, and director of films. His favorite character was that of an extremely intelligent, but neurotic, New Yorker.

Anderson, Marian
She was a famous contralto during the 1930's and 40's. She was the first black person to sing in the Metropolitan Opera.

Armstrong, Louis
This talented and popular trumpeter and singer was one of the greatest jazz performers of the 1920's. He was nicknamed "Satchmo." He's especially known for his rendition of "Hello, Dolly!"

Audubon, John James
This man is famous as an artist and an ornithologist. Educated in France, he later lived in Philadelphia and New Orleans. By the time of his death, he had completed over 400 paintings of birds, many of which were included in his book, *The Birds of America*. The Audubon Society is named after him.

Barnum, Phineas T.
Famous for his quote, "There's a sucker born every minute," he was a showman responsible for his traveling circus. Ultimately, his "Greatest Show on Earth" was the predecessor of the Ringling Brothers and Barnum and Bailey Circus.

Basie, Count
This famous American jazz pianist was popular during the 20th century.

Berlin, Irving
This man wrote many classic American songs. He also wrote music and lyrics for early musicals. His two most famous songs are "God Bless America," and "White Christmas."

Bernstein, Leonard
This composer and conductor is especially known for his work in musical theatre. He wrote the music for several plays, including "West Side Story," and directed the New York Philharmonic Orchestra for several years.

Cassatt, Mary
This American painter spent much of her life in France, where she borrowed and improved upon the concept of impressionism from many of her French colleagues. Her paintings frequently dealt with mothers and their children.

Cohan, George M.
He wrote many of America's patriotic songs, including the upbeat "You're a Grand Old Flag," and "Yankee Doodle Dandy."

Crosby, Bing
This singer and actor reached the height of his popularity in the 1930's through the 1950's. During that time, he appeared in 58 films and made 1,000 recordings, Most people associate his voice with Irving Berlin's "White Christmas."

Disney, Walt
His concepts of animated characters formed the basis for many lucrative movies as well as the still-popular theme parks, Disneyland and Disneyworld. Mickey Mouse, Donald Duck, and Minnie Mouse are just a few of his original characters.

Dylan, Bob
This 1960's folk singer wrote several popular songs based upon controversial social and political issues of the decade. "Blowin' in the Wind" is one of his more popular pieces.

Ellington, Duke
He was an American jazz composer, songwriter and band leader during the twentieth century.

Fitzgerald, Ella
She was a popular jazz singer. Many of her songs were written by such talented songwriters as Irving Berlin, George Gershwin, Cole Porter, and Duke Ellington.

Garbo, Greta
Born in Sweden, this American actress rose to fame on the screen.

Goodman, Benny
This jazz clarinetist was nicknamed "The King of Swing."

Guthrie, Woody
This early folk singer and songwriter wrote socially relevant lyrics and music, and is especially known for the song, "This Land is Your Land."

Hammerstein, Oscar

He is well known as the lyricist for multiple Broadway musicals. He often teamed with Richard Rodgers. Hammerstein wrote the lyrics, and Rodgers composed the music.

Hepburn, Katharine

This esteemed actress was initially labeled "box office poison" by Hollywood in 1938. She rose to fame in roles starring with Cary Grant and Humphrey Bogart, and won four Academy Awards for her performances on the screen.

Hope, Bob

This long-lived American comedian is known for his work in films and for his dedication in entertaining the American troops abroad.

Houdini, Harry

He is famous for his entertaining exploits as a magician and escape artist.

Key, Francis Scott

This man wrote the words to "The Star Spangled Banner."

Miller, Glenn

He was a bandleader and composer in the 20th century.

Monroe, Marilyn

Still adored, this actress rose to fame as a film icon and sex symbol in the 1950's.

Moses, Grandma

This self-taught artist was in her seventies when she started to paint seriously. Her pictures are set in rural America, and follow the style of primitivism.

Pollack, Jackson

He was notorious in America for his colorful abstract paintings. Sometimes he just poured paint onto a canvas and swirled it around to create a design.

Presley, Elvis

He was one of the first musicians to popularize rock 'n roll, and became known as "The King."

Rockwell, Norman

His illustrations of small-town life in the U.S. are still popular today. Many of his paintings were originally done for the cover pages of "The Saturday Evening Post."

Rodgers, Ginger

This American movie star is best known for her dancing roles opposite Fred Astaire.

Rodgers, Richard

He composed the music for many famous musicals. He often collaborated with Oscar Hammerstein. Some his best known musicals are "Oklahoma," "The Sound of Music," and "The King and I."

Rogers, Will

This prominent actor began his career as an entertainer in wild west shows. He became famous for his persona of the blunt cowboy. He's often associated with the quotes, "I never met a man I didn't like," and "All I know is just what I read in the papers."

Sousa, John Philip

This bandmaster from the late 1800's and early 1900's, is best known for his stirring marches, such as 'The Stars and Stripes Forever." The sousaphone was named after him, and he has been nicknamed "The March King."

West, Mae

She is best known for her seductive roles in mid-twentieth century American movies, and for her role opposite W. C. Fields in "My Little Chickadee."

Authors

Angelou, Maya

She is a twentieth-century American author of many books that were based around her personal experiences while growing up as a black girl in America. She shares her complete autobiography in *I Know Why the Caged Bird Sings.*

Clemons, Samuel

This author, otherwise known as Mark Twain, set many of his tales along the Mississippi River. Two of his most famous characters are Tom Sawyer and Huckleberry Finn.

Eliot, T.S.

This author is well known for poetry, prose, plays, and books. His poetry about cats was the inspirational basis for the 20th century musical, "*CATS.*"

Emerson, Ralph Waldo

This well-known essayist and lecturer of the 19th century pioneered the Transcendentalist movement within the U.S. and encouraged all Americans to rely on their own good judgment when making decisions.

Faulkner, William

This ambitious Southern writer wrote 19 novels, 80 short stories, 2 books of poetry, as well as some essays. His best-known books include *The Sound and the Fury* and *As I Lay Dying*.

Fitzgerald, F. Scott

This author's most popular book is *The Great Gatsby*.

Frost, Robert

This author is best known for his poetry, including the oft-quoted work, "The Road Not Taken."

Hawthorne, Nathaniel

Hawthorne wrote many books, including *The Scarlet Letter,* and *The House of the Seven Gables*.

Hemmingway, Ernest

This writer won the Nobel Prize for Literature in 1954. He is the author of numerous innovative novels, including *For Whom the Bell Tolls*, and *The Old Man and the Sea*.

Irving, Washington

This American author wrote "The Legend of Sleepy Hollow" and "Rip Van Winkle."

Longfellow, Henry Wadsworth

This man, esteemed in America as well as abroad, was the most popular poet of the 19th century. He is known for his long poems, including *The Song of Hiawatha*, and *Paul Revere's Ride*.

Melville, Herman

Melville is the much-celebrated author of *Moby Dick*.

O'Neill, Eugene

This eminent American playwright changed the face of American Theatre by writing plays with a tragic touch, including *Mourning Becomes Electra*, *Desire Under the Elms*, and *Long Day's Journey Into Night*. He won the Nobel Prize for Literature in 1936.

Poe, Edgar Allen

He is best known for his morbid and suspenseful short stories including "The Fall of the House of Usher," "The Pit and the Pendulum," and "The Raven."

Sandburg, Carl

This author is known for his poetry as well as his biographical accounts of Abraham Lincoln.

Stein, Gertrude
This American author spent much of her life in France. She is most often associated with her famous poetic line, "A rose is a rose is a rose."

Steinbeck, John
He wrote the novels, *The Grapes of Wrath,* and *Of Mice and Men.*

Stowe, Harriet Beecher
This woman is best known for *Uncle Tom's Cabin,* an anti-slavery novel.

Whitman, Walt
This American poet is best known for his collection, *Leaves of Grass.*

Williams, Tennessee
This author has written many plays, as well as some short stories, most of which focus on the crimes of the Deep South and the passions of maladjusted individuals.

Wright, Richard
He is the author of *Black Boy* and *Native Son,* which both focus on the black experience in the U.S.

Activists and Entrepreneurs

Carnegie, Andrew
This self-made immigrant became a leader in the steel industry. He donated much of his money to build libraries throughout the country and also constructed Carnegie Hall, the famous concert hall in New York City.

Chavez, Cesar
This non-violent activist labor leader led Mexican-Americans and formed the United Farm Workers Union. This Union held famous boycotts of grapes and lettuce during the 60's.

Ford, Henry
This industrial leader is famous for his Model T and the Ford Motor Company. He used the innovative assembly-line technique of production, which cut the cost of production and lowered the final price of the automobile.

Iacocca, Lee
This successful man is best known for saving Chrysler Corporation from financial devastation.

Lewis, John L.

This labor leader was best known for his long-standing term as the president of the United Mine Workers. He also founded the Congress of Industrial Organizations, which is better known as the CIO.

Nader, Ralph

This lawyer is well-known for calling attention to conditions that are unsafe for American consumers, especially dangerous automobiles and unsanitary food production.

Pierpont, Morgan J.

This man formed the United States Steel Corporation, which became the first billion-dollar corporation in the world.

Rockefeller, John D.

This businessman founded the Standard Oil Company. When he retired, he was the richest man in the world.

Vanderbilt, Cornelius

This businessman made his fortune in the railroad business.

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STUDY GUIDE:
MUSICAL COMPOSERS AND ERAS

MUSICAL PERIODS OR ERAS:

1. Baroque Period (1600 to 1750, 17th and early 18th centuries)
2. Classical Period (1750 to 1825, mid 18th to early 19th centuries)
3. Romantic Period, or Romanticism (19th century)
4. Impressionism (late 19th and early 20th centuries)
5. Modern (20th centuries)

The **BAROQUE** Period:

Major forms developed during this time were the oratorios, cantatas and fugues. Oratorios were concert productions based upon Bible stories, but without staging or costumes, as in an opera. "The Messiah" by Handel was an oratorio. Cantatas were vocal compositions for soloists and choruses, which were used in churches. In a fugue the subject was introduced by a solo voice (instrument) and then developed by many voices (instruments).

Most music of this time was religious in nature, and used the harpsichord as the major string instrument.

MAIN COMPOSERS: JOHANN SEBASTION BACH
GEORGE FREDERIC HANDEL

The **CLASSICAL** Period:

Music was still more instrumental than vocal, and still based upon religious text. The orchestra was larger than the Baroque orchestra and was divided into 4 distinct sections: strings, woodwinds, brass, and percussion. The string section predominated, followed by the woodwinds, which included flutes, oboes and bassoons. (Clarinets added later)

The harpsichord was no longer used. The piano was invented during this period.

Much music was written in SONATA form. This was music consisting of 3 distinct divisions. In the EXPOSITION, the two main contrasting themes were presented. During DEVELOPMENT, the themes were explored in different ways, and in the RECAPITULATION, the themes from the exposition were restated.

The string quartet was also started during this period. Music for the quartet was written for the first and second violins, the viola, and the cello. CHAMBER MUSIC was the name of music written for small ensembles such as the string quartet, and it became very popular.

MAIN COMPOSERS: FRANZ HAYDN
WOLFGANG MOZART

The **ROMANTIC** Period (ROMANTICISM)

Music of this time was based strongly on personal feelings and emotions. Composers were concerned with self-expression, and the music even suggested scenes. Many composers expressed love of their country (patriotism) in their music.

Melodies were long and had many changes in temp (speed), and contrasted between major and minor keys.

The orchestra was greatly enlarged and similar to our orchestra today. Instruments added during this period were: piccolo, English horn, bass clarinet, contrabassoon, 3 trombones, tuba, harp, trumpets, French horn, and a variety of percussion instruments. The string section was enlarged greatly. The piano was the favorite instrument of the composers.

MAIN COMPOSERS: FRANZ SHUBERT
LUDWIG VAN BEETHOVEN
GIOCCHINO ROSSINI
JOHANN STRAUSS
FELIX MENDELSSOHN
FREDERIC CHOPIN
ROBERT SHUMANN
FRANZ LISZT
JOHANNES BRAHMS
FRANZ LISZT

34. Air Conditioner	Willis H. Carrier
35. Optical Fibers	Peter C. Schultz
36. Cotton Gin	Eli Whitney
37. Steel Plow	John Deere
38. Barbed Wire	Joseph Glidden
39. First Grain Reaper	Cyrus McCormick
40. Electric Street Car	Thomas Edison
41. Microphone	Thomas Edison
42. Motion Pictures	Thomas Edison
43. Bifocal Lenses	Benjamin Franklin
44. Steamboat	Robert Fulton
45. Steam Locomotive	George Stephenson
46. Bicycle	James Staarley
47. Motorcycle	Gottlieb Daimler
48. Gasoline Automobiles	Charles and Frank Duryea
49. Escalator	Jesse W. Reno
50. Piano	Bartholomeo Cristofori
51. Vacuum Cleaner	J. Murray Spangler
52. Electric Battery	Count Allesandro Volta
53. Frozen Packaged Food	Clarence Birdseye
54. Teflon (for DuPont Corporation)	Roy J. Plunkett
55. Velcro	Georges de Mestral
56. Zipper	Whitcomb L. Judson
57. Dishwasher	Josephine Cochran

58. Matches	John Walker
59. Mercury Thermometer	Gabriel D. Fahrenheit
60. Mercury Barometer	Evangelista Torricelli
61. Pendulum Clock	Christian Huygens
62. Aqua Lung	Jacques Cousteau
63. Seed Drill	Jethro Tull
64. Spinning Jenny	James Hargreaves
65. Steam Engine	James Watt
66. Vulcanization (method of Making rubber resistant to heat and Cold)	Charles Goodyear
67. Drilled First Oil Well	Edwin Drake
68. Refrigerator	Karl von Linde
69. Railroad Car Air Brakes	George Westinghouse
70. Liquid Fuel Rocket	Robert Goddard
71. Nylon	Wallace Carothers
72. Xerox Copier	Chester Carlson
73. Television	Philo Taylor Farrnsworth
74. Disposable Safety Razor	King Camp Gillette
75. Electric Iron	Henry Seely
76. Washing Machine	Alva Fisher

MEDICAL INVENTIONS AND DISCOVERIES

1. X-Ray	William Roentgen
2. Stethoscope	Rene Laennec
3. Penicillin	Sir Alexander Fleming
4. Polio Vaccine	Jonas Salk
5. Insulin	Sir Frederick Banting
6. Ether	Crawford Long
7. Cardiac Pacemaker	Wilson Greatbatch
8. Artificial Heart	Dr. Robert K. Jarvik
9. Ambulance	Dominique Larrey
10. Discovered the bacteria that Causes tuberculosis and cholera	Robert Koch
11. Antiseptic Surgery	Joseph Lister
12. Anti-rabies Treatment	Louis Pasteur
12. First Human Liver Transplant (1963)	Dr. Thomas Starzl
13. First Human Lung Transplant (1964)	Dr. James Hary
14. First Human Heart Transplant (1967)	Dr. Christian Barnard

COMPANY AND GROUP INVENTIONS

1. Electric Toaster	General Electric Company (actually designed by Charles Strite for the company)
2. Word Processor	IBM
3. First Laser Printer	IBM

SCIENTIFIC DISCOVERIES AND CONTRIBUTIONS

1. Discovered Radioactivity	Antoine Becquerel
2. Theory of Relativity	Albert Einstein
3. Theory of Atomic Structure	Niehls Bohr
4. First Electron Microscope	Ernst Ruska
5. Discovered Radium	Marie Curie
6. Pasteurization of Milk	Louis Pasteur
7. Discovered Oxygen	Joseph Priestly

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STUDY GUIDE:
FAMOUS SCIENTISTS

Anthropologists:

Jane Goodall - This conservationist is known for her long-term observations of chimpanzees in their natural habitat. Her books, Wild Chimpanzees, In the Shadow of Man, and Reason for Hope tell about her studies and observations.

Louis Leakey - After graduating from Cambridge in 1926, this Kenyan anthropologist focused his research on early man, whom he believed developed in Africa. He published multiple books, including The Stone Age Cultures of Kenya Colony. He discovered one of the oldest Homo sapiens at Olduvai Gorge and the first Proconsul skull with a face at Rusinga Island. During World War II, he acted as a government spy in the Civil Intelligence and African Intelligence Departments.

Margaret Mead - One of the premier anthropologists, she observed multiple primitive tribes in Samoa firsthand, and authored the book, Coming of Age in Samoa. Her Samoan studies convinced her that personality is a product of culture rather than of genetics. She also studied the Arapesh in New Guinea, in which men and women assume equal roles in raising their children. She studied the Tchambuli culture, whose gender roles were the opposite of Americans. She published her findings on this group in Sex and Temperament in Three Primitive Societies. Her discoveries convinced her that sex roles were a product of cultural influences.

Astronauts:

Buzz (Edwin) Aldrin - This West Point graduate served in the Air Force during the Korean War, and then went back to school at MIT to obtain his credentials in aeronautics. He was active in NASA's Gemini Program, and became the second person to walk on the moon as the pilot of the Apollo 11 Lunar Module. He was awarded a Presidential Medal of Honor.

Neil Armstrong - After serving in the Navy in Korea, he obtained his aeronautic education at Purdue. He worked on the Gemini and was the commander of the Apollo 11. He became the first man to walk on the moon. He was also awarded the Presidential Medal of Honor and was appointed to the National Commission on Space under Reagan's administration.

Guion Bluford - This former Vietnam Air Force pilot later got his credentials as an astronaut and served on four key missions for NASA. He was also the first African American to travel into space.

John Glenn - This astronaut distinguished himself when he participated in the first manned orbital mission of the United States, which orbited three times around the Earth. As of July, 2001, he is the oldest person to travel into space. In addition to service to NASA he flew 59 combat missions in World War II, earning honors that included the Distinguished Flying Cross (six times), the NASA Distinguished Service Medal, and the Congressional Space Medal of Honor. He also represented Ohio as a U.S. senator from 1974 to 1999.

Christa Corrigan McAuliffe - This teacher was selected from over 10,000 applicants to be the first private citizen in space. She died during the launch of the Challenger on January 28, 1986 in a catastrophe that was broadcast live.

Sally Ride- She was the first American female to travel into space.

Astronomers:

Nicolaus Copernicus -This Polish astronomer developed the heliocentric theory that the Earth, and other celestial bodies, rotate around the sun. His theory contradicted popular thought at the time of the 16th century that presumed the Earth was the center of the universe.

Galileo Galilei - This Italian made leaps and bounds in many branches of science, including mechanics, astronomy, heat, magnetism, and space exploration. He was condemned and exiled by the church because of his ideas, and forced to recant his theory based on Copernicus' concepts, which the church opposed. He built a telescope and was the first to observe Jupiter's moons, Saturn's rings, Venus' phases, and sunspots. He is remembered for his laws pertaining to falling bodies and projectiles. He also invented a military compass, a model for an inclined plane, the lodestone, and the thermoscope, a machine for raising water. He discovered many attributes of pendulums that enabled them to be used as timekeepers inside clocks.

Stephen Hawking - This recent author of A Brief History of Time, helped us understand black holes.

Hipparchus - Due to his studies of the stars and moon before 100 B.C., this Greek is revered as the "Father of Astronomy."

Edwin Powell Hubble - This astronomer graduated with a law degree from Oxford and later obtained his Ph.D. in astronomy from the University of Chicago. He did the bulk of his research at California's Mount Wilson Observatory, which at the time contained the world's largest telescope (until it was replaced by the Hale telescope in 1948 and the Keck telescope in 1990). He studied nebulae, galaxies, globular clusters, novas, redshifts, and Cepheid stars. He served as a ballistics advisor for the War Department during World War II and had a telescope named after him. His work provided information that improved our astronomical knowledge. First, he located other galaxies similar to ours, and concluded that these galaxies were moving away from each other. He also found a direct correlation between a galaxy's distance from the earth and the velocity of its recession. He summed up his observations in Hubble's Law, which states that the direct correlation between a galaxy's distance from earth and the velocity of its movement proves that the universe is expanding. The correlation between a galaxy's distance to its velocity is dubbed the Hubble constant and, if discovered, could be used to determine the age of the universe.

Johannes Kepler - This 17th century astronomer is best-known for developing the three laws of planetary motion, appropriately called "Kepler's Laws." He overturned Ptolemy and Copernicus' view of the planets while serving as an apprentice to the notable Tycho Brahe. His three laws state that planets move in elliptical orbits. The closer a planet is to the sun, the faster it travels, and the distance of a planet from the sun cubed compared to the square of its orbital equals a constant for all planets. Kepler's Laws formed the basis of Sir Isaac's later studies on the subject of gravity.

Ptolemy - This 2nd century A.D. Greek astronomer, geographer, and cartographer maintained that the Earth was the center of the universe, and all other objects revolved around the Earth.

Biologists:

Rachel Carson - This 20th century marine biologist was educated at John Hopkins University and worked as an aquatic biologist for the U.S. Fish and Wildlife Service. More importantly, she documented her discoveries in various books, including the influential The Silent Spring, which made Americans aware of the long-term dangers of chemicals and pesticides, such as DDT.

Francis Crick & James Watson- In 1962, these scientists were awarded a joint Nobel Prize for their discovery of the shape of the DNA molecule.

Charles Darwin - This 1900's biologist devised "The Theory of Evolution," which stated that humans had evolved from more primitive life forms. He elaborated on his theories of evolution and natural selection (sometimes referred to as survival of the fittest), in his controversial 1859 book, On the Origin of Species. Few people of the time agreed with his ideas and he was a very unpopular scientist. He is occasionally called a naturalist.

Anton van Leeuwenhoek - Essentially uneducated, this 17th century scientist discovered bacteria, protists, blood cells, and animal sperm cells through sheer curiosity and perseverance. He called these microscopic organisms "animalcules." He also developed over 500 microscopes, although they were simple compared to the complex variety invented by Robert Hooke.

Carolus Linnaeus - This botanist and physician was the first to successfully classify living organisms into the five kingdom system. These kingdoms were then subdivided into phylum, class, order, family, genus, and finally species.

Chemists:

Henry Cavendish - This 18th century British chemist discovered hydrogen, and concluded that water was not an element. Rather, he learned that water was comprised of both hydrogen and oxygen.

John Dalton - This meteorologist was best known for his "Atomic Theory," which formed the basis for the periodic table. These discoveries were published in his 1808 book, entitled A New System of Chemical Philosophy. The law that bears his name, Dalton's Law, proposes that the total partial pressures in a mixture of gases equals the sum of the pressures of each of its individual gases.

Dmitri Mendeleev - Born in Siberia in the early 1800's, this teacher and scientist is recognized as the inventor of the Periodic Table.

Inventors:

Charles Babbage - This son of a London banker is known as the "Father of Modern Computing" because he invented the first calculators. He replaced Sir Isaac Newton as the Lucasian Chair of Mathematics at Cambridge, where he worked on designing a primitive calculator called the "difference engine." However, midway through, he had the brainchild for the "analytical engine" that would be capable of performing any math calculation. Although he never completed his work due to lack of financial and social support from the British government, his pioneering efforts on both counts were predecessors of modern calculators and computers.

Alexander Graham Bell - This Scottish-born, American immigrant invented the first telephone in 1876 and demonstrated it at the 1876 Centennial Exposition. The discovery grew out of his passion for helping teach deaf students to speak. Helen Keller was one of his students. He later experimented with other inventions, and eventually became the second president of the National Geographic Society.

Louis Braille - This French teacher redesigned a system of code used by the Army. He used raised dots to represent letters so a blind person could read an article by feeling the raised dots. The pattern of raised dots is called Braille, after its inventor.

Samuel Colt - This inventor patented the six-shooter pistol, which proved to be a valuable weapon in the Mexican War. The guns were so popular that Colt discovered how to produce them more quickly and more efficiently by using the concept of mass production in his factory.

Louis Daguerre - He invented the first daguerreotype, an ancestor of primitive photography.

Leonardo da Vinci - This Renaissance man prided himself on his intellectual curiosity. He designed many engineering innovations in addition to his reputation as an outstanding artist. These included a primitive flying machine, a diving suit, and a pulley system.

John Deere - He invented the steel plow.

Abner Doubleday - This Army veteran served in the Mexican War, and fired the first shot of the Civil War at Fort Sumter on the Union side. He also created the game of baseball.

George Eastman - Not only did this man invent roll film in 1884, he later invented the Kodak camera in 1888, and went on to mass-produce both items, making them widely available. Later he invented a transparent film, which has been used ever since by the motion picture industry.

Thomas Alva Edison - This notorious inventor is most cited for his incandescent light, but his transmitters contributed to the success of the telephone and he made several improvements upon existing phonographs. Edison patented over 1,000 devices and became known as "The Wizard of Menlo Park."

Henry Ford - This entrepreneur was born on a farm in Dearborn, Michigan. He found work as an apprentice in a machine shop in Detroit, where he learned about internal combustion engines. Later he worked for the Westinghouse Engine Company, and then moved back to Detroit as chief engineer at the Edison Company in the city. He experimented with several vehicles, including the semi-successful Quadricycle before he formed his own automobile company and sold the popular "Model T" Ford. Because his vehicles were so much in demand, he later invented the assembly line in 1913 and paid his employees a minimum wage, which was revolutionary at the time.

Ben Franklin - Also known as a popular printer, the first American Postmaster General, a statesman, and an ambassador during the Revolutionary War, this eminent colonist conducted extensive research on static electricity and engineered numerous additional inventions. He is well known for flying a kite during an electrical storm. He invented the Franklin Stove, and bifocal eyeglasses.

Robert Fulton - Originally an artist specializing in portraits, he is credited as the inventor of the steamboat that revolutionized the way Americans used our interior waterways, as well as the way the early Post Office delivered mail. His first successful steamboat, the Clermont, was launched on the Hudson River in New York in 1807.

Robert Goddard - He is called "The Father of the Modern Rocket." In 1926, he engineered the first liquid fuel rocket. He also worked on a multi-stage rocket and assisted the U.S. Government during both World Wars in developing new defense technology.

Johann Gutenberg -This 1400's German invented the moveable type method of printing. He gained his reputation by using this method to print many Bibles.

Elias Howe – Howe was a sickly man who was married to a seamstress. He invented the sewing machine to relieve his wife from her long days of labor by hand sewing, as she struggled to keep them afloat financially.

Steve Jobs & Steve Wozniak -Together, these veterans of Hewlett Packard invented the first personal computer and co-founded Apple Computer Company.

Samuel Morse - His magnetic telegraph was the first step in the climb toward instant communication. It eventually led to transatlantic cables, wireless phones, and radio signals. The Pony Express became obsolete once the telegraph was invented.

Elisha Graves Otis - He invented the elevator brake.

Isaac Merritt Singer - He pirated Howe's initial design for a sewing machine that met with widespread success due to his business savvy as well as his ability to increase its user-friendliness.

Eli Whitney - In 1793, his cotton gin revolutionized Southern agriculture. He also invented the notion of interchangeable parts. Interchangeable parts were later used in all areas of technology.

Wright, Wilbur and Orville - Although they had opposite temperaments (Wilbur was methodical while Orville was impetuous), they joined together to build the first workable aircraft. Originally the co-owners of a bike shop, they capitalized on Wilbur's initial experiments on a five-foot biplane and a full-scale glider. They combined ideas to create the original ancestor of the modern airplane. Their first flight occurred at Kitty Hawk, North Carolina in 1903.

Mathematicians:

Archimedes - This Greek mathematician of the 3rd century B.C. used Euclid's system to prove many of his own geometric and physical science discoveries, including the formula for the volume of a sphere, the law of the lever, the Archimedean screw, and the principle of buoyancy.

Albert Einstein - This eminent scientist fled Germany and immigrated to the United States when the Nazi party rose to power. His equation for the theory of relativity, $E = mc^2$, led to the development of atomic energy and earned him a Nobel Prize in 1921. The element, Einsteinium, was named after him.

Euclid - This mathematician studied under Plato in Alexandria in 300 B.C. He wrote The Elements in which he proved various longstanding mathematical and geometrical premises, using his axiomatic method, which emphasized the use of successive proofs.

Isaac Newton - This graduate of Cambridge had the honor of being the Lucasian Professor of Mathematics at Trinity College, a position he held for 27 years until 1696. His famous book, Opticks, discussed his discoveries on the subject of refracted light in prisms. His other best-known work was Principia, which concentrated on his discoveries regarding gravitational force and his three laws of motion.

Pascal - He was known for his theorem pertaining to hexagons, his arithmetical triangle publicized in 1653, and some aspects of the theory of relativity. Another of his laws states that when pressure is applied to a fluid, it is exerted equally in all directions.

Pythagoras - As one of the earliest mathematicians, he devised the Pythagorean theorem that states that the sum of the squares of two sides of a triangle are equal the square of the hypotenuse.

Medical Pioneers:

Marie Curie - This Polish woman who was nicknamed Madame Curie, discovered the radioactive elements radium and polonium. She won two Nobel Prizes, one in 1903 that was awarded jointly with her husband, and a second in 1911. Because of her research, the unit that's used to measure a substance's radioactivity, has been named the Curie. She died from a cancer caused by excessive exposure to radiation.

Alexander Fleming - This medical researcher discovered penicillin by accident, as well as another important antibacterial substance called lysozyme. He was awarded a Nobel Prize for his contribution to the medical world.

Sigmund Freud is known as "The Father of Modern Psychoanalysis." An Austrian who fled to England during the 1930's, he specialized in dream analysis and the role of the unconscious in behavior. He coined the theory of the Oedipus Complex and wrote much about the war between the superego, ego, and id.

Hippocrates - This ancient Greek doctor is known as "The Father of Medicine." The Hippocratic Oath, a pledge of ethics that is taken by modern doctors, was named after him.

Robert Koch - This 1900's German physician discovered the bacteria that caused anthrax, tuberculosis, and cholera, and was rewarded for his discovery with a 1905 Nobel Prize.

Louis Pasteur - This French microbiologist discovered that bacteria contribute to widespread disease, and that sterilization should be increased in society. He also discovered a vaccine to combat rabies, and most notably, the process of heating milk (and other liquids) to kill invisible germs, rendering it safe for consumption.

Ivan Pavlov - This Russian scientist experimented with training dogs to salivate at the sound of a bell that signaled "suppertime." Eventually, the dogs salivated every time the bell rang, regardless of whether or not they were given food. Pavlov called this a "conditioned reflex." His work gave rise to the behaviorism school of psychology. His work is often cited in studies concerning learning techniques..

Jonas Salk - This medical researcher was best-known for his discovery of a polio vaccine, which wiped out a polio epidemic.

Oceanographers:

Eugenie Clark - This ichthyologist has won numerous awards and honors for her research and dives to investigate sharks. She is so recognized as an expert in the field that she has been dubbed "The Shark Lady."

Jacques Cousteau - This 20th century deep-sea diver was a former member of the French navy. He co-developed the aqualung, which enabled him to do detailed explorations underwater. He documented his underwater explorations for the American people in short films, two of which won Academy Awards for best documentary.

Physicists:

Niels Bohr - This Holland-born physicist is known for his discoveries about the structure of the atom. In 1922 he won a Nobel Prize for his proposal that electromagnetic radiation is emitted by atoms when electrons move between energy levels. He later investigated fission, and proved that uranium 235 is an isotope. He was one of the scientists who developed the first atomic bomb during World War II. Ironically, he later

received an Atoms of Peace Award for his instigation of the first Atoms for Peace Conference in 1955.

George Caruthers - This notable astrophysicist invented the ultraviolet camera that the NASA Apollo 16 crew used to bring back photographic footage from their mission to the moon.

Michael Faraday - This former bookbinder became involved in studies of magnetism and electricity. In 1831, he discovered electromagnetic induction. Many of his findings were published in his book Experimental Researches in Electricity. He is credited with the 1845 discovery of a magnetic force field composed of "lines of force."

Enrico Fermi - This Italian was one of the engineers on the atomic bomb project in New Mexico during World War II, which created the first fission reaction. His efforts with artificial radioactivity earned him a Nobel Prize in 1938. A scientific research center in Batavia, Illinois has been named after him.

Werner Karl Heisenberg - This physicist began his experimentation with matrix mechanics in which he studied the discrepancy between the mathematical behavior of electrons in an atom and classic laws of physics. During this enterprise, he discovered two types of molecular hydrogen, and his matrix mechanics became known as Quantum Mechanics. He also advocated his "uncertainty principle," which stated that both velocity and position cannot be measured accurately at the same time in a particle, but must be measured at different times. In 1932, he won a Nobel Prize in physics for his role in the emergence of quantum mechanics and other scientific breakthroughs. Although he was not an advocate of the Nazi cause, he remains a controversial figure, because he worked with Otto Hahn on the country's atomic research team during World War II.

Robert Hooke - This 17th century Englishman discovered cells, through his early microscope. He also proposed a scientific law that stated that "the change of an elastic object's length is in proportion to the stress applied to it."

Lord Kelvin (Williams Thomson) - This 19th century Englishman developed the scale of absolute temperatures.

Gregor Johann Mendel - This Austrian's 19th century studies on pea plants were actually the ancestor of the modern study of genetics and trait inheritance. Mendel is called "The Father of Genetics."

Max Planck - This German scientist received a Nobel Prize in 1918 for his discovery of Quantum Physics, in which he asserted that a quantum is the smallest unit into which energy can be broken.

Wilhelm Roentgen - This German physicist was awarded the very first Nobel Prize in 1901 for his discovery of X rays.

Ernest Rutherford - This New Zealand physicist proposed the "Theory of Atomic Structure," in which he defined the atom as a nucleus around which electrons orbit. He also engineered one of the first nuclear reactions, and discovered and named the three primary elements of radiation: alpha, beta, and gamma rays. A unit of radioactivity, the Rutherford, was named after him, as was a chemical element, Rutherfordium (Rf.). He won the Nobel Prize in 1908 for his discovery of radioactive decay that occurs when certain radioactive substances give off alpha particles or beta rays. In 1911, he published his "Theory of Atoms," upon which Neils Bohr based his later discoveries.

Nikola Tesla - This visionary was responsible for many electrical improvements that have affected our modern world. His discovery of the rotating magnetic field led to his idea of using alternating current (AC power) to create a rotating magnetic field that was capable of powering a motor. He later built the first induction motor while he was employed at the Continental Edison Company. He even worked with Edison, but the two had professional differences, and Edison believed Tesla's system was potentially dangerous. However, his system was used successfully during the 1893 World Columbian Exposition in Chicago, and his career was launched! One year later, he was commissioned to install patented power machinery at Niagara Falls to supply Buffalo with power. He also invented the "Tesla Coil" which is still used in television broadcasting and long-distance radios.

Sir Joseph John Thomson - He discovered the electron.

Allesandro Volta - This 18th century physicist is best known for inventing the first electric battery. The unit of electrical energy called the "volt" was named in his honor.

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STUDY GUIDE:
HUMAN ANATOMY I

The smallest unit part of any living organism is the cell. In multicellular organisms, such as the human, cells of the same type join together to form tissues. For example, skin cells form skin tissue.

THERE ARE FOUR BASIC DIFFERENT TYPES OF TISSUE IN THE HUMAN BODY:

1. muscle tissue
2. connective tissue
3. nerve tissue
4. epithelial tissue

Muscle tissue is the only type of tissue that can contract, or shorten. Connective tissue provides support for the body and connects all its parts. Bones, blood and fat are examples of connective tissue. Nerve tissue carries messages back and forth between the brain, spinal cord, and the rest of the body. Epithelial tissue forms a protective surface on the body. Skin is epithelial tissue. Epithelial tissue also lines the mouth, nasal cavities, and throat and provides a protective covering for the stomach and other body parts.

Different types of tissues are then combined to create organs. An organ is a group of different tissues working together to perform a job. The stomach, lungs, eyes, and pancreas are examples of organs. The heart is also an organ. Although it contains mainly muscle tissue, it also contains connective and nerve tissue, and is covered and protected by epithelial tissue.

Organs combine with other organs to create organ systems. Each system of organs has a particular function. There are eleven major systems in the human body. Six of these systems will be discussed in this study guide. The remaining five systems will be dealt with in an upcoming guide. All eleven systems are listed in the next section.

THE 11 MAJOR SYSTEMS OF THE HUMAN BODY

1. Skeletal: Supports the body and gives it shape, protects inner organs, produces blood cells, allows movement, and stores some minerals.
2. Muscular: Allows for body movement and controls posture.
3. Digestive: Breaks down food and absorbs the nutrients.
4. Circulatory: Carries nutrients to all parts of the body.
5. Respiratory: Exchanges oxygen and carbon dioxide between the blood and air.
6. Excretory (or urinary): Removes solid and liquid wastes from the body.
7. Nervous: Carries messages from the brain to all parts of the body, detects sensations, and controls any other functions.
8. Endocrine: Regulates the body chemistry, controls metabolism, and maintains integration of other body functions.
9. Reproductive: Performs reproduction and regulates the secondary sex characteristics.
10. Immune (or lymphatic): Fights diseases.
11. Integumentary: Protects the body, helps regulate body temperatures, and receives outside stimuli.

THE SKELETAL SYSTEM

The skeletal system is composed of the 206 bones in the body, cartilage, nerve tissue, blood vessels, and connective tissues. Cartilage is a dense, fibrous connective tissue that can be bent. It is found in the nose and outer ears. It is also located at the ends of bones and serves as a slippery surface to reduce friction at the joints.

JOINTS: A joint is a place in the body where two or more bones are connected. Movement occurs at a joint. There are several types of joints.

1. Hinge joints: examples-knee and elbow allows movement in a forward and backward direction.

2. Ball-and-socket joints: examples- shoulder and hip, provides for circular motion of bone, and consists of a round bone that fits into a cup like pocket of another bone.

3. Fixed joints (or immovable joints): examples- bones of the skull. Permits no movement.

4. Pivot joints: examples- first two vertebrae in the neck, allows for rotation of one bone around another.

5. Sliding joints: example- carpals or wrist, allows one or more bones to roll over other bones.

STRUCTURE OF BONES:

The outer covering of a bone is called the pericardium. Beneath the pericardium is the hard, compact bone. Within the shaft of a long bone is a hollow cavity or space filled with marrow. Marrow is a soft, yellow material that contains fat and blood vessels. Red marrow is found in the inner areas of the skull, ribs, breastbone, and vertebral columns. Red marrow produces the body's blood cells. At each end of the bone shaft is a knob that contains spongy bone. It is actually quite strong and adds strength to the bone without adding mass. Bones need calcium and phosphorus to maintain their strength. Dairy products are an excellent source of calcium.

SKELETAL SYSTEM TRIVIA FACTS:

1. The backbone is composed of 26 bones called vertebrae (singular-vertebra) that are separated from one another by pads of cartilage.
2. The femur is the longest single bone in the entire body.
3. Ligaments are stringy tissues that attach bones to other bones.
4. Tendons attach muscles to the bones.
5. There are a total of 12 pairs of ribs (24 ribs). The bottom two pairs of ribs are attached to the back, but are not attached to the sternum at all. They're called floating ribs.
6. The bones in the fingers are called phalanges. Each finger has 3 phalanges and each thumb has two, making a total of 14 phalanges on each hand.
7. The knee joint is protected by the kneecap. It's scientific name is the patella.
8. Seven round bones are found at the wrists. They are called carpals.

The major bones are labeled on the skeleton found at the end of this study guide.

THE MUSCULAR SYSTEM

THREE MAIN TYPES OF MUSCLES IN THE HUMAN BODY:

1. Skeletal: These muscles attach directly to the bones and move the bones. They are called voluntary muscles, because you can move them whenever you want. These muscles are striated. This means they are composed of bands of muscle tissue that are connected together. Skeletal muscles are attached to the bones by TENDONS.

2. Smooth muscles: These muscles are involuntary, and move or contract without your direction. They help to control breathing, blood pressure, and the movement of food throughout the digestive system.

3. Cardiac muscle: This type of muscle is found only in the heart. Cardiac muscles are involuntary. Your heart beats when your cardiac muscle contracts.

MAJOR MUSCLES AND THEIR LOCATION WITHIN THE BODY:

1. Biceps and triceps: These muscles are found in the upper arm. The biceps is on the top of the humerus and the triceps is on the bottom. They work in a pair. When the biceps contract, the triceps relax.

2. Deltoid: Located at the shoulder, it allows you to raise your arm to the front, side, or back.

3. Pectoralis major: This large fan-shaped muscle of your upper chest pulls your arm toward your body.

4. Gastrocnemius: This is the calf muscle. It is attached to the heel bone by the Achilles Tendon.

5. Trapezius: This muscle is located at the back of the neck and in the upper back region.

6. Gluteus Maximus: These muscles are located in the buttocks region, and you sit on them.

A muscle that bends, or flexes a joint is called a FLEXOR muscle. If a muscle straightens a joint, it's called an EXTENSOR.

THE DIGESTIVE SYSTEM

The digestive system breaks down the food into simpler substances that can be used by the human body. These simple nutrients are then carried by the blood to all the cells in the body. Here is the basic path the food takes as it makes its way through the digestive system..

1. Mouth
2. Esophagus
3. Stomach
4. Small Intestine
5. Large Intestine
6. Rectum
7. Anus

The liver, gall bladder, and pancreas are also digestive organs, but the food does not actually pass through them.

Digestion begins in the mouth. Saliva mixes with the food in the mouth. An enzyme called ptyalin is in the saliva. It breaks down the starches in foods and begins to change them to sugars. The saliva also makes the food slippery so it can be easily swallowed.

When the food is swallowed, it goes down a tube that connects the back of the throat (pharynx) with the stomach. Muscular contractions of the esophagus help push the food downward. These muscular contractions are called peristalsis.

The food then enters the stomach. The walls of the stomach release gastric juices that help to break up the food and make it runnier. These juices contain the enzyme pepsin, hydrochloric acid, and a thick mucus. The stomach muscles contract to churn the food. Then the food is pushed by peristalsis to the small intestine.

Most digestion occurs in the small intestine. More digestive juices are secreted by the walls of the small intestine. The liver produces a substance called bile that helps to break up fatty foods. Bile is stored in the gall bladder until it is needed. Then it is released into the small intestine. THE LIVER IS THE BODY'S HEAVIEST ORGAN. It is also the second largest organ. Only the skin is a larger organ!

The pancreas produces insulin that is sent into the small intestine to control the body's use of sugar.

After a period of five hours, most of the food in the small intestine is digested. It then passes through finger like structures called villi that are found in the walls of the small intestine. The villi contain small blood vessels that absorb and carry away the digested food.

The undigested food is pushed by peristalsis to the large intestine. The excess water is absorbed from these wastes in the large intestine. The solid wastes that remain are pushed through a short tube at the end of the large intestine, called the rectum, and then pushed through an opening at the end of the rectum called the anus.

THE CIRCULATORY SYSTEM

The circulatory system is composed of three main parts: the heart, the blood, and the blood vessels. Its main job is to deliver food and oxygen to all body cells and to carry away waste products and carbon dioxide from the cells.

There are three main types of blood vessels through which the blood travels:

1. **ARTERIES**: These carry blood away from the heart. The aorta is the largest artery in the human body.

2. **VEINS**: These carry blood from all parts of the body back to the heart.

3. **CAPILLARIES**: These are the smallest of the blood vessels. The walls of the capillaries are so thin that food and oxygen leak through them to the body cells, and wastes from the body cells enter the blood through these walls. They also connect the arteries to the veins.

There are four main components of the blood: PLASMA, RED BLOOD CELLS, WHITE BLOOD CELLS, and PLATELETS. Plasma is the liquid portion of the blood. It consists mainly of water. The other three blood components float in the plasma.

Red blood cells, or Erythrocytes, float in the plasma. They carry oxygen from the lungs to the body cells, where oxygen is the exchanged for carbon dioxide. These doughnut shaped components are made in the bone marrow and contain hemoglobin, a protein that contains iron. Hemoglobin easily combines with oxygen when the oxygen

content is high, and easily releases the oxygen again when the oxygen again when the oxygen content is low.

White blood cells, or Leukocytes, are larger than red blood cells, but there are fewer of them in the blood. Their job is to protect the body against infection and to fight infection when it occurs in the body.

Platelets, or Thrombocytes, are the smallest of the blood components. They cause the blood to clot.

There are four main blood types: A, B, AB, and O.
Type O is called the universal donor, because type O blood can be safely given to everyone. Type AB is the universal receiver. People having this type of blood can safely receive blood from any donor. A blood transfusion is the name for the process of taking blood from one persona and giving it to another person.

THE CIRCULATION OF THE BLOOD:

The blood leaves the heart, travels to the lungs, returns to the heart, is sent to all parts of the body, and is again returned to the heart. The heart is muscular organ that is composed of four distinct chambers, or parts. The two top chambers of the heart are each called an atrium (plural: atria). The two bottom chambers of the heart are each called ventricles. The entire heart is enclosed in a protective bag called the pericardium.

The heart is divided into two sides by a strong, thick, muscular was called the septum. Here are the basic steps that occur in the circulation of blood through the heart.

1. The blood enters the RIGHT ATRIUM of the heart through two main veins called the SUPERIOR VENA CAVA AND INFERIOR VENA CAVA.
2. It passes through the TRICUSPID VALVE to the RIGHT VENTRICLE.
3. The RIGHT VENTRICLE pumps the blood to the lungs through the PULMONARY ARTERIES.
4. The blood receives oxygen form the alveoli in the lungs, and loses the carbon dioxide that it has been carrying.
5. The newly oxygenated blood is sent back to the heart through the PULMONARY VEINS. It reenters the heart in the LEFT ATRIUM.
6. It then passes through the BICUSPID VALVE (also called the MITRAL VALVE) to the LEFT VENTRICLE.
7. The LEFT VENTRICLE then pumps the blood through the AORTA and then to all the tissues in the body. It is returned to the heart and reenters the RIGHT ATRIUM where the cycle once again continues.

THE RESPIRATORY SYSTEM

The main job of the respiratory system is to bring oxygen into the body and to remove carbon dioxide and water from the body. The main respiratory organs are the

NOSE, PHARYNX, TRACHEA, BRONCHIAL TUBES, LUNGS, BRONCHI, ALVEOLI, and DIAPHRAGM.

Air enters the NOSE where it is both warmed and filtered. It then passes down the back of the throat, called the PHARYNCS, and down the wind-pipe, or TRACHEA. The trachea divides at the end into two BRONCHIAL TUES that each lead to a LUNG. When the air enters the lungs, it flows into smaller branches called BRONCHI, and then into tiny air sacs called ALVEOLI. Each alveoli is surrounded by thousands of tiny blood vessels called capillaries. Oxygen and carbon dioxide are exchanged in the alveoli. As blood moves through the capillaries, it picks up oxygen and carries it to cells throughout the body.

A strong muscle called the DIAPHRAGM contracts to bring the air into your chest area. When you exhale, the diaphragm relaxes, causing the space inside the chest cavity to decrease, thus sending the air out the body.

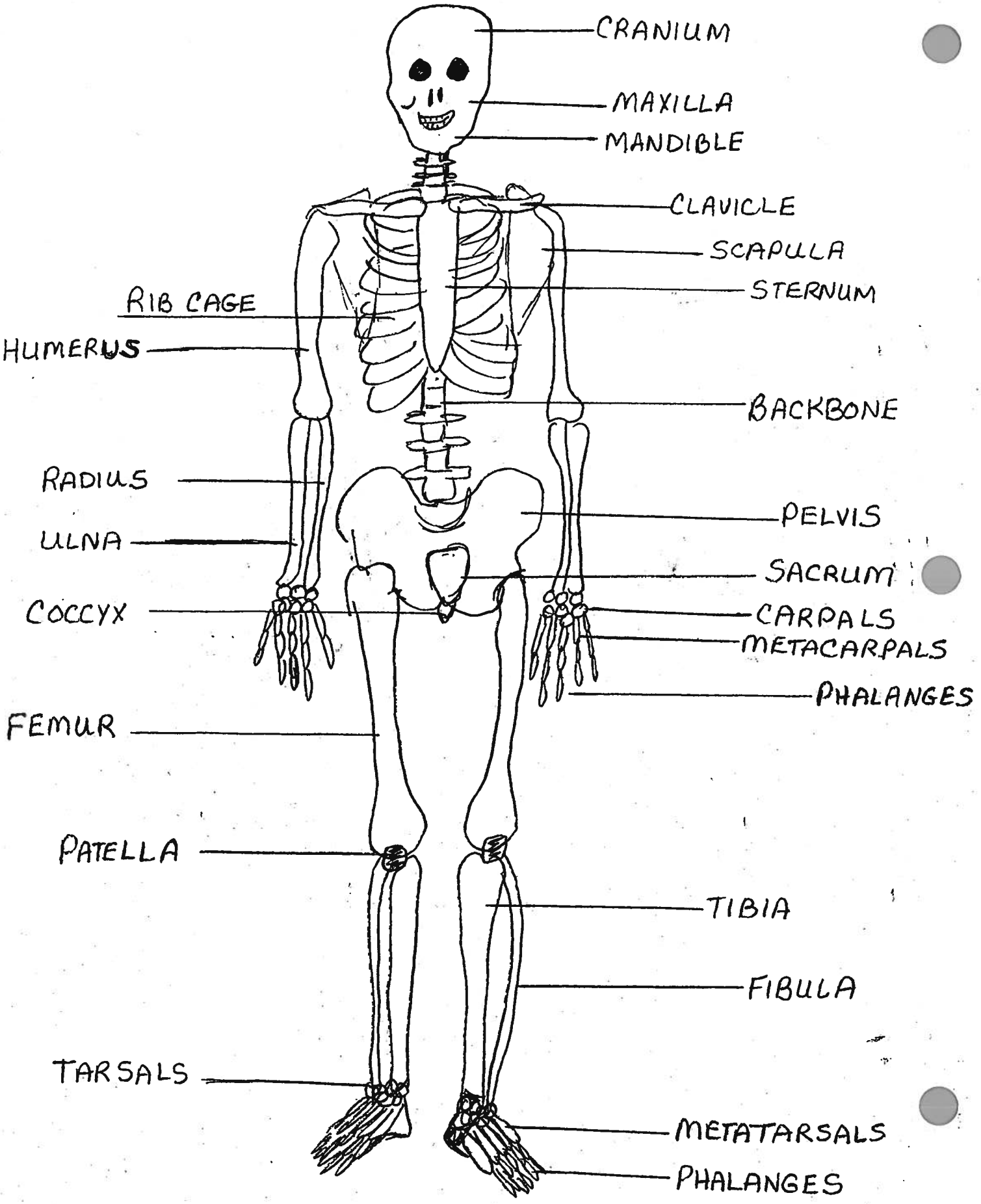
THE EXCRETORY SYSTEM

The job of the excretory system is to remove wastes form the body. Since the lungs remove carbon dioxide and water from the body, they are also considered part of the excretory system. Other organs in the excretory system are the KIDNEYS, LIVER, SKIN, and URINARY BLADDER.

The KIDNEYS are the main organ in this system. They filter nearly one liter of blood per minute. The filtering takes place in the NEPHRONS, which are a network of tubes that are enclosed in a complex network of capillaries. The nephrons filter out water, salts, urea, and nutrients, which are reabsorbed into the blood. The liquid that remains is called urine. It is composed mainly of water with some excess urea and salts. This urine is sent through two narrow tubes called URETERS to a muscular sac called the URINARY BLADDER. The urine is stored in the bladder until it is released from the body through another small tube called the URETHRA.

The LIVER also helps to filter the blood. It removes excess amino acids, and cleanses the blood by removing most of the bacteria that enters it.

The SKIN removes wastes through perspiration. The skin is composed of two layers. The upper layer is called the epidermis and the lower layer is called the dermis.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STUDY GUIDE:
FAMOUS ASTRONOMERS, ASTRONAUTS, and GEOLOGISTS

FAMOUS ASTRONOMERS

- **PTOLEMY** (Tol uh mee) An ancient Greek astronomer who calculated that the earth was the Center of the solar system, and the sun, planets, moon, and stars revolved around the earth.

- **ARISTOTLE** (384 – 322 B.C) Provided proof that the earth had a spherical shape.

- **TYCHO BRAHE** (1572) Spotted the first supernova, thus proving that the heavens do change over time.

- **NICOLAUS COPERNICUS** (1473 – 1543) A Polish astronomer who developed the theory that the sun is the center of the solar system, and that all the other heavenly bodies revolve around the sun. He's considered THE FOUNDER OF MODERN ASTRONOMY.

- **GALILEO GALILEI** (1564 – 1642) Italian scientist and mathematician who was called the first modern scientist, and who is best known for his mathematical study of motion and other bodies.

  1. Contributions to the field of astronomy.

     A. He improved (BUT DID NOT INVENT) the telescope. He developed the FIRST REFRACTING TELESCOPE.
     B. His discoveries in Astronomy:
        1. The moon's surface was rough and irregular.
        2. The moons of Jupiter.
        3. The rings of Saturn.
        4. The phases of Venus, similar to our moon.

5. Sunspots
6. Confirmed the idea of Copernicus – that the sun is the center of the solar system, and the earth moves around the sun.

2. Other inventions:
   A. The first thermometer
   B. Hydrostatic balance that found the specific gravity of any object by weighing it in water.

- **ROBERT H. GODDARD**: Built the first rocket in 1926 by combining gasoline with liquid oxygen, and burning this mixture. The rocket went straight up for 184 feet at 60 mph for 2 and ½ minutes. It was 10 feet long. He continued to build larger rockets, and drew up plans for multistage rockets. In 1935, he designed a rocket that reached a speed of 500 mph and an altitude of 7,200 feet. He was called the FATHER OF MODERN ROCKETRY.

- **EDMUND HALLEY** (1656 – 1742) An English astronomer who is best known for predicting the return of a comet, HALLEY's Comet, which bears his name. HE DID NOT DISCOVER THIS COMET, but was the first to realize that this same comet had previously appeared in 1456, 1531, 1607, and 1682. He thus predicted that the comet would reappear in 1759, which it did. The comet appears every 75 to 79 years. It was seen in 1986, and is due back in 2062.

  A. Other contributions:

  1. Compiled a catalog of the stars seen in the Southern Hemisphere.
  2. Published a book called Synopsis of the Astronomy of Comets.
  3. Discovered an accurate way to measure the distance from the sun to the earth.
  4. Produced the first meteorological weather chart of the world to show prevailing winds.
  5. Made the first charts of the Atlantic and Pacific Oceans.

- **EJNAR HERTZSPRUNG** (Danish Astronomer) and HENRY NORRIS RUSSELL (American Astronomer) early 1900's: discovered that as the magnitude of a star increases, the temperature of that star also increases. They developed a diagram in which the surface face temperature of stars is plotted along the horizontal axis, while the absolute temperature is plotted along the vertical axis. This chart, called the HERTZSPRING –RUSSELL (H-R) DIAGRAM, is still used today by astronomers.

- **EDWIN HUBBLE**: An American astronomer of the twentieth century. He was the first to show that galaxies other than the Milky Way did exist. He also was the first to notice that objects which are moving away from an observer tend to have a reddish cast. He called this phenomena the RED SHIFT, and used it as a basis for the expansion of the universe by a means similar to the Big Bang Theory.

The HUBBLE Telescope was named after him. This large, optical telescope was placed into orbit in 1989 and was the first permanent observatory located above the Earth's atmosphere.

- **IMMANUEL KANT**: Theorized that he sun was part of a vast galaxy, but that there were other galaxies scattered throughout space, too. He also suggested that the sun and planets were formed from the same elements and in the same way.

- **JOHANNES KEPLER**: German astronomer and mathematician who discovered that the planets orbit the sun in elliptical, or oval orbits, not in perfect circles.

- **MARIA MITCHELL** (1847) American Astronomer who discovered a new comet. First woman member of the American Academy of Arts and Sciences in 1848. Taught astronomy at Vassar College.

- **SIR ISAAC NEWTON**: Theorized that planets maintained their orbits because of two factors: inertia and gravity. Inertia causes the planet to move in a straight line, while gravity pulls the planet toward the sun, thus causing an elliptical orbit.

- **HERMANN OBERTH**: Born in Romania, but did most of his rocket research in Germany. In 1942, he and Dr. Von Braun built a V-2 rocket that flew 60 miles into space. After World War I I, he worked in Huntsville, Alabama on rocket research, but retired and went back to Germany in 1958.

- **DAVID RITTENHOUSE**: 1770, Built a precise model of the solar system.

- **HARLOW SHAPLEY**: Theorized that the entire universe could be found in one huge galaxy.

<u>DISOVERY OF THE PLANETS OR OTHER HEAVENLY BODIES</u>:

JUPITER: Galileo discovered 4 of Jupiter's moons.

SATURN: Galileo discovered the rings of Saturn.

URANUS: Sir William Herschel (1781) English Astronomer, discovered the planet, Uranus.

NEPTUNE: John Couch Adams: (1845) English astronomer, calculated where Neptune should be in space, based upon the orbital path of Uranus, which appeared to be affected by the gravitational force of another body.

Johann Galle: German astronomer, located Neptune from Germany's Berlin Observatory, exactly where Adam's had predicted.

PLUTO: Percival Lowell: suggested that another planet's gravity was pulling on both Neptune and Uranus.

Clyde Tombaugh: originally from Illinois, discovered Pluto in 1930 exactly where Lowell suggested.

James Christy: (1978) discovered Charon, Pluto's moon.

FAMOUS ASTRONAUTS

- **YURI GAGARIN**: A Russian cosmonaut, FIRST HUMAN PUT INTO SPACE, first person to orbit the earth (1961)
- **ALAN B. SHEPARD, JR**: First American in space (1961)
- **JOHN H. GLENN**: First American to circle the earth (1962)
- **VALENTINA TERESHKOVA**: Russian, first woman in space (1963)
- **VIRGIL (GUS) GRISSOM, EDWARD H. WHITE, ROGER B. CHAFFEE**: (1967) All three astronauts were being trained for the first mission in NASA's Apollo Program. While sitting atop a Saturn Rocket on the Cape Canaveral launch pad a fire broke out in the cockpit. THE 3 ASTRONAUTS ALL DIED OF BURNS AND SOFFOCATION before the technicians could rescue them.
- **VLADIMIR KOMAROV**: (1967) Russian cosmonaut, died when the parachute of the Soyuz 1 space capsule did not open, and the capsule crashed upon reentry.
- **NEIL ARMSTRONG**: First person to step onto the moon's surface. Famous Quotation associated with this venture: "That's one small step for man, one gian leap for mankind." (1969)
- **EDWIN (BUZZ) ALDRIN**: Second man to step onto the moon's surface right behind Neil Armstrong (1969)
- **MICHAEL COLLINS**: (1969) Remained in orbit around the moon in the Apollo Command Module, the Columbia, while Armstrong and Aldrin stayed on the moon.
- **JOHN YOUND AND ROGER DRIPPEN**: (1981) Piloted the United States first space shuttle, the Columbia.

- **SALLY RIDE**: (1983) First American female astronaut in space. She traveled on the Challenger.

- **GUION BLUFORD**: (1983) First Black American in space. He traveled on the Chellenger.

- **BRUCE McCANDLESS and ROBERT STEWART**: (1984) First humans to fly free of the spacecraft with jet-propelled backpacks. This was during the fourth flight of the Challenger.

- **JAKE GARN**: (1985) Utah Senator, first congressman in space. He traveled aboard the Discovery.

ASTRONAUTS ABOARD THE CHALLENGER WHEN IT EXPLODED IN 1986: (THERE WERE NO SURVIVORS)

1. **MICHAEL J. SMITH**: Challenger Pilot
2. **FRANCIS R. SCOBEE**: Challenger Commander
3. **CHRISTA McAULIFFE**: Social Studies Teacher from Concord, New Hampshire
4. **JUDITH A. RESNIK**: Mission specialist, Second American Woman in Space when she flew earlier on the Discovery in 1984.
5. **RONALD E. McNAIR**: Mission Specialist who was an expert laser physicist. Second American, African American to travel in space.
6. **ELLISON S. ONIZUKA**: Mission Specialist
7. **GREGORY B. JARVIS**: Payload Specialist

THE NASA MERCURY PROJECT ASTRONAUTS:

Seven men were chosen by NASA to become part of the first manned space flights. They were:

ALAN SHEPARD
JOHN GLENN
VIRGIL (GUS) GRISSOM
SCOTT CARPENTER
WALTER SCHIRRA
GORDON COOPER
DONALD SLAYTON.

FAMOUS GEOLOGISTS IN EARTH SCIENCE

- **LOUIS AGASSIZ** (1840) Theorized that huge sheets of ice once extended from the North Pole to Central Europe, and changed the surface of the earth as they slowly moved over it.

- **RACHEL CARSON** (1962) Published Silent Spring to awaken the public to the dangers and problems of pollution.

- **JAMES HUTTON** (1775) Developed the idea of uniformitarianism, which said that features on the earth were formed by gradual change, and not by explosions or other drastic methods. Rivers and canyons were formed by weathering, erosion, and other elements that had always been present in that area.

- **CHARLES LYELL** (1830-1833) Published the first geology textbook called Principles of Geology. In this book he expressed his firm beliefs that the earth's surface has changed slowly over time.

- **FRIEDRICH MOHS**: Developed a hardness scale for the camparison of mineral hardness. Talc, the softest mineral, was listed as a 1 on the scale, and a diamond, the hardest mineral, was listed as a 10.

- **CHARLES RICHTER**: Developed a scale that measures the strength of an earthquake, based upon observations. The scale measures how much energy an earthquake releases by assigning a number from 1 to 10. The more energy that is released, the higher its number on the scale.

- **ERNEST RUTHERFORD** (1905) Theorized that the half life of radioactive minerals could be used to determine the age of the mineral.

- **ALFRED WEGENER**: Developed the theory of Continental Drift, which stated that at one time, the continents were all formed together into a giant continent, or super-continent called Pangaea. Over time, the continents drifted apart to their present locations.

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STUDY GUIDE:
OUR SOLAR SYSTEM

The solar system contains the sun, the nine planets that revolve around the sun, and the moons that revolve around the planets. Comets, asteroids, and meteoroids are also found in our solar system.

THE SUN:

The sun composes 98% of the mass of the solar system and is located in the center of the solar system. It is a star made mainly from hydrogen and helium gases. It produces energy and light for the solar system. This energy is released during a nuclear reaction called **fusion** that occurs when hydrogen atoms fuse into helium atoms.

The sun is the largest object in our solar system. Approximately 1.3 million Earths would fit into the interior of the sun. However, the sun is only a medium-sized star compared to other stars in the universe, and is yellow in color.

The sun's atmosphere is divided into three layers, and another layer makes up its interior. This interior layer of the sun is called the **core**. The **fusion** of the hydrogen atoms into helium atoms occurs within the core, which is the hottest part of the sun, having an average temperature of 15 million degrees Celsius.

THE THREE LAYERS OF THE SUN'S ATMOSPHERE: The **corona, chromosphere,** and **photosphere.**

1) The **corona** is the outermost layer of the sun's atmosphere. It is the second-hottest area of the sun after the core, with temperatures that reach 1,700,000 degrees Celsius. This area of the sun becomes visible during a total solar eclipse.

2) The **chromosphere** lies beneath the corona and above the photosphere. It is the middle layer of the sun's atmosphere. The average temperature of this layer is about 27,000 degrees Celsius. Violent sun storms start in the chromosphere.

3) The **photosphere** is the innermost layer of the sun's atmosphere. It is the coolest area of the sun. Seldom do the temperatures in this layer exceed 6,000 degrees Celsius. Since this layer is directly above the core, it's often called the sun's surface.

There are three main types of **sun storms**, or **solar storms** that occur on the sun.

1) **Prominences**—Hot gases from the chromosphere burst through the corona and shoot outward before looping back onto the sun, sending much energy and gas into space.

2) **Solar flares**—Gases erupt suddenly from the sun's surface, causing an immediate increase in the temperature around this area. They are short-lived, but do release a huge amount of energy into space during their eruption.

3) **Solar wind**—The solar wind is caused by the escape of high-energy particles from the corona.

The dark areas that appear on the sun are **sunspots**. Sunspots are cooler areas on the surface of the sun.

THE PLANETS:

There are **nine planets** that orbit the sun.

Order of planets from the sun:

1. Mercury
2. Venus
3. Earth
4. Mars
5. Jupiter
6. Saturn
7. Uranus
8. Neptune
9. Pluto

Size of the planets from smallest to largest:

1. Pluto
2. Mercury
3. Mars
4. Venus
5. Earth
6. Neptune
7. Uranus
8. Saturn
9. Jupiter

The inner planets: Mercury, Venus, Earth, Mars
The outer planets: Jupiter, Saturn, Uranus, Neptune, Pluto
The Jovian (gas giant) planets: Jupiter, Saturn, Uranus, and Neptune. All Jovian planets have a ring system.
The terrestrial planets: Mercury, Venus, Earth, Mars, and Pluto

Mercury

Mercury is the planet closest to the sun and the planet having the shortest orbit. It takes Mercury 88 days to revolve one time around the sun. Because it takes such a short time to revolve around the sun, the planet was named after Mercury, the Roman winged-foot messenger of the gods.

Mercury is the densest of all the planets other than the Earth. It has a huge metal core surrounded by rock. Its surface is bare and rocky and is covered with craters and lava plains.

Most of the craters were formed by meteorites striking the planet's surface. The Caloris Basin is the largest impact feature on the planet.

Mercury is so small that it has little gravity, and is thus unable to hold an atmosphere around it. Therefore, there is no weather or winds on Mercury.

Mercury does spin on its axis. A day on Mercury is equal to nearly 59 Earth days.

The only spacecraft to visit Mercury was Mariner 10, which flew by in 1974 and 1975.

Venus

Venus is the second planet from the sun. It takes 224.7 days to revolve once around the sun. Because Venus is nearly the same size as Earth, it has been nicknamed "Earth's Twin," although it has very few other things in common with the Earth.

The surface of the planet is rocky, and the large number of lava plains and volcanic uplands suggest much prior volcanic activity on the planet. Maxwell Montes, a volcanic mountain, is the highest mountain on the planet and the second highest mountain in the entire solar system. Winds create fields of dunes and "wind streaks" on the surface.

Venus is surrounded by clouds of sulfuric acid. Its atmosphere is composed mostly of carbon dioxide. Infrared rays penetrate this dense carbon dioxide atmosphere and are unable to escape, creating an overwhelming greenhouse effect. Venus is the hottest planet in the solar system with surface temperatures that often exceed 900 degrees Fahrenheit. Because its cloud cover reflects light, it is also the brightest planet, and the second-brightest object in the solar system after our Moon. The Romans named this bright planet after Venus, the goddess of love and beauty.

Venus has no moons, and is the only planet to rotate clockwise on its axis. This type of motion is called **retrograde rotation**. It takes 243 Earth years to rotate once, so a day on Venus is longer than a year on Venus!

Since it is often visible in the early morning and early evening hours, Venus is known as the "evening star" or "morning star."

The Magellan space probe was launched in 1989. While orbiting the planet, it mapped the surface of Venus by emitting radio signals that bounced off the surface to the probe.

Earth

Earth is the third planet from the sun and takes 365.26 days (365 days) to complete one revolution. It spins once on its axis every 24 hours and has one moon.

Earth's atmosphere is composed mainly of nitrogen. Oxygen and water vapor are also components of the planet's atmosphere. An entire study guide has been written about the Earth and its Moon.

Mars

Mars is the fourth planet from the sun and takes 687 days to make a complete revolution around the sun. The surface of Mars is rocky, and dotted with many craters. Huge amounts of iron oxide, or rust, in the soil cause Mars to appear red when viewed through a telescope, so Mars has been nicknamed "The Red Planet." Because of its red color, the planet was named after the Roman God of War.

Valles Marineris, an extremely large canyon that would stretch from Los Angeles to New York, is located on Mars. This canyon is deeper than American's Grand Canyon. Olympus Mons, a large volcano on Mars, is the highest peak in the entire solar system. Many valleys and channels on the planet's surface were probably carved by running water, but running water is no longer found on Mars. However, carbon dioxide ice and ice formed from water is found on the surface of Mars in its polar icecaps. Many of the clouds that surround the planet have also been formed from ice crystals.

Two small moons, Phobos and Deimos, circle the planet. Their names were derived from the Greek words for fear and terror. It is very possible that both were asteroids that were captured by the planet's gravity.

Mars Pathfinder landed on Mars in 1997 with a small robotic rover named Sojourner. The rover failed to find any indication of life on the planet.

Jupiter

Jupiter is the fifth planet from the sun. It takes 11.9 years to revolve once around the sun. Twenty-eight moons revolve around Jupiter. The four largest moons were discovered by Galileo in 1610 and are called the Galilean moons or Galilean satellites. The Galilean satellites in order of their size are Ganymede, Callisto, Io, and Europa. All four of these moons are larger than the planet Pluto.

Ganymede is the largest moon of Jupiter and the largest moon in the entire solar system. It is composed of rock and water ice, and has craters and possible earthquakes.

Callisto is the most heavily cratered object in the solar system. It has a huge bull's-eye crater called Valhalla, and its surface is also made of rock and ice.

Io is the innermost of Jupiter's large moons. Large deposits of sulfur on its surface cause it to appear brilliant orange, yellow, and red. Io is also covered with active volcanoes.

Europa's surface consists of ice sheets that continually melt and resolidify.

Jupiter is called a gas giant. Although it may have a small solid core, the dense clouds surrounding the core are composed of hydrogen that may be liquefied in places. Its outer area is made mainly of hydrogen and helium gases and so it has no solid surface. Jupiter revolves very quickly, having a day of 9.8 hours. Jupiter bulges at the equator due to its rapid rotation and this rapid rotation may also be responsible for the continual storms on the planet. The Great Red Spot is Jupiter's most dominant feature. The Great Red Spot is a storm three times larger than the Earth. Astronomers believe that it has been raging for over 300 years on Jupiter.

Jupiter is the largest planet in the solar system. Because of its size, it was named after the Roman King of the Gods.

Jupiter has a faint ring system that is made from pieces of dust. These rings were discovered by the Voyager spacecraft.

Saturn

Saturn is the sixth planet from the sun and takes 29.5 years to revolve once around the sun. This planet was first observed by Italian astronomer Galileo during the 17th century. It has

flattened poles, storm spots, and a banded atmosphere composed mainly of hydrogen and helium gases. These gas clouds form colored bands around the planet.

Saturn has 30 moons—more moons than any other planet in the solar system. Its largest moon is Titan. Titan is the second largest moon in the solar system. Only Jupiter's Ganymede is larger. Titan has been described as "a mini earth in a state of deep freeze," because Titan is the only moon in the solar system with a thick atmosphere of mainly nitrogen. This atmosphere is very similar to Earth's. All of Saturn's moons are composed of ice mixed with silicate rock.

Saturn is known for its magnificent ring system composed of more than 1,000 rings made from billions of pieces of ice and rock. Galileo discovered Saturn's rings. Three of these rings can be detected from Earth. Its outer ring is called the A ring. The widest and brightest of these three rings is the B ring. The Voyager 2 space probes actually discovered that there were many rings surrounding the planet instead of just a few.

Although Saturn is the second largest planet in the solar system, it is the least dense, and would float in a huge body of water.

Saturn was named after the Roman father of Jupiter.

Uranus

Uranus is the seventh planet from the sun and takes 84 years to make one complete revolution. Sir William Herschel, an amateur German astronomer, discovered Uranus in 1781. It was the first planet to be discovered with a microscope. Uranus is very unusual because it is tilted at a 98-degree angle and thus revolves around the sun on its side while it also rotates. During its 84-year revolution, the two poles take turns facing the sun.

Uranus has 21 moons. The five largest moons listed in order of their size are Oberon, Titania, Umbriel, Ariel, and Miranda. Oberon has many large craters, while Titania has no visible ones. Umbriel is covered with craters, one of which is a very large white crater called Wunda. Ariel shows very few craters or other old features. Pictures from Voyager 2 revealed that Miranda's landscape looks as if it has been patched together. It is very possible that Miranda was once broken up and then fused back together.

This planet is covered by a thick atmosphere composed of hydrogen, helium, and methane gases, which gives it a blue-green color. At least 11 faint rings circle the planet from top to bottom. Each ring is approximately 6 miles wide and is made of black ice.

Uranus was named after the Greek God of the Sky. According to Greek and Roman mythology, Uranus was the husband of Gaea, the earth, and became the father of the Titans.

Neptune

Neptune is the next to the last planet from the sun. At times it appears farther from the sun than Pluto because the two orbits cross each other. It takes Neptune 164.8 years to revolve once around the sun.

The planet was discovered in 1846 by German astronomer Johann Galle. A few days later, Triton, the largest of Neptune's 8 moons was also discovered. Strangely enough, Triton orbits Neptune in the opposite direction of Neptune's rotation. The moon has an icy surface.

Neptune was named after the Roman God of the Sea because of its distinctive blue color. Triton was named for the son of Neptune, whom the Greeks called Poseidon. It is believed that Triton was formed elsewhere and was captured by Neptune's gravity.

Triton has a small rocky core surrounded by an ocean of warm water and thick clouds of methane and ammonia. Its atmosphere is composed mainly of hydrogen and helium.

Five rings encircle the planet. They appear to be made of dark, icy particles that range in size from minute pieces of dust to refrigerator sized boulders. At one time a Great Dark Spot was visible on the surface of the planet. It was believed to be a large hurricane-like storm. It is no longer visible.

Voyager 2 has provided astronomers with most of their knowledge of Neptune.

Pluto

Pluto is the ninth, and last planet from the sun. Its orbit crosses inside Neptune's orbit for 20 of the 248 years in its revolution around the sun. The planet was discovered by an amateur American astronomer named Clyde Tombaugh in 1930. Pluto is the smallest and coldest planet in the solar system. Since it is located so far away, very little is actually known about Pluto. It is the only outer planet that has not been visited by Voyager 2, and since no space probe has ever visited the planet, astronomers can only guess what it looks like.

Another American astronomer, Jim Christy discovered Pluto's one moon in 1978. Pluto's moon, called Charon, is just over half of Pluto's size and both of their orbits seem to be "locked together." Charon orbits Pluto with the same hemisphere always facing the same hemisphere on Pluto. For this reason, they are sometimes called a "double planet." Astronomers believe that Pluto and Charon both have large rocky cores covered by dirty water ice. Their surfaces are probably made of ice that is a mixture of nitrogen, carbon monoxide, and methane, thus giving them a slightly red color. Polar caps and dark spots appear near Pluto's equator.

Because the planet is a dark, icy body, it was named after the Roman God of the Underworld.

FACTS ABOUT THE PLANETS:

Largest planet: Jupiter
Smallest planet: Pluto
Planet closest to the Sun: Mercury
Planet that comes closest to Earth: Venus
Fastest-moving planet: Mercury
Slowest planet: Pluto
Warmest planet: Venus
Coldest planet: Pluto
Longest day: Mercury
Shortest day: Jupiter
Least dense planet: Saturn

Other Interesting Facts:

1. Jupiter has a gigantic magnetic field called the **magnetosphere.**
2. Jupiter gives off more heat than it absorbs from the sun.
3. All four of the gas giants have a ring system.

4. All the planets orbit the sun in the same direction.

5. The orbits of all the planets lie in a flat plane except for the orbit of Pluto, which is tilted compared to the other orbits.

6. Mercury and Venus are the only two planets that do not have at least one moon.

7. Mars looks like a red star in the sky.

8. Jupiter has a striped appearance when viewed through a telescope. These stripes are due to its rapid rotation.

9. Some of Jupiter's and Saturn's moons are very similar in size to the planet Pluto.

Asteroids

Asteroids are defined as small, irregular bodies that are covered with craters. The largest asteroids are often referred to as minor planets. Most of the asteroids lie in the **asteroid belt**, which is located between the orbits of Mars and Jupiter. The largest asteroid is **Ceres**, which was discovered in 1801. Apollo, Icarus, and Adonis are three asteroids that actually pass inside Earth's orbit. Occasionally, pieces of asteroids fall to the Earth. Those that do not burn up from the friction and heat as they pass through the atmosphere are then called **meteorites**. Many scientists believe that the extinction of the dinosaurs was caused by a huge meteorite hitting the earth. If asteroids or grains of dust burn up in the earth's atmosphere, they are then called **meteors**. The common name for a meteor is a shooting star.

Comets

Comets are balls of dust and ice that orbit the Sun. A comet has three basic parts: the **nucleus**, **coma**, and the **tail**. The **nucleus** is the core of a comet. Gas that evaporates from the nucleus forms a cloud of dust called the **coma**, which spins around the nucleus. Together, the nucleus and the coma make up the head of the comet. Solar wind blows the coma outward into a long tail which streams away from the sun. This **tail** is actually composed of two separate tails, a straight gas tail and a broader, curved dust tail.

Edmond Halley was the first astronomer to discover the regular orbiting patterns of comets. He observed a comet in 1682 and predicted its return in 1758. This comet, which did indeed return, came to be known as **Halley's Comet**.

The comet called Shoemaker-Levy smashed into Jupiter in 1994. The Hale-Bopp comet could be easily viewed from Earth in 1997.

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STUDY GUIDE:
STARS

Facts You Should Know:

Stars are created in swirling masses of gas and dust particles called a **nebula**. A star is fueled by internal **nuclear energy**, in a process called **thermonuclear fusion**, and stays together due to the forces of its own **gravitation**. The hotter a star's **core**, or center, the more reactions it produces. A star's gravity depends upon the **mass** of the materials inside its core. Most stars are composed primarily of **hydrogen**. The rest of a star's content is **helium**. In the core of a star, hydrogen **fuses** to form helium, thereby releasing nuclear energy. In **Main sequence** stars, the greater a star's mass, the brighter its **luminosity** will be.

Stars vary greatly in mass, temperature, and luminosity.

Astronomers have categorized visible stars into six different **magnitudes**, depending upon their **apparent brightness**. Apparent magnitude refers to how bright a star appears when seen from the Earth. The first magnitude is a **relative measurement** because it often depends on the star's distance from us. Closer stars often appear brighter than some of the farther stars, even though the farther stars are actually brighter.

Luminosity is the measure of the total amount of light a particular star emits. To measure luminosity, astronomers must measure the u-v rays that are emitted, but this is sometimes difficult, because our atmosphere blocks these rays from visibility.

Astronomers use a star's light rays to calculate its **spectral type**, which indicates its approximate temperature. To do this, these use a **spectroscope**. Since the color of a star is correlated with its surface temperature, this measurement, which breaks the star's light into color bands, helps to determine the star's temperature. Astronomers classify stars according to their temperatures into seven spectral classes. In order from hottest to coldest, these spectral classes are **O, B, A, F, G, K**, and **M**. The hottest stars are placed

in the O and B class and are blue. The next hottest are classified in the A class and are white. F and G are yellow. Those in the K class are orange, and the M class contains the red stars, which are the coolest of the stars.

A graph developed by Ejnar Hertzsprung and Henry Norris Russell, now known as the Hertzsprung-Russell diagram, plots the relation of absolute brightness to its spectral type. When the stars are plotted, most of the stars fall along a "Main Sequence" diagonal from the top left to the bottom right. This chart portrays surface temperatures horizontally and plots luminosity vertically, so that the brightest stars fall at the top of the chart, and the hottest stars congregate on the left. The faintest stars are found at the bottom.

The sun is a star! In fact, it is the closest star to Earth, only 150 million kilometers (93 million miles) away. This may seem like a long way, but it's still 250,000 times closer to us than the next closest star, which is Proxima Centauri. The Sun is 4.6 billion years old and its light only takes 8 minutes to reach Earth, while the light of many other stars takes billions of years. **Red giants**, the biggest tars, are hundreds of times larger than the sun. **White dwarfs** are approximately the size of the Earth.

The earliest astronomers thought stars were motionless and formed fixed patterns in the night sky that became known as **constellations**. Now we know that stars do move, but do so very slowly. This factor is known as **proper motion**. The motion we see of stars across the night sky is called **apparent motion**, and is actually a by-product of the Earth's rotation.

The universe contains countless **galaxies**, each composed of billions of stars that orbit around one central location. Galaxies are classified according to their shape. The three main types of galaxies are **elliptical, spiral, and irregular**. All the visible stars in relation to us are in the **Milky Way**, our galaxy, which contains the sun and our solar system of planets as well. The Milky Way is a spiral galaxy.

Star clusters can be **open** (also called **galactic**) or **globular**. There are fewer and more sparse stars found in an open cluster than globular one. Stars in an open cluster are usually about the same age. One of the more famous visible open clusters is the **Pleiades** (also known as the Seven Sisters) in Taurus, which contains approximately 500 stars. The brightest star is the Pleiades is Alcyone. One of the most well-known open clusters in the Southern Hemispheres is the Jewel Box, which contains stars of many colors.

Globular clusters are more common. They are symmetrical, spherical, and closely bound. They surround the Galaxy in a "galactic halo." They can contain millions of stars that are bunched together in a "glob." In comparison, open clusters are shapeless and contain relatively few stars. There are approximately 120 known globular clusters in the Milky Way. Most are found near Scorpio and Sagittarius.

Phases of Stars

Stars go through several phases as they age. Once they are formed in a nebula from gas and dust, they continue to survive by burning hydrogen for billions of years. This phase is called the **main-sequence.**

When a star runs out of hydrogen, the star is out of balance and the core shrinks. However, the star itself expands, becoming a **red supergiant**. As the core shrinks, the internal pressure rises, making it hot enough to begin another nuclear reaction, at which point the core stops shrinking and the atmosphere begins to consolidate.

When supergiants contract, they often form **neutron stars**, dense, compact stars that spin rapidly.

Extremely massive supergiants may repeat this process, condensing even further to become **black holes**, whose gravitational fields are strong enough to block light.

A **white dwarf** occurs when a small to middle-mass star uses up its fuel, and collapses. As it collapses, much of its atmosphere disburses into space as gas and dust from which new stars will be formed. After about a billion years, this type of star will lose its fuel, and change into a **black dwarf.**

Unique Types of Stars

Binary stars are actually two stars that orbit each other, which means every so often one of the stars passes behind the other star and is hidden for a short time.

Variable stars alternate between brightness and dimness. Two important variable stars are Delta Cephei in the Northern Hemisphere and R Centaiuro in the southern Hemisphere.

Flare stars are red dwarfs that suddenly release brief bursts of light.

Pulsars emit radio waves and magnetic fields and are created when neutron stars collapse.

Novas occur when a main-sequence star and a white dwarf star in a binary star system explode in the course of a day. Temporarily, this can make their system 300,000 times brighter than the sun. This brightness lasts for a few days or weeks, and then lessens gradually, leaving the stars about the same as they were before. In 1992, Nova Cygni, in the northern constellation Cygnus, became one of the brightest novas visible during this century.

A **supernova** occurs on rare occasions. It happens when a star explodes, giving off light, and typically destroying itself. The most notable recent supernova, because it was the first to be visible to us on Earth in 300 years, was SN 1987 A, which erupted near the Milky Way in a galaxy known as the Magellanic Cloud.

THE BRIGHTEST STARS IN THE SKY IN ORDER OF BRIGHTNESS:

1. Sirius
2. Canopus
3. Alpha Centauri
4. Arcturus
5. Vega

The next brightness stars are Capella, Rigel, Procyon, Archernar, and Betelgeuse. Vega is the brightest star in the northern hemisphere.

THE CLOSEST STARS TO EARTH, IN ORDER:

1. The Sun
2. Proxima Centauri/Alpha Cen C
3. Rigil Kentaurus/Alpha Cen A
4. Alpha Centauri B
5. Barnard's Star

THE CONSTELLATIONS:

Stars form patterns in the sky called constellations. The constellations in the northern sky that circle Polaris, the north star, are called the north circumpolar constellations. The five most popular north circumpolar constellations are Ursa Major, Ursa Minor, Draco, Cassiopea, and Cepheus.

Ursa Major is known as the Big Bear and contains the seven stars that compose the Big Dipper. The front stars of the big Dipper are called the pointer stars because they point to Polaris, located at the end of the handle of the Little dipper, which is found within Ursa Minor, the Little Bear. Draco is a dragon, and Cassiopea is a queen, whose shape resembles a wide "w" in the sky. Cepheus, the king of Ethiopia, also sits beside Cassiopea in the northern sky. This constellation appears as a simple picture of a house, and is often upside-down in the sky. These north circumpolar constellations can be found at any time of the night.

THE ZODIAC CONSTELLATIONS:

The zodiac constellations are 12 constellations that appear to encircle the earth. A list of these constellations and pictures associated with each constellation are given below.

CONSTELLATION	PICTURE THAT IT FORMS
1. Capricorn	Goat
2. Aquarius	Water bearer
3. Pisces	Two Fish
4. Aries	Ram
5. Taurus	Bull
6. Gemini	The Twins
7. Cancer	Crab
8. Leo	Lion
9. Virgo	Virgin
10. Libra	Measuring Scales
11. Scorpio	Scorpion
12. Sagittarius	Archer

OTHER STAR CONSTELLATIONS:

CONSTELLATION	PICTURE THAT IT FORMS
1. Bootes	Herdsman
2. Corvus	Crow
3. Crater	Cup
4. Hydra	Sea serpent
5. Aquila	Eagle
6. Corona Australis	Southern Crown
7. Corona Borealis	Northern Crown
8. Cygnus	Swan
9. Hercules	Hercules
10. Lacerta	Lizard
11. Lupus	Wolf
12. Lyra	Lyre
13. Vulpecula	Fox
14. Andromeda	Princess of Ethiopia
15. Cetus	Sea Monster (Whale)
16. Delphinus	Porpoise or Dolphin
17. Equuleus	Little Horse
18. Pegasus	Winged Horse
19. Perseus	Perseus
20. Triangulum	Triangle
21. Auriga	Charioteer
22. Camelopardus	Giraffe
23. Canis Major	Large Dog
24. Canis Minor	Small Dog
25. Columba	Dove
26. Lepus	Hare
27. Orion	Hunter
28. Apus	Bird of Paradise
29. Crux	Southern Cross
30. Musca	Fly
31. Pavo	Peacock
32. Reticulum	Net
33. Triangulum Australe	Southern Triangle
34. Tucana	Toucan
35. Volans	Flying Fish

SELECTED CONSTELLATIONS	BRIGHT STARS IN CONSTELLATION

Within a star constellation there is sometimes a star that shines brighter than the rest. You will be given the bright stars in the following constellations.

1. Bootes	Arcturus
2. Ursa Minor	Polaris
3. Leo	Regulus
4. Virgo	Spica
5. Cygnus	Deneb
6. Lyra	Vega
7. Aquila	Altair
8. Perseus	Algol
9. Auriga	Capella
10. Gemini	Castor and Pollux
11. Taurus	Aldebaran
12. Canis Major	Sirius
13. Canis Minor	Procyon
14. Orion	Rigel and Betelgeuse

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STUDY GUIDE:
PLANTS

The study of plants is called **botany**, and the scientist who studies plants is called a **botanist**.

Plants have five main characteristics:

1. They are **multicellular organisms**. This means that they are composed of several cells instead of just one cell.
2. They do not move by themselves.
3. They have a **cell wall** surrounding the **cell membrane** of each cell.
4. They are **autotrophs**, which means they produce their own food by a process called **photosynthesis**. Photosynthesis is the scientific process whereby plants produce food by utilizing solar energy. Chlorophyll in the leaves traps the sunlight's energy to produce carbohydrates for its own nourishment.
5. They have **chloroplasts** within their cells that contain **chlorophyll** to aid in photosynthesis. Besides aiding in photosynthesis, chlorophyll gives plants their green color.

Plants are divided into two main groups according to their structure. They may be nonvascular or vascular plants.

Nonvascular plants are plants that have no internal tube-like structures to carry the sugar, water, and minerals throughout the plant. They also lack true roots, stems, and leaves.

There are two main types of nonvascular plants:
MOSSES and LIVERWORTS

Vascular Plants are plants that have a system of tube-like cells that carry materials throughout the plant. There are two types of vascular tissue in a vascular plant. The **phloem** carries food from one part of a plant to another. Food is produced in the leaf

and travels downward to the root and to other parts of the plant through phloem. The other type of vascular tissue is the **xylem**. The xylem carries water and dissolved minerals upward from the roots to the stem and leaves. Vascular plants do have true roots, stem, and leaves. Vascular plants tend to be taller than nonvascular plants, because they are able to transport materials longer distances through their tube-like vascular systems.

All plants EXCEPT mosses and liverworts are vascular plants.

Because they have a simpler structure, let's examine the **nonvascular plants** first. Mosses and liverworts are nonvascular plants that belong to the phylum **bryophyta**. Bryophytes are small land plants that produce spores and live in a moist environment. Bryophytes do not have true roots. They are held in the ground by a mass of root-like threads called **rhizoids**. Water travels through the rhizoids and to all parts of the plant by **osmosis**. The rhizoids are connected to the green, stalk-like part of the plant. Surrounding the stalk are green, leaf-like parts that contain the chloroplasts and carry on the photosynthesis. Once the food is manufactured, it is carried to the other parts of the plant by **diffusion**. Both osmosis and diffusion are very slow processes. A capsule is located at the top of each stalk. This is the spore case of the moss.

The life cycle of **moss** is unique. Moss undergoes an asexual stage as well as a sexual stage during its life cycle. During the asexual stage, the moss capsule produces spores. When these are scattered by natural forces, such as wind and water, they sometimes land in moist soil. If so, they **germinate**, meaning they sprout into a new plant. When this new plant matures, it develops sex organs at the top of the leaf-like parts and begins the sexual phase of its life. The male sex organ produces the sperm, which swims through the inherent moisture, such as rainwater or dew, and fertilizes the egg of a nearby female sex organ. This fertilized egg is called a **zygote**. It develops into an **embryo** that remains in the moist female sex organs for protection. Here it develops a stalk and a capsule, and the process starts over again.

OTHER VOCABULARY RELATED TO MOSSES:

1. **Gametes** are the sex cells.
2. **Gametophytes** are the stage in the life cycle that produces the gametes.
3. **Sporophytes** are the stage in the life cycle that produces spores, the cells which are capable of reproducing into a new entity.

Liverworts are another nonvascular plant and are very similar to mosses.

Vascular plants are divided into **two main types**: those that are **seedless**, such as club mosses, horsetails, and ferns, and those that have **seeds**, which are then subdivided into the **gymnosperms** and **angiosperms**. Gymnosperms include conifers, cycads, and gingkoes, and **angiosperms** include the flowering plants.

The club moss is a **vascular seedless plant**. It lives in tropical regions or on forest floors in the cooler climates. It reproduces by producing spores called gametes. It is not a true moss because it has scale-like leaves, and mosses do not have leaves. Horsetail are very similar to club mosses. Both were much more widespread in the past.

Another **vascular seedless plant** is the fern. Like all vascular plants, ferns have true leaves, stems, and roots. They are often grown as houseplants. The other parts of a fern are the:

Rhizomes: The part of the plant between the roots and the young leaves.
Fronds: The large feathery leaves.
Fiddleheads: The young leaves that are coiled up. They uncoil and become mature fronds and the plant ages.
Sporanzia: The structure in which reproductive cells are produced.
Sori (Sorus): The term for the clusters of spore cases that develop on the underside of a fern frond. Spores released from the sori are carried by the wind and water.

Ferns were the first plants to evolve vascular tissue and the first to evolve true roots, stems, and leaves.

Vascular plants with seeds are subdivided into the **gymnosperms** and the **angiosperms**. Gymnosperms are plants that produce seeds but do not have flowers. Most trees and shrubs are gymnosperms. Like all vascular plants, gymnosperms have true roots, stems, and leaves. **Conifers** are gymnosperms that have needle-like leaves and produce seeds in cones. Pines, spruces, and sequoias are examples of conifers.

Reproduction in Conifers:

1. The small, male cones produce pollen, a yellow powder that produces sperm.
2. The wider female cone has two ovules near its base that produce one or more eggs. The ovules protect the eggs.
3. Pollen is released from the male cones in the spring.
4. The pollen is carried to female cones by the wind, other weather conditions, or animals.
5. The pollen lands on the female cone. It slides down the scales of the female cone and is caught in the sticky substance released by the ovules. Pollination has occurred, and the sperm fertilizes the egg.
6. The fertilized egg grows into an embryo that becomes a seed.
7. The seed coat is a tough, outer covering that protects the seed, which is finally released in the second autumn after pollination.

Cycads and ginkgoes are also gymnosperms.

Angiosperms are **vascular plants with seeds** that produce flowers. There are two types of **angiosperms**.

1. The first type is **monocotyledons** (monocots). Monocots have the following distinctive characteristics:

    a. One seed leaf (cotyledon).
    b. Parallel leaf veins.
    c. Scattered vascular bundles inside its stems.
    d. Fibrous roots.
    e. Flowers that occur in multiples of three parts.

2. The second type is **dicotyledons (dicots).** Dicots have the following distinctive characteristics:

    a. Two seed leafs (cotyledon).
    b. Veins that have a netlike pattern or are palmates.
    c. Vascular bundles that form a ring pattern in the stems.
    d. Tap roots.
    e. Flowers that occur in multiples of four or five.

ANGIOSPERMS have eight distinct parts.

1. **Stamens** are the male reproductive organs of the flower.
2. **Pistils** are the female reproductive parts.
3. **Stigma** refers to the sticky surface on the pistil that traps the pollen.
4. **Sepals** are usually green. They are leaf-like and are found at the base of the flower. They enclose the flower before it blooms and protect it.
5. **Filaments** are the long stalk-like parts of the stamen that support the knob-like anthers where the pollen is produced.
6. The **style** is the section of the pistil that links the stigma to the ovary.
7. **Ovules** are the female reproductive organs of the flower that produce the eggs.
8. **Ovaries** contain the ovules.

Angiosperms are grouped according to the length of their growing periods. They can be **annuals**, **biennials**, or **perennials**. Annuals are plants that complete their life cycle in one year. Biennials are plants that require two years to complete their growth and life cycle. Perennials are plants that grow year after year and reproduce many times.

ROOTS

There are two main types of roots: **fibrous roots** and **tap roots**. Both types of roots are covered with **root hairs**. Root hairs are tiny hairs that gather water and nutrients from the soil. They also help anchor the plant into the ground. The roots of some plants store food.

Fibrous roots are slender and branch out in many directions. They are often found in such food crops as wheat, barley, and beans.

A taproot is a single, large root that grows straight down into the ground. It has tiny root hairs that shoot out form its core. Its purpose is to store a large amount of food. The carrot is an example of taproot.

ROOT STRUCTURE

The **epidermis**, an outer layer of cells, protects the root. Inside this layer is **vascular tissue**, which includes two types of cells, the **phloem** and the **xylem**. The function of the phloem is to transport food from one part of the plant to another. The function of the xylem is to carry water upward from the roots to the rest of the plant.

STEMS

There are two main types of stems: **herbaceous** and **woody**. An herbaceous stem is soft, green, and flexible. Woody stems are hard, strong, and firm.

The purpose of stems is to transport the food from the leaves to the roots, and to hold the plants erect, so the leaves can capture light, and thus undergo photosynthesis.

Stems are composed of **xylem**, **phloem**, and **cambium**. Xylem is found towards the core of the stem, and phloem is found closer to the outside. The cambium is a layer of cells that manufactures new xylem and phloem. When you look at the growth rings of a tree, you are actually looking at its xylem! **Bark** is the outer protective layer found on woody stems.

LEAVES

Leaves are the part of the plant that manufacture the food. The flat part of the leaf is called the **blade**, and the **veins** are actually bundles of xylem and phloem.

OTHER LEAF PARTS INCLUDE:

A. The **epidermis** is the outer protective coating of cells on the leaf.
B. The **mesophyll**: the middle part of the leaf containing the chlorophyll and the part of the leaf where most of the food is actually made.

C. The **cuticle** is the waxy layer found on some leaves that keeps the plant from losing water through evaporation.
D. The **palisade layer** contains long cells under the epidermis (in the mesophyll) that aid in the process of photosynthesis.
E. The **spongy layer** contains irregularly shaped cells that also help during photosynthesis.
F. **Stomata (Stomates)** are the openings on the underside of the leaf where carbon dioxide enters the leaf and oxygen exits the leaf during photosynthesis.
G. **Petioles** are stalk-like particles that attach the leaves to the stem.

LEAF VEIN PATTERNS

There are three main leaf vein patterns:

1. **Pinnate**: The veins in a pinnate leaf pattern resemble the veins in a feather. One main vein, called the midrib, goes up the center of the leaf. Several smaller veins branch off from the midrib. Elm leaves have a pinnate leaf pattern.
2. **Parallel**: Grass has a parallel vein pattern. The veins tend to run parallel to each other. They never touch or intersect each other until they get to the very tip where they taper toward the point of the leaf.
3. **Palmate**: There is not one main midrib in the palmate vein pattern. Three to five larger veins branch outward from one point near the bottom of the leaf, resembling fingers on a hand. Other small veins then branch from these larger veins. Maple leaves have palmate leaf patterns.

PHOTOSYNTHESIS

Photosynthesis is the food-making process in the plant. The four things needed for photosynthesis are carbon dioxide, chlorophyll, water, and light energy. Photosynthesis takes place in the leaf of the plant. Carbon dioxide is brought into the plant through the stomata on the leaves, and the roots gather water and transport it upward to the leaves. The following steps then occur.

1. The chlorophyll captures and traps the light from the sun.
2. The captured energy is split into two parts. One part is stored in the compound ATP and will be used for other cell purposes. The other part is split apart to release the hydrogen and oxygen. The oxygen is released into the air through the stomates, or tiny holes, on the underside of the leaf. The hydrogen remains in the chloroplasts.
3. Enzymes and energy that has been stored as ATP then combine with carbon dioxide to create a simple sugar, called glucose that is used by the plant to perform its life processes.

RESPIRATION

Respiration is the process where the energy stored within the newly manufactured glucose is released from the glucose. Contrary to photosynthesis, which occurs only during the daylight, respiration occurs continuously. It is the opposite of photosynthesis in that it uses some of the oxygen produced in photosynthesis and releases carbon dioxide and water.

TROPISMS

Tropisms are the processes in which a plant grows toward a particular stimulus.

There are four different types of tropisms:

Phototropism: The plant responds and grows toward a **light** source.
Geotropism: The plant responds to **downward gravity**. If a plant is placed upside down, with the roots extending upward, those same roots with gradually turn and grow downward due to gravity.
Thigmotropism: Plants respond and grow toward **touch**. They may wind around a wooden stake, or grow along a wall.
Hydrotropism means that the plants respond and grow toward **water**.

OTHER PLANT VOCABULARY TERMS

Auxins are hormones that determine stem growth. They are connected with tropisms.
Bulbs are the underground portions of the plant that put down roots.
Cross-pollination occurs when pollen is transferred from the anther of one flower to the stigma of another flower by the action of weather conditions or insects.
Dormancy is the time period during which a plant does not grow.
Embryo is a term for the young plant that develops from the zygote.
Endosperm is the material which turns into stored food for the seed.
Epiphytes are plants that grow on trees but do not leech food from the tree or harm the tree in any way. For example, in some tropical forests, ferns may grow on the sides of taller trees.
Fruit is the name given to the ripened ovary that surrounds and protects the seeds.
Germination refers to the beginning of growth.
Gnetophytes are a group of plants that possess characteristics of both gymnosperms and angiosperms. Included in this category are tropical vines and several desert plants.
Grafting is the science through which a bud of one plant is inserted into an existing stem or trunk of another, where it grows as a permanent part of that plant.
Hydroponics is the science of growing plants in water as opposed to the traditional method of planting them in soil.
Pollination is the process by which pollen is transferred from the male reproductive structure (stamen) to the female reproductive structure (ovule).
The **Radicle** is the root part of an embryo seedling.
The **Seed Coat** is the outer casing that protects the seed.
Self-pollination occurs when pollen from the stamen is transported to the pistil in the same flower.
Tuber refers to the short, fleshy part of an underground stem from which new plants develop.
Vegetative reproduction occurs when a new plant grows from the root, stem, or leaf of another parent plant.

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STUDY GUIDE:
AGRICULTURE: CROPS

MAIN FIELD CROPS GROWN IN THE UNITED STATES:

1. Corn
2. Soybeans
3. Wheat
4. Rice

The United States produces more corn than any of the other main field crops. However, we export more wheat than any of the other crops.

CORN

Corn is an important agricultural crop. It is grown on every continent of the world except Antarctica.

The Corn Belt is the name given to the area in our country that grows the most corn. Illinois, Iowa, Nebraska, and Minnesota are the four states in the Corn Belt that produce the most corn. Other states in the Corn Belt are: Ohio, Indiana, Missouri, Kansas, and South Dakota. Iowa usually leads in the production of corn and is followed closely by Illinois.

Approximately 61% of the corn grown by U.S. farmers is used for feeding livestock, and about 22% is exported.

There are four main types of corn grown in the state of Illinois. The four main types of corn grown in Illinois are **seed corn**, **sweet corn**, **field corn**, and **popcorn**.

Corn is measured in bushels. One bushel weighs approximately 56 pounds. Each piece of corn is called a KERNEL. The elongated oval in the center of the corn kernel is called the GERM. The germ contains most of the oil and some of the protein in the corn kernel. This is the part of the kernel that is used in cooking oils, margarine, mayonnaise and salad dressing. The fibrous outer layer of a corn kernel is the HULL.

Corn is attacked by a variety of parasites and fungi. Corn smut, a parasitic fungus, produces a large mass of black spores on ears, stalks, or tassels. The corn rootworm, a larva of the cucumber beetle, feeds on the root system of corn plants. The European corn borer attacks the stem of the plants.

SOYBEANS

Soybeans originated in China, but today the United States leads the world in the production of soybeans. Brazil and China are also important soybean producers. Illinois is usually the leading soybean-producing state, and is followed closely by Iowa. Indiana, Minnesota, and Missouri are the next three largest soybean producers.

Soybeans are usually planted in the Midwest in May or June. After six to eight weeks, small flowers appear on the soybean plant. The flowers may be purple, white, or pink. About two weeks later, the pods are produced. Each pod usually contains two or three soybean seeds, which are also called beans. It takes 30 to 40 days for the beans to mature. During this time, the plant continues to grow until it stands from two to four feet tall. The leaves turn yellow and fall to the ground. Combines are used to harvest the beans in late summer or early fall.

Soybeans are legumes and belong to the same family as the pea. They thrive in fertile, well-drained soil, and require at least 20 inches of rain per year. Because they obtain nitrogen from the air, they do not require nitrogen fertilizers.

Soybeans are the nation's largest source of vegetable oil and protein meal for livestock. Forty percent of the soybean is protein, and 20% is oil. Soybean oil is cholesterol-free and is the number-one edible oil in the world, and the most frequently consumed oil in our country. Each bushel of soybeans can be crushed to yield over 10 pounds of soybean oil, and 39 pounds of soy flour can be obtained from one bushel of beans.

Soybeans are attacked by many different diseases. Diaporthe pod and stem blight is a fungal disease that attacks the pods and stems of the plant. Other pests, such as the bean leaf beetle, stinkbug, velvetbean caterpillar, and tiny worms called nematodes also attack the soybean plants.

We export soybeans to many countries, but more soybeans are exported to the following countries than any others: Canada, Mexico, Venezuela, Saudi Arabia, China, and the Philippines.

WHEAT

Wheat is grown in many countries of the world. The countries producing the most wheat are listed below in order of their production.

1. Russia
2. China
3. United States
4. India
5. Canada
6. France

The two main types of wheat are winter wheat and spring wheat. Winter wheat is planted in the fall and harvested in the spring or early summer of the next year. It accounts for 70 to 80% of the U.S. wheat production. Spring wheat is planted in the spring and harvested in the summer of the same year. It is usually grown in cool, dry regions where the soil quality is poor. The wheat is usually planted by using a drill. The plant turns a golden brown when ready for harvesting.

There are six major classes of wheat that are classified according to their hardness, color, and shape of their kernels.

1. Hard Red Winter Wheat
2. Hard Red Spring Wheat
3. Soft Red Winter Wheat
4. Durum
5. Hard White Wheat
6. Soft White Wheat

Hard Red Winter Wheat is the largest class of wheat produced each year in the United States. It is grown mainly in the Great Plains states. Hard Red Spring Wheat contains the highest percentage of protein. It is grown mainly in Montana, North Dakota, South Dakota, and Minnesota. Hard White Wheat is the newest class of wheat grown in the United States.

Wheat is grown mainly for flour that is used for breads and pastries. Many breakfast cereals are made from wheat, as well as tortillas and other snack foods.

The wheat kernel contains three parts that are separated during the milling process to produce the flour. These three parts are the **endosperm**, **bran**, and the **germ**.

The leading wheat-producing states in our country are North Dakota, Kansas, Montana, and Oklahoma.

The principal diseases of wheat are RUST and SMUT.

RICE

Rice requires warm temperatures and at least 40 inches of rainfall per year to grow. The rice is planted by low-flying airplanes and grown in flooded fields called rice paddies. Rice grows to be about one meter tall. It has perfect flowers with six stamens and one pistil. The rice grain is actually the fruit of the plant, and is produced in spikelets at the top of the stalk. The white endosperm is enclosed by a layer of bran and surrounded by a brown husk.

In the United States, a flooded field, called a paddy, is seeded by an airplane. The field is kept flooded during most of the growing season. The crop is harvested and threshed by machine, producing brown rice. If white rice is desired, the bran is removed from the rice, leaving the white endosperm intact. This white internal kernel is polished with glucose and talc to improve its appearance.

The four main rice-growing states in our country are Arkansas, California, Texas, and Louisiana. Rice is also grown in Florida, Missouri and Mississippi.

China is the leading rice producer in the world. It is followed closely by India.

The main rice diseases are seedling blight, leaf smut, stem rot, and kernel spots. Most of these diseases are caused by fungi. Seedling blight occurs when a fungus infects the seedlings. Leaf smut, another fungus, is very prevalent in Arkansas, Louisiana, and Texas. Stem rot attacks the stalks of rice, causing them to weaken and break.

FARM MACHINERY:

Tractor: The tractor is the most important implement used on a farm because it pulls many other types of farm machinery.

Plow: The plow is used to break the ground and prepare the soil. It has bladelike plowshares that cut into the soil, lift it up, and turn it over. Harrows are then used to cover the seeds.

Disk harrows: These are sometimes used before plowing to chop up crop residues that have been left in the field from the previous crop.

Corn planters: Corn planters are used to plant corn seeds in rows. A special wheel picks up small amounts of corn seed and places them in the ground.

Manure spreader: This wagon has a conveyor belt that carries the manure to a beater attachment where it is pulverized and then scattered on the ground to serve as a natural fertilizer.

Cultivator: This machine destroys weeds and loosens the soil, thus allowing air to enter.

Combine: This machine harvests corn, soybeans, and several other crops. It removes the fruiting heads, beats the grain kernels, and cleans the grain. Corn is also picked with a corn picker, which strips the ears from the stalks.

Auger: This is a spiral device on a shaft. It resembles a giant, rotating screw that is used to move grain through a tube.

Hay baler: This machine compresses the cut hay into bales and secures them with heavy twine.

Cotton gin: It twists the cotton fibers from the boll and removes the seeds.

Chisel plow: This machinery is pulled behind a tractor to break up very hard soil.

Drill: This piece of machinery pokes holes in the soil for the seeds, plants the seeds, and covers them up.

Float: This device is pulled behind a tractor to level or smooth the soil.

Header: The header is the part of the combine that cuts the talks and conveys them to the threshing part of the combine.

TYPES OF FARMING METHODS:

Strip cropping: Farmers grow clover crops in strips between other crops to help hold the soil in place.

No- Till: Fields are not plowed or tilled after the crops have been harvested. Stalks and other parts from the crop are left in the ground until the spring. This helps prevent wind and water erosion.

Crop rotation: Because different crops use different nutrients from the soil, one crop is grown in a field the first year and a different crop is grown in the same field the next year. Plants, such as legumes, can revitalize the soil and help maintain good yields.

Dry farming (or dry land farming): Crops are grown without irrigation.

Contour plowing: Furrows are plowed at right angles to a slope to help catch the rainwater and retain runoff, thus halting erosion. Rows are made around a hill instead of vertically up and down.

Terraces: A flat, wide ledge is cut into the side of a hill or mountain to create a level place for crops to be grown.

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STUDY GUIDE: AGRICULTURE: LIVESTOCK, PART 1
CATTLE and SHEEP

CATTLE: GENERAL CHARACTERISTICS OF CATTLE

Cattle have one stomach that is divided into four compartments: the rumen, the reticulum, the omasum, and the abomasum.

They are ruminants. The animals chew the food and swallow it. The food goes into the rumen and is then regurgitated. This regurgitated food, called the CUD, is again chewed in the mouth before it is swallowed and passed once again through the rumen and the other three stomach parts.

They have a total of 32 teeth. Eight incisor teeth are located on the bottom front jaw, but no teeth are found on the top front. There are six strong, flat molars on the back of both sides of each jaw.

They are even-toed hoofed mammals. Some cattle are polled. This means that they have no horns. Others have hollow, unbranched horns that are never shed.

The average gestation period is 281 days. The gestation period refers to the actual number of days in the pregnancy from conception to birth.

Cattle are divided into two main categories—**beef cattle** and **dairy cattle**. Beef cattle are cattle that are produced for their meat, while dairy cattle are cattle that provide milk for drinking or for the manufacturing of other dairy products.

BEEF CATTLE

THE FIVE MAIN TYPES OF BEEF CATTLE RAISED IN AMERICA ARE:

1. Angus (Black Angus or Aberdeen Angus)—Black in color and polled (no horns). They originated in Northeastern Scotland.
2. Herefords—Brown or red in color with white faces and white spots on the crest, brisket, and below the knees on the hock. They originated in England.
3. Charolais—White or cream-colored cattle that originated in Europe.
4. Shorthorn—Red or white in color, or a mixture of the two colors. They originated in Northeastern England and are sometimes called "Durhams."
5. Brahma or Brahman—White or gray in color with loose, hanging skin. This breed is able to tolerate high heat levels because they have sweat glands, and sweat freely from pores in their skin. They are humpbacked with large droopy ears and a large dewlap (loose skin hanging from the neck area). They originated in Asia.

THE TEN LEADING BEEF CATTLE STATES IN AMERICA ARE:

1. Texas	2. Missouri	3. Oklahoma
4. Nebraska	5. South Dakota	6. Montana
7. Kansas	8. Iowa	9. Florida
10. Kentucky		

Most beef available in today's supermarkets has been graded by the U.S. Department of Agriculture. The grad eof beef is determined by the amount of marbeling (fat) that the meat contains. The three most common grades of beef are PRIME, CHOICE, AND SELECT, with prime being the superior grade.

DAIRY CATTLE

Dairy cattle do not produce any milk until after they have born a calf. The dairy farmer usually feeds the calf soon after its birth, so that the cow can be milked. Most cattle are milked twice a day for ten months. The average amount of milk produced annually by a cow is 15,000 pounds, with good milk-producing cows providing up to 30,000 pounds of milk per year.

THE FIVE MAJOR BRANDS OF DAIRY CATTLE RAISED IN AMERICA ARE:

1. Holstein-Friesian (or Holstein)—Most are black and white, but a few are red and white. This breed produces the largest volume of milk. They originated in the Netherlands.
2. Ayershire—Red, brown or mahogany color with white. They originated in Scotland, are medium in size, and are good "hill grazers."
3. Brown Swiss—Light brown to medium brown in color. They originated in Switzerland.
4. Guernsey—Fawn or creamy white in color. They originated in France.
5. Jersey—Color ranges from fawn through shades of gray, brown, or even black. They originated in Jersey, which is one of the Channel Islands located off the northern coast of France. They're one of the smallest breeds of dairy cattle, and their milk has the highest percentage of butterfat.

THE NINE LEADING DAIRY CATTLE STATES IN AMERICA ARE:

1. California	2. Wisconsin	3. New York
4. Minnesota	5. Pennsylvania	6. Texas
7. Michigan	8. Ohio	9. Iowa

Although Wisconsin is nicknamed "The Dairy State," California is actually the leading dairy producing state in our country, producing an average of 27 billion pounds of milk and cheese per year. Fresno is the top-producing dairy county within California.

THE COMPOSITION OF MILK: The following materials are found in milk. The listed percentages are the average percentages for each ingredient.

1. Water—87.1%
2. Fat (butterfat)—3.9%
3. Casein—2.5% (This is a milk protein that is white in color and rich in calcium.)
4. Lactose—5.1%
5. Albumin-- .7%
6. Mineral matter--.7%

Milk is pasteurized. This means that it is treated with heat to kill the germs. Homogenized milk is milk that is well mixed so that the cream and water in the milk do not separate. Vitamin D or Vitamin A has been added fortified milk to make it healthier. Different types of milk can be purchased in the stores, depending upon the fat content. The amount of fat in the milk is called butterfat.

1. Whole milk—contains 3.5% butterfat
2. 2% milk—low fat
3. 1% milk
4. Skim milk—all butterfat removed
5. Buttermilk—cultured milk that has been soured by certain small organisms
6. Half & Half—contains 10 to 12% butterfat.

CATTLE TERMINOLOGY:

Bovine: A scientific term referring to all cattle.

Bull: A mature male bovine.

By-products: The other products that are obtained from the animal besides beef or milk.

Calf: The name for a young bovine up to one year of age.

Cow: The mature female bovine.

Cud: Food that has been regurgitated by the cattle for further chewing.

Dogie: A stray motherless calf (usually found on the range).

Heifer: A female calf that is younger than three years old, and has not born a calf.

Eartag: A metal or plastic tag attached to the ear of an animal for identification purposes.

Foot rot: A common inflammation caused by fungus and bacteria that invade the hooves of cattle, causing swelling and limping.

Forage: Plants used as food for the livestock.

Hide: The skin of the cattle.

Lactation Period: The length of time that the female gives milk after the birth of an offspring.

Maverick: The name given to an unbranded cow on the range.

Polled: Having no horns.

Udder: The group of mammary glands that produces the milk.

Weaning: The process of separating the young calves from their mothers so they can no longer obtain their mother's milk.

SHEEP

Cattle are the number-one animal raised on U.S. farms. Sheep rank second to cattle. They are raised mainly for their meat and wool. However, they are also the source of lanolin, oil that is obtained from their wool, as well as a source of feta cheese. Meat that is obtained from a sheep that is less than one year of age is called lamb. Meat obtained from older sheep is called mutton.

GENERAL CHARACTERISTICS OF SHEEP:

Sheep, like cattle, are ruminants, and have four stomach parts. Their upper incisor teeth are also missing. They are grazing animals that eat mainly grasses, and live in groups called flocks. Sometimes large flocks are subdivided into smaller groups called bands.

They are even-toed, hoofed mammals that have a pair of hollow horns that are not shed. The horns on the male are large and curved, while the horns on the female are short and only slightly curved.

Female sheep bear one to three young at a time. Their gestation period is 150 days. Lambs are born in the spring. Their fleece is sheared once a year.

Sheep belong to the scientific family of Bovidae and the genus, Ovis.

THE SIX LEADING SHEEP-RAISING COUNTRIES (IN ORDER) ARE:

1. Australia
2. Russia
3. China
4. New Zealand
5. India
6. Turkey

The United States raises about 1% of the sheep raised in the world. Most of the sheep raised in the United States are raised in the semiarid western states.

THE FIVE LEADING U.S. SHEEP STATES (IN ORDER) ARE:

1. Texas
2. California
3. Wyoming
4. South Dakota
5. New Mexico

Other major sheep-producing states are Colorado, Utah, Montana, Arizona, Oregon, and Iowa. Denver, Colorado has the largest sheep marketing center in our country.

Sheep are usually grazed on the open range. Shepherds maintain control of the flocks, and sheep dogs (mainly border collies) are used to herd the sheep.

BREEDS OF SHEEP:

There are 914 different breeds of sheep in the world, and 35 different breeds that are raised in the United States. The five most popular U.S. breeds are the Rambouillet, Columbia, Suffolk, Merino, and Hampshire.

Major wool breeding sheep: Rambouillet and the Merino.

Major mutton breeding sheep: Suffolk, Merino, and Hampshire.

Other breeds of sheep raised mainly in other countries:

Dorset Cheviot Oxford Leicester

Lincoln Romney Marsh

Suffolk and Hampshire breeds have black faces, while most other breeds have white faces.

SHEEP TERMINOLOGY:

Carding: Combing the wool to straighten the fibers.

Dipping: Submerging an animal in a vat of liquid insecticide to control parasites.

Docking: Cutting off the tails of young sheep to about three inches for sanitation purposes.

Ewe: The adult female sheep.

Feeders: Sheep that are ready for market and usually weigh between 60 and 70 pounds.

Fleece: Shorn wool.

Jug (or jail): A small birthing pen that holds the ewe and her newly born lambs.

Lamb: A sheep that is less than one year old.

Lambing: The name given to the birthing process.

Lanolin: A wax that is secreted by the sheep to protect the wool. It is used by humans in cosmetics.

Pelt: The skin and wool from a slaughtered sheep.

Ram: The adult male sheep.

Shearing: The process of removing the fleece.

Shepherd: The herdsman who cares for the sheep.

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STUDY GUIDE:
GEOLOGY: ROCKS AND MINERALS

This study guide will introduce the three basic types of rocks and will give examples of each kind. It will define a mineral, tell the basic properties of minerals, give examples, and tell ways to identify one mineral from another.

The study of rocks and the earth is called **geology**, and the person who studies these topics is a **geologist**.

The study of minerals is called **mineralogy**, and the scientist who specialized in the study of minerals is called a **mineralogist**.

ROCKS

Geologists divide all rocks into three types or groups, based upon how they were formed. The three basic rock types are:

1. Sedimentary Rocks
2. Igneous Rocks
3. Metamorphic Rocks

Sedimentary rocks are formed when dirt, dust, pebbles, and other sediments are deposited by either wind or by water. These rocks often form under water. One layer of sediment drops to the bottom of the lake or river. Another layer is deposited on top of the first. Pressure from the layers above causes heat, which causes the particles to merge to form sedimentary rocks. Minerals found in the water also help to cement the particles together. When animal remains are trapped between the layers, **fossils** are often formed, as the particles harden into rocks. Because most sedimentary rocks are formed under a body of water, **fossils are commonly found in sedimentary rock layers**. Layers are usually visible in this type of rock.

Igneous rocks are formed by the eruption of a volcano. They were all originally hot, liquid magma beneath the Earth's surface. Once the magma reaches the earth's surface, it is called **lava**. If an igneous rock is formed when hot magma reaches the Earth's surface, and then hardens into a rock as it cools on the surface of the earth, it is called an **extrusive rock**.

If the magma becomes trapped **below** the earth's surface, and the igneous rock is formed in a pocket deep within the earth, the rock is called an **intrusive rock**.

Metamorphic rocks were all either sedimentary rocks or igneous rocks at first. Then something happened to these rocks to change them. In most cases, the sedimentary or igneous rocks were subjected to heat or pressure for long periods of time. The heat and pressure caused the rocks to change to a different rock, which is then classified as a metamorphic rock.

Types of Sedimentary Rocks

Name of the Rock	The Material that has been Cemented Together to Create the Rock
1. **Sandstone** (This rock feels gritty to touch. Particles of sand can often be rubbed off the rock.)	**Small Pieces of Sand**
2. **Shale** (This rock is usually brown, black, tan, or reddish-brown in color, depending upon the type of dirt or mud that was deposited. If you wet the rock and smell it, the rock will smell just like mud.)	**Dirt and Mud**
3. **Conglomerate**	**Tiny Pebbles**
4. **Limestone** (Limestone is often light gray in color. If a drop of vinegar is put on a piece of the limestone, the acid in the vinegar will cause a bubbling and slight popping sound. In regular limestone, the bones and shells have been ground up so fine that they are not visible. All limestones have a large quantity of the mineral calcite in them because this mineral is found within the shells and bones.)	**Shells and Bones of Sea Animals**
5. **Coquina** (Coquina is a special type of limestone. The shells **have not been ground up into fine pieces**. You can actually see shells that have been cemented together by minerals in the water.)	**Shells of Animals**
6. **Chalk** (Chalk is another type of limestone. The shells have been broken up into fine pieces cemented together loosely.)	**Shells of Sea Animals**

7. **Rock Salt** — **The Mineral, Halite**

8. **Coal** — **Plant Materials Such as Mosses, Ferns, or Parts of Trees.**

(All coal contains the elements **carbon**, **hydrogen**, and **oxygen**. When the plant materials are buried under mud or other sediment, most of the hydrogen and oxygen escape, leaving the black carbon. There are four types of coal, based upon how long the materials were pressed together.

Peat is coal in which the twigs and remains can still be seen. It has only been pressed slightly.

Lignite is soft brown coal that is formed when peat is heated and pressed. It is only about 40% carbon. It is not a good energy source because it burns too rapidly.

Bituminous coal is called soft coal. It has been compressed longer than lignite, and contains about 85% carbon. It burns easily but creates much smoke.

Anthracite is the hardest type of coal. It is about 95% carbon and has been pressed into a hard rock. It burns for a long time, and it provides the best type of energy. However, it is the most expensive type.)

Other examples of sedimentary rocks that are less common include the following: flint, chert, breccia, stalactites, and potash ore

Types of Igneous Rocks

1. **Basalt**: This extrusive rock is formed on the surface of the earth. It makes up many of the volcanic cones, and it is dark gray or dull black in color. It has very fine grains that are hard to distinguish. The Hawaiian Islands and much of Iceland have been formed from basalt.

2. **Gabbro**: This intrusive rock was formed under the surface of the earth. It cooled more slowly than basalt, and thus has larger grains or crystals. It is also very dark in color.

3. **Obsidian**: This is a very shiny black or dark brown rock, and it appears to look like black glass. It is hard and brittle and often has lava swirl marks on its surface.

4. **Granite**: This is the most common intrusive rock. It is made of three minerals: feldspar, mica, and quartz. It is usually pink or gray in color, with black specks and white shiny crystals. Granite is usually used for buildings and tombstones.

5. **Pumice**: The steam and gases that come from the volcano cool to form pumice, which resembles a sponge because of all its air holes. Pumice is sometimes light enough to float in water.

6. **Scoria**: Scoria is a piece of basalt that hardened so quickly that it hardened right around the air bubbles. It has more holes than a piece of Swiss cheese, but is much heavier and darker in color than pumice.

7. **Tuff**: Tuff is similar to pumice, but is usually darker in color because particles of dust and dirt were trapped in the steam and lava when it hardened.

Other less common types of igneous rocks are the following:
diorite, pegmatite, dolerite, and syenite

Types of Metamorphic Rocks

Remember that metamorphic rocks are rocks that began as either sedimentary or igneous and were changed into a new and different rock.

Metamorphic Rock Name	Type of Rock That was Changed to Create This New Rock
1. **Slate**	**Shale** (sedimentary rock made from mud and dirt.)
2. **Marble**	**Limestone** (sedimentary rock made from shells and bones of sea animals.)
3. **Gneiss (pronounced NICE)**	**Granite** (igneous rock which was pressed so much that the black mica specks lines up in nice straight lines.)
4. **Quartzite**	**Sandstone** (sedimentary rock made from sand grains.)

MINERALS

A mineral is defined as a "naturally occurring, inorganic solid that has a definite chemical composition and crystal shape." Let's look at these four characteristics of all minerals more closely.

1. A mineral must occur naturally in nature. Cement is **not** a mineral because it has been created by man.

2. A mineral must be **inorganic**. This means that it is **not made from living things or from the remains of living things**. Quartz is a mineral, but coal is not a mineral because coal was made from decaying plants.

3. A mineral has a definite chemical composition. This means that it is made from one or more elements that have been joined together to form a compound.

4. The atoms of a mineral are arranged into a definite pattern called **crystals**. Every mineral has a specific crystal shape.

There are so many different kinds of minerals that it is hard to tell them apart. Mineralogists use eight main properties of minerals to help in identification. Below is a list of the eight main properties used in mineral identification.

1. Color
2. Luster
3. Hardness
4. Streak
5. Crystal Shape
6. Density
7. Cleavage or Fracture
8. Specific Gravity

Some minerals are easily identified by their colors. **Cinnabar**, which contains the ore of mercury, is red. **Malachite**, which contains the ore of copper, is green. **Azurite** is blue, and often occurs with Malachite. **Quartz** can be different colors. **Pure quartz** is clear or white in color. Quartz with a grey cast is called **smoky quartz**. Purple quartz is called **amethyst**, which is February'' birthstone. Yellow quartz is called **citrine**. Pink quartz is called **rose quartz**. **Topaz** is usually yellow.

Luster refers to the mineral's shine, or how it reflects light. Certain minerals, such as silver, copper, gold, and pyrite shine brightly when light hits them. We say they have a **metallic luster**. Nonmetals appear to be glassy, pearly, or dull. They have little luster.

Hardness is a valuable way to identify minerals. Fredrich Mohs, a German mineralogist, developed a scale of hardness for minerals. He took ten minerals and arranged them in order from softest to hardest. Number 1 was assigned to the softest mineral, Talc, and number 10 was assigned to the hardest mineral, the Diamond. A mineral will scratch any other mineral having a lower number. Here is a list of the minerals on Moh's Scale of Hardness with their accompanying numbers.

1. Talc
2. Gypsum
3. Calcite
4. Fluorite
5. Apatite
6. Feldspar
7. Quartz
8. Topaz
9. Corundum
10. Diamond

The streak test is also used to identify minerals. A mineral sample is rubbed across a small glazed piece of porcelain called a "streak plate." A color is rubbed from the rock onto the plate, which has a hardness of about 7, and can thus be used to test any mineral that is softer than a 7 on the hardness scale. Each mineral makes a particular color streak when rubbed on the plate. All nonmetallic minerals produce a white or colorless streak. Hematite, which contains iron, always has a reddish-brown streak. Iron pyrite's streak is greenish-black in color.

Crystal shape can sometimes help identify a mineral. There are six basic types of crystal shapes that most minerals can have. You will be given a list of these six basic crystal shapes, and the name of a mineral that has this particular shape.

Basic Crystal Shape	**Mineral Example**
1. Cubic	Fluorite
2. Hexagonal	Tourmaline
3. Orthorhombic	Topaz
4. Monoclinic	Malachite
5. Tetragonal	Wulfenite
6. Triclinic	Amazonite

The exact characteristics of these crystals shapes will be covered more thoroughly in upcoming guides.

Density is the "amount of matter in a given space." It can also be expressed as "mass per unit volume." The density of any mineral is the same, regardless of how big the piece of mineral is. Every mineral has a specific density. You can determine the density of a mineral by finding its mass on a balance scale and dividing this mass by its volume.

Cleavage is the way a mineral breaks. If it breaks along smooth, definite lines, it has cleavage. Halite always breaks into neat cubes. Mica always breaks into thin sheets. In fact, you can peel off layers of mica that are so thin you can read through them!

Fracture also refers to the way a mineral breaks. However, it is just the opposite from cleavage. If a mineral does not break along visible lines, it fractures. The majority of all minerals tend to fracture.

Specific gravity is another property that can be helpful in naming a mineral. Specific gravity is "the ratio of the weight of a mineral to the weight of an equal volume of water." It tells us how many times denser the mineral is than water. Most minerals are denser than water and will sink when emerged in the same volume of water. For example, feldspar has a specific gravity of 3. This means it is 3 times denser than water. Many metallic elements have a specific gravity of about 5. Pure gold is 19.3 times denser than an equal volume of water.

Here are a few other hints to help you identify particular minerals:

1. Sulfur is a soft, yellow rock. It smells like rotten eggs!
2. Magnetite is a fairly heavy rock. It is magnetic!
3. Halite always breaks into cubes. It tastes salty, and looks clear or slightly foggy square ice cubes.
4. Talc feels soapy and will easily rub off on your hands.
5. Galena is a very bright, shiny, silver rock, which feels quite heavy when held in your hand.

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STUDY GUIDE: WEATHER

The study of weather is called **meteorology**, and the scientist who studies the weather is a **meteorologist**. Weather is defined as the "condition of the earth's atmosphere."

Scientists divide the earth's atmosphere into four layers.

1. **Troposphere**: The lowest layer nearest the earth, approximately 18 kilometers thick. Weather occurs in the troposphere.
2. **Stratosphere**: The second layer which reaches from the troposphere to about 50 kilometers above the earth's surface. Jets usually fly in the stratosphere.
3. **Mesosphere**: The third layer.
4. **Thermosphere**: The uppermost layer extending to about 500 kilometers from the earth's surface.

FOUR MAIN ATMOSPHERIC FACTORS AFFECT THE WEATHER AND CAUSE IT TO CHANGE.

1. temperature 2. air pressure 3. wind (moving air) 4. humidity

Temperature is a measure of the heat energy. The majority of our heat energy comes form the sun, and it is called radiant energy. Part of the sun's energy is reflected away from the earth by the ozone layer in the stratosphere. The rest of the sun's energy is absorbed by the earth, and it is spread through the atmosphere. There are three basic ways the sun's energy is spread throughout the atmosphere:

1. **Conduction**: Heat energy is directly transferred from the warm ground to the air directly above it.
2. **Convection**: Heat is transferred within the air or other fluids. The warmed air near the earth's surface becomes less dense and rises. Cooler air moves in

toward the earth's surface. As it becomes heated, it also rises, causing convection currents.

3. **Radiation**: Heat is transferred through empty space from the sun to the earth.

Temperature is measured in degrees by using a thermometer. On the Celsius scale, water freezes at 0 degrees and boils at 100 degrees. On the Fahrenheit scale, water freezes at 32 degrees and boils at 212 degrees.

The wind chill index (wind chill factor) measures how cold it feels, and the heat index indicates how warm the air temperature feels.

Isotherms: Lines drawn on a weather map that connect places with the same temperatures.

Air pressure is a measure of the force of air that's pushing down on the earth's surface. Denser air exerts more air pressure than less dense air.

Three Main Factors that Affect Air Pressure:

1. **Temperature**: Warm air is less dense than cold air. The molecules are spread farther apart, and therefore, the mass of a volume of warm air is less than the mass of a similar volume of cold air.
2. **The Amount of Water Vapor in the Air**: As the amount of the water vapor in the air increases, the mass of the air decreases, and the air becomes less dense.
3. **Elevation (Altitude)**: Air becomes thinner and less dense as the altitude increases. The air pressure decreases as one travels higher into the atmosphere.

In most cases, **high air pressure** usually means **fair weather**. **Low air pressure** usually brings **cloudy, rainy weather**.

Isobars: These are curved lines on a weather map that connect places having the same air pressure.

Winds are moving air. Winds flow from areas of high pressure to an area of lower pressure. A large body of air having approximately the same temperature and moisture content is called an **air mass**. The boundary between two air masses is called a **front**.

Four Types of Fronts

1. **Warm Front**: Warm air moves into a cold air mass. Because the density of the warm air is less than that of the cold, the warm air mass slides up over the cold air mass. Rain and showers are common. The weather becomes hot and humid. Warm fronts are marked on a weather map by placing semi-circles above a line.

2. **Cold Front**: Cold air moves toward a warm air mass, forcing the warm air up over the colder air. Violent storms accompany cold fronts. Cold fronts are shown on a weather map by putting triangles under a line.
3. **Stationary Front**: Two air masses meet, and neither mass moves. Such fronts may cause several days of rain.
4. **Occluded Front**: A cold front overtakes a warm front and pushes the warm front upward. As it does, the cold front comes in contact with cool air, and the two masses merge.

Four Major Types of Air Masses that Affect U.S. Weather

1. **Maritime Tropical Air Mass**: Forms over the ocean near the equator and contains warm moist air that causes high humidity.
2. **Maritime Polar Air Mass**: Forms over the Pacific Ocean and the North Atlantic waters, causing fog in California, and cooler temperatures to eastern sections of our country.
3. **Continental Tropical Air Mass**: Forms over Mexico in the summer and brings hot, dry air to the southwestern United States.
4. **Continental Polar Air Mass**: Forms over land in northern Canada, and brings extremely cold air and temperatures to the United States in the winter.

Humidity is the amount of moisture, or water vapor, in the air. Warm air can hold more water vapor than cold air. **Relative humidity** is the percentage of moisture that is in the air, compared to the amount that same air could hold at a particular temperature. If a volume of air is holding all the water vapor that it can hold at that temperature, the relative humidity is 100%.

Clouds are formed when water vapor begins to condense. The temperature at which the vapor condenses is called the **dew point**.

Four Basic Types of Clouds

1. **Cumulus Clouds**: These are thick, puffy, white clouds that resembles piles of cotton in the sky. They are usually associated with fair weather.
2. **Stratus Clouds**: These clouds appear in layers. They cover the entire sky, and often block the light from the sun, causing it to be overcast. Light rain accompanies these clouds.
3. **Cirrus Clouds**: These high curly clouds are usually filled with ice crystals. They were once called "mare's tails" because of their curved shape. They are most often associated with rain or snow.
4. **Nimbus Clouds**: These are the black, rolling, rain clouds that develop when cumulus clouds get dark on the bottom, forming thunderheads that are often called cumulonimbus clouds.

Precipitation is moisture that falls from the clouds to the earth. There are four main types of precipitation: **rain, snow, sleet, and hail**.

Frost is water vapor that turns to ice on an object.

Acid rain is caused when water vapor condenses on sulfate and nitrate particles in the atmosphere. These sulfate particles come from sulfur dioxide, which is released when fuels are burned. Nitrates are added to the atmosphere through the release of automobile exhaust and natural sources like volcanoes. When water vapor attaches to these particles, they fall to the ground as acid rain, causing the soil and water to become acidic.

BASIC WEATHER INSTRUMENTS:

1. **Thermometer**: Measures the temperature of the air.
2. **Anemometer**: Measures the wind speed.
3. **Barometer**: Measures the air pressure.
4. **Wind Vane**: Identifies the direction the wind is moving.
5. **Hygrometer**: Measures the relative humidity by measuring the amount of stretch in a human hair.
6. **Psychrometer**: A special type of hygrometer that uses the differences between the readings on a wet and dry bulb thermometer to determine the relative humidity.
7. **Rain Gauge**: Measures the amount of precipitation.

INTERESTING WEATHER FACTS AND ADDITIONAL TRIVIA

1. The hottest temperature ever recorded in the United States was 134 degrees in Death Valley, California on July 10, 1913.
2. To convert a Fahrenheit temperature to the Celsius scale, subtract 32 degrees from the Fahrenheit temperature, and then multiply the results by 5/9.
3. A tornado is a whirling wind that moves over land. Most tornadoes occur in the late afternoon or early evening hours. More tornadoes occur in the United States than any other country. Winds have reached speeds up to 300 miles per hour in a tornado.

4. July is the warmest month in the Northern Hemisphere. January is the coldest month in this hemisphere.

5. Although Chicago is called the Windy City, it is not the windiest place in the United States. Mt. Washington, New Hampshire is considered the windiest location in our country, having an average wind speed of 35.3 miles per hour. At one time, winds were clocked at 231 miles per hour at Mt. Washington.

6. The least windy city in the United States is Oak Ridge, Tennessee, which has an average wind speed of 4.4 miles per hour.

7. According to daily temperatures, the two hottest cities in our country are Yuma, Arizona and Phoenix, Arizona.

8. Hilo, Hawaii has the record for the most number of rainy days in a year, with 278.

9. April is the only month that tropical storm has not formed on the Atlantic Ocean.

10. The national groundhog appears every year on February 2. His name is Punxsutawney Phil. According to American tradition, the groundhog leaves his burrow where it has been hibernating to see if cold weather will continue. If he sees his shadow, there will be six more weeks of cold weather, and he returns to his burrow. The national groundhog is fed a regular diet of dog food.

11. The Gulf Stream is a warm ocean current in the Atlantic Ocean which flows from the tip of Florida to the outer edge of North Carolina, where it turns toward Europe.

12. The jet stream usually blows from west to east.

13. The cricket can help predict the temperature of the air. To determine the air temperature, count the number of chirps a cricket makes in 15 seconds. Add this number to 67 degrees Fahrenheit, and you will have an accurate estimate of the air temperature.

14. January is the only month of the year that a 100 degree temperature has not been recorded in any U.S. state. The highest January temperature that has been recorded is 98 degrees Fahrenheit in Laredo, Texas.

15. David Letterman was a TV forecaster and meteorologist during his early career years.

16. The foggiest location in our country is Cape Disappointment, Washington. It has three and a half months of dense fog each year.

17. In 1953, we began to name hurricanes after women!

18. The amount of electricity in a single bolt of lighting would cost about $30 if purchased from your power company.

19. The average speed of a snowflake is ½ mile per hour.

20. Strangely enough, it is usually warm and sunny in California just prior to an earthquake.

21. The first weather satellite was called Tiros I, and it was launched from Cape Canaveral, Florida in 1960. It raveled about 500 miles above the earth's surface.

22. On a typical summer day, the relative humidity is at its highest at about 6 a.m.

23. Sir Edmund Halley discovered more than just his comet. He also discovered the Gulf Stream near England.

24. Spiders survive the winter by creating a chemical compound within their circulatory system that keeps their bodies from freezing during the winter. It works in a similar way to antifreeze.

25. In Antarctica, almost all the mountains are snow covered, but Mount Erebus, which stands nearly 12,000 feet, has no snow-capped top. It is an active volcano, and its crater is filled with hot lava, which melts all snow!

26. One million cloud droplets are needed to make one average-sized raindrop.

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STUDY GUIDE:
AUTHORS and THEIR MAJOR WORKS

This is a listing of some of the more important authors and their works. Many of the books will be the names of books that you will probably read by the time you graduate from eighth grade. Other books are for older students, but have been included because they were written by famous authors, and most people who write questions for scholastic bowl teams, include these books and authors in their questions.

To simplify this guide, all poems or short stories will be enclosed within quotation marks to distinguish them from books.

AUTHOR	LITERARY WORK
Joy Adamson	Born Free
Louisa May Alcott	Little Women Little Men
C.W. Anderson	The Blaze horse books: Billy and Blaze, Blaze and the Gypsies, Blaze and Thunderbolt
Hans Christian Andersen	"The Ugly Duckling" "The Princess and the Pea" "The Emperor's New Clothes" "The Little Match Girl" "The Little Mermaid"
Maya Angelou	"Still I Rise" "I know Why the Caged Bird Sings"
William Armstrong	Sounder

Ann Nolan Clark	Secret of the Andes
Beverly Cleary	Henry and Beezus, The Ramona Quimby Series Freckle Juice Dear Mr. Henshaw
Vera and Bill Cleaver	Where the Lilies Bloom
Elizabeth Coatsworth	The Cat Who Went to Heaven
Jane Conly	Crazy Lady!
James Fennimore Cooper	The Last of the Mohicans The Deerslayer
Bruce Coville	Jennifer Murdley's Toad
Stephen Crane	Red Badge of Courage
Sharon Creech	Walk Two Moons
Roald Dahl	The BFG Charlie and the Chocolate Factory Charlie and the Glass Elevator James and the Giant Peach
Marguerite de Angeli	The Door in the Wall
Daniel Defoe	Robinson Crusoe
Carl Deuker	Heart of a Champion
Charles Dickens	A Christmas Carol David Copperfield Great Expectations Oliver Twist A Tale of Two Cities
Franklin W. Dixon	The Hardy Boys Mystery Book Series
Sir Arthur Conan Doyle	Sherlock Holmes
Allan W. Eckert	Incident at Hawk's Hill
Elizabeth Enright	Thimble Summer

Homer	The Iliad The Odyssey
Johanna Hurwitz	Aldo Applesauce
Aldous Huxley	Brave New World
Washington Irving	The Legend of Sleepy Hollow Rip Van Winkle
Mary James	Shoebag
Norton Juster	The Phantom Tollbooth
Carolyn Keene	The Nancy Drew Mystery Book Series
Peg Kehret	Horror at the Haunted House
John F. Kennedy	Profiles in Courage
Alexander Key	Escape to Witch Mountain
Rudyard Kipling	The Jungle Book Captains Courageous Just So Stories How the Leopard Got Its Spots
Jim Kjelgaard	Big Red (and many other dog books)
Joseph Krumgold	...And Now Miguel Onion John
Jane Langston	The Fledgling
Robert Lawson	Rabbit Hill
Emma Lazarus	"The New Colossus"- poem on the Statue of Liberty's base
Edward Lear	"The Owl and the Pussycat" (also known for his many Limericks)
Madeline L'Engle	A Wrinkle in Time
Lois Lenski	Strawberry Girl
C.S. Lewis	The Chronicles of Narnia, including: The Lion, the Witch, and the Wardrobe

Mary Norton	The Borrowers The Borrowers Afloat
Robert C. O'Brien	Mrs. Frisby and the Rats of NIMH
Scott O'Dell	Island of the Blue Dolphins
Thomas Paine	"Common Sense" pamphlet
Peggy Parish	The Amelia Bedelia series
Katherine Patterson	Bridge to Terabithia Jacob Have I Loved
David Patneaude	Someone Was Watching
Gary Paulsen	Woodsong Canyons
Patricia Pendergraft	Miracle at Clement's Pond
William Pene du Bois	The Twenty-One Balloons
Edgar Allan Poe	"The Raven" "Annabelle Lee" "The Tell-Tale Heart"
Eleanor Porter	Pollyanna
Beatrix Potter	Tales of Peter Rabbit
Ellen Raskin	The Westing Game
Marjorie Rawlings	The Yearling
Wilson Rawls	Where the Red Fern Grows
Conrad Richter	The Light in the Forest
Keith Robertson	Henry Reed
Mary Rodgers	Freaky Friday
Carl Sandburg	Biography of Abraham Lincoln
Sir Walter Scott	Ivanhoe

Mildred Taylor	Roll of Thunder, Hear My Cry
Theodore Taylor	The Cay
Henry David Thoreau	Walden
J.R.R. Tokien	The Hobbit and The Lord of the Rings Series
Pamela (P. L.) Travers	Mary Poppins
Mark Twain (Samuel Clemens)	The Adventures of Tom Sawyer The Adventures of Huckleberry Finn Puddin' Head Wilson Connecticut Yankee in King Arthur's Court
John Updike	Rabbit Run Series
Jules Verne	Journey to the Center of the Earth
E.B. White	Charlotte's Web Stuart Little
Laura Ingalls Wilder	The Little House on the Prairie Series
Vera B. Williams	Scooter
Elvira Woodruff	George Washington's Socks
Richard Wright	Native Son
Lawrence Yep	Dragonwings

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STUDY GUIDE:
FAMOUS POETS AND THEIR WORKS

William Blake

This predecessor of the Romantic Movement began as a painter, but later began to write poetry, which he illustrated himself. He wrote Songs of Experience and Songs of Innocence, in which he is best remembered for his poems, "The Tyger" and "The Lamb." He lived from 1757-1827.

Elizabeth Barrett Browning

Elizabeth Barrett Browning, born in 1806, was an invalid with a spinal cord injury and a lung disease. She lived with her domineering father until she met and married Robert Browning, a prominent poet. Her best-known book of poetry is Sonnets From the Portuguese. The following poem from that book is one of her more famous poems.

> How do I love thee? Let me count the ways.
> I love thee to the depth and breadth and height
> My soul can reach, when feeling out of sight
> For the ends of Being and ideal Grace.
> I love thee to the level of everyday's
> Most quiet need, by sun and candlelight.
> I love thee freely, as men strive for Right;
> I love thee purely, as they turn from Praise.
> I love thee with the passion put to use
> In my old griefs, and with my childhood's faith.
> I love thee with a love I seemed to lose
> With my lost saints,--I love thee with the breath,
> Smiles, tears, of all my life!--and, if God chooses,
> I shall but love thee better after death.

Her poem "Aurora Leigh" was adapted by feminists since it defends women's rights to intellectual independence. She died in 1861.

Lewis Carroll

Lewis Carroll was the pseudonym adopted by Charles Lutwidge Dodgson, an English writer born in 1832. His parents had strong ties to the Anglican Church and the

Army. He was educated at Rugby College and Christ Church in Oxford. He is best-known for his book Alice's Adventures in Wonderland, and its sequel, Through the Looking Glass and What Alice Found There. Two of his notorious poems, "The Walrus and the Carpenter"and "Jabberwocky" are found in it. He has had other poetry published in volumes including "Phantasmagoria and Other Poems," "The Hunting of the Snark," and "Rhyme? And Reason?" He died in 1898.

"The Walrus and the Carpenter" and a few lines of "Jabberwocky" are included below.

The Walrus and the Carpenter

The sun was shining on the sea,
Shining with all his might;
He did his very best to make
The billows smooth and bright—
And this was odd, because it was
The middle of the night.
The moon was shining sulkily,
Because she thought the sun
Had got no business to be there
After the day was done—
"It's very rude of him,"she said,
"To come and spoil the fun!"
The sea was wet as wet could be,
The sands were dry as dry.
You could not see a cloud because
No cloud was in the sky:
No birds were flying overhead—
There were no birds to fly.
The Walrus and the Carpenter
Were walking close at hand;
They wept like anything to see
Such quantities of sand:
"If this were only cleared away,"
They said, "It would be grand!"
"If seven maids with seven mops
Swept it for half a year,
Do you suppose," the Walrus said,
"That they could get it clear?"
"I doubt it," said the Carpenter,
And shed a bitter tear.
"O Oysters, come and walk with us!"
The Walrus did beseech.
"A pleasant walk, a pleasant talk,
Along the briny beach:
We cannot do with more than four,
To give a hand to each."
The eldest Oyster looked at him,
But never a word he said:
The eldest Oyster winked his eye,
And shook his heavy head—
Meaning to say he did not choose
To leave the oyster-bed.
But four young Oysters hurried up,
All eager for the treat:
Their coats were brushed, their faces washed,
Their shoes were clean and neat—
And this was odd, because, you know,
They hadn't any feet.
Four other Oysters followed them,
And yet another four,
And thick and fast they came at last,
And more, and more, and more—
All hopping through the frothy waves,
And scrambling to the shore.
The Walrus and the Carpenter
Walked on a mile or so,
And then they rested on a rock
Conveniently low:
And all the little Oysters stood
And waited in a row.
"The time has come," the Walrus said,
"To talk of many things:
Of shoes—and ships—and sealing wax
Of cabbages—and kings—
And why the sea is boiling hot—
And whether pigs have wings."
"But wait a bit," the Oysters cried,
"Before we have our chat;
For some of us are out of breath,
And all of us are fat!"
"No Hurry!" said the Carpenter
They thanked him much for that.
"A loaf of bread," the Walrus said,
"Is what we chiefly need:
Pepper and vinegar besides
Are very good indeed—
Now if you're ready, Oysters dear,
We can begin to feed."
"But not on us!" the Oysters cried,
Turning a little blue.
"After such kindness, that would be
A dismal thing to do!"
"The night is fine," the Walrus said
"Do you admire the view?"
"It was so kind of you to come!
And you are very nice!"

The Carpenter said nothing, but
"Cut us another slice:
I wish you were not quite so deaf—
I've had to ask you twice!"
"It seems a shame," the Walrus said,
"To play them such a trick
After we've brought them out so far,
And made them trot so quick!"
The Carpenter said nothing but
"The butter's spread too thick!"
"I weep for you," the Walrus said:
"I deeply sympathize."
With sobs and tears he sorted out
Those of the largest size
Holding his pocket-handkerchief
Before his streaming eyes
"O Oysters," said the Carpenter
"You've had a pleasant run!
Shall we be trotting home again?"
But answer came there none—
And this was scarcely odd, because
They'd eaten every one.

Jabberwocky

'Twas brillig, and the slithy toves
Did gyre and gimble in the wabe:
All mimsy were the borogoves,
And the mome raths outgrabe.
"Beware the Jabberwock, my son!

Samuel Taylor Coleridge

Coleridge was born in England in 1772. He attended Cambridge, but never graduated. A lyrical poet and member of the Romantic Movement, he was a contemporary and close friend of Wordsworth. Together they published Lyrical Ballads, in which his best-known poem, "The Rime of the Ancient Mariner," was included. Other popular poems of his include "Kubla Khan" and "The Nightingale."

e.e. Cummings

Educated at Harvard, this World War I veteran was known for his experimental break with traditional styles of poetry. He was the first poet to disregard capitalization rules in his poems and to opt for slang and colloquial word usage.

Emily Dickinson

Emily Dickinson was nicknamed "The Belle of Amherst" by one Broadway playwright. She was born in Amherst, Massachusetts in 1830 to a good family in New England. She had a sister and a brother. Her father was Treasurer of Amherst College and a prominent lawyer in the town. He also became a Massachusetts Congressman. Emily attended Amherst Academy for her formative schooling and went away to Mount Holyoke Seminary until she returned home in 1948. She never married and rarely left her parents' house. She died of Bright's Disease in 1886. Over her lifetime she wrote 1,775 poems, many of them nature riddles and some of them that focused on themes of love, war, religion, death, and immortality. Her best-known poems include, "A Bird Came Down the Walk," "Safe in Their Alabaster Chambers," "Dying," and "My Life Closed Twice Before its Close."

T.S. Eliot

T.S. Eliot was born in St. Louis in 1888. He attended Harvard, and then the prestigious Sorbonne in Paris. He later settled in London and ultimately opted to become a British citizen. In London, he met and was influenced by Ezra Pound. He wrote plays, including Murder In the Cathedral, prose, and poetry, including "Ash Wednesday" and "The Sacred Wood." His compilation of poems based on cats, Old Possum's Book of Practical Cats, is a classic upon which the Broadway musical "Cats!" was based. In 1948, he was awarded the Nobel Prize for Literature, and he died in 1965.

Ralph Waldo Emerson

Emerson was born in 1803 in Boston. He was the son of a minister, and after graduating from Harvard, he also became a minister, but resigned during a crisis of faith. He became a vital part of the Transcendentalist Movement and is best known as a lecturer and essayist, particularly on abolition. He wrote "The Conduct of Life" as well as the poems "Give All to Love" and "Concord Hymn" before he died in 1882.

Eugene Field

Eugene Field was born in St. Louis. He established himself as a writer with his long-running column in the *Chicago Morning News.* His best-known children's poems include the nursery rhymes "Little Boy Blue" and "Wynken, Blynken, and Nod." Another popular poem of Field's is "The Duel" about the gingham dog and the calico cat, which starts:

> "The gingham dog and the calico cat
> Side by side on the mantle sat;
> 'Twas half-past twelve and (what do you think!)
> Nor one nor t'other had slept a wink!
> The old Dutch clock and the Chinese plate
> Appeared to know as sure as fate
> There was going to be a terrible spat.
> (I wasn't there; I simply state
> What was told to me by the Chinese plate!)"

Robert Frost

Robert Frost was born in San Francisco in 1874. His father died when he was 11 and the family moved to Massachusetts, where he dabbled at both Dartmouth and Harvard, but never obtained a degree from either institution. In 1912, he moved to England with his wife to establish his writing career. There he met Ezra Pound who became an encouraging influence and a good friend. After he attained success, he moved back to New England, where he died in 1963. He won four Pulitzer Prizes for poetry and published multiple poetry books including New Hampshire and In the Clearing. He wrote in a traditional style of poetry and refused to use the form of free verse. His best-loved poems include "Stopping by the Woods on a Snowy Evening," "The Death of the Hired Hand," and "The Road Not Taken."

The Road Not Taken

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;
Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,
And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.
I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood and I—
I took the one less traveled by,
And that has made all the difference.

Oliver Wendell Holmes

Holmes was born in Boston and educated at Harvard. He became a physician and dabbled in light verse for the *Atlantic Monthly*. His best-known poem is "Old Ironsides."

John Keats

Keats was born in London in 1795. Both his parents died during his childhood. He ultimately forsook his apprenticeship to a surgeon in favor of his literary aspirations. Before he died of consumption in 1821, he became a major poet of the Romantic Movement. His most popular poems include "La Bell Dame Sans Merci," "To Autumn," "Hyperion," "Ode to a Nightingale," "Ode on a Grecian Urn," and "On First Looking into Chapman's Homer." He left a significant legacy to the realm of poetry.

Joyce Kilmer

Joyce Kilmer was born in 1886 in New Jersey. He attended Rutgers and Columbia Colleges, and then worked briefly as an editor for the *Standard Dictionary* and for the *New York Times*. He adopted the Catholic faith, which figured prominently in his creative work along with his love of nature. He went into the National Guard with the intent of writing a book about war, but was killed in the military in 1918. His most familiar poem is "Trees."

Trees

I think that I shall never see
A poem lovely as a tree.
A tree whose hungry mouth is prest
Against the earth's sweet flowing breast;
A tree that looks at God all day,
And lifts her leafy arms to pray;
A tree that may in Summer wear
A nest of robins in her hair;
Upon whose bosom snow has lain;
Who intimately lives with rain.
Poems are made by fools like me,
But only God can make a tree.

Rudyard Kipling

This British Imperialist author was born in India in 1865 and educated in England. He won the Nobel Prize for literature in 1907. He is best-known for his books The

Jungle Book, Just So Stories For Little Children, and Captains Courageous. He also wrote poems such as "Gunga Din" and "Mandalay."

Emma Lazarus

Emma Lazarus was born in 1849 in New York City to a rich Jewish family. She showed many of her early poems to Ralph Waldo Emerson, with whom she developed a life-long correspondence. Her books of poetry include Admetus and Other Poems, The Spagnoletto, and Songs of a Semite. In 1881, she began working to advance the cause of Jewish immigrants to the U.S. One of her poems, "The New Colossus," was chosen for the base of the Statue of Liberty. She died in 1887.

The New Colossus
Not like the brazen giant of Greek fame,
With conquering limbs astride from land to land;
Here at our sea-washed, sunset gates shall stand
A mighty woman with a torch, whose flame
Is the imprisoned lightning, and her name
Mother of Exiles. From her beacon-hand
Glows world-wide welcome; her mild eyes command
The air-bridged harbor that twin cities frame.
"Keep, ancient lands, your storied pomp!" cries she
With silent lips. "Give me your tired, your poor,
Your huddled masses yearning to breathe free,
The wretched refuse of your teeming shore.
Send these, the homeless, tempest-tost to me,
I lift my lamp beside the golden door!"

Edward Lear

Edward Lear was born in London in 1812. He traveled frequently and was known for his travel books as well as his ornithological drawings for The London Zoological Society. However, he found his primary fame as a master of limericks and verse, particularly for children and he is best known as the author of several nonsense poems including "The Owl and the Pussycat," and "the Jumblies." His poems have been compiled in books including A Book of Nonsense, Nonsense Songs, and Laughable Lyrics.

The first verse of "**The Owl and the Pussy-Cat**" begins with the familiar words:

The Owl and the Pussy-cat went to sea
In a beautiful pea-green boat,
They took some honey, and plenty of money,
Wrapped up in a five-pound note.
The Owl looked up to the stars above,
And sang to a small guitar,
"O lovely Pussy! O Pussy, my love,
What a beautiful Pussy you are,
You are,
You are!
What a beautiful Pussy you are!"

Henry Wadsworth Longfellow

Longfellow was born in Maine and educated at Bowdoin College where he later taught. He also worked as a professor at Harvard, but retired to devote himself to his poetry. His lengthy recognizable poems include "Paul Revere's Ride," "The Song of Hiawatha," "The Courtship of Miles Standish," and "The Children's Hour."

"**Paul Revere's Ride**" begins:

"Listen my children and you shall hear
Of the midnight ride of Paul Revere.
On the 18th of April in '75
Hardly a man is now alive
Who remembers that famous day and year.
He said to his friends,
"If the British come by land or sea from the town tonight
Hang a lantern aloft in the belfry arch
Of the Old North Church as a signal light.
One if by land and two if by sea
And I on the opposite shore shall be
Ready to ride and spread the alarm
Through every Middlesex village and farm
For the country folk to be up and to arm."

Clement C. Moore

Clement C. Moore was born in 1779 and educated at Columbia College where his father was president. He became a professor of Oriental and Greek languages at the Episcopal General Theological Seminary in New York City. Supposedly he wrote the traditional Christmas Poem, "A Visit From St. Nicholas" for his own children, and many scholastic bowl questions have been written about this literary work.

A Visit from St. Nicholas

'Twas the night before Christmas, when all through the house
Not a creature was stirring, not even a mouse,
The stockings were hung by the chimney with care,
In hopes that St. Nicholas soon would be there.
The children were nestled all snug in their beds,
While visions of sugarplums danced in their heads,
And mamma in her 'kerchief, and I in my cap,
Had just settled our brains for a long winter's nap...
When out on the lawn there arose such a clatter,
I sprang from the bed to see what was the matter.
Away to the window I flew like a flash,
Tore open the shutters and threw up the sash.
The moon on the breast of the new-fallen snow
Gave the luster of mid-day to objects below,
When, what to my wondering eyes should appear,
But a miniature sleigh, and eight tiny reindeer,
With a little old driver, so lively and quick,
I knew in a moment it must be St. Nick.
More rapid than eagles his coursers they came,
And he whistled, and shouted, and called them by name:
"Now, Dasher! now, Dancer! now Prancer and Vixen!
On, Comet! on Cupid! on, Donder and Blitzen!
To the top of the porch! To the top of the wall!

Now dash away! dash away! dash away all!"
As dry leaves that before the wild hurricane fly,
When they meet with an obstacle, mount to the sky,
So up to the house-top the coursers they flew,
With the sleigh full of toys, and St. Nicholas too.
And then, in a twinkling, I heard on the roof
The prancing and pawing of each little hoof.
As I drew in my head, and was turning around,
Down the chimney St. Nicholas came with a bound.
He was dressed all in fur, from his head to his foot,
And his clothes were all tarnished with ashes and soot.
A bundle of toys he had flung on his back,
And he looked like a peddler just opening his pack.
His eyes -- how they twinkled -- his dimples how merry!
His cheeks were like roses, his nose like a cherry!
His droll little mouth was drawn up like a bow,
And the beard of his chin was as white as the snow.
The stump of a pipe he held tight in his teeth,
And the smoke it encircled his head like a wreath.
He had a broad face and a little round belly
That shook, when he laughed, like a bowl full of jelly.
He was chubby and plump, a right jolly old elf,
And I laughed when I saw him, in spite of myself.
A wink of his eye and a twist of his head
Soon gave me to know I had nothing to dread.
He spoke not a word, but went straight to his work,
And filled all the stockings; then turned with a jerk,
And laying his finger aside of his nose,
And giving a nod, up the chimney he rose.
He sprang to his sleigh, to his teams gave a whistle,
And away they all flew like the down of a thistle.
But I heard him exclaim, ere he drove out of sight,
"Happy Christmas to all, and to all a good-night!"

Edgar Allen Poe

Edgar Allen Poe was born in Boston to a pair of actors. When he was orphaned, he was adopted by the Allan family who sent him to private schools in England and in the United States. Poe's irresponsible personal habits caused a falling out with his foster father and ended with a brief stint in the Army. Later he got married and worked as an editor. His first love was poetry. He published several books of poetry such as Tamerlane and Other Poems, Al Aaraaf, and Poems, but he achieved the most fame (and profit) from his macabre short stories such as "The Pit and the Pendulum," "The Fall of the House of Usher," and "The Tell-Tale Heart." "Annabel Lee," "The Bells," "Lenore," and "The Raven" are four of his easily recognized poems.

The Raven begins:

Once upon a midnight dreary, while I pondered, weak and weary,
Over many a quaint and curious volume of forgotten lore,
While I nodded, nearly napping, suddenly there came a tapping,
As of some one gently rapping, rapping at my chamber door.
"'Tis some visiter," I muttered, "tapping at my chamber door —
Only this, and nothing more."

Carl Sandburg

Carl Sandburg was born in 1868 in Galesburg, Illinois. He worked for the *Chicago Daily News* writing editorials. He soon became noted as a writer, gaining a Pulitzer Prize for his biographies of Abraham Lincoln in 1940 and another in 1951 for his Complete Poems. He was known for his unrhymed free verse and colloquial truth. His most famous poem is "Chicago." He died in 1967. Below is just an excerpt from "Chicago."

Chicago
HOG Butcher for the World,
Tool Maker, Stacker of Wheat, Player with Railroads and the Nation's Freight Handler;
Stormy, husky, brawling,
City of the Big Shoulders:

Percy Bysshe Shelley

Shelley was born in 1792 in Sussex, England. He studied at Eton and Oxford. He is considered one of the Romantic Poets. "Ozymandus" is one of his major sonnets. He drowned in 1822.

Shel Silverstein

Born in Chicago in 1930, Shel Silverstein began his career making cartoons for a military publication, and was also a musician. However, he gained fame as a writer and illustrator of children's books and poetry. He began writing short fiction in 1963, including Lafcadio, the Lion Who Shot Back, The Giving Tree, The Missing Piece, and the Missing Piece Meets the Big O. Later he gained even greater fame with his poetry publications Falling Up, A Giraffe and a Half, A Light in the Attic, and Where the Sidewalk Ends. Some of his most familiar poems are "Sick" and "Sarah Cynthia Sylvia Stout." "Sarah Cynthia Sylvia Stout" is a poem about a girl who would not take the garbage out. The garbage covered the floor and piled up to the ceilings.

The last part of "**Sarah Cynthia Sylvia Stout**" reads:
"At last the garbage reached so high
That finally it touched the sky.
And all the neighbors moved away,
And none of her friends would come to play.
And finally Sarah Cynthia Stout said,
'OK, I'll take the garbage out!'
But then, of course, it was too late...
The garbage reached across the state,
From New York to the Golden Gate.
And there, in the garbage she did hate,
Poor Sarah met an awful fate,
That I cannot right now relate
Because the hour is much too late.
But children, remember Sarah Stout.
And always take the garbage out!"

Gertrude Stein

Born in 1874 to an upper-middle class family in Allegheny, Pennsylvania, Gertrude Stein lived in Paris, California, and Baltimore when she was growing up and attended Radcliffe College where she was taught by William James. She went on to John Hopkins Medical School, and then lived for the rest of her life in Paris with Alice B. Toklas, another eminent American author of the time. Their home became a creative salon hosting literary and artistic artists such as Hemingway, Matisse, Picasso, and Thornton Wilder. Her first novel was entitled Things as They Are. She entitled her own autobiography The Autobiography of Alice B. Toklas, and published other works including Three Lives and Tender Buttons, a collection of verse that emphasizes sound over syntax. She was the first to label the Post-World War I generation of disillusioned artists as "The Lost Generation."

Alfred Tennyson

Born in 1809, Tennyson was heavily influenced by Lord Byron, and succeeded in making a name for himself, and even becoming poet laureate of Great Britain. His notorious contribution to literature includes the poems, "The Lady of Shallot," "Oenone," and "Morte d'Arthur."

Ernest L. Thayer

Thayer began his "literary" career working for the Harvard Lampoon. Later he worked for William Randolph Hearst's *Examiner*. His poem, "Casey at the Bat," first appeared in this venue, but wasn't popularized until it was read orally by the popular comedian De Wolf Hooper.

This poem tells the story of a baseball player from Mudville named Casey, who finds himself at the plate with two outs and Mudville trailing four to two. The crowd cheers on the proud, arrogant player as he takes two strikes. The pitcher winds up for the next pitch and Casey swings. The last verse of the poem says:

> Oh, somewhere in this favored land the sun is shining bright,
> The band is playing somewhere, and somewhere hearts are light,
> And somewhere men are laughing, and little children shout;
> But there is no joy in Mudville -- mighty Casey has struck out."

Walt Whitman

Walt Whitman was born in rural New York in 1819. His family moved to Brooklyn. He later taught in Long Island, and then returned to the city as a printer and a journalist. He wrote a revolutionary volume of poetry, Leaves of Grass, which he revised many times in his lifetime. It was largely written in free verse and contained many of his best-known poems, "O Captain! My Captain!," (an ode to Abraham Lincoln after his assassination), "I Sing the Body Electric," "Song of Myself," "When I Heard the Learn'd Astronomer," and "Crossing Brooklyn Ferry." He later cared for wounded soldiers during the Civil War and died in 1892.

William Wordsworth

Wordsworth was born in 1770 and educated at Cambridge. He was a key poet of the Romantic Movement, and co-authored lyrical ballads with Samuel Taylor Coleridge. One of his contributions to that volume was his well-known poem "Tintern Abbey." He wrote volumes of sonnets and free verse, many that focused on themes of God and nature. Wordsworth died in 1850.

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STUDY GUIDE:
NEWBERY MEDAL WINNERS

INTRODUCTION

The John Newbery Award is presented each year to the author of the most outstanding children's literature book that was published during the previous year. The award was established in 1921 by Frederic Melcher, and named for John Newbery, an English publisher and bookseller. The award was first presented in 1922. Here is a complete list of the authors who have won this award and the books for which they were honored.

Year	Book	Author
1922	*The Story of Mankind*	Hendrik Willem Van Loon
1923	*The Voyages of Doctor Doolittle*	Hugh Lofting
1924	*The Dark Frigate*	Charles Hawes
1925	*Tales from Silver Lands*	Charles Finger
1926	*Shen of the Sea*	Arthur Bowie Chrisman
1927	*Smoky, the Cowhorse*	Will James
1928	*Gay Neck, the Story of a Pigeon*	Dhan Gopal Mukerji
1929	*The Trumpeter of Krakow*	Eric P. Kelly
1930	*Hitty, Her First Hundred Years*	Rachel Field
1931	*The Cat Who Went to Heaven*	Elizabeth Coatsworth

1932	*Waterless Mountain*	Laura Adams Armer
1933	*Young Fu of the Upper Yangtze*	Elizabeth Lewis
1934	*Invincible Louisa: The Story of the Author of Little Women*	Cornelia Meigs
1935	*Dobry*	Monica Shannon
1936	*Caddie Woodlawn*	Carol Ryrie Brink
1937	*Roller Skates*	Ruth Sawyer
1938	*The White Stag*	Kate Seredy
1939	*Thimble Summer*	Elizabeth Enright
1940	*Daniel Boone*	James Daugherty
1941	*Call It Courage*	Armstrong Sperry
1942	*The Matchlock Gun*	Walter Edmonds
1943	*Adam of the Road*	Elizabeth Janet Gray
1944	*Johnny Tremain*	Esther Forbes
1945	*Rabbit Hill*	Robert Lawson
1946	*Strawberry Girl*	Lois Lenski
1947	*Miss Hickory*	Carolyn Sherwin Bailey
1948	*The Twenty-One Balloons*	William Pene du Bois
1949	*King of the Wind*	Marguerite Henry
1950	*The Door in the Wall*	Marguerite de Angeli
1951	*Amos Fortune, Free Man*	Elizabeth Yates
1952	*Ginger Pye*	Eleanor Estes
1953	*Secret of the Andes*	Ann Nolan Clark
1954	*...And Now Miguel*	Joseph Krumgold

1955	*The Wheel on the School*	Meindert DeJong
1956	*Carry On, Mr. Bowditch*	Jean Lee Latham
1957	*Miracles on Maple Hill*	Virginia Sorenson
1958	*Rifles for Watie*	Harold Keith
1959	*The Witch of Blackbird Pond*	Elizabeth George Speare
1960	*Onion John*	Joseph Krumgold
1961	*Island of the Blue Dolphins*	Scott O'Dell
1962	*The Bronze Bow*	Elizabeth George Speare
1963	*A Wrinkle in Time*	Madeleine L'Engle
1964	*It's Like This, Cat*	Emily Neville
1965	*Shadow of a Bull*	Maia Wojciechowska
1966	*I, Juan de Pareja*	Elizabeth Borton de Trevino
1967	*Up a Road Slowly*	Irene Hunt
1968	*From the Mixed Up Files of Mrs. Basil E. Frankweiler*	E. L. Konigsburg
1969	*The High King*	Lloyd Alexander
1970	*Sounder*	William H. Armstrong
1971	*Summer of the Swans*	Betsy Byars
1972	*Mrs. Frisby and the Rats of NIMH*	Robert C. O'Brien
1973	*Julie of the Wolves*	Jean Craighead George
1974	*The Slave Dancer*	Paula Fox
1975	*M.C. Higgins, the Great*	Virginia Hamilton
1976	*The Grey King*	Susan Cooper
1977	*Roll of Thunder, Hear My Cry*	Mildred D. Taylor

1978	*Bridge to Terabithia*	Katherine Paterson
1979	*The Westing Game*	Ellen Raskin
1980	*A Gathering of Days: A New England Girl's Journal, 1830-1832*	Joan W. Blos
1981	*Jacob Have I Loved*	Katherine Paterson
1982	*A Visit to William Blake's Inn: Poems for Innocent and Experienced Travelers*	Nancy Willard
1983	*Dicey's Song*	Cynthia Voigt
1984	*Dear Mr. Henshaw*	Beverly Cleary
1985	*The Hero and the Crown*	Robin McKinley
1986	*Sarah, Plain and Tall*	Patricia MacLachlan
1987	*The Whipping Boy*	Sid Fleischman
1988	*Lincoln: A Photobiography*	Russell Freedman
1989	*Joyful Noise: Poems for Two Voices*	Paul Fleischman
1990	*Number the Stars*	Lois Lowry
1991	*Maniac Magee*	Jerry Spinelli
1992	*Shiloh*	Phyllis Reynolds Naylor
1993	*Missing May*	Cynthia Rylant
1994	*The Giver*	Lois Lowry
1995	*Walk Two Moons*	Sharon Creech
1996	*The Midwife's Apprentice*	Karen Cushman
1997	*The View from Saturday*	E.L. Konigsburg
1998	*Out of the Dust*	Karen Hesse
1999	*Holes*	Louis Sachar

2000	*Bud, Not Buddy*	Christopher Paul Curtis
2001	*A Year Down Yonder*	Richard Peck
2002	*A Single Shard*	Linda Sue Park
2003	*Crispin, The Cross of Lead*	Avi
2004	*The Tale of Desperaux: Being the Story of a Mouse, a Princess, Some Soup, and a Spool of Thread*	Kate DiCamillo
2005	*Kira-Kira*	Cynthia Kadohata

BRIEF SUMMARIES OF SELECTED WINNERS

2004 *The Tale of Desperaux: Being the Story of a Mouse, a Princess, Some Soup, and a Spool of Thread* by Kate DiCamillo

The Tale of Desperaux is a story about a small mouse that was the last born in his family. He was a very small mouse with huge ears and open eyes. This is not normal for a mouse. This unusual mouse was born in a castle and fell in love with the princess, a human! The mouse likes to read, and loves light and music. He reveals himself to the Princess, and allows her to touch him. He even speaks to her. The Prince is also allowed to touch the mouse. Despereaux's father reports his son's behavior to the mouse council. When they hear about his behavior, they sentence him to death in the castle's dungeon. A red thread of death is attached to his neck, and he is thrown into the dark dungeon. Despereaux earns his life back by telling a story to Gregory, the Jailer.

2003 *Crispin, The Cross of Lead* by Avi

This book tells the story of a thirteen-year-old peasant, known as Asta's son, who lived in medieval England during the 14th century. His life is completely changed when his mother dies, his dwelling is burnt, and he is accused of a crime he didn't commit. He fled his village, alone and frightened, after being declared "a wolf's head" and was pursued by those he once trusted. He took nothing with him except his mother's cross and his newly discovered name of Crispin.

During his flight, he encountered Bear, a juggler who became his new "master," and who encouraged him to think and to learn survival skills. When Bear was captured and tortured by the enemy, Crispin fought to free his master and friend.

As the plot evolves, Crispin learns why he is being pursued, and uses this knowledge to his advantage.

2002 *A Single Shard* by Linda Sue Park

This book is set in twelfth-century Korea and tells the story of Tree-ear, an orphan, who lives under a bridge with a crippled man called Crane-man. The boy and the man survive by sharing bits of food from the rubbish heaps.

Their lives change drastically when Tree-ear accidentally drops a piece of pottery made by Min, a master potter. He offers to work for the potter to repay the cost of the broken pottery, and is given several hard tasks to perform. Min's wife provides him with a free meal during the day and Tree-ear saves some of each meal for his friend, Crane-man.

Tree-ear yearns to work at the pottery wheel, but is denied the privilege. He continues to work for Min and helps the potter by taking a special order to the Royal Court for examination, in hopes of obtaining a royal commission to make more pottery.

He must travel many miles by foot with the prized pottery and is robbed along his route. The robbers toss the pottery over a cliff. Tree-ear finds a single shard of pottery and continues on with it to the Royal Court, where the shard is examined. A commission is granted to Min.

Upon returning to the potter's village, Tree-ear learns that Crane-man has died. Min and his wife give Tree-ear a home and he learns the potter's trade.

2001 *A Year Down Yonder* by Richard Peck

This award-winning book is a sequel to the 1999 Newbery Honor Book, *A Long Way from Chicago.* This first book introduces us to two Chicago children, Joey and Mary Alice, who spend each summer at their Grandma Dowdel's house in rural Illinois.

In the second book, *A Year Down Yonder,* only Mary Alice is featured. Joey has taken a job with the Civilian Conservation Corps and has moved westward. Their father lost his job during the depression, and Mary Alice is sent to live with Grandma Dowdel in her "hick-town." Her cat Bootsie accompanies her.

Mary Alice dreads living with her large, unconventional Grandmother, who is not a popular person in the small community due to her unpredictable mannerisms and her cold, "matter-of-fact" ways. However, the year provides much entertainment as Grandma frightens away the boys who attempt to knock over her outhouse on Halloween, embarrasses and ridicules some of the more elite members of the community, and crashes into a pecan tree with a tractor to jar the pecans from their branches.

Mary Alice grows to love her Grandmother more with each passing day, and they form a strong emotional bond. At the conclusion of the book, Mary Alice marries Royce McNabb in Grandma's house in rural Illinois, and Grandma Dowdel gives her away in marriage.

The author, Richard Peck, was born and raised in Decatur, Illinois. He now lives in New York City.

2000 *Bud, Not Buddy* by Christopher Paul Curtis:

Set in the 1930's in Michigan, Bud (Not Buddy) is a ten-year old orphan on the run from a succession of abusive foster homes. Armed with his own book, *Bud Caldwell's Rules and Things for Having a Funner Life and Making a Better Liar Out of Yourself,* an advertisement for a jazz band, and the belief that the legendary stand-up bass player, Herman E. Calloway, is his real father, he sets out on an adventurous pilgrimage to find his father.

1999 *Holes* by Louis Sachar

Stanley Yelnats is sent to Camp Green Lake, a juvenile detention center. Ironically, there is no lake, and he is innocent in the first place. While he is there, the warden makes him dig a five-foot by five-foot hole with the rest of the detainees. This assignment is based upon the philosophy that hard labor will convert delinquents into upstanding citizens. Ultimately, he discovers that this is only a cover. The warden really has them digging for loot buried on the detention center grounds by the legendary Kissin' Kate.

1998 *Out of the Dust* by Karen Hesse

This book centers around its 14-year old narrator, Billie Jo, who documents her trials during the Depression in her journal, which is written in free form poetic style. Her mother dies in an accident while her father is on an alcoholic binge. Billie Jo blames her father and herself for her mother's death. Billie Jo's hands are also badly burned during the accident, and she becomes reluctant to pursue her musical talent on her piano. She faces unspeakable grief with stoic courage and ultimately jumps a train west, but soon discovers that the "Oklahoma Dust" remains within her, and she must return to her home.

1997 *The View from Saturday* by E.L. Konigsburg

This book tells the story of a group of sixth-graders who were chosen as members of the Academic Bowl team. They win the sixth grade contest and go on to be winners during the seventh and eighth grades, too. Throughout the process, they learn more about themselves and each other, as well as scholastic bowl facts, trivia, and concepts.

1996 *The Midwife's Apprentice* by Karen Cushman

Brat, a poor homeless girl in medieval England, gets a lucky break and rises to the rank of apprentice to the rude midwife, Jane Sharp. Finally she discovers a caring family and becomes known as Alyce. Thinking that she knows as much as the midwife, she attempts a delivery, but she fails on this first delivery attempt. Instead of confronting her failure, she runs from the town. This is the story of her struggles, her mistakes, and her self-realizations.

1995 *Walk Two Moons* by Sharon Creech

Salamanca Tree Hiddle is 13. Her mother has disappeared. She tells the story of her trip with her grandparents from Ohio to Idaho to Phoebe, a friend whose mother has also vanished. Phoebe claims to be receiving intermittent notes from her missing mother. One of these notes said, "Don't judge a man until you have walked two moons in his moccasins." Over the course of their interaction, Salamanca embraces her Native American ancestry and discovers the truth of her mother's disappearance.

1994 *The Giver* by Lois Lowry

This story is based upon a futuristic utopian society in which there is no poverty, sickness, unhappiness, or unemployment. Twelve-year-old Jonas is named the official Receiver of Memories. In time, he discovers the truth of his society's hypocrisy and chooses to stand up for what is right.

1993 *Missing May* by Cynthia Rylant

May, one of Summer's adoptive parents has died, and Summer and her adoptive father, Ob, are preoccupied with their grief over May's absence. Cletus, one of Summer's playmates, tries to help Summer and Ob contact May's spirit. Although they will always miss May, they discover that their togetherness lessens the pain of their loss.

1992 *Shiloh* by Phyllis Reynolds Naylor

Marty Preston, an 11-year-old boy, finds a hungry beagle near Shiloh school. He brings him home and names him after the school. Later he discovers that the dog belongs to Judd Travers, who mistreats the dog and he's forced to return the dog to Judd. The book tells of Marty's adventures and emotions as he tries to save the dog from his cruel master.

1991 *Maniac Magee* by Jerry Spinelli

Jeffrey Lionel "Maniac Magee" ran away from his aunt and uncle's house after his parents died. He ended up in a town named Two Mills, where the blacks and whites refused to intermingle due to their mutual fear and distrust. He shook things up in this small town and calmed down some of the tensions. He performs some amazing feats and learns much about racism.

1990 *Number the Stars* by Lois Lowry

This is a story of two friends, Ellen and Anne Marie, during World War II. It takes place in 1943. Ellen is Jewish, and Anne Marie is not. When Ellen has to flee the Nazis, she stays in Anne Marie's apartment for a short time and pretends to be Anne Marie's sister when the guards arrive. Anne Marie shows much courage and persistent when trying to help her friend.

1989 *Joyful Noise: Poems for Two Voices* by Paul Fleischman

This comical book of poetry is designed with two separate columns on each page so that children can alternate reading the verse aloud. The poems consist of stories about insects and are accompanied by vivid illustrations and large text.

1988 *Lincoln: A Photobiography* by Russell Freedman

This biography combines photographs, art, and written text to recreate the story of Abraham Lincoln's life and career.

1987 *The Whipping Boy* by Sid Fleischman

This is the story of the relationship between Prince Brat, the royal heir, and an orphan named Jemmy. Since royal heirs could not be spanked, Jemmy was appointed to take the Prince's whippings. Jemmy intended to run away, but the Prince ran away first, and took Jemmy with him. The authorities then charged Jemmy with kidnapping the Prince.

1986 *Sarah, Plain and Tall* by Patricia MacLachlan

Sarah lives in Maine. She answers an advertisement from a widowed Midwestern farmer named Caleb, who is searching for a new wife and a mother for his two children. She travels to Kansas to meet Caleb and his family. At first she is homesick and the children worry that she will abandon them, but in the end, Sarah decides to stay. She realizes that she would miss Caleb and his children more than she misses Maine.

1985 *The Hero and the Crown* by Robin McKinley

Aerin has been an outcast all her life because she is the daughter of the notorious "witchwoman" who was mistress to the king. Aerin's mother died of grief, because Aerin was a girl instead of the son the king so desperately wanted. Despite her gender, Aerin was destined to become a hero, and was ultimately endowed with the power of the Blue Sword. She became a legendary dragon slayer and was known throughout the land as Lady Aerin, Dragon-Killer.

1984 *Dear Mr. Henshaw* by Beverly Cleary

Leigh Botts, a second grade boy, writes to his favorite author, Mr. Henshaw, in the pages of his diary. He shares his activities, inner thoughts, and actual feelings that reveal truths about his painful and awkward transition from childhood to adolescence.

1979 *The Westing Game* by Ellen Raskin

This book is about a group of sixteen potential inheritors who gather for the reading of Mr. Samuel W. Westing's will. To their surprise, the will prescribes a contest whose outcome will determine the disbursement of the murdered man's fortune. One of them is his murderer and the group is challenged to discovery the murder's identity. The possible inheritors are each paired up with a "perfect" partner, given $10,000, and provided with some clues. The question is, can they solve the mystery and reveal the name of the murderer before someone gets hurt?

1972 *Mrs. Frisby and the Rats of NIMH* by Robert C. O'Brien

The central character, Mrs. Frisby, is a widowed mouse. She needs to move her four children to summer quarters immediately to escape death. Unfortunately, it is not so easy. Her youngest, Timothy, has pneumonia and can't be moved. Luckily, she meets the rats of NIMH, who are extremely intelligent escapees from a laboratory experiment. They help her solve her problem and several other problems that occur within the plot.

1971 *Summer of the Swans* by Betsy Byars

A young girl, Sara, and Charlie, her mentally disturbed brother, have been living with their aunt after their mother's death. The story begins during summer vacation. During this season, swans frequent a lake near their home, and Sara and Charlie visit them during the day. One day the brother runs away. Sara assumes that he has gone to visit the swans. During the frantic search for the retarded child, Sara realizes how much Charlie really means to her.

1970 *Sounder* by William H. Armstrong

This book centers around a Southern African-American family during the 1800's. The mother is a maid for a rich family. The father is a sharecropper. They have three boys and a mongrel dog named Sounder. The father is taken to jail for stealing a hog to feed his family. At this point, Sounder is shot and can't be found. Ultimately, a battered Sounder returns, but in the meantime, the oldest son has to take on the father's work to feed the family, thus quickly transforming him from a child to an adult.

1967 *Up a Road Slowly* by Irene Hunt

This is the story of a young protagonist named Julie, whose mother dies when she is seven. She goes to live with her Aunt Cordelia, who is a spinster. The book chronicles the many growing changes and emotional traumas that she undergoes between the ages of seven to eighteen.

1957 *Miracles on Maple Hill* by Virginia Sorenson

In this book we meet Marly, Joe, Mr. Chris, and Margie, as well as other family members and friends. It's based upon the experiences of a family that helps old friends with their maple syrup crop, and is told from the view of a small girl. They live in the countryside where miracles do happen, and each chapter of this book depicts a separate miracle of nature, thus inspiring the reader to appreciate the everyday miracles.

1956 *Carry on, Mr. Bowditch* by Jean Lee Latham

This biography centers around the figure of Nat Bowditch, a historical mathematician, astronomer, and sailor. Nat fulfilled his dream of becoming a captain and was the author of The American Practical Navigator. Action and adventure intersperse with historical detail in this exciting book.

1946 *Strawberry Girl* by Lois Lenski

This book is about a girl and her family who move to a new house. They struggle to produce crops, relate to their "not-so-nice" new neighbors, who are consumed with feuding, and triumph over other life's other hardships.

1942 *The Matchlock Gun* by Walter Edmunds

This short book centers around Edward, a young boy who lived during the French and Indian War. His father left home to go fight against the Indians in the war, but he left an old Spanish gun with Edward, and told him to use the gun, if necessary, to protect his mother and sister. The gun was so large and awkward that Edward wondered if he would be able to use it to defend their home if the situation occurred.

1939 *Thimble Summer* by Elizabeth Enright

This book is about a girl named Garnet who finds a silver thimble in the ground. Shortly afterwards, a slew of lucky occurrences ensue. A rain finally comes to end the drought that prevented her father from making a living. The government loans their family some money to build a new barn, and they adopt Eric, a nice orphan. She also adopts a pig that she names Timmy. She takes care of Timmy all summer and wins a blue ribbon and prize money for him at the fair in September. She concludes that the thimble must have been magical, and spends the rest of the summer exuberant.

1935 *Dobry* by Monica Shannon

This book is about a young boy, Dobry, who grows up on a farm in Bulgaria in the 1920's and 30's. As he gets older, he realizes that his true dream is to be a sculptor.

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STUDY GUIDE:
COMPUTER BASICS, TERMS & ACRONYMS

A computer is defined as "a machine that takes in information, processes it, stores it, and gives it back on request."

There are three main parts of a computer:

1. **PROCESSOR** (or CPU… Central Processing Unit)
   This unit is the "brains of the computer." It takes in information which it uses to perform calculations or to process information.

2. **MEMORY**
   This is the storage unit for all information that is put into the computer. Information is held here until it is retrieved at a later time.

3. **INPUT AND OUTPUT DEVICES**
   Input devices enable the user to put information into the computer. The two most commonly used input devices are the keyboard and the mouse. Joysticks, and modems are also input devices.
   Output devices display or print the information that has been stored by the computer. The monitor and the printer are the most common output devices.

For a computer to work, three things are necessary:

1. **HARDWARE**: the actual pieces of equipment that make up the computer system
   EXAMPLES: computer, monitor, modem, printer, disks, and disk drives.

2. **SOFTWARE**: programs and instructions that direct the computer and tell it how to perform various tasks.

3. **A USER OR OPERATOR**: You or another person who can enter data into the computer.

PARTS OF A COMPUTER

1. **CPU**: Central Processing Unit: It's the computer chip that acts as the brain of the computer to process the information. Sometimes the casing that holds this unit is also called the CPU.

2. **Monitor**: The screen upon which the information is shown.

3. **Keyboard**: An input device that resembles a typewriter.

4. **Printer**: A mechanical output device that can print text or graphics onto paper. The three main types or printers that have been used throughout computer history are the dot matrix, ink jet, and laser.

5. **Mouse**: An input device that moves on a ball to move the cursor and select menu programs.

6. **Modem**: A device that allows information to ravel over telephone lines. A modem is necessary for accessing the Internet, and for e-mail correspondences.

7. **Disk-Drives**: The slots into which the disks are inserted. They read from and write to a floppy disk or hard disk. The **CD-ROM** drive allows you to insert special disks called CD-ROM's. The hard drive is composed of a metal disk that can not be removed. It holds more information than a floppy disk.

A computer doesn't comprehend English. Each piece of information is changed into a binary code, which uses the digits 0 and 1. For example, the letter "a" is 01000001. Every other letter in the alphabet is assigned a different combination of 0 and 1. Each 0 and 1 is called a BIT. This is the smallest piece of computer information that computers can handle. Bits are joined together into longer strings called BYTES. Eight bits make one byte.

1,024 Bytes = 1 Kilobyte

1,024 Kilobytes = 1 Megabyte

1,000 Megabytes = Gigabyte

GENERAL COMPUTER TERMS

Backspace/delete Key: The key on the computer keyboard that moves the cursor one space to the left, and will delete any characters located to the left of the cursor.

Baud rate: A measurement of how fast a modem transfers data.

Boot: To start up a computer by loading a program into the memory from an outside source, such as a disk.

Bug: An error or glitch in a program.

Caps Lock Key: A key on the computer keyboard that creates all capital letters when the key is pressed.

Catalog: A list of all the files stored on a disk. It's a synonym for a "directory."

Character: Each individual letter, number, punctuation mark, or other symbol used in printing or displaying information that can be read by humans.

Chip: The small piece of material on which the integrated circuit is fabricated. Silicon is the material from which most computer chips are made.

Cursor: A line or small block that appears on the monitor screen to show where the next information will be placed.

Command: A communication from the user to the computer system. Usually the commands are typed on the keyboard.

Database: A large collection of information, such as a library, newspaper, or list of names, that the computer can easily read and retrieve as output.

Default: The setting that is automatically used by a computer if the user has not specified a different setting or action.

Disk: A flat, circular magnetic surface on which information can be stored.

DOS: Disk Operating System: A software system that allows the computer to communicate with the disk drives.

Edit: To change the text by adding, deleting, cutting, or pasting.

E-Mail: Electronic mail which has been sent from one computer system to another via telephone lines.

Expansion Slot: A connector inside the computer into which a peripheral card can be placed.

File: A collection of information stored together on a disk, similar to the information that would be placed into one file folder of a file cabinet.

Font: They type of design used for letters or other characters.

Format: To prepare a blank disk so it's ready to receive information. It's a synonym for "initialize."

Expansion Slot: A connector inside the computer into which a peripheral card can be placed.

File: A collection of information stored together on a disk, similar to the information that would be placed into one file folder of a file cabinet.

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Hardcopy: The printed copy of the computer information.

Input: The information that is fed into the computer.

Insert Key: A key on the computer keyboard that is used to add text without deleting the text that has already been written.

Interface: A type of equipment that is used to connect the computer to the other hardware.

I/O: Input/Output: The transfer of information into the computer and then out of it.

Internet: A network of thousands of computers that are connected together.

Joystick: A lever that's used to move the cursor, especially in some computer games.

Load: To enter information (such as a program) from a storage disk into the main memory.

Mainframe: A large computer used by the government and large businesses that stores vast amounts of information, and can be used by many people at the same time.

Memory: A hardware component of the computer that stores information for later retrieval.

Menu: A list of choices offered by a program.

Output: The information that a computer feeds out, which is usually shown on the monitor or in printed form.

Password: A secret code that protects computer information, and allows only certain people to use a computer or program.

Piracy: The reproduction and distribution of software that has been copyright protected.

Public Domain Programs: Software that can be copied by anyone and used without charge.

Personal Computer: PC, A microcomputer small enough to be used in homes and small businesses.

Program: A set of instructions that tells the computer the actions necessary to accomplish a particular task. As a verb, this word means to write these computer instructions.

RAM: Random Access Memory: A type of memory within the computer that allows the user to change the programs and information in RAM. However, this information is lost when the computer's power is shut off.

Return or Enter Key: A key on the computer keyboard that is used to enter information, and that also returns the cursor to the beginning of a new line.

ROM: Read Only Memory: The type of memory within the computer that can not be changed. It remains permanently, even when the computer is shut off.

Save: To place the contents of a file on a disk or the hard drive for future use.

Scanner: A device that can transfer a printed page and pictures into the computer without using the keyboard or mouse. They are also used in stores to scan prices.

Shift Key: The key on the computer keyboard that is used to capitalize letters and type the upper symbol on the number keys.

Space Bar: The longest key on the computer keyboard. It's used to produce a blank space between words, and to advance the cursor.

Spreadsheet: A type of software that is used in the field of accounting to perform quick mathematical calculations.

Slot: An opening inside the computer into which the peripheral cards are inserted.

User-friendly: A term signifying that a computer or computer program is easy to use.

Video Display Terminal: Another name for the monitor.

Virus: A program that causes damage to other computer programs.

Word Processor: A program used to create and modify text, thus creating professional documents.

COMPUTER ACRONYMS

IBM: International Business Machines
DOS: Disk Operating System
ProDOS: Professional Disk Operating System
RAM: Random Access Memory
ROM: Read Only Memory
CPU: Central Processing Unit
BASIC: Beginner's All Purpose Symbolic Instruction Code
MB: Megabytes
GB: Gigabytes
VR: Virtual Reality
VIOS: Basic Input/Output System
CRT: Cathode ray Tube
GDI: Graphic Device Interface
MCI: Media Control Interface
LCD: Liquid Crystal Display

INTERNET TERMS AND ACRONYMS

AOL: America On Line

BBS: Bulletin Board Service

Bounced Message: An e0mail message that is returned to you because it did not reach its destination.

Browser: A client software program that's used to explore information on the Internet. Netscape Navigator is the top selling browser, followed by Mosaic and Microsoft Internet Explorer.

BTW: By the way

Chat: A program that enables people to type messages to a server who displays the messages immediately so that others who are logged on can respond at once.

Crash: An unexpected shut-down of a program or an entire system. This results in a loss of all work that was not saved.

Cyberspace: The imaginary space on the Internet where you go when you're on-line, or where your e-mail goes.
Domain name: The name in an e-mail address that identifies the Internet host. In the address jray@erienet.net, erienet.net is the domain name.

Dot: The period used in a URL.

Downloading: The transferring of information from the server to your computer.

E-Mail: (Electronic Mail) Messages sent from one computer to another over the Internet.

Emoticons: Often called smileys, these are special characters that represent human faces when turned sideways. They attempt to express the writer's emotions and gestures. For example: : -) represents the ☺.

FAQ: Frequently Asked Questions

FTP: File Transport Protocol

Flame: An angry or insulting message sent by one person to another by e-mail.

FWIW: For What It's Worth

Gopher: An Internet service that locates and delivers electronic files.

Hacker: A computer enthusiast who taps into closed networks.

Home page: The opening page of a document on the Web.

HTML: Hypertext Markup Language

http: Hypertext transfer protocol

IMO: In My Opinion

IOW: In Other Words

IP: Internet Protocol

ISP: Internet Service Provider

Lurker: A person who goes to electronic meetings and doesn't say anything and also breaks into other computers.

Microsoft: The computer industry giant responsible for DOS, Windows and Windows 95.

Netiquette: The correct form of behavior to be used on the Internet.

Online: It's when you're connected to the Internet, and your computer is ready to accept data.

PPP: Point to point protocol.

Search Egine: A tool that matches key words with titles and descriptions on the Internet, Yahoo, Alta Vista, and Infoseek are examples of search engines.

Server: The company that proyeds the netword operations for other computer users.

Surfing: Crusing the net, and aimlessly exploring various web pages and sites.

URL: Universal Resource Locator

www: World Wide Web

YAHOO: Yet Another Hierarchically Officious Oracle

The last few letters in an e-mail address usually indicate the type of organization or country that is associated with the sender.

ORGANIZATIONS	COUNTRIES
com commercial	au Australia
gov government	ca Canada
net network	it Italy
edu education	jp Japan
mil military	us United States
org organization	

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STUDY GUIDE:
GEOMETRY: TERMS AND FORMULAS

Geometry is the branch of mathematics that deals with lines, solids, angles, surfaces, shapes, and measurements. An ancient Greek mathematician named Euclid, was the founder of geometry.

BASIC VOCABULARY TERMS:

1. Angle: two rays that are joined together with a common endpoint.
2. Area: the measure of the space within a two-dimensional figure; expressed in square units.
3. Bisect: to divide equally into two congruent pieces or parts.
4. Chord: a straight line segment that touches two different points upon a circle, but does NOT go through the center of the circle.
5. Circle: the set of points that are equidistant from a central point of a plane figure.
6. Circumference: the distance around a circle; its perimeter.
7. Compass: a geometric tool used to draw circles, or construct other geometric constructions.
8. Cone: a space figure that is formed by connecting a circle to a point that is not in the same plane.
9. Congruent figures: figures that are exactly the same size and shape.

10. Counterclockwise: the direction around a circle that is opposite to the way the hands on a clock move.

11. Cube: a three-dimensional figure having 6 sides, called faces, where each face is in the shape of a square.

12. Cylinder: a space figure with two circular bases that are identical in size and shape, and parallel to one another.

13. Degree: a unit of measurement used to measure angles and revolutions; there are 360 degrees in one complete circle.

14. Diagonal: any straight line that connects two vertices of a polygon, but is not a side of that polygon.

15. Diameter of a circle: the distance from one side of a circle to the opposite side, when traveling through the center of the circle.

16. Edge: the segment where two outermost sides of a three-dimensional figure meet and join.

17. Endpoint: the starting point of a line segment or ray.

18. Faces: the sides of a three-dimensional figure of solid.

19. Hypotenuse: the side opposite the right angle in a right triangle.

20. Intersect: to cross one another.

21. Legs: the two sides of a right triangle that are not the hypotenuse.

22. Line: a set of points that continue without end in both directions.

23. Line segment: the two endpoints and the straight line distance between these two points; a portion of a line that begins at a specific point and ends at a different specific point.

24. Midpoint: a point that divides a segment into exactly two segments of equal length.

25. Opposite rays: rays that have the same endpoint, but travel in opposite directions to form a line.

26. Parallel lines: two lines in the same plane that are equidistant from each other, have no points in common, and never intersect or cross each other.

27. Perimeter: the distance around the outer edges of a polygon; the sum of the sides of that polygon.

28. Perpendicular lines: lines that meet or intersect to form right angles.

29. Pi: the number obtained by dividing the circumference of a circle by its diameter; commonly accepted as 3.14

30. Polygon: a closed figure made from straight line segments and having three or more sides.

31. Protractor: a geometric tool used to measure angles using the unit of degrees.

32. Pythagorean Theorem: in a right triangle, the sum of the squares of the legs equals the square of the hypothesis; a squared + b squared = c squared.

33. Quadrant: ¼ of a circle or other plane figure.

34. Radius of a circle: the distance from the center of the circle to any point on the circle; one half the length of the circle's diameter.

35. Ray: a part of a line that begins at a specified point and travels forever in a particular direction.

36. Revolution: one 360 degree turn.

37. Semicircle: one half of a circle; 180 degrees of the circle.

38. Similar figures: two figures that have the same shape and look alike, but are not always the same size.

39. Skew lines: lines that are in two different planes.

40. Sphere: a set of points in space that are a given distance from a specified point.

41. Surface area: the sum of the areas of the faces of a solid figure.

42. Transversal: a line that intersects two or more other lines.

43. Triangle sum property: the fact that the measures of all of the angles in a triangle add up to 180 degrees.

44. Vertex: the point where two line segments, or rays, join.

45. Vertices: the plural form of the word vertex.

46. Volume: the measure of the space within a three-dimensional figure; the amount of space occupied by a figure.

ANGLES: the geometric figures formed by two rays joining at one point, or vertex.

TYPES OF ANGLES

1. Acute angle: an angle whose measure is less than 90 degrees.
2. Right angle: an angle whose measure is exactly 90 degrees.
3. Obtuse angle: an angle whose measure is larger than 90 degrees but less than 180 degrees.
4. Straight angle: an angle whose measure is exactly 180 degrees, and thus creates a straight line.
5. Complementary angles: two angles that share a common vertex and a common side, and whose sums equal 90 degrees.
6. Supplementary angles: two angles that share a common vertex and a common side, and whose combined sums equal 180 degrees.
7. Alternate interior angles: two angles that are formed by two lines and a transversal that are between the two lines, and on opposite sides of that transversal.
8. Central angle of a circle: an angle who vertex is the center point of a circle.
9. Corresponding angles: any pair of angles that are in similar positions after two lines have been cut by a transversal.
10. Exterior angles: any angles formed when two lines are cut by a transversal, but the angles are not between the two lines.
11. Interior angles: any angles formed by two lines that have been cut by a transversal and the angles are between the two lines.
12. Vertical angles: angles that are formed by two intersecting lines, but do not make a linear pair.

POLYGONS: These are closed plane figures that are created by straight line segments. They have three or more sides. POLYGONS ARE NAMED BY THE NUMBER OF SIDES THAT THEY HAVE.

NAMES OF POLYGONS

Number of Sides	Polygon Name
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon
11	11-gon
12	Dodecagon

TRIANGLES: Triangles are polygons having three sides, and therefore, three angles.
Angle A + Angle B + Angle C = 180 degrees.

TYPES OF TRIANGLES

1. Acute Triangle: A triangle having three acute angles.
2. Right Triangle: A triangle having one right angle.
3. Obtuse Triangle: A triangle having one obtuse angle.
4. Scalene Triangle: A triangle with no congruent sides.
5. Isosceles Triangle: A triangle with at least two congruent sides.
6. Equilateral Triangle: A triangle with 3 congruent sides and three equal angles.

The height of the triangle (also called the altitude) is determined by drawing a perpendicular line from a vertex to the base, which is the bottom of the triangle.

TO FIND THE AREA OF A TRIANGLE: A = ½ hb

Area equals ½ the height of the triangle times the base. It is expressed in square units.

If the height of a triangle was 8 centimeters and the base of that triangle was 24 centimeters, the area of the triangle would be ½ times 8 times 24, or 96 square cm.

TO FIND THE PERIMETER OF A TRIANGLE, ADD THE LENGTH OF EACH SIDE. If the sides of a triangle measured 9 ft., 6 ft, and 14 ft., the perimeter of that triangle would be 9 + 6 + 14, or 29 feet.

QUADRILATERALS: These polygons have 4 sides, and therefore, four angles.

TYPES OF QUADRILATERALS

1. PARALLELOGRAM: A quadrilateral with opposite sides parallel.

2. RECTANGLE: A parallelogram with four right angles.

3. SQUARE: A rectangle in which all four sides are congruent.

4. RHOMBUS: A parallelogram with four congruent sides.

5. TRAPEZOID: A quadrilateral with exactly two parallel sides.

Every square is a rectangle, because a rectangle has 4 right angles, and every square has four right angles. However, not every rectangle is a square, because most rectangles have a different length and a width, whereas the length of all the sides in a square are equal.

TO FIND THE PERIMETER OF ANY QUADRILATERAL : Add the length of every side together.

TO FIND THE AREA OF A RECTANGLE: A = lw

Area = the length times the width. It is expressed in square units.

If the length of a triangle was 19 meters and the width was 4 meters, the area would be 19 x 4, or 76 square meters.

TO FIND THE AREA OF A SQUARE: A = s squared

Area = the length of one side squared. If a side was 6 cm, the area would be 6 x 6, or 36 sq. cm.

CIRCLES:

The distance around the outside of a circle is called its CIRCUMFERENCE.

TO FIND THE CIRCUMFERENCE OF A CIRCLE: C = Pi x d
The circumference equals pi times the diameter.

Pi has an accepted value of 3.14, or in its fractional form, its value is 22/7.

If the diameter of a circle is 9 meters, the circumference of that circle would be 3.14 times 9, or 28.26 meters.
TO FIND THE AREA OF A CIRCLE: A = pi r squared
The area equals pi times the radius squared. It is always expressed in square units.

If the radius of a circle was 4 meters, the area would be 3.14 times 16 (because 4 squared is 16), or 50.24 square meters.

TO FIND THE VOLUME OF A PRISM OR RECTANGULAR BOX:

V = l x w x h

The volume equals the length times the width times the height. It is always expressed in cubic units.

If a box had a length of 5 centimeters, a width of 3 centimeters, and a height of 8 centimeters, its volume would be 5 x 3 x 8, or 120 cubic centimeters. (120 centimeters cubed)

OTHER VOLUME FORMULAS:

VOLUME OF A CYLINDER: V = pi r squared h, where r is the radius and h is the height.

VOLUME OF A CONE: V = 1/3 pi r squared h, where r is the radius and h is the height.

VOLUME OF A SPHERE: V = 4/3 pi r cubed, where r is the radius.

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STUDY GUIDE:
1990-1994

1990 WORLD EVENTS:

THE GULF WAR began on August 2, 1990 after Iraq invaded Kuwait. At first, the operation was known as Operation Desert Shield and was intended to protect neighboring countries. The main goal at this time was to convince Saddam Hussein to withdraw from Kuwait. However, Hussein did not withdraw, thus causing the start of Operation Desert Storm.

Ethnic cleansing began in Croatia. UN peacekeepers tried to intervene.

Nelson Mandela was released from prison and spoke to his people against apartheid at Cape Town in South Africa.

Margaret Thatcher stepped down as the British Prime Minister, after serving longer than any other Prime Minister.

Mikhail Gorbachev won the Nobel Prize for Peace for his innovations "perestroika" and "glasnost."

McDonald's opened its first restaurant in the U.S.S.R.

1990 U.S. EVENTS:

The Keating Five Hearings by the Senate Ethics Committee began to investigate the involvement of five Senators with a corrupt savings and loan scandal, involving Charles Keating. Alan Cranston was found guilty, while the other four were given small fines.

Dr. Kevorkian and the Right to Die were controversial topics in the news.

Judge David H. Souter was appointed to the U.S. Supreme Court to replace the retiring William Brennan.

Science:

"Sue," an almost perfectly intact dinosaur skeleton of a Tyrannosaurus Rex was discovered in South Dakota. (This skeleton is now displayed at the Museum of Natural History in Chicago, Illinois.)

The Hubble telescope went up into space.

Consumer Events:

The Ford Explorer (an SUV) was introduced on the market and sold twice as many models as the Jeep Cherokee.

Television:

"Seinfeld" began its prime time run on NBC. Three years later, after moving to Thursday nights, it became extremely popular, winning many Emmy awards, as well as People's Choice Awards and a Peabody Award over the course of its nine seasons and 178 episodes. It starred Julia Louis-Dreyfus as Elaine, Michael Richards as Kramer, and Jason Alexander as George, as well as Jerry Seinfeld as himself.

Movies:

The NC-17 rating came into use. This rating was attached to movies that were not acceptable for children under the age of 17.

"Dances With Wolves," directed by Kevin Costner, was a success, winning 7 Academy Awards, including one for Costner as Best Director.

"Driving Miss Daisy" won four Oscars.

Other important films of 1990 include, "Pretty Woman," starring Richard Gere and Julia Roberts, "Home Alone," starring Macaulay Culkin and Joe Pesci, and "Total Recall," starring Arnold Schwarzenegger and Sharon Stone.

Sports:

At the Super Bowl, the San Francisco 49ers, led by Joe Montana, beat the Denver Broncos.

The Cincinnati Reds beat the Oakland A's in the World Series.

The International Olympic Committee announced that the 1996 Summre Olympic Games would be held in Atlanta, Georgia.

Notable Obituaries:

Sammy Davis, Jr. -- a singer, dancer, actor, musician, and mime who died from throat cancer.

Greta Garbo--an early twentieth century movie star known for her beauty and portrayal of moody characters, and for her starring role in "Grand Hotel."

Roald Dahl--a popular children's author whose works include "James and the Giant Peach," and "Matilda."

Leonard Bernstein--a famous American composer and conductor of the twentieth century known for his music in "West Side Story."

Pearl Bailey--a popular U.S. nightclub singer who starred in the first all-black version of "Hello Dolly."

B.F. Skinner--an American psychologist who devised a box (Skinner Box) in which an animal learned to press a lever in order to get food or water.

1991 WORLD EVENTS:

Latvia, Estonia, and Lithuania obtained their independence from the Soviet Union.

Operation Desert Storm began on January 17, 1991. The United States engaged in air strikes as well as ground forces, led by General Norman Schwartzkopf. On February 28, 1991 U.S. forces liberated Kuwait. Notably, much of this war was telecast on CNN.

1991 U.S. EVENTS:

On July 22, 1991 Jeffrey Dahmer was finally apprehended and arrested for multiple slayings and cannibalism in a series of serial killings.

The minimum wage was raised from $3.80 to $4.25 per hour.

President Bush was admitted to the hospital for irregular heart rhythms.

Four Los Angeles police officers were indicted following the March 3rd beating of 25-year old Rodney King, a black motorist.

Thurgood Marshall, the first black to ever serve on the U.S. Supreme Court, retired after 24 years of service at the age of 84.

The Clarence Thomas hearings took place, and investigated the accusations of Anita Hill who claimed to have been sexually harassed ten years before by her boss, Clarence Thomas. In the end, Thomas was cleared and nominated for the U.S. Supreme Court.

President Bush refused a loan of $10 billion to Israel, which was targeted for housing developments in the Occupied Territories.

Movies:

"The Silence of the Lamb" and "Thelma & Louise" debuted this year.

"JFK," directed by Oliver Stone, reinstated public controversy and conspiracy theories on the results of the Warren Commission findings of 1964, which determined that Lee Harvey Oswald was the culprit in the JFK assassination. Other top movies included: "Robin Hood: Prince of Thieves," starring Kevin Costner, Morgan Freeman, and Christian Slater, and "Terminator 2," starring Arnold Schwarzenegger, and Linda Hamilton.

Sports:

In the Super Bowl, the New York Giants beat the Buffalo Bills.

The Minnesota Twins won the World Series against the Atlanta Braves 4-3.

In tennis, Monica Seles won the U.S., French, and Australian Open Tournaments.

Magic Johnson was diagnosed with HIV.

Carl Lewis set the world record for the 100-meter sprint at the World Track and Field Championships, finishing with a time of 9.86 seconds.

Notable Obituaries:

Frank Capra--a motion picture director for movies like "It's a Wonderful Life"

Dr. Seuss--an author of children's books such as "The Cat in the Hat," and "How the Grinch Stole Christmas."

Martha Graham--an American modern dancer and dance director, who founded the Martha Graham School of Contemporary Dance in New York City.

Michael Landon--an actor who starred in "Bonanza" and "Little House on the Prairie."

Isaac Bashevis Singer--Nobel-winning novelist who wrote about the heritage of Polish Jews and is best known for Gimpel the Fool and The Magician of Lublin.

1992 WORLD EVENTS:

The president of Serbia, Slobodan Milosevic, led Bosnian Serbs to attack and take over parts of Bosnia Herzegovina, resulting in the bloodiest conflict in Europe after WWII.

"Ethnic cleansing" continued, checked somewhat by UN sanctions and relief efforts.

Canadians voted 54% against granting Quebec its independence.

Anarchy raged in Somalia, a starving country entrenched in Civil War. Clinton sent troops in, and several Americans were killed before the troops were finally withdrawn.

The "no-fly" zone was imposed in Iraq. UN inspectors determined that nuclear weapons were not an issue there.

Boris Yeltsin maintained power in Russia.

Disney opened the $4 billion Euro Disney theme park just outside of Paris.

General Noriega, former leader of Panama, was sentenced to 40 years in prison for drug trafficking.

1992 U.S. EVENTS:

Hurricane Andrew devastated Florida and Louisiana.

An all-white jury acquitted four Los Angeles police officers (also all white) of beating Rodney King, a black man. Riots began in South Central Los Angeles and continued for three days. Several black men beat up a white truck driver, Reginald Denny. (These men were later convicted.) A curfew was instituted in many towns to prevent the riots from spreading.

Serial killer Jeffrey Dahmer was sentenced to 15 consecutive terms of life in prison with no possibility of parole.

Science:

Nicoderm patches were approved as a possible solution to the "stop smoking" problem.

Theater:

Tony Kushne's "Angels in America," a two-volume epic play, debuted in England. By 1993 it was also popular on Broadway.

Television:

After 30 years at the "Tonight Show" host, Johnny Carson resigned, leaving it to Jay Leno.

Movies:

Top movies of the year were "Basic Instinct," "Wayne's World," and "Batman Returns."

Sports:

The Washington Redskins beat the Buffalo Bills in the Super Bowl.
The Toronto Blue Jays beat the Atlanta Braves 4-2 in the World Series.
Al Unser, Jr. won the Indy 500.
Larry Bird retired from basketball and the Boston Celtics.
Former tennis champ Arthur Ashe announced he was HIV-positive.
Michael Jordan, Magic Johnson, and fell Dream Team members celebrated their Olympic victory in Barcelona.

Notable Obituaries:

Isaac Asimov--a science-fiction writer who published Pebble in the Sky and Opus 200.
John Cage--an American composer who invented the Prepared piano.
Alex Haley--the Pulitzer Prize-willing author of Roots.
Anthony Perkins--an actor who starred in the original "Psycho" movie series.
Lawrence Welk--a Big Band conductor, composer, and singer who hosted his own weekly television hour of Big Band music.
Sam Walton--the founder and chairman of Wal-Mart who died of cancer at the age of 74.

1993 WORLD EVENTS:

On September 13, 1993 Yitzhak Rabin, Prime Minister of Israel, and Yasir Arafat, chairman of the PLO, shook hands in a ceremony supervised by Bill Clinton on the lawn of the White House.

The Czechoslovakian Republic split into two countries with different languages, governments, and cultures: the Czech and Slovak Republics.

1993 U.S. EVENTS:

Bill Clinton, a Democrat, and his First Lady, Hillary Clinton, took office in January, thus ending twelve years of Republican rule of the Presidency.

Janet Reno became the first female Attorney General.

Ruth Bader Ginsburg became the second woman on the Supreme Court.

The Senate enacted a bill that imposed a five-day waiting period for background checks for anyone making a handgun purchase.

An explosion in the World Trade Center, spearheaded by Muslim fundamentalists living in New Jersey, trapped many employees in the Twin Towers, killed others, and caused extensive damage on February 26.

NAFTA (The North American Free Trade Agreement) was signed and ratified by the U.S., Mexico, and Canada. It phased out trade barriers and tariffs over a 15-year time span.

The Bureau of Alcohol, Tobacco and Firearms attacked the Branch Davidian commune, led by David Koresh, in Waco, Texas on April 19.

The Mississippi River flooded, causing The Great Flood of 1993 that resulted in $12 billion in damages.

Culture:

AmeriCorps was created in this year so that students could pay for college by volunteering community service.

The Information Superhighway came into common usage.

Toni Morrison won the Nobel Prize for Literature.

Nelson Mandela and F.W. de Klerk won the Nobel Prize for Peace, for their efforts and contribution in ending apartheid.

Theater:

On Broadway, Andrew Lloyd Weber's creation "Sunset Boulevard" and Harold Prince's "Kiss of the Spider Woman" gained acclaim.

Television:

The final episode of "Cheers" was shown on May 20th. This popular show ran for 11 years, won 26 Emmy awards, and was seen in 38 countries.

Movies:

"Jurassic Park," directed by Steven Spielberg, was a hit. It won 3 Academy Awards, for best Sound, Sound Effects Editing, and Visual Editing.

"Schindler's List," also directed by Steven Spielberg, was awarded 7 Oscars, including Best Director and Best Picture, as were "Philadelphia" and "Sleepless in Seattle," which starred Tom Hanks. Other top movies included: "The Fugitive," "The Firm," and "Aladdin."

Sports:

At the Super Bowl, the Dallas Cowboys defeated the Buffalo Bills.

In the World Series, the Toronto Blue Jays beat the Philadelphia Phillies.

Michael Jordan retired from basketball and switched to playing baseball in the minor leagues, but returned to the Chicago Bulls a little more than a year and a half later.

The Chicago Bulls won their third straight N.B.A. championship after defeating the Phoenix Suns.

Notable Obituaries:

Marian Anderson--the first black person to sing with the Metropolitan Opera of New York City.

Arthur Ashe--a tennis champion and human rights activist who was the first black athlete to ever win a Grand Slam event, which he accomplished in the first U.S. Open in 1968.

Raymond Burr--the actor known as TV's Perry Mason, who died of cancer at age 76.

Cesar Chavez--the organizer and founder of the United Farm Workers, who organized food harvesters in California, many of which were Mexican-Americans.

Agnes de Mille--a choreographer, dancer, and author, who was best-known for her choreography in the musical play "Oklahoma."

Helen Hayes--a stage and screen actress born in 1900, who was married to playwright Charles MacArthur.

William Randolph Hearst--a journalist and newspaper publisher of the late nineteenth and early twentieth centuries, who pioneered in the sensational reporting technique called "yellow journalism."

Audrey Hepburn--a famous actress known for her roles in "My Fair Lady," and "Breakfast at Tiffany's."

Thurgood Marshall--the first black associate justice of the Supreme Court of the United States.

Dizzy Gillespie--a famous trumpeter who helped create bebop and introduced Cuban rhythms into jazz.

1994 WORLD EVENTS:

The 1994 election near Johannesburg, South Africa was the first ever open to all races in that nation. Nelson Mandela was elected president of South Africa.

On September 19 the United States invaded Haiti. The United Nations had approved the invasion to drive out the military government and to restore the president, Jean-Bertrand Aristide, who had been exiled, back to the presidency. This was accomplished without firing a shot.

1994 U.S. EVENTS:

The Whitewater scandal emerged, with Special Prosecutor Robert Fiske appointed by Janet Reno to investigate Bill and Hillary Clinton's possible involvement in a savings and loan scandal.

Parts of Los Angeles were devastated by an earthquake centered in Northridge on January 18.

On June 17, O.J. Simpson attempted to evade police in a chase in his white Ford Bronco as television captured the live drama.

Former first lady Jacqueline Kennedy Onassis died of lymphatic cancer at the age of 64.

Former President Richard M. Nixon died at the age of 81. He was president during the Viet Nam War and later resigned from the presidency due to the Watergate scandal.

Science:

The Hubble Telescope discovered incontrovertible evidence of the existence of Black Holes.

Culture:

Yasir Arafat and Yitzhak Rabin were awarded Nobel Prizes for Peace.

Theater:

Composer Stephen Sondheim's "Passion" was onstage as was Anna Deavere Smith's epic drama "Twilight: Los Angeles, 1992."

Movies:

"Forrest Gump," directed by Robert Zemeckis, "Pulp Fiction," directed by Quentin Tarantino, and "Quiz Show," directed by Robert Redford were all in theaters. Other popular movies included: "Four Weddings and A Funeral" and "The Lion King."

Sports:

In the Super Bowl, the Dallas Cowboys beat the Buffalo Bills.

The World Series was canceled this year because the players were on strike.

The U.S. hosted the World Cup for the first time. In this competition, Italy was defeated by Brazil.

Houston Rockets defeated New York Knicks to win the NBA championships.

The Olympics were ongoing in Lillehammer.

Tanya Harding had competitor Nancy Kerrigan attacked. However, she was still able to compete, as was Harding, who sued to avoid disqualification. Iksana Baiul, a Ukrainian skater, won the gold, with Kerrigan placing behind her for second.

Forty-five year old George Foreman beat Michael Moorer to retake the world heavyweight boxing title.

Notable Obituaries:

Cab Calloway--a Big Band leader.

Kurt Cobain--the lead singer for the rock group Nirvana.

Ralph Ellison--a black American author noted for his book "The Invisible Man," a novel about blacks in America.

Kim II Sung--the President of North Korea

Eugene Ionesco--a Romanian born French playwright who wrote "The Bald Soprano."

Burt Lancaster--a movie star involved in movies like "From Here to Eternity."

Richard Nixon--the former President involved in the Watergate scandal.

Jacqueline Kennedy Onassis--First Lady, who was previously married to President John F. Kennedy and later married to shipping magnate, Aristotle Onassis.

Roy J. Plunkett--an inventor who appears in the Inventor's Hall of Fame for Teflon.

Wilma Rudolph--a black track and field star who was the first American woman to win three gold medals in the Olympic Games.

Jessica Tandy--a stage and screen actress who won an Oscar for "Driving Miss Daisy."

Telly Savalas--the star of the television show "Kojak."

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STUDY GUIDE:
1995-1999

1995 WORLD EVENTS:

Conflict continues in Rwanda, Bosnia, and Croatia.

France invites worldwide censure after detonating a nuclear device in the Pacific Ocean.

Yitzhak Rabin is assassinated at a peace rally by a Jewish extremist.

1995 US EVENTS:

The Jury in the O.J. Simpson trial declared him "not guilty" in the slaying of Nicole Simpson and Ronald Goldman, thus ending a much-talked about and thoroughly televised trial.

Pope John Paul II toured the United States.

On April 19th, a car bomb tore a nine-story hole in the Alfred Murrah Federal Building in Oklahoma City, Oklahoma. The blast killed 167 people.

President Clinton created a $20 billion dollar line of credit to help save the peso.

Bobbi McCaughey gave birth to septuplets.

Louis Farrakhan led his "Million Man March" on Washington with good intentions. However, his exclusion of women or white sympathizers caused much controversy. The march fell short of a million but did have 600,000 participants.

The space probe Galileo launched a capsule into Jupiter's atmosphere, resulting in close-up pictures of Jupiter's atmosphere and the first close-up pictures of the planet's surface.

Actor Christopher Reeves, who played Superman, was paralyzed in a horseback riding accident.

Cultural:
The Rock and Roll Hall of Fame opened in Cleveland, Ohio.

Movies:
"Batman Forever," "Babe," "Braveheart," "Leaving Las Vegas," "The Usual Suspects," and "Dead Man Walking" were popular movies.

Sports:
San Francisco beat San Diego in the Super Bowl. The Atlanta Braves beat Cleveland at the World Series. Steffi Graf won at Wimbledon.

Notable Obituaries:
Jerry Garcia, leader of the Grateful Dead.

Mickey Mantle, a famous New York Yankees baseball player and Hall of Fame member.

Ginger Rogers, noted dance partner of Fred Astaire.

Rose Fitzgerald Kennedy, mother of John F. Kennedy, who died of pneumonia at the age of 104.

1996 WORLD EVENTS:
Mad Cow Disease emerged in Europe.

The Chechnya treaty was signed.

South Africa adopted a new constitution.

1996 U.S. EVENTS:
Ted Kaczynski was arrested as the (Harvard-educated) Unabomber. He was charged with making bombs that he used to attack universities, airlines, and computer stores, resulting in the deaths of three people and in additional injuries to 23 others.

Madeleine Albright becomes the first female Secretary of State.

Congress passed the Welfare Reform bill, which was approved by Clinton.

Timothy McVeigh, a Persian Gulf War Veteran, was indicted by a grand jury for his role in the terrorist attack on the Oklahoma City Federal Building on April 19th, the anniversary of the blast of the WACO commune in 1993.

The Clinton-Gore team was nominated for the presidential candidacy at the Democratic Convention. The Republican Convention nominated Bob Dole and Jack Kemp.

The Olympic Games in Atlanta, Georgia were disrupted when a pipe bomb destroyed a sound tower, killing two people and injuring an additional 111 people.

Consumer Events:
Remember! A postage stamp still only cost $.32 this year.

Theater:
The Pulitzer Prize in Drama was given to "Rent," a musical that was actually based on "La Boheme," a century-old opera by Puccini.

Movies:
The top-grossing films this year were "Independence Day," "Twister," and "Mission Impossible." "The English Patient," "Fargo," "Jerry Maguire," and "Shine" were also popular movies.

Sports:
The nineties saw the beginning of two professional leagues of women's basketball: the ABL (American Basketball League) in 1996, and the WNBA (Women's National Basketball Association) in 1997. Steffi Graf won at Wimbledon. Dallas beat Pittsburgh in the Super Bowl. The New York Yankees beat the Atlanta Braves in the World Series.

Americans at the Atlanta Olympics:
The women's gymnastic team won the gold medal.

Carl Lewis won his fourth gold medal in the long jump competition.

Michael Johnson won the 200-meter race, with a world record time of 19.32 seconds.

Notable Obituaries:
Ella Fitzgerald, an American jazz singer of the twentieth century.

Spiro Agnew, vice-president under Richard Nixon who resigned after being charged with income tax evasion.

Gene Kelly, an actor, dancer, choreographer, and director who starred in many movies including the 1952 movie, "Singin' in the Rain."

George Burns, an early comedian who became famous for comic bantering with his wife, Gracie Allen.

Carl Sagan, a noted astronomer.

Timothy Leary, a psychologist who researched LSD and wrote the controversial book, The Psychedelic Experience.

1997 WORLD EVENTS:

Princess Diana was killed in a tragic car crash while being pursued by the paparazzi. The world mourned her passing.

Mother Theresa died only a week later.

1997 U.S. EVENTS:

Timothy McVeigh was sentenced to death for his role in the Oklahoma City bombing.

The World Trade Center perpetrators were convicted.

Clinton used the line-item veto for the first time.

The members of a cult known as Heaven's Gate in California committed a mass suicide.

Science:
Scottish embryologist cloned a sheep he named Dolly from a single cell.

Comet Hale-Bopp came the closest it would to Earth before the year 4397.

Movies:

The film "Titanic" was successful, and won 11 Academy Awards. It starred Leonardo DiCaprio and Kate Winslet. Other popular movies included "As Good As It Gets," "The Full Monty," and "Good Will Hunting."

Sports:

Green Bay beat New England in the Super Bowl. At the World Series, the Florida Marlins were victorious over Cleveland.

Tiger Woods, at the age of 21, became the youngest player to win the U.S. Master's Golf Tournament. He established the largest record ever for his margin of victory, winning by a 12-stroke lead with 22 under par.

Notable Obituaries:

John Denver, a popular singer, songwriter, performer, actor and environmentalist.

Gianni Versace, a noted fashion designer who was murdered at his Miami Beach mansion.

Jacques Cousteau, marine biologist and underwater explorer who helped develop the aqualung.

James A. Michener, a well-known author.

Michael Kennedy, 39 year-old son of the late Robert F. Kennedy, who died in a skiing accident.

1998 WORLD EVENTS:

Ethnic conflict occurred between the Serbs and Albanians in Kosovo.

Europeans agreed to adopt the Euro as their standard currency.

Clinton ordered air strikes after Iraq stopped cooperating with UN weapons inspectors.

1998 U.S. EVENTS:

President Bill Clinton was accused of having sexual relations with an intern, Monica Lewinsky.

Al Gore announced himself as a candidate for the Democratic presidential nomination.

Terry Nichols was convicted in the Oklahoma City bombing.

The Unabomber was sentenced to four consecutive life sentences.

Science:

John Glenn became the oldest astronaut in space by serving on the space shuttle "Discovery" at the age of 77. (Fun fact: After his early space career ended in 1964, John Glenn served as an Ohio Senator from 1975 until 1998, when he went back into space.)

Television:

The last episode of "Seinfeld" aired.

Movies:

"Shakespeare in Love," and "American History X" did well in theaters.

Sports:

Denver beat Green Bay in the Super Bowl. The New York Yankees defeated San Diego in the World Series.

Cal Ripken (known as the "Iron Man") set a record in Major League Baseball this year, for playing 2,632 consecutive games. This beat Lou Gehrig's record for 2,130 games, which was set in 1939.

In this same year, Mark McGwire set a new record for 70 home runs in a season, breaking Roger Maris's record of 61, set back in 1961. Sammy Sosa broke this record this year, with 66 home runs.

Notable Obituaries:
Frank Sinatra, a well-known singer and actor.

Sonny Bono, Cher's former husband and singing partner who later served as a Congressman.

Gene Autry, an actor who became known as America's "singing cowboy."

Florence Griffith Joyner, a track star and sprinter, nicknamed "Flo-Jo," who won several Olympic gold medals in track competitions.

1999 WORLD EVENTS:

Nelson Mandela stepped down and Thabo Mbeki took over as President of South Africa.

A severe earthquake killed many in Turkey.

1999 U.S. EVENTS:

Many feared the new millennium and potential consequences of the Y2K bug.

The Senate opened impeachment hearings against President Clinton, but did not convict him.

Students at Columbine High School took the lives of 12 of their peers and one teacher, before taking their own lives.

Culture:
Woodstock '99 took place in the state of New York.

Consumer:
The cost of a stamp rose by one cent to $.33 cents this year.

The Melissa virus attacked many computers.

Movies:
"The Blair Witch Project" became the most profitable movie in history.

Sports:
Denver beat Atlanta at the Super Bowl.

During the Winter Olympics in Japan, Tara Lipinski became the youngest person to ever win an individual gold medal.

The Chicago Bulls won the NBA Championship.

Notable Obituaries:
Joe DiMaggio, the New York Yankees baseball star who married Marilyn Monroe.

George C. Scott, an actor especially noted for his starring role in "Patton."

Alan Shephard, the first American to travel into space.

John F. Kennedy, Jr., the 38 year-old son of John F. Kennedy and the founder of "George," a politically-based magazine, died in an air crash with his wife and his wife's sister.

OTHER 90'S TRENDS:

SUV's more than doubled in popularity. The Ford Explorer was the best-selling sport utility vehicle in the 1990's. Among other popular models were the Jeep Cherokee, the Toyota 4Runner, and the Nissan Pathfinder.

Rollerblades (also known as inline skates) became popular.

The Internet (also known as the Information Superhighway), as well as E-mail, became more widely used.

Coffee, particularly the gourmet varieties, became an increasingly popular beverage. Cybercafes, coffee shops where patrons could surf the web, were also a nineties phenomenon.

Cell phone sales burgeoned and Virtual Reality Technology was introduced.

Women's professional basketball established itself. In addition, "extreme sports," such as rock climbing gained popularity.

Many employees began to telecommute, or web-commute from offices in their homes.

Many researchers and scientists continued to study genes and DNA.

The AIDS epidemic grew.

Computers increased their presence in many American homes. Bill Gates and the presence of Microsoft (partnered with IBM) grew.

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STUDY GUIDE: FAMOUS AMERICANS, PART 2

Historical and Political Figures Before 1865

Boone, Daniel
This frontier settler from the late 1700's and early 1800's is most closely associated with Kentucky. He established a fort at Boonesborough, Kentucky and later led many settlers through the Cumberland Gap.

Brown, John
This 1800's abolitionist tried to incite uprisings among the slaves and free them by military force. He was best known for his attack on Harpers Ferry in Virginia. He was tried, convicted, and hanged for treason.

Burr, Aaron
He served as vice-president to Thomas Jefferson from 1801 to 1805. He killed Alexander Hamilton in a duel, and was later involved in a conspiracy to separate the western states from the Union. Burr was tried, but acquitted, for treason.

Calhoun, John C.
This southerner served as Vice-President under Andrew Jackson and later as a Senator for South Carolina. He was pro-slavery and pro-states' rights.

Carson, Kit
He was a skilled frontier guide, known for opening the territory of California for settlement.

Clay, Henry
This man served in the House of Representatives as well as the Senate on behalf of Kentucky, but he lost the election for the presidency twice. He was known for his involvement in the "Missouri Compromise" and the "Compromise of 1850." He is often associated with his famous quote: "I would rather be right than president."

Crockett, Davy

This frontier settler was known for his coonskin cap and outdoors image, but he also represented the state of Tennessee in Congress while Andrew Jackson was President. He died at the Alamo in 1836.

Davis, Jefferson

This man left the Senate and served as president of the Confederacy when the South seceded from the Union.

Douglas, Stephen A.

This man engaged in frequent debates with Abraham Lincoln. He beat Lincoln for the Illinois Senate position in 1858, but lost the Presidency to Lincoln in 1860. Douglas was nicknamed the "Little Giant."

Douglass, Frederick W.

This escaped slave made his living as a public speaker and abolitionist. His autobiography, Narrative of the Life of Frederick Douglass, is still a widely read account of life as a black man.

Franklin, Benjamin

Although he is better known for his work as a diplomat, scientist, printer, and inventor, this man was also a founding father of the United States. He was one of the signers of the Declaration of Independence and the oldest participant at the Constitutional Convention. He was the author of Poor Richard's Almanac and is infamous for his research on electrical currents. He served as the first Postmaster General of our country.

Hale, Nathan

This American spy was hung by the British during the Revolutionary War. He is often associated with his famous quotation: "I only regret that I have one life to lose for my country."

Hamilton, Alexander

This founding father served as adviser to George Washington during the Revolutionary War, was active in drafting the Constitution, and wrote various essays in The Federalist Papers. He became the first Secretary of the Treasury for our country. Thomas Jefferson disagreed with him politically, as did Aaron Burr, who eventually killed Hamilton in a duel.

Hancock, John

He served as president of the Constitutional Congress and was the first to sign the historical Declaration of Independence.

Henry, Patrick

This Virginia statesman served in the Continental Congress and is associated with his fiery speech that ended with the words, " Give me liberty or give me death."

Houston, Sam

He led Texas in the battle for its independence from Mexico and served as president of The Republic of Texas. Once Texas was recognized as a state, he represented the state in the Senate. He also served as its governor for a time, but opposed its desire for secession, and was consequently removed from office.

Jackson, Stonewall

This man was a prominent Confederate general in the Civil War. He earned his nickname at the First Battle of Bull Run, because he and his troops "stood like a stone wall." Ironically, Confederate soldiers who mistook him for a Union soldier later killed him.

Lee, Robert E.

This man was in charge of the Confederate troops during the Civil War. He surrendered to Grant at Appomatax Courthouse at the conclusion of the war.

Madison, Dolly

She was the first lady during James Madison's administration, and was a gracious hostess. When the residents vacated the White House during the War of 1812, she saved many important documents, as well as Gilbert Stuart's famous portrait of George Washington.

Mann, Horace

As an educational reformer, he campaigned for free, nondenominational public schools. He founded the American public school system.

Paine, Thomas

This patriot advocated American independence in his famous pamphlet, Common Sense.

Penn, William

He led the Quakers to the Philadelphia, Pennsylvania area, and founded an early colony there that was originally called "Penn's Woods."

Pocahontas

This Native American saved Captain John Smith's life. She later married John Rolfe, the man who introduced tobacco to the Jamestown colony.

Revere, Paul

This Boston silversmith became a Revolutionary War hero when he crossed Massachusetts on horseback one night to warn all the colonists to prepare for the British invasion.

Ross, Betsy
It is speculated that this celebrated seamstress sewed the first American flag.

Smith, Captain John
This man was one of the first colonists and early leaders of the Jamestown Colony.

Truth, Sojurner
This escaped slave became a notable abolitionist speaker during the nineteenth century.

Tubman, Harriet
Nicknamed Moses, this abolitionist helped hundreds of slaves escape via the Underground Railroad. She also served as a spy for the Union during the Civil War. Rewards as high as $12,000 were offered for her as either "dead or alive."

Turner, Nat
This slave was hung in 1831 for leading the only effective revolt among the slaves in America. During this revolt, this black preacher led 65 slaves in a violent uprising against plantation owners in Virginia.

Webster, Daniel
This member of the Whig party lost the nomination for presidency three times. He was best known for his debate and oratory during his service as Senator of Massachusetts.

Webster, Noah
Noah Webster compiled the *American Dictionary of the English Language.*

Williams, Roger
This Puritan founded Rhode Island after he was expelled from Massachusetts because he refused to follow the strict religious customs of the Puritans.

Historical and Political Figures After 1865

Addams, Jane
Jane Addams founded Hull House, a settlement house in Chicago. She also won the Nobel Peace Prize in 1931 for her efforts to improve conditions for women.

Agnew, Spiro
He was Nixon's vice-president and a strong advocate of U.S. involvement in Vietnam. He became the first person to resign from the Vice-Presidency after being accused of income tax evasion.

Anthony, Susan B.

She was one of the main leaders for women's suffrage, and was arrested when she tried to vote in an election before women had been given the right to vote. She was the first woman to be honored on an American coin. Unfortunately she died before the Nineteenth Amendment gave women the right to vote.

Barton, Clara

This woman founded the American Red Cross and served as a nurse to Union soldiers during the Civil War.

Bryan, William Jennings

This politician and fundamentalist helped prosecute the advocates of Darwin's theory at the Scopes trial.

Calamity Jane

This frontier woman was a Pony Express rider who became legendary for her accurate marksmanship.

Carver, George Washington

The son of slaves, this agricultural innovator was the first black scientist to attain nationwide recognition. He became head of the Agriculutral Research branch of Tuskegee Institute in Alabama. It was here that his research uncovered hundreds of uses for peanuts.

Daley, Richard

Daley was the mayor of Chicago throughout the 50's, 60's, and 70's.

Darrow, Clarence

This famous lawyer defended many unpopular individuals and controversial cases, including the teacher in the Scopes trial, and Eugene V. Debs, presidential candidate of the Socialist Party.

DuBois, W.E.B.

He authored many books that advocated black advancement, and also founded the NAACP, the National Association for the Advancement of Colored People.

Earhart, Amelia

This female aviator was the first to fly a plane across the Atlantic. She was last cited flying over the Pacific in the 1930's. Her death remains a mystery.

Ferraro, Geraldine

This politician was the first female to run as a vice-presidential candidate on a major party ticket.

Friedan, Betty

This feminist wrote *The Feminine Mystique* in 1963, which promoted women's liberation. She was also one of the founders of NOW, the National Organization for Women.

Gehrig, Lou

This major league baseball player set the first record for playing in over 2,000 consecutive games. He died in his early thirties from a rare nerve disease that has become known as "Lou Gehrig's Disease."

Goldwater, Barry

This Arizona Senator ran against Lyndon Johnson for the presidency in 1964 and lost. As a republican, he was noted for gaining majorities in several southern states that had been predominanantly democratic.

Graham, Billy

This evangelist calls his meetings "Crusades for Christ." He has led revivals in nearly every state and has appeared on national television.

Halsey, William F.

Nicknamed "Bull," this admiral commanded the Navy in the Pacific Ocean during World War II. He is primarily known for his successes on the Japanese coast.

Hearst, William Randolph

Hearst was a journalist and newspaper publisher at the turn of the century. He was known for his sensational reporting, which became known as "yellow journalism." The propaganda published in his newspapers actually led to our conflict in the Spanish-American War in the 1890's.

Hickock, Wild Bill

This frontier settler and Pony Express Rider was also a U.S. marshal who pursued many notorious old west outlaws.

Holmes, Oliver Wendell, Jr.

This man served as a Supreme Court judge from 1902 to 1932. He strongly believed in freedom of speech unless it caused a "clear and present danger."

Hoover, J. Edgar

J. Edgar Hoover headed the FBI from 1924 to 1972. He was known for his success in capturing and prosecuting gangsters and spies Some critics feel that he abused his power during FBI investigations.

Jackson, Jesse

This man was, and is still, a leader in the Civil Rights Movement and campaigns continuously for the advancement of African Americans. He ran in the presidential primaries of 1984 and 1988.

James, Jesse

This legendary outlaw of the old west and his brother, Frank, committed many bank and train robberies.

Keller, Helen

This lady was blind and deaf at an early age, but overcame her handicap and was eventually able to communicate by reading, writing, and using sign language. William Gibson dramatized the early years of her life in his famous play, *The Miracle Worker*.

Kennedy, Robert

Robert Kennedy was the younger brother of John Fitzgerald Kennedy and held the office of Attorney General during his Presidency. He was assassinated because of his views concerning the Arab-Israeli conflict.

King, Martin Luther

He was the dominant leader of the Civil Rights Movement during the 50's and 60's and utilized Ghandi's principle of non-violent resistance to stage his boycotts, marches, and protests. He received the Nobel Prize for Peace in 1964. He authored the famous "I Have a Dream" speech, and was assassinated in 1968.

Kissinger, Henry

This man served as a prominent advisor, and later as the Secretary of State under Nixon. He received the Nobel Prize for peace in 1973 for his negotiations with the North Vietnamese during the Vietnam War.

Lindbergh, Charles A.

This aviator made the first nonstop flight across the Atlantic Ocean, which was also the first solo flight across that ocean.

MacArthur, Douglas

This general commanded the Allied forces in the Pacific during World War II. He also commanded UN troops during the Korean War, but was removed from his position by President Truman.

Malcom X

This Black Muslim leader of the African American Rights Movement was assassinated in 1965.

Marshall, George C.

This man was a leading strategist for the Allies during World War II. He later served as Secretary of State and was awarded the Nobel Peace Prize.

McCarthy, Joseph R.

This Wisconsin Senator led a controversial campaign to weed out and punish Americans that might be communists. He accused people of being communists if they had communistic friends or were otherwise "guilty by association."

McGovern, George
This presidential candidate lost to Nixon in 1972. He was known for his political opposition to the U.S. involvement in Vietnam.

Mondale, Walter
This twentieth-century politician served as a Senator and later as Vice-President under Carter.

Nation, Carry
This female social reformer advocated abstinence and supported prohibition. She was known for her unorthodox method of protest. She broke down saloon doors with her hatchet, entered the saloons, and destroyed the liquor bottles.

Oswald, Lee Harvey
This man allegedly assassinated John F. Kennedy, and was then shot by Jack Ruby before he could be tried for Kennedy's assassination.

Parks, Rosa
This black woman refused to give up her seat on a bus in Montgomery,Alabama in 1965. The incident became the first major event of the Civil Rights Movement.

Patton, George
This World War II general led the Battle of the Bulge and was nicknamed "Old Blood and Guts."

Peary, Robert E.
Robert Peary was the first person to reach the North Pole in 1909.

Rockefeller, Nelson
The grandson of John D. Rockefeller, this New York governor later served as vice-president under Gerald Ford.

Roosevelt, Eleanor
Eleanor Roosevelt was the wife of Franklin D. Roosevelt and our country's first lady during his administration. She was highly respected as a humanitarian, and was active in the General Assembly of the United Nations from 1949 to 1952.

Seward, William H.
This Secretary of State became famous for his decision to purchase Alaska from Russia for $7.2 million dollars in 1867. In fact, Alaska became known as Seward's Folly!

Stevenson, Adlai
This Illinois governor and U.S. ambassador to the United Nations ran for the presidency twice, but lost both times to Dwight D. Eisenhower.

Wallace, George.

This Alabama governor during the 1960's opposed integration, and insisted on barring black students from attending the University of Alabama. He ran twice for the presidency on the Populist ticket, but was defeated both times. During his second campaign for the office, he was shot and paralyzed by a would-be assassin.

Warren, Earl

This governor of California served on the Supreme Court from 1953 to 1969. He also led the government commission that investigated the John F. Kennedy assassination.

Washington, Booker T.

This man founded Tuskegee Institute, a college for African Americans in Alabama. He also wrote the book *Up From Slavery* that encouraged his people to concentrate on the more tangible goal of economic equality, rather than social and political equality.

Scientists and Philosophers

Carnegie, Dale

This author of the popular book, How to Win Friends and Influence People sold millions of copies. The book is a practical guide for achieving success.

James, William

This American philosopher proposed that human behavior is grounded in instinct.

Mead, Margaret

This anthropologist is best known for her courageous field research, as well as for authoring the 1928 book, Coming of Age in Samoa.

Skinner, B.F.

This psychologist is famous for his Skinner box experiment, which increased our understanding of the learning process as well as the impact of conditioning on behavior.

Sports Figures

Aaron, Henry (Hank)

Hank Aaron beat Babe Ruth's home run record by hitting 755 home runs during his major league career.

Ali, Muhammad

Born as Cassius Clay, this boxer was the world champion heavyweight boxer from 1964 and 1979. However, his title was revoked because he was a conscientious objector to the draft, but he regained it later. His boxing style became associated with the simile, "float like a butterfly and sting like a bee."

Louis, Joe

This twentieth-century boxer was nicknamed the "Brown Bomber," and he held the world championship title as a heavyweight from 1937 to 1949.

Owens, Jesse

This black track and field athlete won four gold medals at the 1936 Olympics which were held in Germany during Hitler's reign. His victories served as an embarrassment to the Nazis, who considered themselves the "master race."

Robinson, Jackie

This talented athlete was the first African American to play major league baseball.

Ruth, Babe

This major league baseball player hit 60 home runs in 1927, setting a longstanding record that was first beaten by Roger Maris. Born as George Herman Ruth, baseball fans soon nicknamed him "The Babe."

Thorpe, Jim

This Native American athlete performed well in many track and field events in the 1912 Olympics.

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STUDY GUIDE

STUDY GUIDES: WOMEN IN AMERICAN HISTORY

JANE ADDAMS

She founded Hull House in Chicago in 1889. It provided social services for poor women and immigrants, and offered education, day care for children, and recreational facilities.

From 1915 to 1929, she served as president for the Women's International League for Peace and Freedom. In 1931, she was awarded the Nobel Prize for her efforts to promote peace.

LOUISA MAY ALCOTT

She was one of the most widely read authors of the late 1800's. Her main works were Little Women and Little Men.

SUSAN B. ANTHONY

She was a powerful organizer and leader of the women's suffrage movement. Along with Elizabeth Cady Stanton, she organized the National Women's Suffrage Association which fought for the right of women to vote.

She also worked to secure equal pay for women teachers and for the right of women to hold property.

Her picture was placed on a $1 coin minted by the U.S. Government, and she was the first woman to be pictured on a coin that was put into general circulation.

She died in 1906, just 14 years before the 19th Amendment gave women the right to vote.

SARAH BAGLEY

She organized the textile workers of Lowell, Massachusetts into the Federal Labor Reform Association,

which was the first American women's group to work for improved labor conditions.

CLARA BARTON

She helped nurse the sick and wounded during the Civil War, and also organized supplies and nursing services for the North.

She organized the American Red Cross in 1881 to aid victims of disaster.

MARY McLEOD BETHUNE

She was the child of a former slave. She opened a school for women in Daytona Beach, Florida in 1903. The school joined with a school for men in 1923, and became Bethune-Cookman College.

She set up the National Council of Negro Women and was appointed as an advisor to President Franklin D. Roosevelt.

ELIZABETH BLACKWELL

She set up a training program for nurses during the Civil War, and became the first woman doctor in America.

ANNE BRADSTREET

She was a Puritan who lived in the Massachusetts Bay Colony, and was the first American poet to publish a book of poetry in America. Her book was titled "The Tenth Muse Lately Sprung Up in America," and was published in 1650.

JANE BYRNE

She was the first woman mayor of Chicago from 1979-1983.

RACHEL CARSON

RACHEL CARSON –

This woman scientist warned Americans about over-using pesticides. Her book, entitled Silent Spring (1962) inspired a law against DDT and other harmful poisons.

MARY CASSATT

She was an American painter of the late 1800's, who explored the theme of Mothers and their children.

WILLA CATHER

She was an author of the 1920's who wrote about the courage of Americans in the Midwest.

SHIRLEY CHISHOLM

She became the first black woman elected to the U.S. House of Representatives in 1968, and she was reelected 6 times.

She wrote two books: Unbought and Unbossed in 1970, and The Good Fight in 1973.

MARGARET CORBIN

During the Revolutionary war, she took over her husband's cannon when he was killed in battle in 1776 in New York.

VIRGINIA DARE

She was the first English child born in American in Roanoke Colony.

EMILY DICKINSON

This New England woman wrote hundreds of short, witty poems that were mostly unknown until after her death.

DORTHEA DIX

DORTHEA DIX -

She persuaded President Lincoln to use nurses during the Civil War, and became the director of nursing for the Union.

In the the early 1800's, Dorthea Dix helped improve the conditions in both mental hospitals, and in prisons, where she stressed the rehabilitation of prisoners.

ELIZABETH DOLE

She was appointed Secretary of Transportation by President Ronald Reagan in January of 1983.

AMELIA EARHART

This American aviator was the first woman to cross the Atlantic Ocean by air. She wrote 20 Hours. 40 Minutes in 1928, which described this transatlantic flight. Later, in 1931, she also wrote The Fun of It.

In 1932, she became the first woman to fly over the Atlantic alone, and in 1935, she was the first woman to fly the Pacific Ocean from Hawaii to California.

In 1937, she attempted to fly around the world. During this flight, her plane disappeared and was never discovered.

GERTRUDE EDERLE

She was the first woman to swim the English channel in August of 1926.

GERALDINE FERRARO

This Congresswoman from New York ran as Walter Mondale's running mate in the 1984 presidential campaign. She was the first woman ever nominated for the Vice-Presidency by any major political party.

BETTY FRIEDAN

She led the National Organization for Women (NOW), and worked to pass more laws during the 1960's to gain equal rights for women. Her book, The Feminine Mystique, accused

society of forcing women to be housewives instead of career ladies.

ELLA GRASSO

She was elected Governor of Connecticut in 1974.

PATRICIA HARRIS

She was appointed ambassador to Luxembourg in 1965 by President Lyndon B. Johnson, and became the first black woman to receive such an appointment.

In 1976, she was appointed by President Jimmy Carter as the head of Housing and Urban Development. Later she became Secretary of Health and Human Services.

MARY LUDWIG HAYS (Better known as MOLLY PITCHER)

She carried pitchers of water to soldiers during a battle at Monmouth, New Jersey during the Revolutionary War, and took over her husband's cannon when he collapsed due to heatstroke.

JANE EDNA HUNTER

She was a black nurse from South Carolina who established the Working Girls Home Asssociation in Cleveland, Ohio to help black women obtain jobs in the city.

ANNE HUTCHINSON

She was forced to leave the Massachusetts Bay Colony in 1637 because she expressed her idea that personal religious experience was more important that formal religion and church attendance.

She fled to Rhode Island where she founded the settlement of Portsmouth, which gave complete religious freedom to its settlers.

HELEN HUNT JACKSON

HELEN HUNT JACKSON -

She was one of the first citizens to speak out against the government's poor treatment of Indians. In 1881 she wrote a documented history of such treatment in a book called A Century of Dishonor.

Her novel, Ramona, published in 1884, also protested poor treatment of the Indians.

EMMA LAZARUS

She wrote the poem called "The New Colossus," which is inscribed on the pedestal of the Statue of Liberty.

CHRISTA McAULIFFE

She was the social studies teacher who died upon the Challenger shuttle when it exploded one minute after liftoff from Cape Canaveral.

LUCRETIA MOTT

She, with the help of Elizabeth Cady Stanton, launched a vigorous campaign for women's rights and suffrage. They organized the first national women's rights convention at Seneca Falls, New York. Here they adopted a plan of action called the Seneca Falls Declaration, which stated that all men and women were created equal and should be treated accordingly.

CARRIE NATION

She became well-known for her violent attempts to stop the sale of alcoholic liquors, and was arrested many times for disturbing the peace when she smashed saloons with her hatchet during the 1880's and 1890's.

ANNIE OAKLEY

She was a famous sharpshooter who appeared in Buffalo Bill's Wild West Show, where she shot a dime from her husband's hand. Other times she shot a cigarette from his mouth.

The popular musical comedy "Annie Get Your Gun," which features songs by Irving Berlin, is based upon Annie Oakley's life.

SANDA DAY O'CONNOR

In 1981, President Ronald Reagan appointed her as a judge of the Supreme Court. She was the first woman justice to serve on the bench of the Supreme Court.

GEORGIA O'KEEFFE

This early American painter specialized in painting Southwestern desert scenes.

ROSA PARKS

In December, 1955, this black woman refused to give up her seat on a Montgomery, Alabama bus to a white man. She was arrested, and this event led to a boycotting by blacks of the buses in Montgomery until equal treatment was given to both blacks and whites. The boycott lasted one year.

POCAHONTAS

She was the Powhatan princess who married John Rolfe from the Jamestown colony. She supposedly saved the life of Captain John Smith when he was held captive by the Indians.

JEANETTE RANKIN

She was the first woman to be elected to the U.S. Congress in 1917 and again in 1919, from the state of Montana.

MARY LOU RETTON

In the Summer Olympics of 1984, she scored a perfect 10 on the vault.

SALLY RIDE

She was the first woman astronaut in space. (June 1993, on the Challenger).

BETSY ROSS

She was the seamstress who made the first American flag having the stars and stripes.

NELLIE TAYLOR ROSS

She was the first woman to be elected as a state governor, when she was elected to succeed her husband as governor of Wyoming after his death in 1924.

SACAJAWEA

This Shoshoni Indian guided Lewis and Clark on their exploration of the Louisiana Purchase.

DEBORAH SAMPSON

During the Revolutionary War, she disguised herself as a man and joined the Continental Army. She was wounded outside of Philadelphia.

BESSIE SMITH

This Blue's Singer of the 1920's recorded "Down Hearted Blues," which sold over 800,000 copies in 1923. She became known as the Empress of the Blues.

ELIZABETH CADY STANTON

She worked with Lucretia Mott to fight for women's rights and suffrage. They organized the first women's rights convention in Seneca Falls, New York in 1848.

ELLEN STARR

ELLEN STARR -

She helped Jane Addams found Hull House in Chicago.

HARRIET BEECHER STOWE

This author wrote Uncle Tom's Cabin, which dramatized the story of slave life. It sold over 300,000 copies during its first year in print, causing many people to join the fight to end slavery.

GERTRUDE STEIN

She wrote very critical material about the American Society in the 1920's. She finally left America and went to Paris, France to live.

MARGARET THATCHER

Although she was not an American, Margaret Thatcher was the first woman to become the Prime Minister of England in 1979. She strongly supported the NATO plan and said that Great Britain would use force against Argentina during the Falkland Crisis.

SOJOURNER TRUTH

She was the first black woman to speak publicly against slavery. She, herself, was born a slave, but gained her freedom when New York abolished slavery. She then travelled all over the North, telling the truth about slavery.

SALLY LOUISA TOMPKINS

During the Civil War, she used her own money to open a hospital in Richmond, Virginia. Jefferson Davis made her a captain in the Confederate Army.

HARRIET TUBMAN

She was a runaway slave who returned to the South many times, and helped over 300 slaves escape by the Underground Railroad. She was one of the most famous conductors of the Underground Railroad, which earned her the nickname "Moses."

A U.S. postage stamp bearing her portrait was issued in 1978.

MARIE AND BESS VAN VORST

These sisters were writers of the 1900's who focused on the problems of women workers. They disguised themselves as common workers in order to gather information for their book, The Woman who Toils.

LILLIAN WALD

She started the Henry House Settlement in New York, which provides free nursing care for the needy.

VANESSA WILLIAMS

She was the first black Miss America.

SARAH WINNEMUCCA

Along with Helen Jackson, she spoke out against the government's treatment of Indians. She criticized the U.S. government's handling of Indian affairs in her book called Life Among the Paiutes: Their Claims and Wrongs.

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STUDY GUIDE:
FAMOUS 20th CENTURY FIGURES

Albright, Madeleine. This 64th Secretary of State was the highest ranking woman in the Clinton Administration, as well as the first female to hold that office. She held her position from January, 1997 until January of 2001. She is known for her role in the war against ethnic cleansing in Kosovo.

Anderson, Marian. She became the first African American to sing at the Metropolitan Opera in New York City in 1955, and was given the Presidential Medal of Freedom by Lyndon B. Johnson in 1963.

Arafat, Yasir. As the chairman of the PLO (Palestine Liberation Organization), he called for a Palestinian state to be established on the West Bank. Arafat died on November 11, 2004.

Armstrong, Neil. This astronaut commanded the Apollo 11 excursion and became the first person to walk on the moon, with Buzz Aldrin following right behind him. He is noted for saying, "That's one small step for man, one giant leap for mankind."

Castro, Fidel. This Cuban dictator used guerilla warfare to overthrow the previous dictator, Batista, in the 1959 Revolution. Since he was a Marxist, the new regime was openly Communistic.

Chaplin, Charlie. This comic genius starred in many Hollywood silent films and created his most famous vaudeville-style character, "The Tramp."

Chavez, Cesar. This president of the National Farm Workers Association fought to improve conditions for farm workers, especially Mexican-Americans. He fasted for 36 days to draw attention to the link between pesticides in grapes and cancer in children of farm workers.

Churchill, Winston. This statesman became Prime Minister of Britain during Hitler's rise to power and served through the end of the war. He was determined to fight the Nazi takeover and lead his people and the world in a rally against Nazi tyranny. He coined the phrase "The Iron Curtain." He was also an author and is best remembered for his two books, A History of the English-Speaking People and The Second World War. He later returned to the post of Prime Minister for a few years during the 1950's and is known for his famous quote, "I have nothing to offer but blood, toil, tears, and sweat."

Clinton, Hillary Rodham. She was born in Chicago, Illinois on October 26, 1946, and graduated from Yale Law School. She married Bill Clinton in 1975 and had one daughter, Chelsea in 1980. During her husbands Presidency she headed a Task Force on National Health Care Reform as well as spoke out for women's rights at home and abroad. Clinton was elected to the United States Senate on November 7, 2000.

Cousteau, Jacques. This famous French diver helped to develop the Aqua Lung which made exploration possible in the realm of the sea. He made a documentary entitled *The Silent World*, which won an Academy Award for the best documentary in 1056. He also founded the Cousteau Society, an agency to protect sea life.

Curie, Marie. This groundbreaking female scientist won the Nobel Prize in both physics and chemistry and discovered both radium and plutonium with the help of her husband, Pierre.

Disney, Walt. This legendary artist was first known for his creation of Mickey Mouse, an animated cartoon character who paved the way for animation as a full-scale category of entertainment. He opened his cartoon studio in Hollywood in 1923 and the Disneyland Theme Park in 1955. His first full-length animated film was *Snow White and the Seven Dwarfs*. He also designed Disney World in Florida and the Epcot Center, which was completed just two years before his death in 1966.

Edison, Thomas. Known as the "Wizard of Menlo Park," this American inventor is best-known for inventing the light bulb and the phonograph. However, he patented more than a thousand devices, and is known for the quote "Genius is about 2% inspiration and 98% perspiration."

Einstein, Albert. This scientist developed the Theory of Relativity as well as premises which led to the development of the atomic bomb. Then he educated the public on the bomb's destructive potential. He was selected as Time Magazine's Man of the Century.

Ferraro, Geraldine. She became the first woman nominated for the Vice-Presidency by a major political party in 1984, when she ran as Walter Mondale's running mate.

Ford, Henry. He invented the Model T car in 1908, and established the first assembly line at his Detroit plant. He died in 1947, leaving a fortune that was valued at more than $500 million.

Freud, Sigmund. This prominent psychologist first proposed the theory of the Oedipus Complex as well as that of the id, ego and super-ego. His theories served as the foundation for modern psychiatry.

Gates, Bill. This 1975 Harvard drop-out co-founded Microsoft. He licensed MS-DOS to IBM for its first personal computer in 1980, and released the popular Windows 3.0 in 1995. He is currently the chairman and chief software architect for Microsoft. Gates wrote two best selling books: The Road Ahead and Business at the Speed of Thought. 2005 marks the 12th year in a row that Gates heads the Forbes Magazine list of richest Americans.

Ghandi, Idira. The daughter of Nehru, she became the first female Prime Minister of India in 1966, and was eventually assassinated by her own bodyguards.

Ghandi, Mohandas. This Indian activist protested English dominion over India through the means of nonviolent civil disobedience. Martin Luther King, Jr. studied his theories in college and later implemented them in his battle for Civil Rights within the U.S.

Gibson, Althea. This black tennis player was the first to compete in the U.S. Lawn Tennis Association National Championships in New York. She won both the Wimbledon and U.S. National Singles Championships, published an autobiography, and was appointed to the National Lawn Tennis Hall of Fame. Gibson died in 2003.

Goddard, Robert H. This American physicist designed and launched the first liquid fuel rocket in 1926. Because the American space program was based upon his work, Goddard has been nicknamed "The Father of Modern Rocketry."

Gorbachev, Mikhail. This Russian leader modernized the USSR when he became head of the Communist party in 1985. He instituted his concepts of glastnost and perestroika. In 1990, he won the Nobel Peace Prize. He resigned in 1991 when the USSR was dismantled.

Hitler, Adolf. This man rose to power as a Nazi dictator of Germany in 1933. This skilled orator used propaganda and force to spread Anti-Semitism, and ordered the widespread persecution of the Jews in concentration camps. He began to conquer European countries and enact this program designed to create the "master race." He invaded Poland in 1939. This act led to the Second World War. Before the war was over, over six million Jews and other minorities were slaughtered under his regime. He committed suicide in 1945 when it became apparent that Germany was going to be defeated.

Jackson, Jesse. This African American clergyman and civil rights leader ran for the U.S. Presidency in both the 1984 and 1988 primaries. The Founder and President of the Rainbow/PUSH Coalition Inc. On August 9, 2000, President Bill Clinton awarded Jackson with the Presidential Medal of Freedom, the nation's highest civilian honor, for his work in human and civil rights and for nonviolent social change.

Jinnah, Mohammed Ali. He was the head of the Muslim League in India, and worked to found Pakistan. He then became the first-governor-general of Pakistan.

Jung, Carl. This Swiss psychologist is most noted for his Theory of the Collective Unconscious, as well as the presence of recurring archetypes in personality. He was the first psychologist to classify humans as introverts or extroverts.

Johnson, Earvin "Magic." This basketball player was the MVP of the NBA in 1987, 1989, and 1990. One year later, he publicly announced that he had contracted the HIV virus. He proceeded to win the Gold Medal at the Barcelona Olympics the next year and played the 1996 season with his team, the LA Lakers.

Kenyata, Jomo. This Kenyan politician led the nationalist movement and became its first president, from 1964-1978.

King, Martin Luther, Jr. He founded the Southern Christian Leadership Conference which advocated nonviolent ways to deal with racism. In 1963, he delivered his "I Have a Dream" speech in Washington, D.C. One year later he won the Nobel Peace Prize for his attempts to end racism in America. He was assassinated in 1968.

Lindbergh, Charles. He completed the first non-stop flight across the Atlantic Ocean in 1927 in his monoplane, *The Sprit of St. Louis.* The flight from Long Island to Paris took 33 hours, 29 minutes. Tragedy struck his family in 1932 when his son, Charles, was kidnapped and found dead.

Mandela, Nelson. He served as head of the African National Congress, which fought against the government to end apartheid. As a result of his involvement, he served a 28 year prison sentence, and ultimately became President of South Africa in 1994.

Marshall, Thurgood. Before he was appointed to the Supreme Court, this NAACP lawyer won a landmark ruling against segregation in schools in the case of *Brown v. Board of Education*, which determined that "separate but equal" schooling was a violation of the Constitutional rights of African Americans.

Marx, Karl. This man founded the theory of Marxism, closely associated with communism. He authored many treaties warning of the class struggle and exploitation.

Meir, Golda. This lady was born into poverty and discrimination in Russia. She lived much of her life in the United States. She later became the Prime Minister of Israel in 1969 and led Israel in the war against Egypt.

Minh, Ho Chi. This leader of the Communist party in Vietnam organized the movement for Vietnamese Independence, the Viet Minh. He declared Vietnam a republic, and became its president. Subsequently, the republic was involved in the Indochina War that resulted in the division between North and South Vietnam. He was president of North Vietnam and organized the guerilla armies in South Vietnam during the Vietnamese War.

Morrison, Toni. This writer was the first African-American woman to win the Nobel Prize for Literature. Her books The Bluest Eye and Beloved are internationally known for the poignant portrayal of the painful legacy of prejudice.

Mother Teresa. This Catholic nun is famous for her humanitarian efforts among the poor of Calcutta. She won the Nobel Peace Prize in 1979. In 1985, Mother Teresa established the first hospice for AIDS victims in New York. Mother Teresa was awarded the Medal of Freedom, the highest U.S. civilian award. Mother Teresa died in 1997.

Nehru, Jawaharial. He was a leader in India's struggle for independence from Britain. He became India's first prime minister in 1947, and was also three-time president of the Indian National Congress.

O'Connor, Sandra Day. This American was the first female to be appointed as a Supreme Court Justice in 1981. On July 1, 2005 Associate Justice O'Connor announced her retirement from the Supreme Court after 24 years of service.

Oppenheimer, J. Robert. This scientist's research led to the development of the atomic bomb. He was accused of communist involvement, thought, and was no .longer allowed to do his scientific research for the government.

Perkins, Frances. This woman served as the first female Cabinet member, under Franklin Roosevelt's presidency, where she served as the U.S. Secretary of Labor from 1933 to 1945.

Picasso, Pablo. This distinguished artist is notorious for breaking the confines of traditional art. He is best known for his concepts of abstraction and distortion, and is considered one of the founders of Cubism.

Princess Diana of Wales. This princess was known for her compassion and her grace, and was continually in the public eye. Born as Diana Spencer, she married Charles, the future king of England in 1981, and bore him two sons, William and Harry. She became known as "The People's Princess," and her death in a 1997 car crash is still regarded as a worldwide tragedy.

Queen Elizabeth II . This monarch was appointed queen of England in 1952 and still reigns.

Robinson, Jackie. This talented athlete became the first African American to play on a major league baseball team. He signed with the Brooklyn Dodgers' farm team in Montreal in 1945 and played hi first professional game for the Dodgers in 1947. Two years later he won the National League's Most Valuable Player award.

Sadat, Anwar. This Egyptian President attended the Camp David Peace Accords in 1978, where President Carter negotiated for peace in the Middle East. Sadat won the Nobel Peace Prize for his efforts to create peace between Egypt and Israel. Sadat was assassinated in 1981.

Salk, Jonas. This scientist invented a vaccine for polio.

Stalin, Joseph. He helped to convert communism in the USSR from an egalitarian, revolutionary movement into an authoritarian, bureaucratic governmental system. This Soviet dictator prevented Hitler from conquering Russia during World War II.

Taylor, Anna Edson. In 1901, she was the first person to go over Niagara Falls in a wooden barrel.

Teller, Edward. This American scientist helped create nuclear weapons for defense purposes. He was nicknamed "The Father of the H-Bomb."

Thatcher, Margaret. She became Prime Minister of England in 1979, and was not only the first woman to head the British government, but also the first female leader of a major western country.

Tutu, Archbishop Desmond. This Anglican Bishop of South Africa won the Nobel Peace Prize in 1984 for his efforts to end Apartheid. In 1978 he became the first black General Secretary of the South African Council of Churches. Tutu is an honorary doctor of a number of leading universities in the USA, Britain and Germany.

Wright, Orville. This man and his brother, Wilbur, made the first successful human flight in the primitive handmade airplane. They performed their first flight at Kitty Hawk, North Carolina in 1903.

Zedong, Mao. He was the chairman of the Communist Party of China from 1943 and the chairman of the Central Committee of the Communist Party of China from 1945 until his death in 1976. Mao has been credited for converting the country to full-scale Communism.

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STUDY GUIDE:
THE REVOLUTIONARY WAR

Events Leading Up to the Revolution

Post Office Act – 1710: The English Parliament set up a mail system in the colonies controlled by the London Postmaster General and his New York deputy.
Molasses Act 1733: The English Parliament began taxing molasses, rum, and sugar that the colonists imported from any place that was not under English rule.
French and Indian War 1754-1763: This war arose as a territory dispute over portions of the Ohio River Valley. Washington led the Americans against the French. The English, under General Braddock, assisted the colonists against the French and the Indians. England declared war on France and then Spain, who had threatened to join France. This Seven Years' War ended with a treaty that required France to surrender all territory east of the Mississippi, excluding New Orleans. Spain gave Florida to the English but was allowed to keep Cuba.
Sugar Act – 1764: This tax doubled the tax that was already being paid on sugar, wine, coffee, and dyes that were imported from England. The colonists were also forbidden to purchase these products and other goods from foreign countries.
Currency Act – 1764: This act stated that the colonists could not issue their own paper money and required them to pay all debts with gold or silver.
Quartering Act – March, 1765: This act mandated that colonists must provide housing and food to English troops living in America.
Stamp Act – March, 1765: This taxed all printed materials, such as bills, legal papers, newspapers, almanacs, playing cards, and brochures. Once the tax was paid, a stamp was affixed to the document. As with many of the previous acts, the colonists refused to comply and boycotted the supplies that were being taxed. An underground organization, The Sons of Liberty, was formed. These colonists harassed British stamp officials and caused confrontation in the colonies. The colonial government asked the king to repeal this act as well as the Quartering Act. Benjamin Franklin even appeared in Parliament to warn about potential revolutions that might surface if the Stamp Act was not repealed.

Repeal of Stamp Act/Declaratory Act – March, 1766: King George III repealed the Stamp Act but passed the Declaratory Act on the same day. The Declaratory Act granted the English Parliament the power to make governing laws in the colonies "in all cases whatsoever."

Townshend Acts – 1767: These acts created taxes, called duties, on all luxury items such as tea, lead, glass, paper, and paint. These duties were collected at the ports by British officials. They were called the Townshend Acts because Charles Townshend, the British finance minister, proposed them.

Samuel Adams' Circular Letter – February, 1768: Samuel Adams drafted a circular that called for resistance against the British taxes and against the taxation without representation. The action angered the English, who sent more troops, and the Sons of Liberty mobilized and instigated several minor skirmishes.

Virginia Resolves – May, 1769: The House of Burgesses in Virginia condemned the English actions and joined in the colonial opposition to taxation without representation.

Boston Massacre – March 5, 1770: A mob of colonists harassed British troops stationed in Boston, who responded by firing their muskets into the crowd, killing three, wounding two others fatally, and injuring several. Crispus Attucks, an African-American sailor and crowd leader, was one of the first to lose his life during this confrontation. British troops were withdrawn, and the British repealed the Townshend Acts except for the tax on tea.

Gaspee – June 1772: A British customs boat was intentionally attacked by multiple Rhode Island colonists who removed the soldiers from the ship, and then they set the ship on fire. The English government threatened to try the perpetrators in England if they were captured. This caused more anti-British sentiment in the colonies.

Tea Act – May 10, 1773: Another tax on tea gave the British East India Company a monopoly on the product.

Boston Tea Party – December 16, 1773: The colonists tried to send back three British ships carrying tea without paying the taxes, but the Massachusetts Royal Governor insisted they pay the taxes. The Sons of Liberty then disguised themselves as Indians and boarded the boat in the middle of the night. They proceeded to dump its entire load of tea into the Boston Harbor.

Coercive Act/Broadened Quartering Act – 1774: In response to the colonial action, these acts effectively punished Massachusetts in various ways, giving British officials almost absolute power, extending the border of Canada into the colonies and shutting down Boston Harbor to imports until they paid for both the tax and the tea that was destroyed. They also expanded the powers of the Quartering Act.

First Continental Congress – 1774: Every colony except for Georgia sent representatives to this convention in Philadelphia. The colonists declared their resistance to the British and began forming small bands of militia to defend the colonies.

"Give Me Liberty or Give Me Death": The English declared Massachusetts in a state of insurrection and ordered Governor Gage to enforce the Coercive Acts. British soldiers began seizing Boston ammunition. Patrick Henry expressed his opinion about these events in his famous speech before the Virginia convention of delegates on March 23,

1775. He believed a revolution was inevitable, and he encouraged his countrymen to join him in the fight for independence when he stated, "Give me liberty, or give me death."
New England Restraining Act – 1775: The English forbade the colonists to trade with any other country or even among themselves.
Lexington and Concord – April 19, 1775: General Gage ordered British soldiers to destroy the Americans' ammunition supply that was kept at Concord and to capture the colonists' outspoken leaders, Samuel Adams and John Hancock. James Warren sent Paul Revere and William Dawes to mobilize their Minutemen, warn the colonists, and hide Hancock and Adams. The colonists met the British at Lexington, where the first shot of the Revolutionary War was fired as a stray "shot heard round the world" came from a British gun. Immediately both sides began shooting. The British moved on to Concord and succeeded in destroying a few war supplies. However, they were surprised when American Minutemen and rebels attacked them from behind trees, bridges, and bushes. The real significance of this battle was that it convinced many undecided American citizens to support the Revolutionary War.

People of the Revolution

John Adams: This Harvard graduate and lawyer became an important mediator, statesman, and ambassador during the Revolution. As a member of the Continental Congress, he was active in campaigning for the passage of the Declaration of Independence. He ran for the presidency on the Federalist Party ticket and won the election, becoming the second president of the United States. His son, John Quincy Adams, followed in his footsteps and became the sixth president of the United States.
Samuel Adams: This cousin of John Adams did not share his moderation. He was the leader of the Sons of Liberty, who opposed many of the English Acts and taxes.
Ethan Allen: Born in the wilderness, but sent to Yale, this patriot led the Green Mountain Boys and the army at Ticonderoga. He was captured in Canada and was sent to England. The English returned Allen to America because they feared colonial retribution if he was punished. Washington later gave him the title of colonel. He devoted his post-war activities to obtaining statehood for Vermont.
Benedict Arnold: This notorious traitor was a major general who was influential at the victory at Saratoga. When he fell into debt, he allowed the British to convince him to become a traitor. When the plot was discovered, he escaped with the British Army, where he was appointed a brigadier general. He then lived the remainder of his life in Canada and England.
Major John Buttrick: This American leader told the soldiers at Concord not to fire unless fired upon.
Benjamin Franklin: This newspaper publisher and author of *Poor Richard's Almanac*, was also known for his inventions, scientific discoveries, and service in the Pennsylvania Assembly. He started the first public library in Philadelphia and invented many helpful inventions, including the Franklin stove and the lightning rod. During the Revolutionary

War, he was often sent to England on extended stays to negotiate with the British Parliament.

Nathanael Greene: He was one of Washington's greatest generals who fought at Trenton, Brandywine, Germantown, Monmouth, and Rhode Island. He even donated his fortune to the cause, which prompted Georgia to give him a Savannah plantation when he retired.

Nathan Hale: He became a martyr when he was executed without a trial for spying on British troops and is remembered for the quote, "I only regret that I have but one life to lose for my country."

Alexander Hamilton: This signer of the original Constitution became the first Secretary of the Treasury. He fought in the Continental Army at Princeton, White Plains, Trenton, and Yorktown. After the war, he pursued law, and then he was chosen as a representative at both Continental Congresses, the Annapolis Convention, and the Constitutional Convention. Hamilton served as the first Secretary of the Treasury. He angered many with his essays in *The Federalist Papers*, where he proposed a government that was basically controlled by a few rich men. This concept enraged the Secretary of State, Thomas Jefferson. The friction between the two caused the development of two political parties, the Federalists and the Democratic-Republicans. John Adams appointed Hamilton as major general when America became involved in the war between France and England. He ultimately died from a gunshot wound in a duel with Vice President Aaron Burr.

John Hancock: This Harvard graduate became a close friend of Samuel Adams. He was the first person to sign the Declaration of Independence, and he signed his name large enough that the king could see it without wearing his spectacles!

Patrick Henry: He was a well-reputed lawyer and speaker that became a prominent member of the Virginia House of Burgesses. He proposed various moves of opposition to the unfair acts passed by the British Parliament and advocated taking up arms in resistance. He is most famous for his quotation, "Give me liberty, or give me death!" He also attended the 1st and 2nd Continental Congresses. He refused to attend the 1787 Constitutional Convention because he did not want to expand the powers of the central national government. He was elected governor of Virginia and crusaded for the Bill of Rights and several other Constitutional Amendments.

Thomas Jefferson: This graduate of the College of William and Mary was initially a representative in the Virginia House of Burgesses. As a member of the Continental Congress, he drafted the Declaration of Independence. He later became the governor of Virginia, then Secretary of State under Washington, and finally vice president under John Adams. He ran against Aaron Burr for the presidency in 1800. Although both received equal electoral votes, the House of Representatives declared Jefferson president. In office, he became known for the Louisiana Purchase and the Lewis and Clark expedition.

John Paul Jones: He rose quickly from the rank of lieutenant to captain to commodore in the new Continental Navy. When a British commander ordered him to give up his ship, he supposedly replied, **"I have not yet begun to fight,"** and he actually did win that battle. He engineered one of the most successful naval engagements in U.S. history

against the British ship, *Serapis*, in 1779. Congress honored his heroic deeds by bestowing him with the only gold medal ever given to a Navy sailor.

Marquis de Lafayette: This wealthy Frenchman refused payment for his services in the American Revolution. He became a major general and a close advisor and friend to George Washington. He helped Americans gain financial support and additional backing from France and helped fight in the battles at Brandywine, Monmouth, and Yorktown.

Thomas Paine: This friend of Patrick Henry, Samuel Adams, Thomas Jefferson, and John Adams became famous for his pamphlet, *Common Sense,* which encouraged the Americans to assert their independence. His quote, "These are the times that try men's souls," came from this pamphlet. He also fought in the war, and he wrote many other articles that boosted morale within the ranks. He later wrote a book entitled The Age of Reason, and served as a member of Thomas Jefferson's cabinet.

Molly Pitcher - This was the nickname for Mary Ludwig Hays, who followed her husband to the army camps and devoted herself to cooking and cleaning for him. She even went onto the battlefields to bring him pitchers of water, and she hauled pitchers to the other soldiers as well, which is how she earned her nickname. When her husband passed out at his cannon, she fired it for him. She was later given a pension for her services during the war.

Betsy Ross: This woman took over her husband's upholstery business when he died. According to legend, George Washington and other statesmen made a visit to her in 1776 and asked that she fulfill their specifications for the new American flag. Supposedly, they wanted a six-pointed star, but Betsy suggested using a five-pointed one instead. She then stitched the first "Stars and Stripes" flag that was adopted by the Continental Congress in 1777. The house from which she ran her upholstery business is now restored as a historical site.

Deborah Samson: Allegedly, this woman enlisted in the Army under the alias Robert Shirtliffe, and served for three years, even after being treated for two injuries, without discovery of her sex. When she came down with brain fever, typical in the ranks, her doctor discovered her identity. He told her commanding officer, who ordered her to deliver a letter to George Washington. Washington handed her a discharge and enough money to get home. After the war, he granted her a pension and some land in return for her services in the war.

Joseph Warren: He discovered the British plans to capture both the ammunition supply at Concord, and the patriots, Hancock and Adams. He dispatched William Dawes and Paul Revere to warn the colonists.

George Washington "The Father of our Country": Washington was the major leader during the Revolutionary War and was elected the first president of the United States.

British Leaders

John Burgoyne: He led the campaign that captured Ticonderoga, but later he surrendered his army to General Gates after two battles near Saratoga. He went back to England in embarrassment and became a playwright.

General Henry Clinton: He had served in the French and Indian War. In the Revolution he fought with Howe, Burgoyne, and Gage. He was promoted after his victories at the Battle of Bunker Hill and the Battle of Long Island, but he was later forced to retreat through New Jersey where he fought in the Battle of Monmouth.
General Cornwallis: After several major victories, this British general surrendered to George Washington at the final battle in Yorktown in 1781, thus ending the major confrontations of the Revolution.
General Howe: He led the charge up Bunker's Hill and later succeeded General Gage as commander-in-chief on the British side. He successfully drove American forces out of New York and into Pennsylvania while Cornwallis captured Philadelphia.

Events and Battles of the Revolution

Second Continental Congress – May 10, 1775: This convention met in Philadelphia. The representatives at this convention elected John Hancock its president, and they appointed George Washington commander-in-chief of the Continental Army. It began to formalize the war plans.
Battle of Bunker Hill – June 17, 1775: Gage placed America under martial law, but the Americans began to fortify Bunker Hill and Breed's Hill. British troops, under Mark Howe, subdued the Americans after three charges. The Americans had been ordered by William Prescott not to fire until they could "see the whites of their eyes," but they finally ran out of ammunition. Although they ultimately lost, they were encouraged by the fact they held out so long and inflicted so many casualties on the British.
Olive Branch – July 5, 1775: The Americans declared their loyalty to England in a petition to the king, but he refused to read it and declared the colonies officially in a state of insurrection. In response, Congress began building a Navy, established a colonial post office under Ben Franklin, and also tried to make friends with the Indians in an attempt to recruit them as allies against the British.
***Common Sense* – January 9, 1776**: Thomas Paine wrote this best-selling pamphlet that was published in Philadelphia. It criticized the monarchial intervention and urged the Americans to fight for their independence.
Declaration of Independence: The Continental Congress appointed Thomas Jefferson to draft the Declaration of Independence, which was endorsed by the colonies on July 4, 1776. The document declared that the colonies were free and independent from Great Britain and offered reasons for this separation.
Battle of Long Island – August 27-29, 1776: British General Howe, who withdrew from Boston, headed to New York instead, where he outnumbered Washington's army two to one. Washington's army scattered to Manhattan Island and Brooklyn Heights.
Battle of White Plains – October 28, 1776: General Howe succeeded in capturing this important New York fort and causing Washington's army to retreat again, this time across the Delaware River into Pennsylvania.

Battle of Trenton – December 26, 1776: Washington led his men across the river in boats where they surprised the sleeping German mercenary soldiers (Hessians) on Christmas night at Trenton. The German soldiers surrendered.
Battle of Princeton – January 3, 1777: Washington mastered another surprise attack and defeated British troops in New Jersey.
Flag – June 14, 1777: Congress decided on a prototype for the U.S. flag: thirteen red and white stripes in alternation and thirteen white stars on a background of blue.
Battle of Brandywine/Germantown – September 11, 1777: English forces, under Howe and Cornwallis, attacked at Brandywine and took Philadelphia, the temporary capitol, from which Congress was forced to escape. Washington surprised their army at dawn, but major confusion resulted, and his troops were forced to retreat.
Saratoga – October 7, 1777: Howe, Clinton, and Burgoyne were victorious at Ticonderoga. At the first battle of Saratoga, Burgoyne was successful over Gates and Arnold, but at the second battle of Saratoga, Gate's forces defended successfully against an attack by Burgoyne's tired forces. Arnold (at this point on the American side) went even further and attacked the forces once they were down. After this battle, Burgoyne retreated and asked for terms of surrender, which involved his retreat all the way to England. This battle was a significant turning point in the war.
Valley Forge: Washington's troops endured a freezing winter and starvation conditions.
France enters the War: Benjamin Franklin convinced the French to ally with the Americans. Four months later, England and France were also at war.
British Attempt at Peace: The English Parliament tried to pacify colonists by repealing the Tea Act and the Coercive Acts, but would not recognize America as independent, which was now the most prominent issue for colonists.
Battle of Monmouth – June 28, 1778: Clinton had been ordered from abroad to evacuate Philadelphia and go to New York. Washington, Lee, and Lafayette pursued his troops.
Spain joins the war: Spain offered their alliance to England in return for territory, but the British declined, so Spain entered on the French side, even though they didn't acknowledge the American cause.
Charleston: The British captured many American soldiers in Charleston as well as four American ships. This battle was the worst defeat for the colonial side during the Revolution.
Difficulty supplying the Army: Congress had difficulty providing food and supplies to its army.
Benedict Arnold: This American general became a traitor by making a deal with Clinton to lose the Battle at West Point. After his scheme was revealed, he fled to the British army, where he was made a brigadier general.
Department of Finance created: Congress tried to correct its financial problems by creating a Department of Finance.
Articles of Confederation Ratified – 1781: The Articles, which had been under debate for four years, were finally ratified. Their powers were weak, but they did create a national government.

Battle of Yorktown -October, 1781: The French and American forces allied to defeat the British under Cornwallis, who surrendered his army of 8,000 on October 19, 1781. This was the final turning point in the American victory.

Results of the Revolution

Treaty of Paris – January 14, 1784: Under the terms of the agreement, England withdrew its troops from colonial soil, recognized America's independence, and surrendered the territory between the Allegheny Mountains and the Mississippi River.
Shay's Rebellion – August 31, 1786: Many farmers had been imprisoned because they were unable to pay their debts. Before the war, they were able to sell their goods in the West Indies, but they were left with little marketing power when these markets were taken away. Daniel Shays, a former captain and now a bankrupt farmer, led a force of farmers in a charge against a Springfield arsenal. They planned to use the guns to protect their property from the state militia. Their plan was crushed by the militia, but it upset many Americans.
New York Capitol: New York was agreed upon as the temporary capitol.
Virginia Statute for Religious Freedom: Thomas Jefferson drafted this 1786 declaration which maintained that no citizen should have to endure religious discrimination. This was the predecessor of the First Amendment.
Attempts to Revise the Articles of Confederation: Congress needed power to control commerce, so a convention was called to discuss the matter, but the first attempt, the Annapolis Convention, was poorly attended. Hamilton drafted an invitation to the Constitutional Convention in 1787 where he hoped to revamp the Articles of Confederation with other statesmen.
Constitutional Convention – May 25, 1787: This Convention was attended by representatives from every state except Rhode Island. George Washington was elected as president of the Convention. Madison drafted "the Virginia Plan" which proposed a government containing three branches: executive, judiciary, and a bicameral legislative with two houses based on population. The small states were concerned over representation, and some states were concerned over giving up powers to a national government that could become just as tyrannical as the previous British rule. Roger Sherman countered this plan with his "Connecticut Compromise" which involved representation based on a state's population in one house, and equal representation in the other house. Southern states were pacified by the decision that slaves would count as 3/5 of a person for representation purposes. The ideas within the Connecticut Compromise were adapted into the Constitution.
Northwest Ordinance – July 13, 1787: Under this ordinance, the western territories north of the Ohio River were accepted as states with equal rights as the original colonies. They would also have a free public education, trial by jury, religious freedom, and no slavery.

The Federalist – 1787: Multiple essays were published supporting and denouncing the prospective Constitution by both Federalists and anti-federalists. Alexander Hamilton, James Madison, and John Jay were three of the most notable writers for the Federalist cause. The anti-Federalists were concerned that the government would be overrun by a rich elite that would forget the rights of the common person. The Federalists argued that they had built in checks and balances, and they promised to add a Bill of Rights.
The Constitution is Ratified – June 21, 1788: Delaware, Pennsylvania, New Jersey, Georgia, Connecticut, Massachusetts, Maryland, South Carolina, and New Hampshire ratified the new Constitution making the necessary majority. Virginia, New York, and North Carolina followed suit, with Rhode Island joining two years later.
New York City: New York City was temporarily designated the center of the government and became our first U.S. capitol.
George Washington 1st President – April 6, 1789: George Washington was elected as our first president and John Adams became his vice president.
Bill of Rights – September 25, 1789: This stipulation was passed in 1791. These rights became the first 10 amendments to the Constitution.
The Potomac Capitol: The House of Representatives voted to set aside land on the Potomac River for the site of the new national capitol.

Weapons and Military War Terms

Artillery

Bayonet: These small swords were attached to rifles.
Cannons: Cannons were used in open field battles and were used to defend ships and forts. They weighed almost a ton and fired solid iron projectiles.
Grenadiers: At first this term referred to the soldiers who threw grenades, but later it came to mean the elite troops who performed the most hazardous assignments.
Light Infantry: These soldiers carried less equipment so they could move faster.
Militia: These soldiers were the lowest in training and fought with muskets.
Minutemen: These soldiers were well-trained, rural reserves that got their nickname because they had to be ready to fight on a minute's notice.
Musket: This type of "muzzle-loaded" gun became obsolete because it was laborious to load and only accurate at close ranges. Bullets, called rounds, were stuffed into the gun after gunpowder and a rag were inserted. Reloading was time-consuming, and rifles eventually replaced the muskets.
Pistols: These were small, short-range weapons that could be easily carried in an officer's belt (holster).

Other Revolutionary War Terms

Blockade: To close off a city or port, so that no ships can enter or leave.
Boycott: To refuse to purchase goods or services from somebody as a means of protest.
Duty: A tax or tariff placed upon imported goods.
Federalist Party: A political party formed in 1792 that emphasized a strong federal government.
Founding Fathers: This title referred to all males who fought for their freedom during the Revolutionary War. It specifically targeted those who drafted the Declaration of Independence and the Constitution.
Intolerable Acts: The four laws that were passed by the British government after the Boston Tea Party as a form of punishment.
Loyalists: American colonists who did not want to break away from Britain.
Mercenary: A soldier that was paid to fight in a foreign army.
Patriots: Colonists who engaged in activities that were designed to gain freedom for the colonies.
Tories: Another name for the loyalists who wanted to remain loyal subjects of Great Britain.
Treaty: A written agreement.
Writ of Assistance: A legal paper that gave British officers the right to search a colonial building or property.

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STUDY GUIDE:
PRESIDENTIAL FACTS I

George Washington: First President **Two terms: 1798-1797**

Born: February 22, 1732 in Wakefield, VA
Death: December 14, 1799 at age 67.
Wife: Martha Custis
Occupation: Planter
Plantation Name: Mount Vernon
Military Career: Fought in the French and Indian War. Commander-in-Chief of the Continental Army during the Revolutionary War.

Most Famous Revolutionary War Events:
1. Washington and his troops crossed the Delaware River on Christmas Day, 1776, to surprise a group of 1,400 Hessian soldiers.
2. The winter at Valley Forge 1777-1778.
3. Washington forced General Cornwallis to surrender at Yorktown in 1781 to end the fighting.

His Presidency:
Elected **unanimously**, with John Adams as Vice President.
Age at Inauguration: 57
Inaugurated in Federal Hall (1789) in New York City, where the nation's first capitol was located.

Important Actions and Events During his Term:
1. Congress passed the Bill of Rights.
2. The Federal Court System was established.
3. The President's Cabinet was established. He chose Thomas Jefferson as the first Secretary of State, and Alexander Hamilton as the First Secretary of the Treasury.
4. The cornerstone for the new capitol in Washington D.C. was laid.
5. First U.S. census was authorized.

6. The following Governmental Departments were established: Department of Foreign Affairs, Department of War, Treasury Department, Post Office, Office of the Attorney General.

HE SERVED TWO TERMS AND RETIRED TO MOUNT VERNON IN 1789.

John Adams: Second President **One term from 1797-1801**

Born: October 30, 1735 in Braintree, Massachusetts
Death: July 4, 1826 at age 91
Wife: Abigail Adams
Occupation: Lawyer with a degree from Harvard
Home: Quincy, Massachusetts
Political Party: Federalist

Important Actions and Events during his Term:
1. Navy Department and Marine Corps were created.
2. Amendment 11, limiting the powers of the federal courts, was passed.
3. Congress established the Library of Congress.
4. The capitol became Washington D.C., and he was the first president to live in the White House.

Thomas Jefferson: Third President **Two Terms from 1801-1809**

Born: April 13, 1743 in Shadwell, VA
Death: July 4, 1826 at age 83
Wife: Martha Jefferson
Occupation: Planter and Lawyer
Plantation Name: Monticello
Political Party: Democratic-Republican

Pre-Presidential Experience:
1. Delegate to the Continental Congress.
2. Writer of the Declaration of Independence
3. Governor of Virginia.
4. Secretary of State under George Washington.
5. Vice-President under John Adams.

Important Actions and Events during his Terms:
1. Louisiana Purchase from France for $15 million.
2. Lewis and Clark sent to explore this purchase.
3. U.S. Military Academy was established.

4. Illinois Territory was established.
5. Amendment 12 passed, which provided that the President and the Vice-President be elected separately.
6. Robert Fulton's steamboat, the **Clermont**, made its first trip up the Hudson River.

THERE WAS NO FIRST LADY IN THE WHITE HOUSE DURING HIS TERMS. His wife had died before his presidency during childbirth.

James Madison: Fourth President **Two Terms from 1809-1817**

Born: March 16, 1751 in Port Conway, VA
Death: June 28, 1836 at age 85
Wife: Dolly Madison, a very popular first lady
Occupation: Lawyer with a degree from Princeton
Plantation Name: Montpelier
Political Party: Democratic-Republican

Pre-Presidential Experience:
1. He created the Constitution and urged its adoption.
2. Delegate to the Continental Congress.
3. Secretary of State under Jefferson.

Important Actions and Events during his Terms:
1. War of 1812 against Great Britain.
2. Burning of the White House during the war.
3. The Cumberland Road was started.
4. Francis Scott Key Wrote the "Star-spangled Banner."
5. The first saving banks were established at Philadelphia and Boston.

Dolly Madison was a popular hostess and First Lady. She hosted many parties and introduced his guests to **ice cream**, a new desert.
After his second term, James Madison retired to his home in Montpelier, where he helped Jefferson found the University of Virginia, and was also active in the composition of a new Constitution for the state of Virginia.

James Monroe: Fifth President **Two Terms from 1817-1825**

Born: April 28, 1758 in Westmoreland, VA
Death: July 4, 1831 at age 73.
Wife: Elizabeth Monroe
Occupation: Lawyer
Political Party: Democratic-Republican

Pre-Presidential Experiences:
1. Lieutenant during the Revolutionary War.
2. Fought with Washington at Valley Forge.
3. Delegate to the Continental Congress.
4. U.S. Senator from Virginia
5. Negotiated the Louisiana Purchase.
6. Governor of Virginia.
7. Secretary of State under Madison.

HE WAS ELECTED TO THE PRESIDENCY ALMOST UNANIMOUSLY, with an electoral vote of 231 to 1. (George Washington was the only president to be elected unanimously.)

Important Actions and Events during his Terms:
1. Spain ceded Florida to the United States.
2. First American Steamship, the SAVANNAH, crossed the Atlantic.
3. MONROE DOCTRINE: He declared that the United States would allow no foreign interference or colonization in the New World. He is best remembered for this doctrine.

John Quincy Adams: Sixth President **One Term from 1825-1829**

Born: July 11, 1767 in Braintree, MA
Death: February 23, 1848 at age 80.
Wife: Louisa Adams
Occupation: Lawyer with a degree from Harvard
Political Party: Democratic Republican

HE WAS THE SON OF THE 2ND PRESIDENT, JOHN ADAMS.

Pre-Presidential Experiences:
1. Secretary of State under Monroe.
2. Senator from Massachusetts.

HIS ELECTION WAS DIFFERENT THAN MOST. Four candidates ran for the election, none of which received a majority of the electoral votes. Adams was selected as President by the House of Representatives, but in actuality, Andrew Jackson received more electoral and popular votes.

Important Actions and Events during His Term:
1. The Smithsonian Institution was established.
2. The Erie Canal was completed.
3. The Baltimore and Ohio Railroad began to lay tracks.

Andrew Jackson: Seventh President **Two Terms from 1829-1837**

Born: March 15, 1767, in Waxhaw District, SC in a log cabin.
Death: June 8, 1845 at age 78.
Wife: Rachel Jackson
Occupation: Planter and Lawyer
Plantation Name: The Hermitage (in Tennessee)
Political Party: Democratic

Military Career during the War of 1812:
1. Commanded the Defense of New Orleans against the British.
2. Led the troops against the Seminole Indians in Florida, which was then owned by Spain.
3. Became nicknamed "OLD HICKORY."

Pre-Presidential Experiences:
1. Senator of South Carolina.
2. Governor of South Carolina

Important Actions and Events during His Terms:
1. Black Hawk War was waged in Illinois against the Sauk and Fox Indians.
2. The first American Made locomotive, "The Tom Thumb," began operation.

Martin Van Buren: Eighth President **One Term from 1837-1841**

Born: December 5, 1782 in Kinderhook, NY
Death: July 24, 1862 at age 80
Wife: Hannah Van Buren
Occupation: Lawyer
Estate Name: Lindenwald (in New York)
Political Party: Democratic

Pre-Presidential Experiences:
1. U.S. Senator
2. Governor of New York
3. Secretary of State under Jackson in his second term.

NICKNAMED "Little Magician" because of his skill in attaining political goals.

Important Actions and Events during his Term:
1. The Depression of 1837
2. Charles Goodyear was issued a patent for the manufacture of rubber.

William Henry Harrison: Ninth President **One Term in 1841**

Born: February 9, 1773 in Berkeley, VA
Death: April 4, 1841 at age 68
Wife: Anna Harrison
Occupation: Soldier
Political Party: Whig

FIRSTS FOR HARRISON:

1. He was the oldest president to be inaugurated at the age of 68. (Ronald Reagan later became the oldest at the age of 69).
2. He was the first president to die in office, dying only 32 days after his inauguration from pneumonia.
3. He held the shortest presidential term.

THERE WERE NO IMPORTANT EVENTS OR ACTIONS DURING HIS TERM.

John Tyler: Tenth President **One Term from 1841-1845**

Born: March 29, 1790 in Charles City County, VA
Death: January 18, 1862 at age 72
Wife: Letitia Tyler, who died in 1842.
Second Wife: Julia Tyler. They were married in the White House. (Between his wives, he had 15 children.)
Occupation: Lawyer
Political Party: Whig

Pre-Presidential Experiences:

1. Senator from Virginia.
2. Vice President under William Henry Harrison. Due to Harrison's early death in office, TYLER WAS THE FIRST VICE PRESIDENT TO EARN THE OFFICE.

Important Actions and Events during His Term:

1. Samuel Morse invented the telegraph.
2. He signed a treaty with China, who opened its ports to world trade.

James Polk: Eleventh President **One Term from 1845-1849**

Born: November 2, 1795 near Pineville, NC
Death: June 15, 1849 at age 54
Wife: Sarah Polk
Occupation: Lawyer
Political Party: Democratic

HE IS BEST KNOWN FOR:
1. Settling the Oregon border by the treaty with Great Britain.
2. The War with Mexico was waged during his term. The land in Texas, California, Nevada, Arizona, Colorado, New Mexico, and Wyoming were made into territories.
3. Gold was discovered in California during his term.

Zachary Taylor: Twelfth President **One Term from 1849-1850**

Born: November 24, 1784 in Montebello, VA
Death: July 9, 1850 at age 66
Wife: Margaret Taylor
Occupation: Soldier
Political Party: Whig

HE WAS THE FIRST MILITARY LEADER TO BE ELECTED PRESIDENT WITHOUT HOLDING ANY GOVERNMENTAL POSITIONS. He fought in the War of 1812, the Black Hawk War, the Florida Seminole War, and he became a hero in the Mexican War of 1846. Because of his military successes, he was nicknamed "Old Rough and Ready."

The main accomplishment during his term was the CLAY COMPROMISE, which admitted California to the U.S. as a free state.

Taylor died of sunstroke just 16 months after taking office.

Millard Fillmore: Thirteenth President **One Term from 1850-1853**

Born: January 7, 1800 in Summerhill, NY
Death: March 8, 1874 at age 74.
Wife: Abigail Fillmore
Occupation: Lawyer
Political Party: Whig

Fillmore, Vice President under Taylor; became President upon Taylor's death.

Major Accomplishments during His Term:
1. Modernization of the White House and the start of a library in the White House.
2. Passage of the Fugitive Slave Act, which made federal officials responsible for returning runaway slaves to their owners.
3. Commodore Perry left for Japan to open that country to world trade.

Franklin Pierce: Fourteenth President **One Term from 1853-1857**

Born: November 23, 1804 in Hillsborough, NH
Death: October 8, 1869 at age 65
Wife: Jane Pierce
Occupation: Lawyer
Political Party: Democratic

BEST KNOWN FOR THE PASSAGE OF THE KANSAS-NEBRASKA ACT, which allowed new settlers in that area to vote whether or not to have slavery. The Su Canal was also opened to shipping, and the Gadsden Purchase was made, which helped acquire more territory from Mexico.

James Buchanan: Fifteenth President **One Term from 1857-1861**

Born: April 23, 1791 in Cove Gap, PA
Death: June 1, 1868 at age 77
Wife: None, no first lady during his term
Occupation: Lawyer
Political Party: Democratic

Important Actions and Events during His Term:
1. THE DRED SCOTT DECISION was made by the Supreme Court, which said that Congress had no power to interfere with slavery.
2. The Pony Express was started between St. Joseph Missouri, and Sacramento, CA.
3. South Carolina seceded from the Union and set up the Confederacy with six other states.

Abraham Lincoln: Sixteenth President **One Term from 1861 to 1865**

Born: February 12, 1809 in Hardin County, KY
Death: April 15, 1865 at age 56
Wife: Mary Todd
Occupation: Lawyer
Political Party: Republican: first Republican elected.

Important Actions and Events during His Term:
1. Civil War
2. The Emancipation Proclamation, issued by Lincoln, declared that the slaves in the Confederacy were free.
3. Dedication of the Gettysburg, PA battlefield with his Gettysburg Address.

4. Signing of the Homestead Act, which allowed settlers to have 160 acres of public land without cost.
5. Passage of the first draft law.
6. THE FIRST PRESIDENTIAL ASSASSINATION. Lincoln was shot by John Wilkes booth while watching a play in Ford's Theatre. He was buried in Springfield, IL.

Andrew Johnson: Seventeenth President **One Term from 1865 to 1869**

Born: December 29, 1808 in Raleigh, NC
Death: July 31, 1875 at age 67.
Wife: Eliza Johnson
Occupation: Tailor
Political Party: Democratic

Johnson, Vice President under Lincoln, became president upon the assassination of Lincoln. JOHNSON NEVER ATTENDED PUBLIC SCHOOL AND WAS SELF-TAUGHT. His wife later taught him to write.

Important Actions and Events during His Term:
1. The reconstruction of the South began.
2. President Johnson dismissed Secretary of War, Stanton, from his cabinet without the consent of Congress. CONGRESS TRIED TO IMPEACH HIM. The House voted for impeachment, but the Senate lacked one vote for the 2/3 majority that was needed to remove the president from office.
3. The 13th Amendment was added to the Constitution, which abolished slavery.
4. The 14th Amendment was added also, which made former slaves U.S. citizens.
5. Secretary of State William Seward purchased Alaska from Russia.

Ulysses S. Grant: Eighteenth President **Two Terms from 1869 to 1877**

Born: April 27, 1822 in Point Pleasant, OH
Death: July 23, 1885 at the age of 63.
Wife: Julia Grant
Occupation: Soldier
Political Party: Republican

He graduated from West Point, fought in the Mexican War, and became the General for the Union forces in the Civil War, thus emerging as a national hero.

LITTLE OF NATIONAL IMPORTANCE WAS ACCOMPLISHED DURING HIS TERM. The 15th Amendment was passed, which assured that all citizens had the right to vote, regardless of race or color.

Grant died from throat cancer. He had lost all his money and was near poverty at that time.

Rutherford B. Hayes: Nineteenth President **One Term from 1877 to 1881**

Born: October 4, 1882 in Delaware, OH
Death: January 17, 1873 at the age of 71
Wife: Lucy Hayes, known as "Lemonade Lucy" because she did not allow alcoholic beverages in the White House.
Occupation: Lawyer
Political Party: Republican

Important Actions and Events during His Term:
1. The first phone was installed in the White House.
2. Reconstruction was ended, and troops were withdrawn from the South.
3. Hayes attempted to appoint people to the governmental positions according to their qualifications.

James Garfield: Twentieth President **One Term in 1881**

Born: November 18, 1831 in Orange, OH
Death: September 19, 1881 at the age of 50.
Wife: Lucretia Garfield
Occupation: Lawyer
Political Party: Republican

GARFIELD WAS ASSASSINATED by CHARLES GUITEAU as he was waiting for a train in Washington. Guiteau had asked for a governmental position, but there was no position available to give him at the time.

Garfield held office for only four months. The American Red Cross was organized, but little else was accomplished.

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STUDY GUIDE:
ILLINOIS: FACTS AND TRIVIA

STATE SYMBOLS

State Flower:	Violet	**State Mineral**:	Fluorite
State Animal:	White-tailed Deer	**State Bird**:	Cardinal
State Insect:	Monarch Butterfly	**State Fish**:	Bluegill
State Tree:	White Oak	**State Fossil**:	Tully Monster
State Prairie Grass:	Big Bluestem	**State Snack Food**:	Popcorn
State Dance:	Square Dance	**State Soil**:	Drummer Series
State Slogan:	"Land of Lincoln"	**State Song**:	"Illinois"
State Nickname:	"Prairie State"		

STATE HISTORY

Illinois became a state on December 3, 1818. It was the 21st state to enter the Union.

Illinois had been a part of the Northwest Territory. After the Revolutionary War, more American settlers began moving into the areas west of the Appalachian Mountains, which collectively had been termed "The Frontier."

The government had this large area of land surveyed and divided into 36 sections that were each sold to a single buyer. Because few individuals could afford to purchase entire sections, land companies bought up much of this land and sold smaller portions to individual settlers.

The government also established guidelines by which a territory could petition the government for statehood. Each territory needed 5,000 free, adult males of voting age living within the territory before they could elect a legislature to decide local matters. When there were 60,000 free settlers in the territory, the people could apply to Congress for statehood. This is the procedure that was followed to obtain statehood in Illinois.

Illinois has had three different capital cities.

1. Kaskaskia (1818—first capital city)
2. Vandalia (1820)
3. Springfield (1838)

STATE GOVERNMENT

The government of the state is divided into three main branches:

1. Legislative
2. Executive
3. Judicial

The legislative branch makes the laws. It is composed of The House of Representatives and the Senate, which are known as THE GENERAL ASSEMBLY.

Number of representatives in the Illinois House: 118
Term of office: Two years
Current Speaker of the House: J. Dennis Hastert
Number of senators in the Illinois Senate: 59
Term of office: Four years

The executive branch enforces the laws. The following public officials are members of the executive branch.

Governor – Rod Blagojevich
Lieutenant Governor – Pat Quinn
Attorney General – Lisa Madigan
Secretary of State – Jesse White
Comptroller – Daniel Hynes
Treasurer – Judy Baar Topinka

JOB DESCRIPTIONS OF THE ABOVE POSITIONS:

Governor: Heads the executive branch.
Prepares the state budget.
Appoints the state department directors.
Reviews, signs, or vetoes all legislation that passes the General Assembly.
Elected for a four-year term and may serve an unlimited number of terms.

Lieutenant Governor: Main assistant to the governor.
Elected with the governor for a four-year term.

Attorney General: The state's chief lawyer.
Protects the people from things such as pollution, fraud, and crime.

Secretary of State: Maintains all official state records and the state seal.
Issues driver's licenses, license plates, and stickers.
Maintains the state library.

Comptroller: Chief financial officer of the state.
Keeps a record of the state's money.

State Treasurer: The state's banker.
Makes decisions about where the state's money should be invested.

The judicial branch interprets and judges the laws. This branch is composed of three different types of courts:

1. Circuit Court
2. Appellate Court
3. Supreme Court

The Supreme Court is the highest court of the state. It interprets the Illinois Constitution and Illinois laws. Seven Supreme Court justices sit on the Illinois Supreme Court bench.

REPRESENTATIVES SENT TO THE U.S. CONGRESS:

18 Representatives
2 Senators

ILLINOIS HAS 20 ELECTORAL VOTES.

ILLINOIS HAS BEEN DIVIDED INTO 102 COUNTIES.

The county that contains the city of Chicago is Cook County. Cook County has the most residents and McLean County is the largest county in terms of land area.

POPULATION AND LARGEST CITIES:

The population of Illinois is approximately 12.4 million people, making it the sixth largest state in the nation according to population.

The five largest cities in the state in order of their population are:

1. Chicago
2. Rockford
3. Aurora
4. Naperville
5. Peoria

ILLINOIS IS RECOGNIZED AS AN AGRICULTURAL LEADER IN OUR NATION.

In 2000, there were 78,000 farms in the state, located on 28.9 million acres. Approximately 80% of the total land area of the state was used for growing crops.

Illinois ranks first in the nation in the production of soybeans, and second in the production of corn, surpassed only by Iowa. The state is fourth in hog production.

It is generally ranked as one of the top five states in cash farm income, cash crop receipts, and in the total value of farm real estate.

The six main crops grown on Illinois farms during 2003 were:

1. Soybeans
2. Corn
3. Wheat
4. Oats
5. Hay
6. Sorghum

THREE PRESIDENTS ARE ASSOCIATED WITH THE STATE OF ILLINOIS.

1. Abraham Lincoln: New Salem is a reconstructed village where Lincoln spent six years as a youngster. Lincoln's tomb is located in Oak Ridge Cemetery in Springfield.

2. Ulysses S. Grant: His home is a tourist attraction in Galena, Illinois.

3. Ronald Reagan: He was born in Tampico, Illinois and attended high school in Dixon, Illinois.

INTERESTING ILLINOIS TRIVIA:

1. The state's largest inland water system is Carlyle Lake, which covers nearly 26,000 acres in the southern part of the state.

2. The name Illinois comes from an Indian term that means "tribe of superior men."

3. The Sears Tower in Chicago was the tallest building in the world until 1996. It still ranks as the tallest building in North America, standing ¼ mile high.

4. Peoria, Illinois is the home of the world headquarters for Caterpillar, Incorporated.

5. Oak Park, Illinois is noted for the many Prairie Style Houses designed by Frank Lloyd Wright.

6. The site of the former Fort Kaskaskia can be seen in Ellis Grove, Illinois.

7. Nauvoo, Illinois is the site of the Mormon settlement established by Joseph Smith. The Mormon Temple has recently been rebuilt in Nauvoo. The jail in which Joseph Smith was killed is located in neighboring Carthage, Illinois.

8. Galesburg, Illinois was the home of author Carl Sandburg.

OTHER INTERESTING ILLINOIS ATTRACTIONS

1. Bishop Hill: This is the original colony of a group of Swedish settlers who were searching for a new "religious home."

2. Cahokia Mounds: This is the only prehistoric Indian city located north of Mexico. It's located in Collinsville.

3. Dickson Mounds Museum: This museum in Lewistown, Illinois houses many Indian artifacts and other archaeological discoveries.

PROFESSIONAL SPORTS TEAMS LOCATED IN ILLINOIS:

Baseball:	Chicago Cubs Chicago White Sox	Hockey:	Chicago Blackhawks
Basketball:	Chicago Bulls	Football:	Chicago Bears

FAMOUS ILLINOISANS:

Abraham Lincoln	Ulysses S. Grant	Ronald Reagan
Marshall Field	A. Montgomery Ward	Jane Addams
Wild Bill Hickok	Enrico Fermi	Hillary Clinton
Stephen A. Douglas	Oscar Mayer	John Deere
Cyrus McCormick	George Pullman	George Ferris
Edgar Lee Masters	Carl Sandburg	

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STUDY GUIDE: EXPLORERS

THE VIKINGS: One of the first groups of sailors to sail into the Atlantic Ocean from Europe (Norse Countries--Denmark, Sweden, and Norway). They explored the islands of Iceland and Greenland, and in the year 1000, a group of Vikings, led by LEIF ERICSON, settled on the coast of North America, calling their land Vinland, which is now Newfoundland, Canada. They were the first Europeans to explore and settle in North America.

PORTUGUESE EXPLORERS: Led the search for an all-water route to Asia.

1. Prince Henry--Called "The Navigator". He built a navigation school in Southwestern Portugal to train Portuguese sailors, and sent many ships to explore the west coast of Africa in hopes of finding the water route to Asia.

2. Batholomew Dias (1487) --First to sail around the tip of Africa, which became known as the CAPE OF GOOD HOPE.

3. Vasco Da Gama (1498)--Followed Dias's route around the Cape of Good Hope and was the first to reach India by traveling across the Indian Ocean. He returned to Portugal with spices, silks, and jewels.

4. Pedro Cabral (1500)--Discovered Brazil when a storm blew his fleet off-course, and he claimed this land for Portugal.

5. Amerigo Vespucci (1499)-- Sailed first for the Portuguese and then for the Spanish. He followed Columbus to the Americas, and was the man for whom America was named.

SPANISH EXPLORERS:

1. Christopher Columbus (1492)--An Italian sailor who believed that the Earth was round, and that he could reach Asia (the East) by sailing west. His journeys were [illegible] by King Ferdinand and Queen Isabella of Spain. He

discovered the island of SAN SALVADOR (one of the Bahama Islands just southeast of Florida) on Oct. 12, 1492. He then sailed to Cuba, and then to Hispaniola, which is presently the countries of Haiti and the Dominican Republic. He made a total of four trips to the New World before his death in 1506.

2. Ponce de Leon (1508)--Discovered and explored Florida. While searching for the "Fountain of Youth," he claimed this land for Spain.

3. Vasco Nunez de Balboa (1513)--The first European to see the Pacific Ocean. He traveled across what is today the Isthmus of Panama in Central America to the Pacific Ocean, which he named the South Sea, and claimed for Spain.

4. Ferdinand Magellan (1519 to 1522)-- His five ships sailed west around South America, and across the Pacific Ocean to the Philippine Islands, where most of ships were wrecked and where he was killed. His crewmen brought the one remaining ship, THE VICTORIA, through the Indian Ocean and around Africa to Europe, thus CIRCUMNAVIGATING the globe, by sailing around the world. The Strait of Magellan at the tip of South America, is named for this explorer.

5. Hernando Cortez (1521)--Discovered the Aztec city of Tenochtitlan in Mexico. He imprisoned the Aztec ruler, Montezuma, and conquered the Aztec empire, claiming this land in Mexico for Spain.

6. Francisco Pizarro (1531)--He conquered the Inca Empire in Peru, and established a settlement on the coast of Peru, which is present-day Lima, for the Spanish.

7. Hernando de Soto (1539)--He traveled north through Florida and explored much of the southeastern part of the United States, and the southern area around the Mississippi River, thus claiming the entire Gulf area and the Mississippi River Valley for Spain. His body was buried in the Mississippi River.

8. Estevanico (1528)-- He was the first Spanish explorer to search for Cibola, "The Seven Cities of Gold", which were supposedly located north of Mexico. He did not find the golden cities, but explored the southwestern land for Spain, and was a fore-runner of other Spanish explorers, who also searched for these cities.

9. Francisco Vasquez de Coronado (1540)--He traveled through the areas that are now Arizona, New Mexico, Texas, Oklahoma, and Kansas in search of the "Seven Cities of Cibola," which were supposedly cities made of gold. He discovered the Grand Canyon and claimed this southwestern area for Spain.

ENGLISH EXPLORERS:

1. John Cabot (1497)--He searched for a Northwest Passage to Asia, and explored the land and islands on the eastern coast of Canada, thus claiming this land for England.

2. Henry Hudson (1610)--He searched for a Northwest Passage in his ship, THE DISCOVERY, and found a large body of water, now called Hudson Bay. This area was claimed by England.

FRENCH EXPLORERS:

1. Giovanni da Verrazano (1523)-- He was hired by King Francis I to find a Northwest Passage through North America. He was the first explorer from France to search for this passage and traveled as far as New York Harbor.

2. Jacques Cartier (kahr-TYAY) (1535)--He sailed west in hopes of finding a waterway that might cut through the continent. He discovered the St. Lawrence River and followed it to the present-day site of Montreal, where he encountered a large Indian village.

3. Samuel de Champlain (1603 to 1608)--He sailed west to North America and founded a fur-trading post on the St. Lawrence River at Quebec. He later explored inward and discovered Lake Champlain in New York, and explored the upper Great Lake area.

4. Father Jacques Marquette and Louis Joliet (1673)-- They explored the Mississippi River as far south as its junction with the Arkansas River. They returned to the Lake Michigan area by way of the Illinois River, and claimed this land for France.

5. Robert de La Salle (1682)-- He sailed all the way down the Mississippi River to the Gulf of Mexico. He claimed this land, which he called Louisiana, for France.

6. Jean Baptiste Pointe du Sable (1779)-- He was a well-known black French explorer who set up a fur-trading post on the Chicago River, at what is now the city of Chicago, Illinois.

DUTCH EXPLORERS:

1. Henry Hudson (1609)--He was hired by the Dutch East India Company to search for the legendary Northwest Passage through North America. He sailed his ship, THE HALF MOON, along the coast of North America, and discovered the Hudson River, which he claimed for the Dutch.

In 1610, Henry Hudson again returned to North America. This time he was sponsored by England, and his ship was named THE DISCOVERY. He found a great body of water, which he called Hudson Bay, and claimed this area for England.

THE MOST FAMOUS PIRATE:

SIR FRANCIS DRAKE (1558 to 1568)--He was an English pirate, called a Sea Dog. He attacked, captured, and raided many Spanish vessels, as well as raiding many Spanish towns. He later became the second explorer to cirucumnavigate the world in his ship called THE GOLDEN HIND.

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STUDY GUIDE:
WORLD RECORDS

LIVING ORGANISMS:

Largest Marine Mammal: Blue Whale
Largest Land Mammal: African Bush Elephant
Tallest Mammal: Giraffe
Largest Reptile: Saltwater Crocodile
Longest Snake: Reticulated Python
Heaviest Snake: Reticulated Python
Heaviest Snake: Anaconda
Largest Fish: Whale Shark
Largest Bird: Ostrich
Fastest Marine Mammal: Blue Whale
Fastest Land Mammal: Cheetah
Fastest Fish: Sailfish
Fastest Bird: Peregrine Falcon
Fastest Insect: Dragonfly
Smallest Mammal: Pygmy Shrew
Smallest Fish: Dwarf Goby
Smallest Bird: Male Bee Hummingbird
Smallest Snakes: Thread Snake and Brahminy Blind Snake
Smallest Lizard: Jaragua Lizard
Smallest Insect : Fairy Fly
Smallest Frog: Brazilian Frog

ANIMALS HAVING THE LONGEST AVERAGE LIFE SPANS:

1. Box turtle: 100 years
2. Human: 75 years
3. Asian elephant: 40 years
4. Grizzly bear: 25 years
5. Horse: 20 years

BUILDINGS AND STRUCTURES

1. Taipei 101, Taipei (1,670 ft.)
2. Petronas Towers 1 and 2, Kuala Lumpur (1,483 ft.)
3. Sears Tower, Chicago, Illinois (1,450 ft.)
4. Jin Mao Building, Shanghai, China (1,380)
5. Two International Finance Center, Hong Kong

TOP 10 ENERGY PRODUCING COUNTRIES:

1. United States
2. Russia
3. China
4. Saudi Arabia
5. Canada
6. Great Britain
7. Iran
8. Norway
9. India
10. Mexico

TOP 10 ENERGY CONSUMING COUNTRIES:

1. United States
2. China
3. Russia
4. Japan
5. Germany
6. Canada
7. India
8. France
9. Great Britain
10. Brazil

BODIES OF WATER:

1. Pacific Ocean: 64,186,300 sq. miles, 12,925 feet deep.
2. Atlantic Ocean: 33,420,000 sq. miles, 11,730 feet deep.
3. Indian Ocean: 28,350,500 sq. miles, 12,598 feet deep.
4. Arctic Ocean: 5,105,700 sq. miles, 3,407 feet deep.

Longest River: the Nile, Egypt and Sudan
Highest Waterfall: Angel Falls, Venezuela
Deepest lake: Lake Baykal, Asia
Biggest Lake: Caspian Sea, Europe and Asia

Deepest part of any ocean: Marianas Trench- in the Pacific Ocean, west of the Philippines.
Saltiest Sea: Dead Sea

OTHER GEOGRAPHICAL WONDERS:

Biggest Desert: Sahara, Africa
Largest Island: Greenland
Tallest Mountain: Mt. Everest, Tibet and Nepal

MOST POPULOUS COUNTRIES, 2004, FROM LARGEST TO SMALLEST:

1. China
2. India
3. United States
4. Indonesia
5. Brazil

LEAST POPULOUR COUNTRIES, 2004, FROM SMALLEST TO LARGEST:

1. Vatican City
2. Tubalu
3. Nauru
4. Palau
5. San Marino

MOST POPULOUS CITIES IN THE WORLD, 2004, FROM MOST HEAVILY POPULATED TO LEAST POPULATED:

1. Shanghai, China
2. Bombay, India
3. Karachi, Pakistan
4. Buenos Aires, Argentina
5. Delhi, India
6. Manila, Philippines
7. Moscow, Russia
8. Soul, Korea
9. Sao Paulo, Brazil
10. Istanbul, Turkey

LARGEST CITIES IN THE U.S. ACCORDING TO POPULATION (2004 Census)

1. New York City, NY
2. Los Angeles, CA
3. Chicago. IL
4. Houston, TX
5. Philadelphia, PA
6. Phoenix, AZ
7. San Diego, CA
8. San Antonio, TX
9. Dallas, TX
10. San Jose, CA

MOST POPULOUS U.S. STATES:

1. California
2. Texas
3. New York
4. Florida
5. Illinois

COUNTRIES FROM WHICH THE MOST IMMIGRANTS COME:

1. Mexico
2. China
3. Philippines
4. India
5. Vietnam

STATES IN WHICH THE MOST IMMIGRANTS SETTLE:

1. California
2. New York
3. Florida
4. Texas
5. New Jersey
6. Illinois

U.S. STATE RECORD BREAKERS: GEOGRAPHY

Largest state: Alaska
Smallest State: Rhode Island

Longest river system: Mississippi-Missouri-Red Rock
Deepest lake: Crater Lake, Oregon
Highest U.S. mountain: Mt. McKinley, Alaska
Lowest U.S. elevation: Death Valley, CA
Tallest building: Sears Tower, Chicago
Longest bridge: Verrazano, Narrows Bridge, NY
Highest bridge: Royal Gorge, CO
First National Park: Yellowstone (Wyoming, Montana, and Idaho)
Largest National Park: Wrangell, St. Elias, AL
Coldest state: Alaska
Largest land gorge in the world: Grand Canyon, AZ
Only diamond mine in the U.S.: Arkansas
World's largest flat-topped mountain: Grand Mesa, CO
Oldest permanent European settlement in the U.S.: St. Augustine, FL
Most heavily wooded state: Georgia
Largest active volcano in the United States: Mauna Loa, HI
Home of the world's first skyscraper: Chicago, IL
Largest cave system in the world: Mammoth Caves, KY
The busiest port in the United States: New Orleans, LA
Highest tides in the United States: Maine
Narrowest state in the United States: Maryland (only 1 mile wide at one point)
Largest Great Lake located entirely within the United States: Lake Michigan
Largest shopping mall in the United States: Mall of America, MN
The tallest free-standing structure in the United States:Gateway Arch, MO
Driest state (least precipitation): Nevada
Windiest spot on Earth: Mount Washington, NH
Oldest state capital city in the U.S.: Sante Fe, NM
Site of the first airplane ride: Kitty Hawk, NC
Country music capital of the world: Nashville, TN
Largest of the contiguous states: Texas
Largest lake, outside of the Great Lakes, in America: Great Salt Lake, UT
World's largest concrete dam: Grand Coulee, Columbia River, WA

U.S. STATE AGRICULTURAL AND MINING LEADERS:

Citrus fruits: Florida
Potatoes: Idaho
Soybeans: Illinois
Wheat: Kansas and North Dakota
Timber: Oregon
Beef cattle: Texas
Dairy cattle: California
Sheep: Texas
Maple syrup and granite: Vermont
Apples: Washington

Corn: Iowa
Rice: Arkansas
Cranberries: Massachusetts
Biggest Mining State: Alaska

SOLAR SYSTEM:

Largest planet: Jupiter
Smallest Planet: Pluto
Planet closest to the sun: Mercury
Planet closest to Earth: Venus
Fastest moving planet: Mercury
Slowest planet: Pluto
Hottest planet: Venus
Coldest planet: Pluto
Planet with the tallest mountain: Mars
Densest planet: Earth
Least dense planet: Saturn
Brightest planet: Venus
The Red Planet: mars
Highest peak in the solar system: Olympus Mons (Mars)
Largest moon in the solar system: Ganymede (Jupiter)
Planet with the most moons: Saturn

OTHER SPACE FACTS:

First human to orbit Earth: Yuri Gagarin
First American in Space: Alan B. Shepard Jr.
First American to orbit Earth: John H. Glenn
First woman in Space: Valentina V. Tereshkova
First person to walk on the moon: Neil Armstrong

AMUSEMENT PARKS RECORD BREAKERS:

World's largest amusement park: Walt Disney World, Lake Buena Vista, Florida

Amusement park with the world's most roller coasters: Six Flags Magic Mountain, Valencia, CA

World's Fastest Roller Coasters:
Dodonpa: Gotemba City, Japan
Superman: The Escape, Valencia, CA

Steel Dragon 2000: Mie, Japan
Millennium Force: Sandusky, OH
Goliath: Valencia, California – tied with Titan: Arlington, TX

World's Longest roller Coasters:
Steel Dragon 2002: Mie, Japan
The Ultimate: North Yorkshire, England
The Beast: Cincinnati, OH
Son of Beast: Cincinnati, OH
Millennium Force: Sandusky, OH

World's Tallest Roller Coasters
Superman: The Escape, Valencia, CA
Tower of Terror: Gold Coast, Australia
Steel Dragon 2000: Mie, Japan
Fujiyama: Yamanashi, Japan
Millennium Force: Sandusky, OH

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STUDY GUIDE:
ACRONYMS AND ABBREVIATIONS

ACRONYMS

AA	Alcoholics Anonymous
AARP	American Association of Retired Persons
AC	Alternating Current
ACT	American College Test
ADD	Attention Deficit Disorder
AFL	American Federation of Labor
AFL-CIO	American Federation of Labor and Congress of Industrial Organizations
AIDS	Acquired Immune Deficiency Syndrome
ALCOA	Aluminum Company of America
AM	Amplitude Modulation
AP	Associated Press
APB	All Points Bulletin
ASAP	As Soon as Possible
ATM	Automated Teller Machine
AWOL	Absent Without Official Leave
BASIC	Beginner's All-Purpose Symbolic Instruction Code (computer language)
B.S.A.	Boy Scouts of America
CAT	(scan) Computerized Axial Tomography
CD	Certificate of Deposit; Compact Disc
CFC	Chlorofluorocarbon

CIA	Central Intelligence Agency
COD	Cash on Delivery; Collect on Delivery
CPA	Certified Public Accountant
CPR	Cardio Pulmonary Resuscitation
CRT	Cathode Ray Tube
CST	Central Standard Time
DA	District Attorney
DC	Direct Current; District of Columbia
DDS	Doctor of Dental Surgery
DDT	Dichlorodiphenl Trichloroethane
DNA	Deoxyribonucleic Acid
DST	Daylight Savings Time
DVD	Digital Video Disc; Digital Versatile Disc
ECG or EKG	Electrocardiogram
EEG	Electroencephalogram
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
ERA	Earned Run Average; Equal Rights Amendment
ESP	Extrasensory Perception
EST	Eastern Standard Time
FAX	Facsimile
FBI	Federal Bureau of Investigation
FCC	Federal Communications Commission
FDA	Food and Drug Administration
FDIC	Federal Deposit Insurance Corporation
FFA	Future Farmers of America
FHA	Future Homemakers of America; Federal Housing Administration
FM	Frequency Modulation
FTC	Federal Trade Commission
GNP	Gross National Product
GOP	Grand Old Party
GPA	Grade Point Average
HMO	Health Maintenance Organization
HUD	Housing and Urban Development (Department of)
IBM	International Business Machines
ICC	Interstate Commerce Commission
IQ	Intelligence Quotient
IRA	Individual Retirement Account
IRS	International Trade Organization

IV	Intravenous
KKK	Klu Klux Klan
LASER	Light Amplification by Stimulated Emission of Radiation
LED	Light Emitting Diode
LPN	Licensed Practical Nurse
MADD	Mothers Against Drunk Driving
MASH	Mobile Army Surgical Unit
MB	Megabyte
MC	Master of Ceremonies
MIA	Missing in Action
MPH	Miles Per Hour
MRI	Magnetic Resonance Imaging
MS	Multiple Sclerosis
NAACP	National Association for the Advancement of Colored People
NAFTA	North American Free Trade Association
NASA	National Aeronautics and Space Administration
NASCAR	National Association of Sports Car Racing
NASDAQ	National Association of Securities Dealers Automated Quotation System
NATO	North Atlantic Treaty Organization
NBS	National Broadcasting Service
NCAA	National College (Collegiate) Athletic Association
NFL	National Football League
NHL	National Hockey League
NLRB	National Labor Relations Board
NOW	National Organization for Women
OPEC	Organization of Petroleum Exporting Countries
PBS	Public Broadcasting Service
PA	Public Address
PC	Personal Computer
PGA	Professional Golf Association
PIN	Personal Identification Number; Police Information Network
PLO	Palestine (Palestinian) Liberation Organization
POW	Prisoner of War
PST	Pacific Standard Time
PTA	Parent Teacher Association
PVC	Polyvinyl Choloride
RADAR	Radio Detecting and Ranging
RAM	Random-Access Memory
RFD	Rural Free Delivery

R.I.P	Requiescat in pace (Latin, rest in peace)
RN	Registered Nurse
ROM	Read-Only Memory
ROTC	Reserve Officers' Training Corps
RPM	Revolutions Per Minute
RR	Railroad
RSVP	Please Reply (repondez, s'il vous plait)
SADD	Students Against Drunk Driving
SAT	Scholastic Assessment Test
SBA	Small Business Administration
SCUBA	Self-Contained Underwater Breathing Apparatus
SOS	Save Our Ship
SPF	Sun Protection Factor
TVA	Tennessee Valley Authority
TWA	Trans World Airlines
UFO	Unidentified Flying Object
UHF	Ultra High Frequency
UN	United Nations
UNESCO	United Nations Educational, Social, and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund (now United Nations Children's Fund)
UPS	United Parcel Service
USAF	United States Air Force
USDA	United States Department of Agriculture
UV	Ultraviolet
VA	Veterans Administration
VFW	Veterans of Foreign Wars
VHS	Video Home System
WAC	Women's Army Corps
Y.M.C.A	Young Men's Christian Association
Y.W.C.A	Young Women's Christian Association
ZIP	Zone Improvement Plan (United States Post Office Zip Code)
3M	Minnesota Mining and Manufacturing

ABBREVIATIONS

adj.	Adjective
adv.	Adverb
Adm.	Admiral
A.M.	ante meridiem (Latin, before noon)
Amb.	Ambassador
anon.	Anonymous
Atty.	Attorney
Ave.	Avenue
B.C.	Before Christ
Bldg.	Building
Blvd.	Boulevard
bu.	Bushel
C	Celsius, Centigrade
Capt.	Captain
cm	Centimeter (s)
Co.	County or Company
Col.	Colonel
cont.	Continued
Corp.	Corporation
cu.	Cubic
dept.	Department
Dist.	District
doz.	Dozen
Dr.	Doctor
Dr.	Drive
e.g.	exempli gratia (Latin, for example)
Ens.	Ensign
etc.	and the others; and so forth (et cetera)
ex.	Example
Expy.	Expressway
F.	Fahrenheit
fl. oz.	Fluid ounce
ft.	Foot; Feet
Ft.	Fort
g	Gram (s)
gal.	Gallon (s)
Gen.	General
Gov.	Governor

hdqs.	Headquarters
Hon.	Honorable
HP	Horsepower
hr.	Hour
Hwy.	Highway
ibid.	in the same place (ibidem)
in.	Inch (es)
Inc.	Incorporated
Is.	Island
Jr.	Junior
kg	Kilogram (s)
K	Kelvin
km	Kilometer (s)
L	Liter
lb.	Pound (s)
loc. cit.	Loco citato (Latin for: in the place cited)
Lt.	Lieutenant
M	meter (s)
Maj.	Major
M.D.	Doctor of Medicine
Messrs.	(Plural of Mrs. And Mme.)
mgr.	Manager
mi.	mile (s)
misc.	miscellaneous
mm	millimeter (s)
Mme.	Madame
Mmes.	(plural of Mrs. and Mme.)
Mr.	Mister
Mrs.	Madame
Ms.	Social title for a single or married woman
Mt.	Mountain or Mount
Natl.	National
no.	Number
op. cit.	In the work cited (opere citato)
oz.	Ounce (s)
pd.	Paid
Pen.	Peninsula
pH.	Measure of acidity or alkalinity
Ph.D.	Doctor of Philosophy
pk.	Peck

Pk.	Park, Peak
Pkwy.	Parkway
pl.	Plural
P.M.	Afternoon (post meridiem)
ppm	parts per million
prep.	Preposition
Pres.	President
Prof.	Professor
pron.	Pronoun
pt.	Pint (s); part
Pt.	Point
Pvt.	Private
qt.	Quart (s)
Rd.	Road
Rep.	Representative
Rev.	Reverend
R.R.	Rural Route
Rte.	Route
Sec.	Secretary or second (s)
Sen.	Senator
sq.	Square
Sr.	Senior
Sgt.	Sergeant
St.	Street
Supt.	Superintendent
syn.	Synonymous
Terr.	Territory
Treas.	Treasurer
tbsp.	Tablespoon (s)
tsp.	Teaspoon (s)
U.K.	United Kingdom
Univ.	University
Xmas	Christmas
yd.	Yard (s)
yr.	Year

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STUDY GUIDE: COOKING

Basic Cooking Terms

Bake	To cook in an oven.
Bake Blind	To bake a pastry shell without any filling.
Baste	To moisten foods while they are cooking by brushing them with butter, juice from the meat, or other sauces.
Beat	To stir quickly with an electric mixer, spoon, or whisk, thus creating a fluffier mixture due to the air that is added.
Blanch	Food is dropped first into boiling water, and then plunged into cold water.
Blend	To thoroughly mix ingredients with a whisk or a blender.
Boil	To heat a liquid to approximately 212 degrees until bubbles come to the surface.
Bone	To remove the bones from a piece of meat.
Braise	Meat is browned, and then cooked slowly in a small portion of liquid in a covered pan.
Bread	Food is dipped into a sticky liquid, such as eggs, and then coated with cracker crumbs, breading, or flour.
Broil	To cook under direct heat from a broiler.
Butterfly	To cut a food partially down the center, but not all the way through, so it can be spread outward like the wings of a butterfly.
Carmelize	To put sugar on top of a dish, and then melt it using high heat.
Churn	Cream is separated into solids and liquids by agitating it, resulting in butter.
Combine	To stir two ingredients together until they are blended.
Core	To remove the central pit or seeds from fruit.
Cream	To beat a substance such as butter or sugar until it is smooth and fluffy.
Crimp	To create finger indentations on the outer edge of a piecrust, thus sealing the upper and the lower crusts together.
Cube	To cut foods, such as meat or cheese, into small squares.
Curdle	This is a process that's used to separate milk into curd (a solid) and whey (a liquid). It can be done by adding vinegar or lemon juice to the milk, or by just boiling the milk.
Cure	A method of food preservation that involves smoking or salting the food.

Cut In	To add a solid ingredient, such as butter, to a dry mixture until they combine.
Degrease	To skim off the fat from the surface of a liquid.
Dice	To chop into pieces measuring about $^1/_8$ or $^1/_4$ inch.
Dollop	To drop a spoonful of soft food, such as whip cream, onto another food.
Drizzle	To pour a slow stream of liquid over food.
Dust	To lightly sprinkle with a substance such as sugar or flour.
Fillet	To remove the bones from a piece of meat.
Flute	To make indentations in food, such as a piecrust, for decoration.
Fold In	To combine a light fluffy substance with a thick mixture by lifting the mixture up and over repeatedly.
Fry	To cook in hot fat.
Garnish	To make a dish more attractive by adding an accent, such as parsley, to the plate.
Glaze	To coat food with a shiny substance.
Grate	To shred a substance by rubbing it against a sharp, serrated metal object.
Grill	To cook over direct heat, as on a barbecue.
Hull	To remove the husks or stems from fruits and vegetables.
Julienne	To cut foods into slender matchstick-sized pieces.
Knead	To work dough with the hands.
Marinade	To soak meat in a seasoned mixture to flavor and tenderize it.
Mince	To cut up into miniscule pieces.
Parboil	To partially cook food by boiling it for a short time.
Pare	To cut away the outer skin of a fruit or vegetable.
Peel	To remove the skin or rind of a fruit or vegetable.
Pit	To remove the seeds from fruits or vegetables.
Poach	To cook in a simmering liquid.
Punch Down	To remove the air trapped within dough by pushing the dough downward.
Puree	To make food smooth by using a food processor.
Sauté	To cook over high heat in fat.
Score	To cut slits in meat or other food to make it cook faster and appear more attractive.
Sear	To quickly brown the sides of a piece of meat on high heat, thus sealing in the juices.
Shuck	Often referring to oyster shells or corn husks, this means to remove the outer covering.
Sift	To pass dry ingredients, such as flour, through a strainer to remove lumps.
Simmer	To cook slowly in a liquid that's close to boiling.
Skim	To remove the fat from a liquid's surface.
Steam	To cook above boiling water, using the vapor to cook the food.
Steep	To soak in a liquid, such as soaking tea leaves in hot water.
Stir-fry	To cook small bits of food quickly over high heat in some fat.
Strain	To use a colander to separate solids from liquids.
Truss	To tie or pin the wings and legs to the body of a piece of poultry.
Whip	To beat quickly with a mixer or whisk, thus adding air and enhancing the volume.
Whisk	To beat with a hand-held wire whip.

Other Terms You Should Know

A la mode	Pie served with ice cream; served in a stylish fashion.
Amandine	A French term given to dishes that contain almonds.
Ambrosia	Chilled oranges and bananas with coconut.
Au Gratin	A casserole dish topped with cheese, butter, or bread crumbs.
Au Lait	In French, this translates as "with milk."
Baking Powder	A leavening agent that causes a rising action.
Baking Soda	A leavening agent that causes a rising agent. It also eliminates food odors in a refrigerator.
Batter	The uncooked mixture that is the base for most baked goods.
Bisque	A creamy soup made from seafood.
Borscht	This dish comes from Russia and Poland and is a hot or cold soup consisting of beef, beets, or other meats and vegetables. It is usually topped with sour cream.
Bouillabaisse	A French stew served over French Bread. Ingredients include fish, shellfish, onions, tomatoes, white wine, garlic, and other spices.
Bouillon	A flavorful broth that occurs when vegetables or meats are cooked in water. Bouillon forms a basis for many soups.
Broccoflower	This fun word refers to a hybrid vegetable halfway between a cauliflower and a broccoli.
Broth	This synonym for stock, refers to the liquid in which meats or vegetables are cooked.
Cacao	The tree from which seeds are harvested for chocolate and cocoa.
Caesar Salad	This salad actually originated in Mexico! It includes romaine lettuce, croutons, garlic, olive oil, lemon juice, anchovies, eggs, and Worcestershire sauce.
Cajun	Any spicy French Southern-style food typical of the Deep South.
Canola Oil	A Canadian oil that is low in saturated fats and is one of the healthier cooking oils.
Caviar	The eggs (roe) of the sturgeon fish.
Chives	A flavorful herb with long hollow leaves that smell like onions.
Chowder	Any chunky soup, and not just clam chowder.
Clarified Butter	This is butter from which the milk solids have been removed. It's made by melting butter, and then skimming off the solids.
Cobbler	Fruit covered with biscuits or piecrust and then baked.
Coleslaw	Chopped up cabbage (red or white) that's mixed with either mayonnaise or vinaigrette. Other vegetables, such as carrots, celery, peppers, or onions are sometimes added.
Compote	A fruit dessert that has been chilled after being cooked in syrup.
Cream of Tartar	This is a powdery, acidic substance found lining wine barrels. It is used to add cream to frosting and volume to egg whites before beating them.
Dough	A firm thick mixture of flour and other ingredients that can be kneaded into baked goods.
Fermentation	A chemical change that occurs during the production of cheese, wine, or yogurt.
Fiber	The part of plant food that cannot be digested by the human body.
Florentine	A French term that refers to dishes containing spinach.

Garbanzo beans	Also known as chickpeas, these large peas are indigenous to the Mediterranean area, India, and the Middle East.
Giblets	The neck, liver, gizzard, and heart of poultry.
Horseradish	A hot, white condiment used primarily on meat and fish.
Meringue	Stiff, foamy egg whites that have been beaten with sugar and put above the pudding portion of a soft pie.
Roux	Melted fat and flour that is used to thicken sauces or soups.
Shortening	A solid fat made from whipped, partially hydrogenated vegetable oil. Crisco is the best-selling shortening on today's market.
Tabasco Sauce	A very spicy sauce made from Tabasco pepper, salt, and vinegar.
Thyme	A minty, lemony herb used to spice vegetables, meats, and soups.
Unleavened	Any baked goods that contain no leavening products such as yeast, baking powder, or baking soda.
Vanilla	A bean that comes from orchids and is used to flavor sweets.
Veal	Meat from any calf younger than three months of age.
Vichyssoise	A creamy soup made from potatoes and leeks that is typically topped with chives and served cold.
Vinaigrette	A salad dressing made from oil and vinegar.
Yeast	A fungus that helps ferment foods.
Zwieback	This German bread is twice-baked, and therefore easier to digest.

Words and Foods We've Borrowed

Asian

Dim sum	Small portions of Chinese food such as steamed dumplings, rice balls, or chicken.
Kimchi	A type of fermented vegetable, consisting of cabbage or radishes, that is standard at any Korean meal.
Tempura	Deep fried fish or vegetables in Japanese cuisine.
Tofu	This popular Asian food is also popular among vegetarians! It is bean curd made from curdled soy milk.
Wasabi	This green condiment is the Japanese version of horseradish.
Won Ton	This is a Chinese appetizer. It is a dumpling stuffed with meat, vegetables, or seafood, and is then fried, steamed, or boiled.

Italian

Al Dente	Literally, "to the tooth," this describes the elasticity of pasta.
Alfredo	This sauce made from butter, cream, parmesan, and pepper, is often served over fettuccini and other pastas.
Angel Hair	Very thin strands of pasta.
Bruschette	Originally, this referred to toast dipped in oil and garlic. Now it sometimes features additional toppings such as tomatoes or mushrooms.
Calzone	A turnover made from pizza dough, folded over itself, and then baked or fried. It is often stuffed with tomatoes, mozzarella or fresh ricotta, and salami.
Cannelloni	This type of pasta is large and hollow and usually stuffed.
Cappuccino	An Italian espresso coffee drink containing steamed milk foam.

Fettuccini	Flat, wide noodles; a type of pasta.
Focaccia	A round, flat bread that is slathered in olive oil, salt, and herbs and then baked.
Marinara	A popular pasta sauce made from tomatoes, onions, garlic, and oregano.
Ravioli	Square-shaped pasta stuffed with meat or cheese.
Ricotta	An Italian cheese resembling cottage cheese that is used in lasagna, manicotti, or other stuffed pastas.
Tortellini	Round pasta stuffed with meat, cheese, and other spices.
Zuppa	The Italian word for soup.

Mexican

Arroz	In Spanish, this word means rice.
Burrito	A large flour tortilla wrapped around a filling.
Caliente	The Spanish word for food that is hot.
Carne	This Spanish word for meat typically refers to beef. Chili con carne is chili that contains beef.
Enchilada	A corn tortilla dipped in red chili sauce, rolled around a filling, and topped with sauce and cheese.
Fajitas	This dish comes from Mexico and consists of meat strips that are fried with peppers and onions. It is served alongside tortillas with guacamole, sour cream, and lettuce or other vegetables.
Frijoles	The Mexican word for beans.
Gazpacho	Tomato and vegetable soup served cold.
Guacamole	An avocado mixture used as a condiment in Tex-Mex dishes.
Jalapeno	The most commonly used "hot" pepper in Tex-Mex cooking.
Pollo	A Spanish word that refers to chicken.
Quesadilla	Grilled cheese inside a folded tortilla.
Tortilla	A flat bread made from corn or wheat flour.
Tostada	A fried corn tortilla topped with beans, shredded beef or chicken, lettuce, tomatoes, cheese, avocado and salsa.

Cooking Utensils and Tools

Casseroles	Baking dishes used for main entrees that are cooked in the oven.
Colander	A bowl with holes and legs that is used to strain or drain foods.
Crockpot	Also known as a "slow-cooker," this is an electric-operated pot that cooks foods for a long time period at a lower temperature so the chef can leave the cuisine unattended.
Double Boiler	One saucepan set inside another, so the bottom can be filled with water and the top pan can be filled with the food.
Frying Pan	A low-sided skillet used for frying, sautéing, and pan broiling.
Griddle	A flat pan used for grilling sandwiches or pancakes.
Ladles	Deep dippers used to dip up soup or stew.
Loaf pan	A rectangular pan used for baking a loaf of bread or a meatloaf.
Paring Knife	A small, sharp knife used for cutting and peeling vegetables.
Pastry cloth	A piece of plastic or canvas that's placed on a countertop or table and dusted with flour before the dough is rolled onto it.
Rolling pin	A round wooden tool used to flatten dough.

Sauce pans	Pans with handles that hold from one to four quarts and are used when cooking food on top of the stove.
Skewers	Stainless steel, wood, or bamboo sticks used to hold together small pieces of food when grilling.
Spatula	A rubber tool used to scrape or fold ingredients. Also, a metal or plastic tool used to flip hamburgers and other foods while cooking.
Stockpots	Tall, deep pots with tight-fitting lids that are used for cooking stews, soups, pasta, and vegetables.
Tube pan	A round, deep pan with a tube in the middle, that's used for baking an angel food cake.
Wok	This is used for cooking Asian foods, such as stir-fry, or for deep fried foods.

Serving styles, terms, and accessories

Buffet	A meal in which all the food is placed in serving bowls on one large table and the diners serve themselves.
Centerpiece	A decoration placed in the center of a table.
Family Style	A meal in which diners sit around a table, and the food is passed in serving bowls from diner to diner.
Flatware	The knives, forks, and spoons used for eating.
Gratuity	A tip given to a server in a restaurant or café for good service.
Manners	The way you behave around other people; rules for proper dining.
Menu	The list of foods offered by a restaurant or eating establishment.
Place Setting	The arrangement of the tableware for each diner.
Table Service	Restaurant service where servers bring the food to the table.
Smorgasbord	A buffet that was originally introduced in America by the Swedish settlers.

Cooking Conversions

1 dash = approximately $^{1}/_{16}$ a teaspoon, but isn't formally measured.
1 Tbs. = 3 tsp. (or 16 mL)
2 Tbs. = 1 fl. oz.
16 Tbs. = 1 cup
1 cup = 8 fl. oz.(or 225 mL)
2 cups = 1 pint (or 450 mL)
4 cups = 1 quart
16 cups = 1 gallon
1 oz. = 28.4 g
1 lb. = 454 g
1 kg = 2.2 lbs.

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STUDY GUIDE:
INDUSTRIAL ARTS: CARPENTRY AND WOODWORKING

Specialized Fields of Carpentry

1. Rough Carpenters: These skilled tradesmen construct the framework for buildings. They work from architectural blueprints and also make repairs and additions to homes and other buildings.

Rough carpenters also assist in the construction of highways, dams, and bridges. They provide the molds for the poured concrete, the scaffolding used when building tall structures and other temporary buildings used at construction sites. They also work on docks and railroad trestles.

2. Finish Carpenters: These craftspeople specialize in the installation of millwork. Millwork consists of the interior parts of buildings such as doors, moldings, casings, cabinets, and the hardware that accompanies them. They add the finishing touches to a building, such as laying the hardwood floors and applying weather stripping to door frames and windows for airtight and watertight seams.

3. Maintenance Carpenters: These carpenters perform both rough and finish work. They keep buildings and equipment in good condition. They also perform small carpentry jobs, such as building benches, counters, or small tool sheds.

4. Ship Carpenters (Shipwrights): These skilled workers construct the foundations for large ships. They lay the deck and complete the interior work to finish the ship. They also work on smaller pleasure boats. Some ship carpenters repair damaged vessels.

5. Cabinetmakers: These craftspeople create artistic masterpieces in furniture and household cabinets. They design, shape, and assemble these items. Some specialize in cutting, fitting, and joining wood to make stairs, tabletops, and other items. They are called joiners. Some work for furniture manufacturers, and others work for companies who make millwork such as doors, windows, and moldings.

Carpentry Skill Levels

Apprentice: This person learns a trade by working under the supervision and guidance of a professional. Apprenticeships usually include on-the-job training as well as classroom training. There are apprenticeship programs at technical and vocational schools. An apprentice receives periodic wage increases and evaluations of their progress. A good knowledge of math, reading, and basic science is necessary to complete an apprenticeship program.

Journeyman: At the completion of apprenticeship training, an individual is certified as a journeyman or skilled carpenter.

Tools

Nails: Nails come in a variety of sizes and shapes that are each designed for a specific purpose.

1. **Common Wire Nail**: A steel nail with a flat head used for general work.
2. **Box Nail**: This nail has a smaller diameter than the common nail and is less likely to cause wood to split.
3. **Finishing Nail**: This nail is made from a finer wire and has a smaller head. It is driven just below the surface of finish work and cabinetry work. A small finishing nail is called a wire brad.
4. **Casing Nail**: This nail has a larger head than the finish nail. Although it's more obvious, it holds the wood more firmly.
5. **Galvanized Nail**: This zinc coated nail resists rusting, and is used for outdoor construction.
6. **Scaffold or Form Nail**: This nail has two heads that enable it to be pulled out easier once it has served its purpose.
7. **Roofing Nails**: These shorter nails with wider heads are made to endure long periods of exposure to weather.

Bolts: Bolts are often confused with screws since they also have ridges called threads. However, the bottom area of a bolt is flat instead of pointed, and bolts are often heavier and more durable. They are used with nuts to hold or connect two pieces of wood or other material. There are different styles and sizes of bolts, including the carriage, machine, and stove bolts. The expansion bolt is used in a wall. A shield expands when the bolt is driven into a wall to provide a secure base.

Measuring and Layout Tools: These tools help the carpenter prepare wood for cutting and construction before the actual work is done.

1. **Steel Tape Measure**: This metal tape measure is usually marked in feet and inches, and it is used for measuring distance. The metal tape, called the blade, retracts into a steel casing when not in use.

2. **Combination Square**: This is a flat, metal ruler and a handle with a built-in level. The adjustable handle can be used to mark 90° and 45° angles.

3. **Chalk Line**: This white string is coated with chalk. It is stretched tightly between two points. The line is then snapped against the surface and leaves a straight line of chalk to guide the carpenter. A chalk line can be used on the ground, floors, walls, or roofs.

4. **Tracing Tape (Layout Line)**: Tracing tape is cotton tape wound on a stick. It's used to lay out long excavation or foundation lines.

5. **Carpenter's Level**: This rectangular metal device contains cylinders of liquid. A bubble within the liquid indicates how level a surface is. If the surface is level, the bubble will appear in the center of the transparent cylinder.

6. **Straight Edge**: A straight edge resembles a ruler. It is used when drawing a straight line, or it is placed is on the work itself to test if the surface is level.

7. **Line Level**: This device is suspended from a line and contains a moving bubble in liquid. The bubble must be in the center to determine if the surface is level.

8. **Framing Square**: This metal tool is shaped like an upside-down "L" and is used to lay out 90° angles.

9. **T-bevel**: This device has a metal blade attached to a wooden handle by an adjusting screw. It is used to measure an angle. The angle measurements are then transferred to a piece of wood to be cut to fit the angle.

10. **Multiple Folding Rule**: This six-foot, measuring device is a long-hinged ruler that can be folded for easy storage.

11. **Scratch Awl**: This sharp, pointed object with a spherical handle is used to scratch a fine line or design on a piece of wood. The carpenter then follows this line when cutting.

Saws: Saws are tools that are used for cutting wood and metal. The metal cutting portion of any saw is called the blade.

1. **Handsaw**: This saw has a long, tapered, steel blade with a handle at one end. The narrow end of the blade is called the point or toe. The end of the blade closest to the handle is called the heel.

2. **Crosscut Saw**: This saw has a blade with sharp, pointed teeth and is used for cutting against the grain of wood.

3. **Ripsaw**: This bladed saw has angled teeth for cutting along the grain of wood.

4. **Keyhole Saw**: This narrow-bladed saw is used to enter holes as small as ¼-inch.

5. **Coping Saw**: The thin, flexible blade on this saw is designed to cut curves. The blade is held tight by a C-shaped, spring frame with adjusting pins and can be replaced when it is dull.

6. **Plumber's Saw**: This saw has a heavy blade with fine teeth and is used to cut through nails or soft metals.

7. **Hacksaw**: This rectangular saw has interchangeable blades used for cutting harder metals such as brass, steel, and cast iron.

8. **Circular Saw**: This power tool is used for creating fast, straight cuts in wood. Special-purpose blades allow the saw to cut metal, plaster, and concrete. A locking base plate moves to adjust the blade depth and also rotates for bevel cuts.

9. **Jig Saw**: This handheld power tool is good for cutting curves in wood. This tool has different styles of blades for cutting different materials.

Hammers

1. **Claw Hammer**: The hammer has a steel head on top of a wooden handle and is used to drive nails. It has a curved claw at one end of the head used to pull out nails. The flat "face" is at the other end of the head. The 16-ounce, curved claw hammer is the most frequently used hammer.

2. **Bell-faced Hammer**: This hammer is similar to the claw hammer except the "face" is rounded, allowing the hammer to drive a nail flush with its surface without leaving a hammer mark.

3. **Tack Hammer**: This hammer has a small, thin, magnetic head and is used to drive nails or tacks that are too small to hold.

4. **Mallet**: This tool has a plastic or rubber head and is used to drive wood chisels.

5. **Nail Set**: This tool is used to push a nail head just below the surface. The tip of the nail set is placed on the nail head and then struck with a hammer until the nail is below the surface. When this is done, a carpenter can then conceal the nail and hole with putty.

Prying Tools: Most pry bars have a curved claw at one end and a chisel-shaped tip at the other end. The claw is used to pull out nails, and the tip is used for prying work.

Wrecking Bar (Crowbar): This strong, metal bar is curved slightly at both ends and is used for demolition and heavy prying work.

Files and Rasps: These scraping tools are made of steel bars and covered with tiny teeth used to shape and smooth wood. The teeth grate against the wood and leave a smooth finish.

Files are long, steel bars with rows of fine teeth.
Rasps are long, steel bars with spaced teeth.

Planes and Chisels

Plane: This is a flat, cutting blade that is housed in a steel base and is used to smooth rough surfaces. It can also be used to shave wood to reduce the width or length of a piece. The blade is set at an angle so that the depth of the cut can be varied by changing the distance the blade protrudes from the plane. A smoothing plane is 9 inches long.

A jack plane is 14 inches long. The jointer plane is 20 to 24 inches long. The block plane is the shortest.

Wood Chisel: A wood chisel is a tool with a wooden or plastic handle and a flat steel cutting blade. It cuts with light hand pressure or by tapping the end of the handle with a mallet. There are different types, shapes, weights, and thicknesses depending on the job they need to perform. Some common types include the socket firmer chisel, tang paring chisel, mortising chisel, and butt chisel.

Drills and Bits

1. **Power Drill**: This electrical device is used for cutting holes in surfaces. Different sized bits are placed in the drill chuck to create holes.

2. **Hand Drill**: This manually powered drill is used for fine woodworking or when electricity is not available. There are two types of hand drills, the eggbeater and the spiral ratchet.

3. **Twist Drill Bit**: This bit is made from high-speed or carbon steel that is fluted and then twisted. It can be used to drill both wood and metal.

4. **Spade Drill Bit**: This bit has a sharp point at the end that extends into a flat-edged cutter. It is used to cut wood holes quickly and accurately.

5. **Extractor Drill Bit**: This bit is used to remove a screw with a worn or broken head.

6. **Bit Brace**: This tool holds auger bits and is also used to drill holes. At the top is the head, the middle is the handle and the end is the chuck where the bits are placed. The brace may be positioned vertically or horizontally while the handle is turned.

Screwdrivers and Screws

Screwdriver: This basic tool is used to twist a screw into a surface. A screwdriver has three main parts: the handle, the shank, and the blade. The handle is what the carpenter grips. The shank is the steel part that extends from the handle. The blade is the end that fits into the screw head. Screwdrivers range in length from 2 ½ to 12 inches.

1. **Stubby Screwdriver**: It has a very short handle. The shank and blade are used for cramped spaces.

2. **Cordless Power Screwdriver**: It has exchangeable bits for slot and Phillips screw heads and saves time and effort.

3. **Slotted Head Screwdriver**: This is the standard screwdriver.

4. **Phillips Screwdriver**: A pointed, grooved blade made to fit a Phillips screw.

Screws: Screws are usually made from iron or brass, and they are categorized by length, slot style, head shape, and thickness. The most common are the round, flat, and oval head screws. Some screws may have a slotted head, and others may have the Phillips head, which has a cross-shaped slot.

Vices and Clamps: Both of these devices are used for holding materials in place while performing a woodworking operation.

1. **Carpenter's Vise (Woodworker's Vise)**: It has long, wide jaws and is attached permanently to a workbench. It is used to hold material for cutting, shaping, or sanding.

2. **C-clamp (Carriage Clamp)**: This metal tool is shaped like a "C," and it is used to hold a piece of wood flat against a surface, or to hold two pieces of wood together.

3. **Three-way Clamp**: This is a metal tool with three thumbscrews that are used to hold materials.

4. **Pipe or Bar Clamp**: These clamps have two jaws on either side of a long pipe or bar that can easily slide towards one another to hold objects together. They are used for connecting larger pieces of wood.

Sanding: Sandpaper and belt sanders are used to smooth and shape wood. Belt sanders are usually used for larger pieces needing the fast removal of material. Sandpaper used manually or wrapped around a sanding block is used for a finer finish.

Router: This high-speed power tool is used to cut decorative shapes, make grooves, and trim laminates by using interchangeable bits. Bits usually have a round pilot at the end, which rests along the edge of an object to control the movement of the cut. The following are some common router bits.

1. **Corner Rounding Bit**: Creates simple curved edges on furniture and wooden moldings.

2. **Ogee Bit**: Makes a decorative cut in wood and is used for wood moldings and for shaping the edges of furniture pieces.

3. **Rabbet Bit**: Cuts step-like edges and is used for woodworking joints and picture frame moldings.

4. **Straight Bit**: Creates a square groove and is used for woodworking joints or for free-hand routing.

5. **Dovetail Bit**: Makes a wedge-shaped groove that is used to make connecting joints for furniture and cabinetwork.

6. **Veining bit** – Cuts a curved groove and is used for free-hand, decorative carving and lettering.

Electric Stud Finder: This great tool locates studs inside walls and identifies both edges of the stud. The stud finder is slid across a wall, and a red light appears when the stud is located.

Pliers: These tools are used for cutting as well as for holding and gripping objects. Some common types of pliers include round-nosed, long-nosed, short-nosed, side-cutting, duck-billed, combination-jaw, diagonal, and curved-needle nosed.

Terminology

Carpentry and woodworking have a language all their own. The following is a list of some common terms used in the carpentry field.

Anchor: A specifically formed piece of metal used to fasten together pieces of wood.

Backing: The groove on the top edge of a hip rafter, which aids in a tight fit between the roofing board and the rafter.

Balloon Frame: A continuous line of studs and corner posts reaching from the first-floor line to the roof plate; this is also the most cost-effective type of construction.

Balustrade: A row of small pillars or columns connected by a rail used for porches and balconies.

Band: A molding that is flat and low.

Base: The area where the walls and floor meet.

Batten Board: A temporary framework that helps to locate the corners when laying a foundation.

Board: Wood that is less than two inches thick.

Braces: Devices attached to the angle of two pieces of wood in order to strengthen that angle.

Bracket: A metal support piece for a shelf.

Break Joints: The arrangement of joints so they do not overlap or go under adjoining shingles or siding.

Carriages: The supports for the steps and risers of a flight of stairs.

Casement: The part of the window where the glass framework opens with hinges.

Casing: Door or window trim; the finished wood around a post or beam.

Center-hung Sash: The glass framework of a window that is hinged in the center in order for the window to swing open horizontally.

Checks: The cracks in a board, usually caused by seasoning.

Clamp: A tool used to hold two or more items together.

Concrete: A mixture of cement and sand with gravel that is used as a building material.

Deadening: Construction materials that are used to soundproof an area.

Flashing: A material or process used to prevent water from leaking through roof intersections or other exposed areas on the outside of a house.

Flue: An opening in a chimney that allows smoke to escape.

Flush: A term that describes two adjacent surfaces that are even.

Footing: An extended area at the bottom of a wall or column that is used to support the load.

Foundation: The part of a building or wall that supports the entire structure.

Frame: The wood skeleton of a building; the surrounding woodwork of windows or doors.

Gable: The triangular area at the end of a building from the eaves to the top of the roof.

Girder: A piece of wood used as a support for wall beams.

Headroom: An open area between the ceiling and the floor, such as in a stairway.

Jamb: The side piece of an opening, such as the side portion of a doorframe.

Joint-butt: Two square ends of material that come together.

Joists: Pieces of wood that support the floorboards.

Kerf: Any cut in wood that has been made by a saw.

Laths: Thin pieces of wood used to support plaster.

Lattice: A criss-crossed design made from wood, bars, or iron plates.

Miter: A joint that is formed by two pieces of wood meeting and fitting together at an angle.

Pitch: A steady rise or slope, such as in stairs or roofs.

Plaster: A combination of lime, cement, and sand used to coat the outside and inside of walls.

Plow: The process of cutting a groove in a piece of wood parallel to the grain.

Post: A long, vertical piece of wood used as a support.

Riser: The vertical board between two stairs.

Sash: The part of the window framework that holds the glass.

Scab: A short piece of wood used to splice or hold two other pieces.

Scaffold: A temporary platform workmen use to reach high places on buildings.

Sheathing: The boards for walls or roofs; thin boards laid on the roof with spaces in between depending on the length of the shingles.

Sizing: Cutting materials to a specific size; or a layer of glue or shellac added to a surface to prepare it for painting or finishing.

Specifications: Instructions outlining the details of a building.

Stucco: A textured plaster used for interior decoration or for the outside of a building.

Stud: A vertical beam in the framework of a building.

Subfloor: A layer of wood between the floor joists and the finished floor.

Threshold: A beveled piece on the floor that a door swings over.

Tongue and Groove: The process of cutting the ends of boards in order to connect to other boards, similar to puzzle pieces.

Tread: The part of a step that is walked on.

Trim: Trim refers to the finished woodwork around doors, walls, windows, etc.

Vestibule: An enclosed entrance to a house.

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Artists, Actors, and Musicians

Allen, Woody
He is a famous comedian, actor, and director of films. His favorite character was that of an extremely intelligent, but neurotic, New Yorker.

Anderson, Marian
She was a famous contralto during the 1930's and 40's. She was the first black person to sing in the Metropolitan Opera.

Armstrong, Louis
This talented and popular trumpeter and singer was one of the greatest jazz performers of the 1920's. He was nicknamed "Satchmo." He's especially known for his rendition of "Hello, Dolly!"

Audubon, John James
This man is famous as an artist and an ornithologist. Educated in France, he later lived in Philadelphia and New Orleans. By the time of his death, he had completed over 400 paintings of birds, many of which were included in his book, *The Birds of America*. The Audubon Society is named after him.

Barnum, Phineas T.
Famous for his quote, "There's a sucker born every minute," he was a showman responsible for his traveling circus. Ultimately, his "Greatest Show on Earth" was the predecessor of the Ringling Brothers and Barnum and Bailey Circus.

Basie, Count
This famous American jazz pianist was popular during the 20th century.

Berlin, Irving
This man wrote many classic American songs. He also wrote music and lyrics for early musicals. His two most famous songs are "God Bless America," and "White Christmas."

Bernstein, Leonard

This composer and conductor is especially known for his work in musical theatre. He wrote the music for several plays, including "West Side Story," and directed the New York Philharmonic Orchestra for several years.

Cassatt, Mary

This American painter spent much of her life in France, where she borrowed and improved upon the concept of impressionism from many of her French colleagues. Her paintings frequently dealt with mothers and their children.

Cohan, George M.

He wrote many of America's patriotic songs, including the upbeat "You're a Grand Old Flag," and "Yankee Doodle Dandy."

Crosby, Bing

This singer and actor reached the height of his popularity in the 1930's through the 1950's. During that time, he appeared in 58 films and made 1,000 recordings, Most people associate his voice with Irving Berlin's "White Christmas."

Disney, Walt

His concepts of animated characters formed the basis for many lucrative movies as well as the still-popular theme parks, Disneyland and Disneyworld. Mickey Mouse, Donald Duck, and Minnie Mouse are just a few of his original characters.

Dylan, Bob

This 1960's folk singer wrote several popular songs based upon controversial social and political issues of the decade. "Blowin' in the Wind" is one of his more popular pieces.

Ellington, Duke

He was an American jazz composer, songwriter and band leader during the twentieth century.

Fitzgerald, Ella

She was a popular jazz singer. Many of her songs were written by such talented songwriters as Irving Berlin, George Gershwin, Cole Porter, and Duke Ellington.

Garbo, Greta

Born in Sweden, this American actress rose to fame on the screen.

Goodman, Benny

This jazz clarinetist was nicknamed "The King of Swing."

Guthrie, Woody

This early folk singer and songwriter wrote socially relevant lyrics and music, and is especially known for the song, "This Land is Your Land."

Hammerstein, Oscar

He is well known as the lyricist for multiple Broadway musicals. He often teamed with Richard Rodgers. Hammerstein wrote the lyrics, and Rodgers composed the music.

Hepburn, Katharine

This esteemed actress was initially labeled "box office poison" by Hollywood in 1938. She rose to fame in roles starring with Cary Grant and Humphrey Bogart, and won four Academy Awards for her performances on the screen.

Hope, Bob

This long-lived American comedian is known for his work in films and for his dedication in entertaining the American troops abroad.

Houdini, Harry

He is famous for his entertaining exploits as a magician and escape artist.

Key, Francis Scott

This man wrote the words to "The Star Spangled Banner."

Miller, Glenn

He was a bandleader and composer in the 20th century.

Monroe, Marilyn

Still adored, this actress rose to fame as a film icon and sex symbol in the 1950's.

Moses, Grandma

This self-taught artist was in her seventies when she started to paint seriously. Her pictures are set in rural America, and follow the style of primitivism.

Pollack, Jackson

He was notorious in America for his colorful abstract paintings. Sometimes he just poured paint onto a canvas and swirled it around to create a design.

Presley, Elvis

He was one of the first musicians to popularize rock 'n roll, and became known as "The King."

Rockwell, Norman

His illustrations of small-town life in the U.S. are still popular today. Many of his paintings were originally done for the cover pages of "The Saturday Evening Post."

Rodgers, Ginger

This American movie star is best known for her dancing roles opposite Fred Astaire.

Rodgers, Richard

He composed the music for many famous musicals. He often collaborated with Oscar Hammerstein. Some his best known musicals are "Oklahoma," "The Sound of Music," and "The King and I."

Rogers, Will

This prominent actor began his career as an entertainer in wild west shows. He became famous for his persona of the blunt cowboy. He's often associated with the quotes, "I never met a man I didn't like," and "All I know is just what I read in the papers."

Sousa, John Philip

This bandmaster from the late 1800's and early 1900's, is best known for his stirring marches, such as 'The Stars and Stripes Forever." The sousaphone was named after him, and he has been nicknamed "The March King."

West, Mae

She is best known for her seductive roles in mid-twentieth century American movies, and for her role opposite W. C. Fields in "My Little Chickadee."

Authors

Angelou, Maya

She is a twentieth-century American author of many books that were based around her personal experiences while growing up as a black girl in America. She shares her complete autobiography in *I Know Why the Caged Bird Sings.*

Clemons, Samuel

This author, otherwise known as Mark Twain, set many of his tales along the Mississippi River. Two of his most famous characters are Tom Sawyer and Huckleberry Finn.

Eliot, T.S.

This author is well known for poetry, prose, plays, and books. His poetry about cats was the inspirational basis for the 20th century musical, *"CATS."*

Emerson, Ralph Waldo

This well-known essayist and lecturer of the 19th century pioneered the Transcendentalist movement within the U.S. and encouraged all Americans to rely on their own good judgment when making decisions.

Faulkner, William

This ambitious Southern writer wrote 19 novels, 80 short stories, 2 books of poetry, as well as some essays. His best-known books include *The Sound and the Fury* and *As I Lay Dying*.

Fitzgerald, F. Scott

This author's most popular book is *The Great Gatsby*.

Frost, Robert

This author is best known for his poetry, including the oft-quoted work, "The Road Not Taken."

Hawthorne, Nathaniel

Hawthorne wrote many books, including *The Scarlet Letter,* and *The House of the Seven Gables*.

Hemmingway, Ernest

This writer won the Nobel Prize for Literature in 1954. He is the author of numerous innovative novels, including *For Whom the Bell Tolls,* and *The Old Man and the Sea*.

Irving, Washington

This American author wrote "The Legend of Sleepy Hollow" and "Rip Van Winkle."

Longfellow, Henry Wadsworth

This man, esteemed in America as well as abroad, was the most popular poet of the 19th century. He is known for his long poems, including *The Song of Hiawatha*, and *Paul Revere's Ride*.

Melville, Herman

Melville is the much-celebrated author of *Moby Dick*.

O'Neill, Eugene

This eminent American playwright changed the face of American Theatre by writing plays with a tragic touch, including *Mourning Becomes Electra, Desire Under the Elms,* and *Long Day's Journey Into Night*. He won the Nobel Prize for Literature in 1936.

Poe, Edgar Allen

He is best known for his morbid and suspenseful short stories including "The Fall of the House of Usher," "The Pit and the Pendulum," and "The Raven."

Sandburg, Carl

This author is known for his poetry as well as his biographical accounts of Abraham Lincoln.

Stein, Gertrude

This American author spent much of her life in France. She is most often associated with her famous poetic line, "A rose is a rose is a rose."

Steinbeck, John

He wrote the novels, *The Grapes of Wrath,* and *Of Mice and Men.*

Stowe, Harriet Beecher

This woman is best known for *Uncle Tom's Cabin,* an anti-slavery novel.

Whitman, Walt

This American poet is best known for his collection, *Leaves of Grass.*

Williams, Tennessee

This author has written many plays, as well as some short stories, most of which focus on the crimes of the Deep South and the passions of maladjusted individuals.

Wright, Richard

He is the author of *Black Boy* and *Native Son,* which both focus on the black experience in the U.S.

Activists and Entrepreneurs

Carnegie, Andrew

This self-made immigrant became a leader in the steel industry. He donated much of his money to build libraries throughout the country and also constructed Carnegie Hall, the famous concert hall in New York City.

Chavez, Cesar

This non-violent activist labor leader led Mexican-Americans and formed the United Farm Workers Union. This Union held famous boycotts of grapes and lettuce during the 60's.

Ford, Henry

This industrial leader is famous for his Model T and the Ford Motor Company. He used the innovative assembly-line technique of production, which cut the cost of production and lowered the final price of the automobile.

Iacocca, Lee

This successful man is best known for saving Chrysler Corporation from financial devastation.

Lewis, John L.

This labor leader was best known for his long-standing term as the president of the United Mine Workers. He also founded the Congress of Industrial Organizations, which is better known as the CIO.

Nader, Ralph

This lawyer is well-known for calling attention to conditions that are unsafe for American consumers, especially dangerous automobiles and unsanitary food production.

Pierpont, Morgan J.

This man formed the United States Steel Corporation, which became the first billion-dollar corporation in the world.

Rockefeller, John D.

This businessman founded the Standard Oil Company. When he retired, he was the richest man in the world.

Vanderbilt, Cornelius

This businessman made his fortune in the railroad business.

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STUDY GUIDE:
MUSICAL COMPOSERS AND ERAS

MUSICAL PERIODS OR ERAS:

1. Baroque Period (1600 to 1750, 17th and early 18th centuries)
2. Classical Period (1750 to 1825, mid 18th to early 19th centuries)
3. Romantic Period, or Romanticism (19th century)
4. Impressionism (late 19th and early 20th centuries)
5. Modern (20th centuries)

The **BAROQUE** Period:

Major forms developed during this time were the oratorios, cantatas and fugues. Oratorios were concert productions based upon Bible stories, but without staging or costumes, as in an opera. "The Messiah" by Handel was an oratorio. Cantatas were vocal compositions for soloists and choruses, which were used in churches. In a fugue the subject was introduced by a solo voice (instrument) and then developed by many voices (instruments).

Most music of this time was religious in nature, and used the harpsichord as the major string instrument.

MAIN COMPOSERS: JOHANN SEBASTION BACH
GEORGE FREDERIC HANDEL

The **CLASSICAL** Period:

Music was still more instrumental than vocal, and still based upon religious text. The orchestra was larger than the Baroque orchestra and was divided into 4 distinct sections: strings, woodwinds, brass, and percussion. The string section predominated, followed by the woodwinds, which included flutes, oboes and bassoons. (Clarinets added later)

The harpsichord was no longer used. The piano was invented during this period.

Much music was written in SONATA form. This was music consisting of 3 distinct divisions. In the EXPOSITION, the two main contrasting themes were presented. During DEVELOPMENT, the themes were explored in different ways, and in the RECAPITULATION, the themes from the exposition were restated.

The string quartet was also started during this period. Music for the quartet was written for the first and second violins, the viola, and the cello. CHAMBER MUSIC was the name of music written for small ensembles such as the string quartet, and it became very popular.

MAIN COMPOSERS: FRANZ HAYDN
WOLFGANG MOZART

The **ROMANTIC** Period (ROMANTICISM)

Music of this time was based strongly on personal feelings and emotions. Composers were concerned with self-expression, and the music even suggested scenes. Many composers expressed love of their country (patriotism) in their music.

Melodies were long and had many changes in temp (speed), and contrasted between major and minor keys.

The orchestra was greatly enlarged and similar to our orchestra today. Instruments added during this period were: piccolo, English horn, bass clarinet, contrabassoon, 3 trombones, tuba, harp, trumpets, French horn, and a variety of percussion instruments. The string section was enlarged greatly. The piano was the favorite instrument of the composers.

MAIN COMPOSERS: FRANZ SHUBERT
LUDWIG VAN BEETHOVEN
GIOCCHINO ROSSINI
JOHANN STRAUSS
FELIX MENDELSSOHN
FREDERIC CHOPIN
ROBERT SHUMANN
FRANZ LISZT
JOHANNES BRAHMS
FRANZ LISZT

IMPRESSIONISM:

This era began toward the end of the Romantic Period. It refined the Romantic music, and captured a dreamlike quality, which seemed to bring everything to a central theme. Much of the is music was based upon literature and art of the time.
MAIN COMPOSER: CLAUDE DEBUSSY

The **MODERN** Era:

Music of this era employs a much greater use of the woodwinds and brass. More percussion was added. Rhythms become more complex and harmonies were often dissonant. There were fewer lyrical melodies than in music of former periods.

Arnold Schonberg developed a composition technique called the "twelve tone" system, where all twelve tones of the octave were of equal importance.
MAIN COMPOSERS: IGOR STRAVINSKY
AARON COPLAND

MAJOR COMPOSERS:

1. JOHANN SEBASTIAN BACH (1685 – 1750) BAROQUE PERIOD

   He was a German composer and organist, who wrote nearly 300 cantatas and over 40 fugues. Most of his works were religious and filled with spiritual intensity. He was known as THE MASTER OF THE FUGUE.

   BEST KNOWN WORKS: "Fugue in G Minor"
   "Brandenburg Concerto"
   "The Well-Tempered Clavier"

2. GEORGE FRIDERIC HANDEL (1685 – 1759) baroque period

   He became England's national composer, and was well known for 18th century operas, and his 30 oratorios. He became blind in later years.

   BEST KNOWN WORKS: "The Messiah"
   "Jeptha" (his last oratorio that records the progress of his blindness)

3. FRANZ JOSEPH HAYDN (1732 – 1809) CLASSICAL PERIOD

   This Austrian composer has been called the FATHER OF THE SYMPHONY. Although he did not write the first symphony, he developed it into a longer form for orchestras, and composed over 144 symphonies of his own.

He was also known for his STRING QUARTETS. (Music arranged for 2 violins, a viola, and a cello.) He wrote a few operas, but was not nearly as good in the opera composition as Mozart.

BEST KNOWN WORKS: "London Symphonies"
"The Surprise Symphony"
"The Clock"

4. WOLFGANG MOZART (1756 – 1791) CLASSICAL PERIOD

Mozart was an Austrian musician who lived to be only 35 years old. However, he composed over 600 works before his death. He had composed hi first 4 symphonies by the age of 8. He composed a wide variety of works, such as chamber music, church music, symphonies, arias, piano compositions, and 22 different operas.

BEST KNOWN OPERAS: "The Marriage of Figaro" (Italian words)
"Don Giovanni" (Italian)
" The Magic Flute" (German words)

BEST KNOWN SYMPHONIES: "E Flat Major"
"G Minor"
"C Major"

5. LUDWIG VAN BEETHOVEN (1770 – 1827) ROMANTIC PERIOD

Beethoven was a German Composer who started to lose his hearing when he was 28 years old, and eventually became totally deaf. Despite this handicap he composed a wide variety of music.
He wrote 9 symphonies. HIS BEST KNOWN SYMPHONIES were his third symphony, called ERIOCA, which he dedicated to Napoleano; his fifth symphony with its unforgettable opening of da-da-da-DAH; and his ninth symphony, called CHORAL which took 8 years to compose.
He wrote one OPERA, "Fidelio"
HIS BEST KNOWN SONATA: "Moonlight Sonata"
His only religious composition (or oratorio) was "Missa Solemnis."

6. GIOACCHINO ROSSINI (1792 – 1868) ROMANTIC PERIOD

He wrote 30 operas in a ten year period. HIS MOST FAMOUS OPERA WAS "The Barber of Seville." He is also known for a mass which he composed called "Little Solemn Mass."

7. FRANZ SCHUBERT (1797 – 1828) ROMANTIC PERIOD

Shubert created over 1,000 compositions, 9 of which were symphonies. He is best known for his lyrical melodies.
HIS BEST KNOWN SYMPHONIES: "The Unfinished Symphony"
"Great in C Major"
He also wrote the popular "Ave Maria."

8. FELIX MENDELSSOHN (1809 – 1847) ROMANTIC PERIOD

Mendelssohn wrote much chamber music for a variety of instrumental groups. He is also known for his Italian and Scotch Symphonies, the "Violin Concerto," and his "Concerto in G Minor" for the piano.
He also wrote "Songs without Words," which is composed of 48 pieces of piano music collected in 8 volumes.

HIS BEST KNOWN WORKS: "The Midsummer Night's Dream Overture" (for his favorite Shakespeare play)
"The Wedding March" (Which came from "A Midsummer Night's Dream)

9. FREDERIC CHOPIN (1810 – 1849) ROMANTIC PERIOD

He was considered the greatest Polish composer and one of the greatest pianists of his era. Unfortunately, he died of tuberculosis before his was 40 years old. He wrote some dance music; waltzes, polanaises, and mazurkas.
His famous "Polonaise in A Major" was the last piece of music heard over the Warsaw, Poland radio station before the Nazi" took over the area. He also wrote "Revolutionary Etude" to help bolster the spirits of the city when it was being continuously bombarded by Nazi bombs.

MOST FAMOUS WORKS: "Polonaise in A Major"
"Funeral March"
"Revolutionary Etude"

10. FRANZ LISZT (1811 – 1886) ROMANTIC PERIOD

This Hungarian composer wrote "Hungarian Rhapsodies"

BEST KNOWN SYMPHONES: "Faust"
"Dante"
He also composed "Liebestraum" (Love's Dream) for the piano.

11. RICHARD WAGNER (1813 – 1883) ROMANTIC PERIOD

He wrote the opera, "The Flying Dutchman."
He also composed "The Bridal Chorus" (Lohengrin) which is commonly referred to as "Here Comes the Bride."

12. JOHANN STRAUSS (1825 – 1899)

He was known as THE WALTZ KING. His two best known waltzes were "The Beautiful Blue Danube," and "Vienna Woods."
Besides his waltzes, he composed over 30 operettas.

13. JOHANNES BRAHMS (1833 – 1897) ROMANTIC PERIOD

This German composer has been regarded as the leading composer of romantic symphonies, concertos, and chamber music. He is best known for his famous BRAHMS LULLABY.

14. PETER TCHAIKOVSKY (1840 – 1893) ROMANTIC PERIOD

This Russian composer composed the "Romeo and Juliet Overture."
He is probably best known for his 3 ballets:
1) Nutcracker Suite
2) Swan Lake
3) Sleeping Beauty

He also wrote 6 symphonies.

15. EDVARD GRIEG (1843 – 1907) ROMANTIC PERIOD

He tried to create a Norwegian national style of music. He composed a popular 10 volume work called "Lyric Pieces" for the piano, and is probably best known for his "Peer Gynt Suite", and his "Piano Concerto."
He founded the Norwegian Academy of Music, located in Oslo, Norway. That same year he married his cousin and wrote the love song, "I Love Thee" for her.
His music brought so much fame to Norway, that the Norwegian government gave Grieg a yearly income for life.

16. ROBERT SCHUMANN (1810 – 1856) ROMANTIC PERIOD

This German composer was best remembered for his piano pieces, including "Traumerei" and "Lieder."

17. CLAUDE DEBUSSY (1862 – 1918) IMPRESSIONISM PERIOD

This French composer was probably the most important Impressionist. He is known for his free rhythms, and based much of his music upon poetry, literature, and works of art.

HIS BEST KNOWN WORKS: "Clair De Lune" (for the piano)
"La Mer" (meaning the sea)
"Prelude to the Afternoon of a Faun"

18. AARON COPLAND, MODERN TWENTIETH CENTURY PERIOD

He is known for his use of American folk rhythms and melodies.

HIS BEST KNOWN WORKS: "Billy the Kid" (a ballet)
"Rodeo" (a ballet)
"Appalachian Spring" (a ballet)
"A Lincoln Portrait" (a work for speaker and orchestra, which was based on the writings of Abraham Lincoln.)

19. IGOR STRAVINSKY, MODERN TWENTIETH CENTURY PERIOD

He was one of the greatest twentieth century composers, and his music has had a great influence on modern music.

HIS BEST KNOWN WORK: "The Rite of Spring" (was written for ballet, and depicted a pagan ceremony celebrating the beginning of springtime.)

CHECK YOURSELF: Can you name the composers of the following musical selections? If not, look back in the study guide for the answers.

1. Clair de Lune
2. Nutcracker Ballet
3. Unfinished Symphony
4. The Wedding March
5. The Lullaby
6. Moonlight Sonata
7. The London Symphonies
8. The Messiah
9. The Rite of Spring
10. The opera "The Marriage of Figaro"
11. The Barber of Seville
12. Here Comes the Bride
13. Billy the Kid
14. Polonaise in A
15. A Midsummer Night's Dream
16. Hungarian Rhapsody
17. The Beautiful Blue Danube
18. Peer Gynt Suite
19. The opera: Don Giovanni
20. Songs Without Words

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STUDY GUIDE:
FAMOUS ARTISTS: WORKS, STYLES, PERIODS

MEDIEVAL ART

Medieval art refers to the art completed during the period between 300 A.D. and the early 1300's. The main subject matter was the Christian religion.

Artists of this time period ignored perspective and gave their work a flat look. Most of the paintings were painted to tell a religious story, and symbols were used extensively, such as painting the sky gold to signify God's supreme presence in the heavens. Because they were concerned about religion, and life after death, they did not worry about painting the world as it really was.

MOST OF THE ARTISTS OF THIS TIME ARE UNKNOWN, ALTHOUGH MANY SAMPLES OF THEIR WORK REMAIN.

Although almost all medieval art dealt with the subject of religion, several different styles were developed, based mainly upon the time frame and the location of the painter.

STYLES OF MEDIEVAL ART

1. **BYZANTINE STYLE:** This popular style was started in 300 A.D., and was centered around the city of Byzantium, which is now Istanbul, Turkey. It became the standard style for Eastern Europe and the Near East.
   All pictures centered around religion. The figures were very stiff and not life like. Much color was used, and most colors were used to symbolize religious ideas.
   One of the most famous paintings of the time was "Enthroned Madonna and Child" by an unknown artist. It now hangs in the national Gallery of Art in Washington,

D.C. It shows Mary holding baby Jesus, who is pictured the size of a small child, but created with the facial features of an adult male.

2. **CELTIC STYLE:** This style developed in Ireland and Northern Europe. It became famous for its illuminations, (illustrations) for Bibles. Each picture was formed by using many interacting lines, thus causing the pictures to have an abstract pattern.

3. **ROMANESQUE STYLE:** This style became common in Western Europe from 1000 to 1100. At this time, many churches were being built, and artists painted lovely pictures on the walls of the churches. Bright colors were used, and all pictures still lacked perspective, thus causing a flat appearance. Most showed events described in the Bible.

4. **GOTHIC STYLE:** This style replaced the Romanesque style during the 1200's. Gothic architectural styles featured many windows, which eliminated the wall space needed for the large Romanesque frescoes. Artists filled the windows with stained glass that told religious stories. Bright blues and reds were favorite glass colors. Many other artists during this time made illuminations, or ornate pictures, for Gospel books and Bibles.

5. **REALISM:** During the 1200's, many European artists turned toward realism. They began to paint and create art that resembled the real object, person, or scene. The main theme still continued to be religious in nature.
GIOTTO: an Italian painter was one of the more famous and influential artists of this time. He still continued to paint frescoes when possible. His painting called "The Lamentation of Christ" shows Mary holding onto Jesus after he was crucified. The sky is blue, as in real life, and the people appear lifelike. Giotto placed a painted frame around his painting to make the picture appear more like a window.

THE RENAISSANCE

The Renaissance began in Italy in 1300, and spread northward until it had reached almost all of Europe by 1600. During this time, people became very interested in the arts. Religious subject matter was still the main focus, but artists turned more toward realism, and tried to portray people and nature as it really appeared. FLORENCE, ITALY was the beginning center for art during this time. The Renaissance in Florence gave us many wonderful painters.

<u>RENAISSANCE PAINTERS IN FLORENCE:</u>

1. **Fra Angelico:** He was a Monk who painted religious topics. His most famous fresco was "The Annunciation", where he painted the angel Gabriel telling Mary that she would become the mother of Jesus.

2. **Sandro Botticelli**: He began Neoplatonism, which combined religious ideas and mythology. His most important painting is "The Birth of Venus." In this painting, Venus, the goddess of beauty and love, is shown emerging from the sea, where she was supposedly born. She is standing on a seashell.

   OTHER WORKS OF BOTTICELLI:
   "Primavera": A figure that represents the season, spring, is carried by the west wind. The 3 Graces from mythology are dancing in a circle in the center of the picture.

   Many of Botticelli's works were painted upon wooden panels.

3. **Leonardo da Vinci**: He was probably the greatest and best known artist of the 1400's. Besides painting, he was an INVENTOR, and drew many sketches of interesting inventions, from which inventors devised many of their ideas in later times.

   HIS TWO MOST FAMOUS PAINTINGS WERE:
   "Mona Lisa" (now in the Louvre)
   "The Last Supper" which was a fresco showing Jesus and his 12 disciples at their last meal. They are seated at a long table. This fresco was painted on a damp wall with oil paint, which caused the paint to chip and crack. It is now so badly damaged that it can not be viewed by the public.

   OTHER WORKS OF DA VINCI:
   "The Madonna of the Rocks"
   "La Giocanda"
   "Leonardo da Vinci: A Self-Portrait"

RENAISSANCE PAINTERS IN FLANDERS:

While Italian painters loved creating frescoes, Flemish painters preferred to paint using oils. They painted realistically, but added many details.

1. **Jan Van Eyck**: "The Arnolfini Wedding" A couple is being married by Jesus instead of by a priest. A pair of slippers are tossed to the side, and a dog is in the forefront of the picture. The people and their surroundings are realistic.

   Van Eyck is noted FOR THE DEVELOPMENT OF OIL PAINTING.

2. **Hieronymus Bosch**: "The Temptation of St. Anthony", which is a collection of all types of grotesque creatures.

RENAISSANCE PAINTERS IN VENICE, ITALY:

1. **Titan**: He was the main painter from this area, and he painted mainly with oils on canvas. He used large brushes and made wide sweeping movements. He chose warm, rich colors. One artist accused him of painting with a broom, because his lines were so coarse and thick.

RENAISSANCE PAINTERS IN ROME:

By the 1500's Rome had replaced Florence as the center of Italian painting. The Pope spent much money on art and the decoration of the city. This time period in art was referred to as the HIGH RENAISSANCE.

1. **Raphael**: He painted a series of paintings of Madonnas. The term Madonna was the title for the Virgin Mary, and most f them were pictured with the infant, Jesus. His Madonnas were graceful, and very real in appearance. He is best known for "Madonna and Child." He is also known for "The School of Athens".

   OTHER WELL-KNOWN WORKS OF RAPHAEL:

   "The Tempi Madonna"
   "Madonna of the Goldfinch"
   "St. George and the Dragon"

Raphael was also hired to decorate 4 rooms in the apartment of the Pope in the Vatican.

2. **Michelangelo**: He decorated the ceiling of the SISTINE CHAPEL in the Vatican, which took 4 years to complete. "The Creation of Adam" is one of the paintings (frescoes) done on the ceiling. In this fresco, God and the angels are reclining on a cloud. God reaches out toward Adam, the first man, to give Adam the spark of life. He also created the statue of "David". The statue was created from marble, and showed David shortly before he went to slay Goliath.

RENAISSANCE PAINTERS OF SPAIN:

1. **El Greco**: often called "The Greek". His real name was Kyriakos Theotokopoulos. He distorted natural forms and used even stranger, more unnatural colors. He started a style called BAROQUE in Europe.

   Works of EL GRECO:
   "View of Toledo", a storm rages above the stillness of the city. The entire picture is done in cold blues, greens, and bluish-white colors.

BAROQUE PERIOD

This period in art began in Europe during the 1600's, or 17th century. The Protestant religion was increasing in strength and people in these countries were beginning to develop a strong sense of patriotism. Patriotism became a strong theme, and was emphasized by clear strokes, realistic portrayals, and a show of emotion.

ITALIAN BAROQUE ARTISTS:

1. **Caravaggio**: He painted directly from life and copied nature faithfully. He showed the poor people of the time in a realistic fashion.

2. **Carracci**: Painted "Hercules at the Crossroads", where Hercules is trying to decide whether he wants to go the easy route, and sin, or go the hard route and obtain pleasure through work.

FLEMISH (FLANDERS) BAROQUE ARTISTS:

1. **Peter Paul Ruebens**: Painted "Elevation of the Cross", which pictures Jesus upon the cross as it is being raised. It is a very emotional picture with realistic people and surroundings.

2. **Anton Van Dyck**: an assistant to Ruebens in his studio. He became the painter to the Court of King Charles I of England. He painted the king on a hunting excursion in his painting called "Portrait of Charles I Hunting."

SPANISH BAROQUE ARTISTS:

1. **Diego Velazquez**: one of the greatest Spanish painters of all times. He painted mainly portraits in the rich, baroque style. His subjects appear very personable, and are painted wih much color. Some of his more famous paintings are of Prince Phillip IV. In "The Maids of Honor" he painted the Spanish princess, Margarita, surrounded by her friends and maids.

DUTCH BAROQUE ARTISTS:

1. **Rembrandt van Rijn** (called just **Rembrandt**): became the greatest master of all Dutch artists. He painted religious subjects even though he, himself, was not very religious, and followed no particular faith. He liked to paint the Bible stories so that the emotions of the people were shown.

   WORKS OF REMBRANDT:
   "Jacob Blessing the Sons of Joseph"
   "The Night Watch"

ROCOCO STYLE: This was style during the late Baroque Period that appeared mainly toward the end of the 1600's in France. It was most popular from 1720 to 1780. Rococo paintings were relaxing, and lighthearted, with very few serious topics.

Jean Antoine Watteau, Francois Boucher, and Jean Honore Fragonard were the three most famous rococo painters. They painted pictures of dreamlike picnics in the park, and girls on swings.

ART IN THE 1800'S

ROMANTICISM: Romantic painters expressed the imagination and feelings of the artist. Pictures showed much activity, and could even be violent in nature. The movement started in France during the late 1700's, and progressed into the early 1800's.

1. **Francisco Goya**: a Spanish painter who was a forerunner of romanticism. He painted a wide variety of topics, such as kings, common people, insane people, and soldiers. He also made many portraits of the Royal Family.

   His most famous painting, "The Third of May, 1808", shows a group of Spanish rebels being executed by French soldiers.

2. **Eugene Delacroix**: a French Painter who considered color the most important element in his work. He chose unusual events and faraway places.

3. **Edouard Manet**: a French artist who was mainly interested in creating lovely pictures. Viewers could find little meaning in his work.

   One of his more famous paintings is "Luncheon on the Grass". He also painted many street and café scenes.

IMPRESSIONISM:

This art movement was started in France about 1870. The three most famous Impressionist Artists were Claude Monet, Pierre Auguste Renoir, and Edgar Degas. They chose to paint nature exactly as it was.

The Impressionists did not think that every picture needed to tell a story. Most of their subjects were everyday people like the painters, themselves. They used bright colors. They based their paintings upon the idea that nature continually changes, and their paintings should reflect these changes, like a camera would capture shadows and light.

Claude Monet often painted the same scene at different times during the day to capture the changes. He dealt mainly with outdoor scenes. "Impression: Sunrise" is one of his more famous paintings.

Renoir mainly painted scenes showing the Parisian life. He used very small brush strokes, and chose red as the dominant color in his paintings. His most famous works were "The Bathers", and "Dance at Bouvigal".

Degas painted inside and outside scenes. He's especially well-known for his ballet dancers and landscapes.

Jean Francois Millet was another impressionist who was not as well-known. However his painting called "The Gleaners" was very admired and hangs in the Louvre today. It pictures three stooped-over women who are working in the fields.

POST IMPRESSIONISM:

The Three most important postimpressionists were Paul Cezanne, Paul Gauguin, and Vincent Van Gogh. Other postimpressionist painters were George Seurat, and Henri de Toulouse-Lautrec. Van Gogh was Dutch, while the others were all French.

These artists stressed form and mass to make their paintings have a more durable appearance. They reacted against the realism that the Impressionists had shown.

Paul Cezanne believed that all forms of nature could be reduced to cones, cylinders, and cubes. His paintings became rather abstract. He liked to paint still-life, which he also painted using geometric shapes.

Gauguin settled on the island of Tahiti and his paintings reflected this area. He made his people look puzzled because he believed that humans were always searching for answers and meaning in life. Many of his paintings were of Polynesian women.

Van Gogh expressed his feelings through the use of strong color. His art was very intense. He is known for his "Starry Night" and "Sunflowers" paintings. In his painting called "Field of Yellow Corn", he just squeezed a tube of yellow paint directly onto the canvas. In a fit of depression, he cut off one of his ears, and eventually he committed suicide.

Toulouse-Lautrec painted and drew pictures of the night life of Paris. His paintings were lively paintings of actresses, dance hall girls, circus performers, and singers.

George Seurat created a style called POINTILLISM. He painted by creating tiny dots that blended from a distance to form a picture. "Sunday Afternoon on the Island of La Grande Jatte" is a huge picture painted in the pointillism style.

ART IN THE 1900'S

CUBISM:

This began in 1907 and became an important form of modern art. The two main cubists were George Braque of France, and Pablo Picasso of Spain. They based their paintings on Cezanne's earlier ideas, and used geometric figures to create objects or people.

Pablo Picasso began this movement. His most important works are "Three Musicians", and "Guernica", which was done in black, white, and gray, and emphasized the horrors of war. Picasso also created many sculptures from metal cutouts. One of his 50 foot sculptures stands in Chicago's Daley Plaza.

MEXICAN ARTISTS:

Most of this art portrayed Mexican heroes and the history of the country. Huge murals were the common form of art.

1. **Diego Rivera**: known for his large murals that depicted poor Mexican peasants, or for his war scenes. One of his main paintings was "Agarian Leader Zapata", which showed the life history of a Mexican revolutionary leader called Emiliano Zapata.

2. **Jose Clemente Orozco**: known for his paintings that mixed Aztec mythology with modern themes. His best known work is "An Epic of American Civilization".

DISTINGUISHED AMERICAN ARTISTS

1. **James Audubon**: an artist and naturalist of the nineteenth century who painted hundreds of different pictures of birds. These pictures are shown in his book called <u>The Birds of America.</u>

2. **Alexander Calder**: an American sculptor of the twentieth century who is known for his elaborate mobiles.

3. **Mary Cassatt**: an artist of the late nineteenth and early twentieth centuries who spent much of her life in France, learning form the French impressionists. She mainly painted pictures of mother sand their children.

4. **Nathaniel Currier and J. Merritt Ives**: two business partners who joined together to produce colorful prints of everyday American life during the nineteenth century.

5. **Rube Goldberg**: an American sculptor and cartoonist of the twentieth century who was known for his diagrams of detailed machines, which he designed to carry out simple tasks in progressive non-stop fashion.

6. **Winslow Homer**: known for his water-color paintings of seascapes.

7. **Grandma Moses**: an American artist of the twentieth century who began to paint when she was in her seventies. She painted mainly farm life, in a very simple way, similar to the art of a child. This style was called PRIMITIVISM.

8. **Georgia O'Keefe**: an American painter of the twentieth century who painted many Southwestern scenes, showing deserts, wildlife, and Indian artifacts.

9. **Jackson Pollock**: an American painter of the twentieth century who created abstract paintings by pouring and swirling paint on the canvas.

10. **Norman Rockwell**: an artist and illustrator known for his illustrations for "The Saturday Evening Post" magazines. He portrayed rural scenes very realistically, and showed the lifestyles of people who lived in rural locations.

11. **Gilbert Stuart**: Known for his portraits of the Presidents, and his entire series of George Washington portraits.

12. **Archibald M. Willard**: an artist who painted scenes during the Revolutionary War. His most famous work is "The Spirit of '76", which shows three wounded soldiers who are still marching along with spirit. One is playing a fife, while the other two are playing drums. A company of soldiers is following them.

13. **James Whistler**: a nineteenth century painter who painted his mother, dressed in black, and seated on the edge of a straight chair. The original name of the painting is "Arrangement in Grey and Black, Number 1", but it has become known as "Whistler's Mother."

14. **Grant Wood**: the artist known for "American Gothic," which shows a farmer and a woman standing in front of a farmhouse. They both wear stern expressions, and the farmer is holding a pitchfork.

15. **Frank Lloyd Wright**: an American sculptor who created the philosophy of ORGANIC ARCHITECTURE. He believed that the building should develop out of its natural surroundings. He created the "prairie houses", which were single family residences located on the prairies during the very early 1900's. The Robie House in Chicago is an example of this style. He also designed the Larkin Building in Buffalo, New York, which was the first office building to use air-conditioning, double glass windows, and metal furniture. Other noted examples of his work are:

    Imperial Hotel in Tokyo
    Millard House in Pasadena, California
    The Guggenheim Museum in New York City
    Falling Water at Bear Run, Pennsylvania

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STUDY GUIDE:
DANCE

History of Dance

The origins of dance can be traced back to very early civilizations. In ancient India, the Hindu god Dshiva was known as Lord of the Dance. In Australia, Africa, and the Americas, native people danced for entertainment, community, and spiritual reasons. In Greek culture, Pan was called a "dancing master." The Renaissance was a revival of the classics, and it fostered an increased interest in dance.

Ballet

During the Renaissance period, ballet became popular in Italy and France within the courts. The first dancers wore court fashions of the day, instead of what we think of as ballet attire. When royalty Catherine de Medici, an Italian, married Henri duc d'Orleans, a Frenchman, ballet continued to develop, and was centered in these countries. Louis XIV was a fan of dancing and established the Royal Academy of Dance in the Louvre. At this time, Jean Baptiste Lully became a well-known dancing master, and almost exceeded the king in his prowess and popularity. He founded what is now the Paris Opera. Pierre Beauchamps, also a ballet master, invented the five positions of ballet. Due to Lully's influence, professional ballet dancers began to emerge by the late 1600's. At this time, ballet skirts got shorter, although they were still heavy, bulky, and prohibitive. In Italy, dance was concerned with acrobatics and athletics, whereas in France it continued to be elegant and dignified, although separated from ballroom dancing by the turn-out of the legs. Pierre Rameau was first to document the five foot positions in his book, The Dancing Master. In 1738, the Russian monarchy established the St. Petersburg school, which became the second-oldest dance academy in the world.

In the early 1800's, ballerinas began to dance en pointe, or on their toes. Marie Taglioni was the first credited with this feat, and her attire in "La Sylphide" inspired the stereotypical Romantic tutu that came into dance fashion in 1882.

Soon, Russia developed what is now considered classical ballet at its St. Petersburg facility, as well as the Bolshoi. During this time, the Russians created what are considered their "Big Three" ballets: "Swan Lake," "The Sleeping Beauty," and "The Nutcracker."

Jazz

Some jazz dance steps evolved through social dances such as the Charleston, Jitterbug, and Fox-Trot. Other aspects of jazz dance emerged on stage in musical theatre, which combined steps from ballet, tap, and modern dance. Unlike ballet, in jazz dance, feet are usually not turned out. Instead, they are parallel. Also, movement is ground-oriented rather than focused on aerial stunts.

Tap

Also widely used in theatrical contexts, tap evolved from Irish step dance, clog dance, and African dance. Slave dances were adapted by minstrel shows in two ways: buck-and-wing (done in wooden-soled shoes), and soft-shoe (done in leather soles). Metal tap plates became common by the 20's. During this time, Mr. Bojangles (Bill Robinson) became the most famous tap dancer in America. Fred Astaire and Gene Kelly later became known for the tap dancing skills. Tap dancing is characterized by steps that create rhythms as specially equipped shoes make contact with the floor.

Modern Dance

Beginning in the late 1800's and continuing through today, dancers began to rebel against the strictures of classical ballet. Isadora Duncan and Ruth St. Denis are considered the founders of modern dance. They began to dance barefoot and flat-footed. Some of their successors were Alvin Ailey, Lester Horton, and Martha Graham.

<u>Famous Dancers</u>

*****Men - Classical**

Maurice Bejart

Maurice Bejart founded the Ballet de l'Etoile in Paris. His creation, "The Rite of Spring," established his international reputation. He also founded companies in Brussels and Switzerland and was made a member of the Academy of the Beaux Arts in 1994. Other notable works include "Symphony for a Lonely Man" and "Bolero."

Vaslav Nijinksy (1890-1950)

This Russian choreographer and ballet dancer studied at the Imperial Dancing Academy in St. Petersburg, and first performed in their company. Throughout his career, he was noted for his technical abilities, particularly on his jumps and leaps, such as grands jetes. In France, he became a lead dancer at the Ballets Russes. There, he rose to the status of premier danseur and created the famous lead parts in "Les Sylphides," "Scheherazade," "Le Spectre de la Rose," and "Petrushka." He choreographed "The Afternoon of a Faun," "The Rite of Spring," and "Till Eulenspiegel" in innovative and daring ways. Unfortunately, he acquired schizophrenia at the age of 29, which shortened his career.

Georges Balanchine (1904-1983)

He began as a dancer and choreographer at the Ballets Russes, then moved to America and established the School of American Ballet, whose first piece was called "Serenade." He co-formed the Ballet Society in 1946. He also changed conventional

costumes into what he called "rehearsal costumes," to de-emphasize the technical elements, and force the audience to focus on the spectacular nature of the dance movements themselves. He formed the company that eventually became the New York City Ballet. At the American School of Ballet he created his Balanchine method, which allowed dancers to embody his choreography easier than other training systems, and had unique hand positions.

Robert Joffrey (1930 -1988)

Robert Joffrey was born in Seattle, but studied in New York. His first performance was in Roland Petit's "Ballets de Paris." Soon after, he formed his own company, The Robert Joffrey Ballet, which was located in New York, then moved to Los Angeles, and finally Chicago, where it became the Joffrey Ballet of Chicago. The company featured choreography by dancers as diverse as Alvin Ailey, George Balanchine, and even new unknown choreographers. Some of his own dances included "The Masked Ball," "Gamelan," and "Astarte."

Mikhail Baryshnikov (1948-)

This Soviet was famous for his technical capabilities. He started as a soloist and principal dancer at the Kirov (also known as the Saint Petersburg) Ballet. He was the first to dance roles in "Vestris," "Hamlet," and "The Creation of the World." When he was touring Canada with the Bolshoi, he chose to defect, although he insisted that it was for artistic, rather than political, reasons. After that, he danced at the New York City Ballet, the American Ballet Theatre, and The Royal Ballet. He was not only a classical dancer, but a modern one as well, who danced in works created by such diverse choreographers as George Balanchine, Jerome Robbins, and Twyla Tharpe. He also served as the director of ABT for nine years until he created his own dance company, the White Oak Dance Project, which specialized in modern dance, and featured choreography by Merce Cunningham, Twyla Tharpe, and many others. Audiences also remember him for his eleven-turn pirouette in the movie "White Knights."

***Men - Modern**

Fred Astaire (1899-1987)

Fred Astaire is often remembered in his typical costume of top hat and tails, with a cane or other prop. He took ballet and tap dance lessons in his childhood, and began as a "hoofer" in vaudeville with his sister. His mother became their manager. One of their hits together was called "Over the Top." Later, Fred went into the movies. His career lasted 50 years. He had over a dozen dancing partners, but his most consistent and popular was Ginger Rogers, with whom he danced in 10 movies. He won 9 Emmys and an Academy Award.

Jose Limon (1908-1972)

This Mexican-American modern dancer and choreographer studied under Doris Humphrey and Charles Weidman, and performed in their company as well as on Broadway. He created his own prestigious modern dance company, which became the first major American modern dance troupe to appear in Europe. Many of his dances were inspired by literature and history. For instance, his most renowned dance, "The Moor's

Pavane," was inspired by the play Othello, written by Shakespeare. Other dances included "Missa Brevis," "There is a Time," "La Malinche," and "Carlota."

Alvin Ailey (1931-1989)

Alvin Ailey formed the eminent modern dance company, Alvin Ailey American Dance Theater. Initially, he studied under Lester Horton at his Dance Theater, and directed that company after Lester's death. In New York City, he studied under Martha Graham, Charles Weidman, Doris Humphrey, and Stella Adler. (Ailey was successful as an actor as well!) His company's works were inspired by African American culture. In fact, his company was the first primarily African American company to perform at the Metropolitan Opera House. However, his members were not all African-America. In 1963, he experienced reverse discrimination himself, which inspired him to integrate his originally all-black dance company. The company also toured worldwide, notably including Australia, Senegal, and China. He also choreographed for The American Ballet Theatre, Paris Opera Ballet, Dance Theatre of Harlem, the Joffrey Ballet, Paris Opera Ballet, and La Scala Ballet. In 1979, he received the Capezio Award for a lifetime contribution to dance. His well-known works include "Blues Suite," "Mass," and "Revelations." "Mass" was performed to music by Leonard Bernstein. "Revelations" was grounded in African American spirituals and his religious heritage. His biography was entitled Revelations: The Autobiography of Alvin Ailey.

***Women - Classical**

Marie Taglioni (1804-1884)

Marie Taglioni was the most important ballerina of her time. She was born in Sweden, but danced in Vienna initially, under the instruction of her father, an Italian choreographer. He created the main role in "La Sylphide" for her, in which she became one of the very first females to dance on her toes (en pointe). In this ballet, she was the first to model the costume that became the standard for classical ballet in the 1800's.

Anna Pavlova (1882-1931)

This most famous ballerina of her time in Russia was born in Saint Petersburg and trained at the Imperial Ballet. She was best known for the purity of her classical technique. She became a soloist there in 1899 and a prima ballerina there seven years later. She toured worldwide, and founded her own troupe in 1911. Many remember her by her solo, "The Dying Swan," in 1905. Some of her other memorable roles were in the ballets "Coppelia," "Don Quixote," "Swan Lake," "Giselle," and "Les Sylphides."

Isadora Duncan (1877-1927)

Isadora Duncan had a major influence on Martha Graham and the emergence of modern dance. She was the first to revolt against ballet by using flexed feet instead of pointed toes. She also danced barefoot with no tights, and instead of traditional classical costumes, she wore a flowing gown. Her movements weren't always specifically repeated, either. Often they were improvised. She opened dance schools throughout Europe, Russia, and the US.

Agnes de Mille (1909-1993)

This American choreographer was inspired to become a dancer when she first saw Ana Pavlova dance. She was born into fame as the niece of Cecil B. De Mille and the granddaughter of Henry George, a famous economist. She had success in New York and then toured Europe. One of her most memorable roles was in "Dark Elegies." She became an eminent choreographer with her initial success, "Rodeo," which was one of the first ballets to originate in America. Her decision to combine dance with the advancement of plot when she choreographed "Oklahoma" in 1943 was a major innovation that made her famous. She later choreographed other musicals including "Brigadoon," "The Sound of Music," and "Carousel." She is also remembered for her ballets "Fall River Legend," "The Wind in the Mountains," and "The Other." She wrote many books including The Book of the Dance, Speak to Me, Dance With Me, and Martha: The Life and Work of Martha Graham.

Margot Fonteyn (1919-1991)

Called Dame Margot Fonteyn de Arias because of her status as a technical and elegant ballet dancer in Britain, she danced in the Royal Ballet (then called the Vic-Wells Ballet), where she became the prima ballerina in 1940. She was such a good ballerina that she was appointed Dame of the British Empire, as well as president of the Royal Academy of Dancing. Her most renowned part was the role of Aurora in "The Sleeping Beauty."

Maria Tallchief (1925-)

This Native American ballerina has been called the most technically accomplished ballerina in America. Before attending the Ballet Russe and then the New York City Ballet (where she trained with and eventually married George Balanchine), she was schooled as a pianist in Oklahoma, where she was born to a chief of the Osage Indian tribe. She became artistic director of the Lyric Opera Ballet in the 70's. Ultimately, she founded her own company in 1979, the Chicago City Ballet, and also wrote an autobiography, Maria Tallchief: America's Prima Ballerina. Her sister Marjorie also became a ballerina, although she got less credit. Maria was dubbed "Woman of Two Worlds" by the state of Oklahoma in 1953 in honor of her accomplishments as a Native American and a dancer.

Suzanne Farrell (1945-)

She studied at the School of American Ballet, and then danced with the New York City Ballet, where she changed her name from Roberta Sue Ficker to Suzanne Farrell. Her first solo there was called "Serenade." Balanchine took a profound interest in her. He made her a principal dancer and even created lead roles for her. Dulcinea in "Don Quixote" was one of these. Eventually, conflict arose between them and she moved on to dance in Canada and Belgium. Seven years later, she returned to the New York City Ballet and worked with Balanchine again until she retired. She starred in "Tzigane," "Vienna Waltzes," and "Mozartina." Her autobiography was entitled Holding On to the Air.

***Women - Modern

Ruth St. Denis (1877-1968)

Along with Isadora Duncan, Ruth St. Denis began modern dance in America. She was born in Newark and danced on vaudeville, until she did her own ballet, "Radha," which enabled her to tour America and Europe. With her husband, Ted Shawn, she founded the Denishawn school of dance, where they attempted to experiment with dance to create a new American form. Martha Graham was one of their prestigious students. Memorable pieces in her repertoire were influenced by Oriental culture, and included "Incense," "Radha," and "Yogi." Her autobiography was titled An Unfinished Life.

Doris Humphrey (1895-1958)

Doris Humphrey was a student at the Denishawn School, and a soloist in several of their Oriental ballets. She formed the Humphrey-Weidman Company with Charles Weidman. She is best known for the theories of modern dance and motion she developed. She believed that dance is just what happens between fall and recovery, before you lose your balance, or, as she called it, "the arc between two deaths." She published a book called The Art of Making Dances. She also tried to make music less important in her compositions. At the end of her career, she served as artistic director of the Jose Limon Company.

Judith Jamison (1943-)

This American dancer debuted at the American Ballet Theatre in a work choreographed by Agnes De Mille, entitled "The Four Marys." Soon after that, she entered Alvin Ailey's dance troupe. He created a well-known solo for her, "Cry," that was a tribute to African American women. Later she starred on Broadway, and then began to choreograph independently. Alvin Ailey's company featured her first dance, called "Divining." It also had an African flavor. When Ailey died, she succeeded him as artistic director, and choreographed a tribute to him, "Hymn." Some of her other notable dances included "Riverside" and "Sweet Release." Dancing Spirit was the title of her autobiography.

Twyla Tharp (1941-)

This dancer began as an aspiring ballerina at the American Ballet Theatre School, but then trained under notable modern dancers Martha Graham, Merce Cunningham, Alwin Nikolais, and Paul Taylor, at whose company she made her professional debut. She began to expand her training into jazz, tap, and social dance, although always maintaining the discipline she learned in classical ballet. By the time she wrote her autobiography, Push Comes to Shove, she had created an impressive body of work as a choreographer. She choreographed "Deuce Coupe" to music by the Beach Boys for the Joffrey Ballet. She choreographed Mikhail Baryshnikov in "Push Comes to Shove" for American Ballet Theatre. She also choreographed "Brief Fling," "How Near Heaven," and "Americans We" for the ABT. She used Philip Glass's prestigious music to choreograph "In the Upper Room." For the Hubbard Street Dance in Chicago, she choreographed "I Remember Clifford," and for the Paris Opera Ballet, she created "Grand Pas: Rhythm of the Saints." She was also an artistic associate for the American Ballet Theatre.

Martha Graham (1893-1991)

Martha Graham trained at the Denishwan School , danced briefly on Broadway, then began to create independently. She developed a technique for modern dance that significantly changed and improved what Denishawn had begun. It was based on contraction and release, grounded connection and breathing, and angular shapes in space with the body. Her theatrical sets, lights, and costumes were abstract and symbolic. Noted composers Aaron Copland and William Schuman composed music especially to accompany her dances, as in "Appalachian Spring" and "The Witch of Endor," respectively. Some of her important original dances include "Primitive Mysteries," "El Penitente," "Deaths and Entrances," "Every Soul Is a Circus," "Letter to the World," and "Clytemnestra." She also choreographed Igor Stravinsky's the "Rite of Spring."

Important Choreographers

Rudolf von Laban (1879-1958)

Laban is best described as a ballet master and theorist. He is considered the father of modern dance in Europe, but more importantly, he invented the most common method of notation for dance choreography. He called it eukinetics, when he devised it in Kinetographie Laban, but it has since been renamed Labanotation. Interestingly, it is still used by physiotherapists and many other non-dance industries as a system of recording human movement.

Bob Fosse (1927-1987)

Bob Fosse was best known for his choreography on Broadway. His movements were sharp, staccato, and unique. Thrusts, leans, pops, rolls, and general razzle-dazzle were common in his pieces. He received his dance training in Chicago, where he was born. He won Tony Awards for his choreography in "Pajama Game", "Damn Yankees," and "Pippin." He is also remembered for his choreography in "How to Succeed in Business Without Really Trying" and "Sweet Charity." He also choreographed for two movies that won Academy Awards: "Cabaret" and "All That Jazz."

Jerome Robbins (1918-1998)

Jerome Robbins was one of the most-remembered choreographers on Broadway. He went to NYU, and then danced on Broadway himself. He first danced at American Ballet Theatre (Ballet Theatre at the time) where he soloed and then choreographed "Fancy Free." His first ballet was performed to the music of famous composer Leonard Bernstein. The piece later became a full musical, "On the Town." He went on to choreograph musical theatre shows including "Call Me Madam," "Look, Ma, I'm Dancin'," "The King and I," "Bells Are Ringing," "Gypsy," "Fiddler on the Roof," and most notably, "West Side Story." He redid excerpts of these shows in the musical revue, "Jerome Robbins' Broadway." He taught and worked at New York City Ballet for many years, while still choreographing ballets for that company, as well as the Ballet Theater, and the company he founded, Ballets: USA.

Some Famous Ballets - Synopses

Coppelia

Swanilda enters the town square to see Coppelia, a young girl, reading on a balcony. She tries to get her attention, but Coppelia doesn't notice her. Then Swanilda's lover, Franz, enters and blows Coppelia a kiss. Even though she ignores him, Swanilda gets jealous. It is announced that the Burgomaster will grant dowries to any young couples that want to get married. Everyone celebrates, during which Dr. Coppelia is whisked away by the celebrators. He drops the key to his shop. Swanilda and her friends find it and break in. Franz uses a ladder to climb in the balcony. They discover that the room is full of life-size dolls. Dr. Coppelius comes back and everyone but Swanilda and Franz run away. She runs into Coppelia's chamber and hears Franz pleading for Coppelia. Dr. Coppelius gets him drunk, and then brings in Coppelia. He doesn't know it is Swanilda who has switched clothing with the doll in order to be Franz' beau. He believes he is bringing his doll to life as he puts a spell on her and she dances. Unfortunately, though, she is clumsy and ruins everything in the room. She and Franz leave together. When Dr. Coppelius discovers Coppelia is still there, he breaks in on Franz and Swanilda as they are trying to get their dowries to be married. Swanilda tries to pay him for the damages with her dowry, but the Burgomaster gives him a bag of gold instead and they marry and live happily ever after.

Don Quixote

Don Quixote and Sancho Panza go looking for the ideal woman, Dulcinea. In Seville, they meet Kitri, who is in love with a man named Basilio. However, her father, Lorenzo, has arranged her marriage to Gamache. Don Quixote mistakes Kitri for his Dulcinea. Kitri and Basilio sneak off. Don Quixote and Sancho Panza follow them. Lorenzo and Gamache follow the young lovers separately. Don, Sancho, Kitri, and Basilio end up at a gypsy camp, and Ducinea appears to him in a vision that makes him realize Kitri shouldn't belong to him, but to Basilio. He tries to divert Lorenzo and Gamache when they arrive. But the lovers are still discovered and Kitri is forced to accept Gamache. When he hears this, Basilio kills himself, but Kitri begs Don Quixote to convince her father to let her marry Basilio's corpse. Basilio, however, is revived to life just then and Lorenzo allows her to marry him. The whole community celebrates, Don Quixote congratulates the lovers, and goes on to more escapades elsewhere.

Giselle

In this ballet, set during the Wine Festival in the Rhine, Count Albrecht disguises himself as a peasant named Loys, and courts Giselle. However, Hilarion, the village huntsman, is in love with her also and suspects Count Albrecht's dishonest plot. Giselle is proclaimed Queen of the Wine Festival. When Count Albrecht is finally exposed, the shock is too much for Giselle to bear and she goes crazy and dies of a broken heart. She is initiated into the Wilis, maidens whose fiancés failed to marry them before they died. They are fated to walk the night between midnight and four, trapping any man they come across and compelling him to dance until he dies. Hilarion comes looking for Giselle, and dies in this manner. Albrecht also visits her grave, and at first is forced to dance, but Giselle is able to save him by dancing with him until she loses her powers at dawn and he stays alive.

The Nutcracker

This play revolves around a girl named Clara. Her Godfather, Drosselmeier's, gives her a special Christmas gift, a Nutcracker. Clara wants to play with it, but the family makes her go to bed, so she sneaks down afterwards, but falls asleep and her magical adventure begins. The Mouse King whisks her off to his kingdom. The Nutcracker and his army come to save her by fighting the Mouse King's regiment. The Nutcracker wins, and becomes Clara's prince. He whisks her away to his enchanted palace, first trekking through the land of the Snow Queen, Snowflakes, and Candyland, where they meet the Sugar Plum Fairy and some waltzing flowers. She doesn't want to leave, but she wakes up on Christmas, still retaining her memories.

Sleeping Beauty - music by Peter Ilyitch Tchaikovsky

This story is similar to the version you might already be familiar with, but some details are changed. This ballet starts out at the Christening of Princess Aurora, the daughter of King Florestan and the Queen. Fairy godmothers bring magic gifts. Unfortunately, right before the Lilac Fairy can give her gift, the Fairy Carabosse, angry because she didn't receive an invitation, arrives and predicts that the princess will die by pricking her finger on a needle. The Lilac Fairy softens the curse, so that the princess will only fall into a hundred-year sleep, after which she will be revived by a Prince's kiss. On her 16th birthday, a stranger (Carabosse in disguise), gives her a spindle, and she pricks her finger as predicted. The Lilac Fairy casts a sleeping spell over the entire palace, which is covered by a forest. After 100 years pass, Prince Desire goes hunting. He stops to daydream about his ideal woman, when the Lilac Fairy gives him a vision of Aurora and takes him to where she is asleep. He breaks the spell with a kiss, and they are married. The Lilac Fairy blesses their wedding.

Swan Lake

This opera features Prince Siegfried's celebration of his 21st birthday, on which his Queen Mother has declared he must choose a mate from one of six eligible princesses she has chosen. To celebrate his coming of age, he goes hunting and almost shoots a swan that suddenly transforms into a beautiful girl, Odette. She tells him she was a Princess who was turned into a swan by an evil Sorcerer. She can only be human at night, unless a young man swears eternal faithfulness to her and marries her, in which case the spell will be broken. If he goes back on his word, she will be doomed to be a swan for all eternity. The Sorcerer who cast the spell appears, and Prince Siegfried almost kills him, but Odette warns him that if the Sorcerer dies before the spell breaks, she will die as well. She turns back into a swan and he attends the ball his mother planned, dancing with all the maidens, none of whom please him. Then, a beautiful princess, Odile, appears, accompanied by a Baron. The Prince declares his love for Odile, not realizing Odile and the Baron are really Odette and the Sorcerer in disguise. Odette reveals her trick and goes back to the lake to die by morning. The Prince chases after her, begging to be forgiven, but there is only one way they can be together. Odette must kill herself or stay a swan for eternity. The Prince dies with her when they both throw themselves into a lake. This action ends the Sorcerer's power over them, and they live together in the afterlife.

La Sylphide

This ballet was created in 1832 by the father of Marie Taglioni. She played Sylphide, a fairy being who was obsessed with and destroyed by her own obsession with a mortal man. In this ballet, Taglioni wore a long white gauze skirt with wings, which became a new dance style, known as "ballet blanc" or "white ballet."

Common Dance Steps

***Ballet** - Most ballet classes begin at the **barre**. This is a long wooden railing that the students use to keep their balance while they do technique exercises.

Positions - There are five foot positions in ballet.

First -Heels are placed together and both feet are turned out in the opposite directions.

Second - Heels are positioned moderately or widely apart with both feet turned out in opposite directions.

Third – The left foot is placed in the original position; the heel of the right foot is placed at the instep of the left foot.

Fourth - Both feet are turned out with one foot far in front of the other.

Fifth - Both feet are turned out with the heel of the front foot touching the toes of back foot.

Plies - This word means to bend. The dancers bend their knees while their feet are in the positions above.

Demi-Plie - This is a half plie, meaning that the dancer only bends his or her knees halfway, so their heels don't leave the floor.

Grand Plie - This is a big plie when the dancer bends completely, and in most positions, the heels come up off the floor.

Tendues - In this exercise, dancers stretch and point their feet.

Degagee - This is a tendue in which the foot comes off the floor.

Frappe - This means to strike the floor with the foot.

Ronds de Jambe - This movement makes a semicircle with the foot and the floor and warms up the hips.

Adage - In this exercise, one leg is held up in the air to build strength throughout.

Grand Battements - This term means "big beats," and refers to a series of large kicks.

After this warm-up, class proceeds to **centre** work. First, some of the above exercises are done, now without the aid of the barre for balance. Next, the dancers may do some of the following movements.

Arabesque - This is one form of adage.

Pirouettes - In the most typical type of pirouette, the dancer keeps one leg (the supporting leg) straight but turned out, and on pointe, and turns out her working leg

so that the knee faces to the side. She rests her working foot (pointed of course) next to the knee of the supporting leg.

Turns - There are two directions to turn a pirouette. If the dancer turns away from the working leg, it is called **en dedans**. If she turns towards it, it is called **en dehors**.

Fouette - A fouette turn is a complicated pirouette in which the working leg goes out to the side every time, and the dancer repeats this movement continuously.

Chenes - These are fast, turning spins to one side, in which the dancer **spots** (focuses on one point, whipping her head around to the same point each time) to keep going in a straight line.

Petit Allegro -These are small jumps. They include: **sautes** (jumping off of two feet and landing on two feet), **changements** (jumping from third or fifth position from two feet onto two feet, but switching which leg ends up in front) **sisonnes** (jumping from two feet to one foot) **jetes** (jumping from one foot to the other), **temps leves** (jumping and landing from and to the same foot),

If the dancer closes his or her legs in the air and then opens them before landing again, it is said that the jump is "beaten."

Tours en l'air -This is typically a man's jump in which he turns twice in the air.

Grand Jetes - These are split jumps, or large leaping jumps.

Pointe -After warm-up exercises, female dancers will have a pointe class in which they repeat all these exercises, but en pointe. **En Pointe** means the dancer is wearing pointe shoes, which are made of burlap and resin, with a stiff sole that helps the girls stand on their tiptoes, but also cause many blisters and other pains to the dancers' feet.

Pas de deux - This phrase is translated as "step of two," and means to dance with a partner. The man becomes a base for the woman, to show her off. There are four major types of moves in a pas de deuz.

Promenade - In this move, the woman goes on point and the man walks around the woman, while turning her.

Lift - The man lifts the woman.

Turns - It is almost always the woman who turns, usually in a pirouette. With the man behind her to keep her balanced, she can do longer and more complicated, impressive turns.

Jumps - In these, the woman jumps, and the man either assists her in gaining more height, or the man can catch the woman.

*****Jazz**

Jazz is a hybrid type of dance, which incorporates many modified steps from ballet and other popular dances, with other steps added, too. Here are some representative moves you should know in jazz dance.

Grapevine - Take a step with the right foot to the right, then cross left foot behind, step right again, then move left leg to put feet together. This works in both directions.

Box Step - Step with the left, then cross your right leg in front of your left leg. Step back to the left with your left leg, then back to the right with your right leg. You can start on either foot.

Jazz Hands - This is a specific arm position where the fingers are open on the hands, and the palms face out to the audience.

Step Ball Change - This is exactly as it sounds. Take a step so the weight is on that foot, change the weight onto the ball of the foot behind. Then transfer the weight onto the front foot.

Fan Kick - Kick one leg high in a circle in front of you.

Hitch Kick - Bring one knee up bent, then kick the supporting leg out instead, landing on the first leg.

Head roll - Roll head.

Hip roll - Roll hips.

*****Tap**

Most tap dancers also have a background in ballet or jazz, so many concepts are similar as far as turning and stepping.

Clap - People often clap in tap dance.

Snap - People often snap in tap dance.

Stomp - This is what it sounds like. You put the whole foot down, but without changing weight.

Stamp - This is different from a stomp, because you step with the whole flat foot, but you do change weight.

Brush- In this basic move, you brush the floor with the ball of your foot.

Flap - This is a forward brush with the ball of the foot, followed by setting down the ball with the weight on it.

Shuffle - This is one of the most important moves in tap, and is a brush forward and back with the ball of the foot.

Toe - This means you hit the floor with the actual toe of your shoe.

Heel - This means you set down your heel, which creates a specific sound.

Ball Change - This is the same as in jazz dance.

Time Steps - There are almost infinite types of time steps in tap. They are done in specific rhythm and sequence.

Cramp Roll - This makes a military sound, and drops the toe of the right, toe of the left, heel of the right, heel of the left in quick succession.

Riffs - This is a sequence of brushes and heels.

Wings - This move looks like a fast vertical snow angel.

Hop - In a hop, you jump, but land on the same foot.

Jump - The difference between a jump and a hop is that in a jump you land on the other foot.

Turns - There are many turns in tap dance, that have been modified from ballet and jazz.

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STUDY GUIDE:
ART TERMS

Abstract - This type of art is the opposite of representational, which aims to reproduce reality. In abstract art, objects do not look like they really appear. Cubism is one form of abstract art. Often there is no identifiable subject at all, as in "non-objective" art.
Achromatic - This is a term for artwork done in black, white, or gray. Lead pencil sketches and charcoal drawings are achromatic.
Acrylic - This water-based paint has a "plastic" quality and is thicker than watercolors and tempera.
Acrylic Solution - This type of binder, formed by placing acrylic resin in a solvent, causes an acrylic paint to behave more like an oil paint than one made with acrylic emulsion binders.
Adjacent colors - Colors that are next to each other on the color wheel. They are also called analogous colors. There are three or more colors that are included in an "adjacent run."
Aesthetics - Aesthetics refers to one's personal philosophy or idea of beauty in art.
Analogous colors - These related colors sit next to each other on the color wheel because they have a color in common. They are also called adjacent colors.
Anhydrous - This term indicates that something is without water.
Armature - The framework or structure on which a sculpture is built.
Art Deco - This art style was popular during the 1920s and the 1930s. Artists used decorative motifs from other cultures, such as the French, African, Aztec, or Chinese.
Art Nouveau - An 1890s style of art that used asymmetrical decorative elements derived from objects found in nature.
Artist Proof - This is a print that the artist has pulled from a set of limited editions for his or her own personal use. They are marked with an AP and are highly prized by art collectors.
Asymmetry - Asymmetry is the opposite of symmetry. An asymmetrical picture does not have bilateral or radial symmetry.
Avant Garde - A descriptive term for art that departs from the norm and is different from the other art of the time.

Balance - Elements in a work of art are arranged or designed either symmetrically or asymmetrically according to this principle of art.
Baroque - This 17th century style of expression involved flamboyant ornamental forms. Nobles commissioned this type of art because it showed off their wealth. Catholic authorities encouraged painters to use this style, hoping ornate portrayals of religious icons would foster a renewal of Catholicism. Rembrandt and Rubens were two notable artists who frequently utilized this style.
Bas-relief - Figures project outward from the background in this form of sculpture or art.
Batik - Paraffin or beeswax is applied to paper or fabric in an interesting design. The paper or fabric is then dipped into paint or dye, which covers the part that contains no wax.
Binder - This adhesive substance in paint affixes the pigment and the paint film to the canvas.
Bisque - Bisque is clay that has been fired in a kiln and can no longer become malleable by the adding water.
Black - Black is the absence of light, or the absorption of all light.
Bleeding - Bleeding occurs when a dark color penetrates through a lighter color. When we talk about bleeding, we say one color "runs" into another color.
Blending - This is the process of smoothing the separation between two colors on a painting so that they flow gradually into each other.
Brushes - These tools are used to apply paint. There are several different varieties of brushes: 1.) flats, which have a long bristle and a square edge; 2.) brights, which have a flat, square edge, and long sable; 3.) rounds, which have pointed bristles; 4.) longs, which have a long sable and a square edge, and 5.) filberts, which have a flat, but oval edge and a long fiber.
Brushwork - The stylistic way a particular artist applies paint to canvas.
Bust –A sculpture that shows only the shoulders, neck, and head of the subject.
Calligraphy - The art of fancy handwriting.
Canvas - The fabric surface on which painters paint. It is sold by the yard, on frames, and in panels.
Capital - The top portion of an architectural column. There are three main types of capitals: Corinthian, Doric, and Ionic. Sculptured leaves are found on a Corinthian capital. The Doric capital is very plain, and the Ionic capital has scroll shapes.
Caricature - A sketch that exaggerates a physical trait of a person to make the quality appear ridiculous.
Casting - Casting requires plaster to be mixed with water and poured into a mold where it hardens and is removed as a solid piece.
Ceramics - This art form is used when molding and firing clay.
Charcoal - This stick crayon produces a dark line on a drawing, and it smudges easily.
Chiaroscuro - This was originally a 16th century technique of wood-cutting that involved various blocks that printed various tones of the same color. It can also refer to the print that results from this technique. Now, the word also refers to the use of light and shadows to create a mood or focal point for a painting.

Chroma - This is the purity of a color. Paint that is applied directly from the tube would be in the state of "full chroma."
Cityscape - A painting or picture of a city.
Closed - In a closed sculpture, the subject's arms are folded or held close.
Collage - In this art technique, pieces of random materials such as magazines and other everyday items are overlapped and glued onto a picture to create an interesting design or abstract art creation.
Color - Color is a function of light. White light consists of all the colors of the spectrum mixed together. An object's color depends on whether it reflects or absorbs light. The color an object appears is the color of the wavelength it reflects. If it absorbs all wavelengths of light, it will look black. If it reflects them all, it will look white.
Commission - This is the ordering of a work from an artist and the agreement to pay for it.
Complementary Colors - These color pairs do not share common colors, so they are found across from each other on the color wheel. Red is a complement of green. Blue is a complement of orange, and yellow is a complement of purple.
Composition - The way in which line, color, and form are arranged.
Contour drawing - This is the outline of an object's edge.
Contrast - This refers to variations, opposites, and differences between areas in a work of art. It is the juxtaposition of two dissimilar textures or lights.
Cool Colors -This family includes the greens, blues, and violets.
Crackle glaze - Spindly decorative cracks in the glaze of ceramics into which color is often inserted.
Cubism -This art movement used geometric designs to represent ideas or subjects. Pablo Picasso was one of the more famous Cubist painters.
Decoupage - This art form entails cutting out shapes of paper and applying them to a surface as a collage. The paper pieces are then covered with a shellac or varnish to seal and protect them.
Designer Colors - These high-quality paints are usually used for commercial work.
Dilutents - These liquids are used to dilute paint. Oil paints are diluted with turpentine, and water-based paints are diluted with water.
Dominance - The figure or color that stands out because it is the most obvious thing in comparison with the rest of the painting.
Dry Brushing - This method of painting uses a greater percentage of pigment than water.
Dry Mount - In this framing method, a painting is mounted and glued directly to a stiff background with a dry adhesive to prevent buckling.
Earthenware - This type of clay is not waterproof and must therefore be glazed.
Easel - A three-legged stand that holds the canvas while the artist paints.
Edition - The number of prints of a painting that have been reproduced from an original, excluding artist proofs or special editions.
Elements of Art - There are 10 elements of art. They are the following: color, value, line, shape, form, texture, direction, scale, dimension, and space. These elements are the building blocks an artist uses to create a work of art.

Encaustic - This word refers to an ancient technique in which paint was blended with wax and literally burned onto a wall with the assistance of an iron-like tool.
Expressionism - A style of art based upon the artist's emotions. Vincent Van Gogh was one of the first artists to use this style and Henri Matisse also used it extensively.
Film - A thin layer of paint.
Firing -The process of hardening clay in a kiln by subjecting it to a high temperature.
Fixative Spray - This solution made of alcohol and shellac is sprayed onto drawings to prevent them from smudging or to make medium particles stick to the canvas or surface.
Flying Buttress - These external, arched supports for a wall or church were commonly found in Greek architecture.
Focal Point - The part of the painting or artwork that first draws the viewer's eye.
Form - This includes three-dimensional objects, such as cubes, cones, spheres, prisms, pyramids, or cylinders.
Free-standing - This refers to a piece of sculpture or artwork that stands by itself and can be viewed from all sides.
Fresco - In this relatively permanent method of wall decoration, paint was applied directly to moist plaster. It was commonly used in early art murals. Leonardo Da Vinci's The Lord's Supper is one of the most famous frescos.
Fugitive Colors - Pigments that fade when exposed to light.
Gesso - Similar to ground, this mixture of chalk, white pigment, and glue is the bottom layer applied to support a painting.
Glaze - This clear, protective coating is applied to a painting or to ceramics at the bisque stage before the work is refired.
Graffiti - A 1970s art form that was initially done by street teens in the New York. Subways. Today the term refers to any writing or illustrations that appear on walls or in other public places.
Greenware - This is the stage of clay before it has been fired. At this point, the clay is hard, but it can be made malleable again with the addition of water.
Ground - This is a bottom coat of paint applied to a canvas to prepare it for the paint.
Gum - This substance is derived from plants, is soluble in water, and is used in watercolors.
Highlights - The areas in a piece of art that reflect the most light.
Hue - The color of an object.
Illustration – A drawing or sketch that often accompanies words.
Image - A picture within a work of art.
Impasto - In this style of painting, the paint is applied so thick that a relief texture is created.
Impressionism - This late 19th century art style entailed dabbing unmixed primary colors to simulate light. Monet, Degas, and Renoir were important Impressionist painters.
Intensity - The dullness or brightness of colors or artwork.
Intermediate Colors - These are formed from the mixture of one secondary and one primary color. When blue is mixed with the secondary color green, an intermediate color of blue-green is created.

Interpretation - This is the viewer's idea of what he or she sees in a piece of art.
Ionic - This ancient Greek style of architecture was characterized by column tops composed of two spirals rotating in opposition.
Kiln - The oven in which ceramics are fired.
Lake - A type of dye that won't bleed because it is chemically attached to a particle.
Landscape - A painting that shows scenery.
Leaching - The technique whereby excess liquid is extracted from a work of art by using a porous material.
Lean - This type of paint has been thinned with a spirit, so it has a very low oil content.
Lightfast - This adjective describes something that cannot be altered by light or will not fade.
Line - This continuous path can be linear or curvilinear, horizontal or vertical, and angled or diagonal.
Linear Perspective - This mathematical technique arose during the Renaissance to create the illusion of depth in a painting. The artist establishes a vanishing point on the horizon by using slanted lines that lead to it.
Linseed - Linseed is used as a binder in oil paints.
Lithograph - In this popular printing method, the publisher photographs an original, which is then burned into four plates for a full-color, inking process. Lithography also refers to a more primitive printing style that was done on stone or metal.
Loom State - A canvas that has not be prepared or primed.
Louvre - A huge art museum in Paris, France. Many famous pieces of art are housed here, including The Mona Lisa, Whistler's Mother, and Venus de Milo.
Madonna - A synonym for The Virgin Mary when she is portrayed in paintings.
Marouflage - These mural-size paintings are done on fabric or paper, and then they are attached to a wall or other vertical surface with glue.
Mat - A stiff window-frame piece of cardboard that is used to protect a print when framing. It creates a border between the frame and the piece of art.
Matte - This surface is dull or flat, as opposed to glossy.
Media - This is the plural of medium.
Medium - The material that is used to create a piece of art. Popular media are paint, clay, bronze, marble, or charcoal.
Metropolitan Museum of Art - A major art museum in New York City.
Migration - The movement of a pigment through a dried film that's been applied either under over it.
Mixed Media - The artist has employed several different materials to create his work of art.
Mobile - Alexander Calder is credited with the invention of this free-moving, suspended, three-dimensional piece of art that consists of a variety of shapes. Mobiles can hang from the ceiling, stand by themselves, or can be affixed to the wall.
Monochromatic - An adjective that describes a work done in only one color. Thomas Gainsborough's Blue Boy is a monochromatic piece of art.

Mosaic - An artwork in which miniature pieces of glass, tiles, marbles, or other assorted materials have been inserted into cement to form a picture or abstract design.
Mural - Any painting done directly on a wall.
Naturalism - An attempt to recreate nature as it really is.
Negative Space - The area around an object in a piece of art.
Neutral Colors - These are the earth tones such as white, gray, black, tan, and beige. They rarely appear on a color wheel. They can be created by combining black and white, complementary colors, or all three primaries added to black or white.
Newsprint - This is an inexpensive type of art paper that eventually turns yellow.
Numbered - This is the number of the print and the size of the edition. Originally, the earlier prints were higher quality, but that is no longer the case with modern printing technology.
Oil Paint - Jan van Eyck invented this type of paint. It contains a resin that is derived from vegetable oil, dries slowly enough to capture details, and is thick enough to create some texture.
Open - In this type of sculpture, the subject's arms are raised or held outwards.
Open Edition - An unlimited quantity of prints made of a piece of art.
Origami - The Japanese art of paper folding.
Original - The one and only actual painting or artwork from which reproductions are made.
Palette - This is the selection of colors from which an artist chooses or the surface on which he mixes them. Artists are often pictured standing in front of an easel with a paintbrush in one hand and a palette in the other.
Paper Mache - In this medium, glue, paste, or another binder is mixed with strips of paper to form mulch that is applied to a surface to create thickness or shape.
Pastels - Pastels are color sticks, either oil- or chalk-based, that are used for drawing. Mary Cassatt and Edgar Degas both employed many pastels in their work.
Patina - Although it originally referred to the green that appeared on bronze over time, it now means the effect of exposure or age to a surface.
Patron - The person who commissions an artwork.
Pencils - These drawing or sketching tools are grouped according to the type of lead. The harder the lead, the sharper the line.
Pens - These instruments produce lines in various colors or widths.
Pentimento - Old paintings were done with pigments that contained lead. Over the years, the bottom layers have become visible below the top layer, which grew transparent.
Perspective - This technique uses converging lines to create the illusion of depth or three-dimensionality. It can be **linear**, meaning objects get smaller as they retreat, or **aerial**, meaning that objects in the background appear blurry or indistinct.
Pieta - Michelangelo painted a picture of The Virgin Mary holding the dead body of Jesus and entitled his work Pieta. The term generally refers to any painting or drawing that shows The Virgin Mary mourning over Jesus' dead body.

Pigment - This is the part of paint that provides the color. Pigments were originally derived from the powder of plants, clay, or minerals, and mixed with a "binder" such as egg, oil, water, or resin. One color of red contained sulfur and mercury, and a certain blue required a stone called lapis lazuli. Gold required the use of real gold. Pigments are engineered chemically today.
Pinch Pot - This is a ceramic or earthenware pot formed by pinching a ball of clay to create the interior hole.
Plaster - A powder that's mixed with water to create solid sculptures.
Pop Art - This vivid movement started in Britain and influenced American artists of the 1960s. Artists incorporated popular culture into their art, borrowing comic book styles or advertising elements. Roy Lichtenstein's comic book prints and Andy Warhol's paintings of Marilyn Monroe and of soup cans are representative of this style.
Porcelain - Special materials, such as kaolin, silica, and feldspar, that are shaped and fired. Once they are fired, they resemble glass.
Portrait - A work of art depicting a person. It can be done with the model facing the front, the side (called a profile), or in three-quarters which is halfway between the two.
Precipitate - Dyes can be attached to this type of particle without bleeding.
Primary Colors - The colors red, yellow, and blue, from which the other colors are derived.
Primer - This preparatory coat of paint is usually white.
PVA - This acronym stands for polyvinyl acetate, a manmade resin that's contained in varnishes.
Relief - In this type of sculpture, forms and figures are projected outward from the surrounding plane. This term can also refer to the sharpness of a contrast. High relief designates a three-dimensional effect attained by deep cuts. Low relief entails shallow cuts.
Remarque - The artist's original sketch. Collectors consider these as very valuable.
Renaissance - This European period between the 14th and 17th centuries in Italy was marked by great intellectual and artistic advances. The word literally translates as "rebirth," and also refers to the architectural style of this period.
Resins - These transparent polymers are the basic components of paints.
Rhythm - This repetition of elements suggests motion in a piece.
Rococo - This 18th century art movement came out of the Baroque movement and was prevalent in luxurious architecture, tapestries, and decorative ceramics as well as paintings. Subjects included beauty and nature, and classical mythology, but the presentation was subtler than Baroque.
Scumbling - The application of a thin coat of see-through or somewhat translucent paint over other paint to change the look without completely obliterating it.
Secco - A painting that is done on dry plaster.
Secondary Colors - This term indicates the combination of two primary colors to create a new color. The new color is called the secondary color, and the three secondary colors are violet, orange, and green. Red and blue are combined to form violet. Blue and yellow create green. Red and yellow create orange.

Shade - Any color that has been mixed with black to create a darker color.
Shape - This includes any two-dimensional figure created with lines, such as circles, squares, triangles, ovals and other forms. Shapes can be **geometric**, meaning they appear to have been made with a drawing tool, or **organic**, meaning they are **free-form** or irregular. They can also be **biomorphic** (living) or **geometric** (nonliving).
Shellac - This yellow resin is obtained from insects and used in varnishes.
Silicate - This material is formed from metal, oxygen, and silicon. Sand is a silicate.
Sketch - A quick pencil drawing.
Slip - A form of liquid clay that is sometimes used to join pieces of clay together or to fill in gaps.
Space - This can be **negative** or **positive.** Negative space refers to the area around the figure, while positive space refers to the figure itself.
Spectrum - When a beam of white light is broken up into hues by a prism, a band of colors called the spectrum appear. The colors in the spectrum are red, orange, yellow, green, blue, indigo, and violet. These colors can be remembered in order by remembering the name of a man called ROY G. BIV. A rainbow is a spectrum that has been created by the passage of light through water droplets in the air.
Squaring Up - A technique that is used when changing the size of an image.
Stencil - A cut-out pattern used when transferring the pattern to fabric or other surfaces.
Still life - A painting in which the subjects are non-moving objects, such as fruit, vases, or flowers.
Stoneware - A sturdy type of waterproof clay.
Study - A detailed drawing or examination of a portion of a composition.
Subject - The message conveyed by a work of art.
Subtractive - The opposite of additive. This term refers to a type of creation in which art is formed by carving away, as in a marble sculpture.
Symbolism - This is the deeper meaning found within a picture or image.
Symmetry - One side of a symmetrical figure appears equal to its other side.
Tapestry - This hand-woven textile featured complicated designs or pictures and was common in the 15th century. It was often displayed on walls.
Tempera - This term applies to the oldest form of paint, in which powdered pigments from plants, clay, or minerals were mixed with eggs to create a rapidly-drying paint. Because it dried so quickly, it discouraged experimentation and change. This term also refers to the binder that's added to pigment to create paint. Today the term is also used to refer to the opaque paints used by youngsters in elementary schools.
Terra Cotta - This clay is typically brownish-orange in color.
Tertiary Colors - The colors that result when secondary colors are mixed.
Texture - A term that describes how a piece of art feels to the touch.
Tint - The addition of white to a color to make it appear lighter. Tint is an antonym for shade.
Toner - This type of dye can bleed through dried paint film.
Traction - This is the movement of one layer of oil paint over a second layer.
Turpentine - This solvent is used to clean brushes or to thin paints.

Underpainting - The process of "laying in" a base of monochrome before doing a painting in oils.
Urn - An ornamental vase.
Value - The degree of darkness or lightness that is obtained by mixing shades and tints.
Vanishing point - The place in a drawing where the slanted perspective lines seem to come together in the distance.
Varnish - A protective coat of liquid that covers wood or a piece of art and dries to form a protective film.
Volume - The space filled by a figure in a composition.
Warm Colors - The family of colors that include red, orange, and yellow.
Wash -This highly diluted layer of paint is applied with a broad stroke, and may leave a transparent finish.
Watercolor - A water-based paint, or a painting done with water-based paints.
Wet on Wet - Paint is applied to a painting that is still wet.
Wheel Thrown - Wheel thrown describes the process by which ceramic objects are formed from clay, placed on a potter's wheel, and shaped as they spin.
White Spirits - An oil paint thinner that has replaced turpentine.

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STUDY GUIDE:
CHEMISTRY

Chemistry is the study of MATTER. Matter is anything that has mass and volume (takes up space), and everything in our world is matter, even air. The person who studies chemistry is called a CHEMIST.

Elements are the basic building blocks in chemistry. They are made only of themselves, and composed of ATOMS. Gold is an element. It is made of only gold atoms. Hydrogen is an element that is composed of only hydrogen atoms. No two things can be joined to make an element, because they are only composed of one type of atom.

ALL ATOMS ARE ALIKE IN THESE WAYS:

1. Each atom has a central core called the NUCLEUS. The nucleus holds the PROTONS and the NEUTRONS. The protons are particles that have a positive (+) charge. The neutrons have no charge. They are neutral and are placed in the nucleus to add weight to the atom.

2. Each atom has electrons that spin around the nucleus in shells, or energy levels. The electrons have a negative charge and have no weight.

   The first shell, or energy level, can hold only up to two electrons. The second shell can hold up to 8 electrons, and the third shell can hold up to 18 electrons.

3. Electrons are held in their shells by the pull of the positive protons within the nucleus. AN ATOM IS BALANCED IF THE NUMBER OF PROTONS AND THE NUMBER OF ELECTRONS ARE THE SAME.

If an atom loses an electron, it is no longer balanced. It is now positively charged, because there are more (+) charges within the nucleus than there are (-) charges traveling around the nucleus in the shells. The atom is now called on ION, because it is no longer balanced.

If an atom gains an electron, it is no-longer balanced. It is also called an ION because now it has more (-) charges circling in the shells than it has (+) charges within its nucleus.

The 3 parts of an Atom: Protons, neutrons, and electrons.

The parts of the Atom in the nucleus: protons and neutrons.

The charges of the Atom parts: Protons (+)
Electrons (-)
Neutrons (no charge)

The parts of the Atom that have weight, or mass: protons and neutrons.

ELEMENT: something made only of itself.

ATOMS: The main component of an element.

ION: an atom that is not balanced, and has either gained or lost electrons.

ATOMIC NUMBER: The number of protons in the nucleus of an atom that identifies the kind of atom it is, by referring to the periodic table.

MASS NUMBER: The total number of protons and neutrons in the nucleus of the atom.

ISOTOPE: Atoms of the same element that have a different number of neutrons in the nucleus.

Each element is given a chemical symbol. Below you will find a list of the more common chemical elements, their symbols, and a brief description or use for the element.

OXYGEN (gas)	O	A gas needed for combustion, or burning. The gas from the air that is used in animal respiration. A fuel for rockets.
NEON (gas)	Ne	A gas used in many colored lights and signs.
CHLORINE (gas)	Cl	A poisonous gas used as a disinfectant, and in bleach. Also combined with sodium to make table salt.
SODIUM (solid)	Na	A soft metal that combines with chlorine to make table salt.
CALCIUM (solid)	Ca	Found in chalk, limestone, and bones. Needed for strong bones and teeth.
IRON (solid)	Fe	A strong metal used in building supports. When combined with oxygen, it forms rust.
TUNGSTEN (solid)	W	A metal with a very high melting point. Used as filaments in light bulbs.
PLATINUM (solid)	Pt	An inexpensive metal used in jewelry.
COPPER (solid)	Cu	A metal that conducts electricity well. Used for wires, cooking utensils, pennies, and jewelry.
ALUMINUM (solid)	Al	A light metal that does not rust. Used for airplane parts, house siding, cans and other food storage methods.
SULFUR (solid)	S	A yellow explosive solid, used for match heads, sulfuric acid, and pet powders.
ZINC (solid)	Zn	A metal used in dry cell batteries and in galvanizing to prevent rust.
SILVER (solid)	Ag	A metal that will tarnish. Used in jewelry, photography, medicines, and coins.
GOLD (solid)	Au	A soft yellow metal used for jewelry.

MERCURY (liquid)	Hg	A liquid metal that expands when heated. Used in thermometers. Poisonous!
NICKEL (solid)	Ni	A silver white metal used in alloys and for plating Other metals.
TIN (solid)	Sn	A very bendable soft white metal.
BROMINE (liquid)	Br	Used in medicines and for insecticides.
IODINE (solid)	I	A dark crystal that can be used as an antiseptic when dissolved in alcohol.
RADIUM (solid)	Ra	A radioactive metal used in treating cancer.
HELIUM (gas)	He	A gas that is less dense than air. Used to make objects rise, such as weather balloons.
HYDROGEN (gas)	H	The lightest of all the elements. The only element that has no neutrons in its nucleus.
CARBON (solid)	C	A black solid found in fuels, charcoal, and in any object that has been burnt.

ELEMENTS JOIN TO FORM COMPOUNDS:

The following objects are compounds. Each compound has a chemical formula that identifies the elements that have been combined to make that compound.

1. water	H2O	hydrogen and oxygen
2. carbon monoxide	CO	carbon and oxygen
3. carbon dioxide	CO2	carbon and oxygen
4. table salt NaCl	NaCl	sodium and chlorine
5. rust	Fe2O3	iron and oxygen
6. sugar	C12H22O11	carbon, hydrogen, and oxygen
7. sand	SiO2	silicon and oxygen
8. copper sulfate	C4SO4	copper, sulfur, and oxygen

9. hydrogen peroxide	H2O2	hydrogen and oxygen
10. hydrochloric acid	HCl	hydrogen and chlorine
11. calcium carbonate	CaCO3	calcium, carbon, oxygen
12. carbon tetrachloride	CCl4	carbon and chlorine

HYDROCARBONS are compounds composed of only the elements carbon and hydrogen.

The following are common hydrocarbons and their formulas:

Butane	C4H10	portable stoves, heaters
Methane	CH4	cooking gas
Octane	C8H18	occurs in petroleum
Propane	C3H8	bottled gas

MIXTURE: two or more elements or compounds that are mixed together, but can be easily separated, like iron filings and sand, or tossed salad.

SUSPENSION: a mixture of two or more substances that do not dissolve, but can often be separated by settling or filtering.

SOLUTION: a mixture of particles where one or more of the substances is dissolved in the other.

SOLVENT: the substance that dissolves the other substances in a solution.

SOLUTE: the substance that is dissolved by the solvent in a solution.

EXAMPLE: Salt water is a solution. Water is the solvent and the salt is the solute.

SATURATED SOLUTION: A solution that is filled with solute and no more can dissolve at that pressure or temperature.

EVAPORATION: the process by which fast moving molecules escape from a liquid and change into a gas.

CONDENSATION: process by which a gas changes into a liquid.

SUBLIMATION: process by which a gas is changed directly to a solid.

EMULSION: a suspension of two liquids.

Acid: a chemical substance that releases hydrogen ions in water, or that reacts with metals to release hydrogen.

Base: a chemical substance that releases hydrogen and oxygen to form a hydroxide in water.

Properties of Acids:
1. Tastes sour
2. Conducts electricity
3. Neutralizes bases
4. Turns litmus red

Properties of Bases
1. Tastes bitter
2. Conducts electricity
3. Neutralizes acids
4. Feels slippery
5. feels slippery

Uses of Acids:
1. Cleaning products
2. In batteries
3. Etching
4. Found in citrus fruits
5. React with metals to release Hydrogen

Uses of Bases:
1. Soap
2. Milk of magnesia
3. Glass
4. Ammonia solutions
5. Do not react with metal

Examples of Common Acids:
1. Citrus fruits
2. Vinegar
3. Carbonated water
4. Stomach Acid

Examples of Common Bases
1. Antacids for stomachs
2. Baking soda
3. Soaps

Indicators that can identify acids and bases by creating color changes are tea, red cabbage, litmus, bromthymol blue, and methyl orange.

INDICATOR	COLOR IN ACID	COLOR IN BASE
1. litmus	turns blue to red	turns red to blue
2. bromthymol blue	yellow	blue
3. methyl orange	red	yellow

pH scale: a range of numbers from 0 – 14 that indicate the amount of acidic or basic characteristic of a solution.

Numbers 0 – 6: ACIDS with 6 being the weakest acid and the smaller numbers being the stronger acid.

Number 7: NEUTRALS solutions are neither acids or bases. PURE water is a neutral.

Number 8 – 14: BASES with 14 being the strongest base.

When an acid and a base are combined, they neutralize each other, forming a salt and water.

THE PERIODIC TABLE: a list of the elements designed by Dmitri Mendeleev during the 1860's and 1870's, which lists the elements according to their atomic masses.

Each row is called a PERIOD. Each column is called a GROUP.

Metals are listed on the left side of the table and non-metals are listed on the right side. There are many more metals than non-metals.

CHEMICAL BONDING

Atoms are held together to form molecules by chemical bonding. There are two main types of chemical bonding: ionic and covalent.

IONIC BONDING: You should recall that an ion is formed when an atom loses or gains an electron. If a chlorine atom comes close to a sodium atom, and one of the electrons from the sodium atom is pulled into the outer shell of the chlorine atom, two different ions are formed. The sodium atom is now an ion because it has lost an electron and is now positively charged. The chlorine atom is now an ion because it has gained an electron and is now negatively charged. Negative and positive atoms attract. The two ions would bond together, forming an ionic bond, and would become a molecule of table salt, or sodium chloride.

In ionic bonding, usually a METAL and a NON-METAL join to make the bond and the METAL (like sodium) GIVES UP AN ELECTRON to the NON-METAL (like chlorine).

CHARACTERISTICS OF IONIC COMPOUNDS: Once the two ions are bonded together, they form a compound. All ionic compounds are alike in some basic ways:

1. The ions are arranged in an orderly way to form a crystal.
2. They ionic bonds are very strong and extend throughout the entire crystal.
3. Most are hard solids at room temperature.
4. They have high melting points.
5. In their solid form, they do not conduct electricity, but do conduct electricity well when dissolved in water.

COVALENT BONDING: Covalent bonding occurs when two atoms SHARE an electron, which is attracted by both nuclei, thus causing a force that holds the atoms together. Water is an example of a COVALENT COMPOUND, formed from the 2 hydrogen atoms sharing an electron with the oxygen atom. It is like two sisters sharing the same room. COVALENT BONDING USUALLY OCCURS BETWEEN TWO NON-METALS.

CHARACTERISTICS OF COVALENT COMPOUNDS:

1. Most do not conduct electricity.
2. The strength of the bonding varies. Some, like the diamond, are very hard and have a crystal type structure. Others, like sugar, are soft and melt at low temperatures.

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STUDY GUIDE:
FAMOUS INVENTORS

This study guide gives a list of famous inventors and their inventions. Many of these inventors are listed in the "Inventor's Hall of Fame."

INVENTION	INVENTOR
1. Telephone	Alexander Graham Bell
2. Telegraph	Samuel F. B. Morse
3. Wireless Telegraph	Guglielmo Macrconi
4. Phonograph	Thomas Edison
5. Television	Philo Taylor Farnsworth
6. Microwave Oven	Percy Spencer
7. Telescope	Galileo
8. Reflecting Telescope	Isaac Newton
9. Sewing Machine	Elias Howe
10. Model T Car	Henry Ford
11. Factory Assembly Line	Henry Ford

12. First motor car that was never Sold (3 wheels)	Karl Benz
13. First 4 wheel car	Gottlieb Daimler and Wilhelm Maybach
14. Carburetor	Gottlieb Daimler
15. Gas Motor Engine	Nicolaus August Otto
16. Elevator	Elisha Graves Otis
17. Nuclear Reactor	Enrico Fermi
18. Typewriter	Christopher Sholes
19. Ballpoint Pen	Lazlo Biro
20. Electric Light Bulb	Joseph Swan (England) 1878 Thomas Edison (America) 1879
21. Printing Press	Johannes Gutenberg
22. Kodak Camera	George Eastman
23. Polaroid Camera	Edwin Land
24. Miner's Lamp	Humphrey Davy
25. Fire Extinguisher (metal cylinder of water)	George Manby
26. Fire Extinguisher (first chemical)	Alexander Laurent
27. Safety Pin	Walter Hunt
28. Parachute	Leonardo DaVinci (designed) Louis Lenorand (made)
29. A gun called a revolver	Samuel Colt
30. Dynamite	Alfred Nobel
31. Machine gun	Richard Gatling
32. Geiger Counter	Hans Geiger
33. Airplane	Orville and Wilbur Wright

34. Air Conditioner	Willis H. Carrier
35. Optical Fibers	Peter C. Schultz
36. Cotton Gin	Eli Whitney
37. Steel Plow	John Deere
38. Barbed Wire	Joseph Glidden
39. First Grain Reaper	Cyrus McCormick
40. Electric Street Car	Thomas Edison
41. Microphone	Thomas Edison
42. Motion Pictures	Thomas Edison
43. Bifocal Lenses	Benjamin Franklin
44. Steamboat	Robert Fulton
45. Steam Locomotive	George Stephenson
46. Bicycle	James Staarley
47. Motorcycle	Gottlieb Daimler
48. Gasoline Automobiles	Charles and Frank Duryea
49. Escalator	Jesse W. Reno
50. Piano	Bartholomeo Cristofori
51. Vacuum Cleaner	J. Murray Spangler
52. Electric Battery	Count Allesandro Volta
53. Frozen Packaged Food	Clarence Birdseye
54. Teflon (for DuPont Corporation)	Roy J. Plunkett
55. Velcro	Georges de Mestral
56. Zipper	Whitcomb L. Judson
57. Dishwasher	Josephine Cochran

58. Matches	John Walker
59. Mercury Thermometer	Gabriel D. Fahrenheit
60. Mercury Barometer	Evangelista Torricelli
61. Pendulum Clock	Christian Huygens
62. Aqua Lung	Jacques Cousteau
63. Seed Drill	Jethro Tull
64. Spinning Jenny	James Hargreaves
65. Steam Engine	James Watt
66. Vulcanization (method of Making rubber resistant to heat and Cold)	Charles Goodyear
67. Drilled First Oil Well	Edwin Drake
68. Refrigerator	Karl von Linde
69. Railroad Car Air Brakes	George Westinghouse
70. Liquid Fuel Rocket	Robert Goddard
71. Nylon	Wallace Carothers
72. Xerox Copier	Chester Carlson
73. Television	Philo Taylor Farrnsworth
74. Disposable Safety Razor	King Camp Gillette
75. Electric Iron	Henry Seely
76. Washing Machine	Alva Fisher

MEDICAL INVENTIONS AND DISCOVERIES

1. X-Ray	William Roentgen
2. Stethoscope	Rene Laennec
3. Penicillin	Sir Alexander Fleming
4. Polio Vaccine	Jonas Salk
5. Insulin	Sir Frederick Banting
6. Ether	Crawford Long
7. Cardiac Pacemaker	Wilson Greatbatch
8. Artificial Heart	Dr. Robert K. Jarvik
9. Ambulance	Dominique Larrey
10. Discovered the bacteria that Causes tuberculosis and cholera	Robert Koch
11. Antiseptic Surgery	Joseph Lister
12. Anti-rabies Treatment	Louis Pasteur
12. First Human Liver Transplant (1963)	Dr. Thomas Starzl
13. First Human Lung Transplant (1964)	Dr. James Hary
14. First Human Heart Transplant (1967)	Dr. Christian Barnard

COMPANY AND GROUP INVENTIONS

1. Electric Toaster	General Electric Company (actually designed by Charles Strite for the company)
2. Word Processor	IBM
3. First Laser Printer	IBM

SCIENTIFIC DISCOVERIES AND CONTRIBUTIONS

1. Discovered Radioactivity	Antoine Becquerel
2. Theory of Relativity	Albert Einstein
3. Theory of Atomic Structure	Niehls Bohr
4. First Electron Microscope	Ernst Ruska
5. Discovered Radium	Marie Curie
6. Pasteurization of Milk	Louis Pasteur
7. Discovered Oxygen	Joseph Priestly

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STUDY GUIDE:
FAMOUS SCIENTISTS

Anthropologists:

Jane Goodall - This conservationist is known for her long-term observations of chimpanzees in their natural habitat. Her books, Wild Chimpanzees, In the Shadow of Man, and Reason for Hope tell about her studies and observations.

Louis Leakey - After graduating from Cambridge in 1926, this Kenyan anthropologist focused his research on early man, whom he believed developed in Africa. He published multiple books, including The Stone Age Cultures of Kenya Colony. He discovered one of the oldest Homo sapiens at Olduvai Gorge and the first Proconsul skull with a face at Rusinga Island. During World War II, he acted as a government spy in the Civil Intelligence and African Intelligence Departments.

Margaret Mead - One of the premier anthropologists, she observed multiple primitive tribes in Samoa firsthand, and authored the book, Coming of Age in Samoa. Her Samoan studies convinced her that personality is a product of culture rather than of genetics. She also studied the Arapesh in New Guinea, in which men and women assume equal roles in raising their children. She studied the Tchambuli culture, whose gender roles were the opposite of Americans. She published her findings on this group in Sex and Temperament in Three Primitive Societies. Her discoveries convinced her that sex roles were a product of cultural influences.

Astronauts:

Buzz (Edwin) Aldrin - This West Point graduate served in the Air Force during the Korean War, and then went back to school at MIT to obtain his credentials in aeronautics. He was active in NASA's Gemini Program, and became the second person to walk on the moon as the pilot of the Apollo 11 Lunar Module. He was awarded a Presidential Medal of Honor.

Neil Armstrong - After serving in the Navy in Korea, he obtained his aeronautic education at Purdue. He worked on the Gemini and was the commander of the Apollo 11. He became the first man to walk on the moon. He was also awarded the Presidential Medal of Honor and was appointed to the National Commission on Space under Reagan's administration.

Guion Bluford - This former Vietnam Air Force pilot later got his credentials as an astronaut and served on four key missions for NASA. He was also the first African American to travel into space.

John Glenn - This astronaut distinguished himself when he participated in the first manned orbital mission of the United States, which orbited three times around the Earth. As of July, 2001, he is the oldest person to travel into space. In addition to service to NASA he flew 59 combat missions in World War II, earning honors that included the Distinguished Flying Cross (six times), the NASA Distinguished Service Medal, and the Congressional Space Medal of Honor. He also represented Ohio as a U.S. senator from 1974 to 1999.

Christa Corrigan McAuliffe - This teacher was selected from over 10,000 applicants to be the first private citizen in space. She died during the launch of the Challenger on January 28, 1986 in a catastrophe that was broadcast live.

Sally Ride- She was the first American female to travel into space.

Astronomers:

Nicolaus Copernicus -This Polish astronomer developed the heliocentric theory that the Earth, and other celestial bodies, rotate around the sun. His theory contradicted popular thought at the time of the 16th century that presumed the Earth was the center of the universe.

Galileo Galilei - This Italian made leaps and bounds in many branches of science, including mechanics, astronomy, heat, magnetism, and space exploration. He was condemned and exiled by the church because of his ideas, and forced to recant his theory based on Copernicus' concepts, which the church opposed. He built a telescope and was the first to observe Jupiter's moons, Saturn's rings, Venus' phases, and sunspots. He is remembered for his laws pertaining to falling bodies and projectiles. He also invented a military compass, a model for an inclined plane, the lodestone, and the thermoscope, a machine for raising water. He discovered many attributes of pendulums that enabled them to be used as timekeepers inside clocks.

Stephen Hawking - This recent author of A Brief History of Time, helped us understand black holes.

Hipparchus - Due to his studies of the stars and moon before 100 B.C., this Greek is revered as the "Father of Astronomy."

Edwin Powell Hubble - This astronomer graduated with a law degree from Oxford and later obtained his Ph.D. in astronomy from the University of Chicago. He did the bulk of his research at California's Mount Wilson Observatory, which at the time contained the world's largest telescope (until it was replaced by the Hale telescope in 1948 and the Keck telescope in 1990). He studied nebulae, galaxies, globular clusters, novas, redshifts, and Cepheid stars. He served as a ballistics advisor for the War Department during World War II and had a telescope named after him. His work provided information that improved our astronomical knowledge. First, he located other galaxies similar to ours, and concluded that these galaxies were moving away from each other. He also found a direct correlation between a galaxy's distance from the earth and the velocity of its recession. He summed up his observations in Hubble's Law, which states that the direct correlation between a galaxy's distance from earth and the velocity of its movement proves that the universe is expanding. The correlation between a galaxy's distance to its velocity is dubbed the Hubble constant and, if discovered, could be used to determine the age of the universe.

Johannes Kepler - This 17th century astronomer is best-known for developing the three laws of planetary motion, appropriately called "Kepler's Laws." He overturned Ptolemy and Copernicus' view of the planets while serving as an apprentice to the notable Tycho Brahe. His three laws state that planets move in elliptical orbits. The closer a planet is to the sun, the faster it travels, and the distance of a planet from the sun cubed compared to the square of its orbital equals a constant for all planets. Kepler's Laws formed the basis of Sir Isaac's later studies on the subject of gravity.

Ptolemy - This 2nd century A.D. Greek astronomer, geographer, and cartographer maintained that the Earth was the center of the universe, and all other objects revolved around the Earth.

Biologists:

Rachel Carson - This 20th century marine biologist was educated at John Hopkins University and worked as an aquatic biologist for the U.S. Fish and Wildlife Service. More importantly, she documented her discoveries in various books, including the influential The Silent Spring, which made Americans aware of the long-term dangers of chemicals and pesticides, such as DDT.

Francis Crick & James Watson- In 1962, these scientists were awarded a joint Nobel Prize for their discovery of the shape of the DNA molecule.

Charles Darwin - This 1900's biologist devised "The Theory of Evolution," which stated that humans had evolved from more primitive life forms. He elaborated on his theories of evolution and natural selection (sometimes referred to as survival of the fittest), in his controversial 1859 book, On the Origin of Species. Few people of the time agreed with his ideas and he was a very unpopular scientist. He is occasionally called a naturalist.

Anton van Leeuwenhoek - Essentially uneducated, this 17th century scientist discovered bacteria, protists, blood cells, and animal sperm cells through sheer curiosity and perseverance. He called these microscopic organisms "animalcules." He also developed over 500 microscopes, although they were simple compared to the complex variety invented by Robert Hooke.

Carolus Linnaeus - This botanist and physician was the first to successfully classify living organisms into the five kingdom system. These kingdoms were then subdivided into phylum, class, order, family, genus, and finally species.

Chemists:

Henry Cavendish - This 18th century British chemist discovered hydrogen, and concluded that water was not an element. Rather, he learned that water was comprised of both hydrogen and oxygen.

John Dalton - This meteorologist was best known for his "Atomic Theory," which formed the basis for the periodic table. These discoveries were published in his 1808 book, entitled A New System of Chemical Philosophy. The law that bears his name, Dalton's Law, proposes that the total partial pressures in a mixture of gases equals the sum of the pressures of each of its individual gases.

Dmitri Mendeleev - Born in Siberia in the early 1800's, this teacher and scientist is recognized as the inventor of the Periodic Table.

Inventors:

Charles Babbage - This son of a London banker is known as the "Father of Modern Computing" because he invented the first calculators. He replaced Sir Isaac Newton as the Lucasian Chair of Mathematics at Cambridge, where he worked on designing a primitive calculator called the "difference engine." However, midway through, he had the brainchild for the "analytical engine" that would be capable of performing any math calculation. Although he never completed his work due to lack of financial and social support from the British government, his pioneering efforts on both counts were predecessors of modern calculators and computers.

Alexander Graham Bell - This Scottish-born, American immigrant invented the first telephone in 1876 and demonstrated it at the 1876 Centennial Exposition. The discovery grew out of his passion for helping teach deaf students to speak. Helen Keller was one of his students. He later experimented with other inventions, and eventually became the second president of the National Geographic Society.

Louis Braille - This French teacher redesigned a system of code used by the Army. He used raised dots to represent letters so a blind person could read an article by feeling the raised dots. The pattern of raised dots is called Braille, after its inventor.

Samuel Colt - This inventor patented the six-shooter pistol, which proved to be a valuable weapon in the Mexican War. The guns were so popular that Colt discovered how to produce them more quickly and more efficiently by using the concept of mass production in his factory.

Louis Daguerre - He invented the first daguerreotype, an ancestor of primitive photography.

Leonardo da Vinci - This Renaissance man prided himself on his intellectual curiosity. He designed many engineering innovations in addition to his reputation as an outstanding artist. These included a primitive flying machine, a diving suit, and a pulley system.

John Deere - He invented the steel plow.

Abner Doubleday - This Army veteran served in the Mexican War, and fired the first shot of the Civil War at Fort Sumter on the Union side. He also created the game of baseball.

George Eastman - Not only did this man invent roll film in 1884, he later invented the Kodak camera in 1888, and went on to mass-produce both items, making them widely available. Later he invented a transparent film, which has been used ever since by the motion picture industry.

Thomas Alva Edison - This notorious inventor is most cited for his incandescent light, but his transmitters contributed to the success of the telephone and he made several improvements upon existing phonographs. Edison patented over 1,000 devices and became known as "The Wizard of Menlo Park."

Henry Ford - This entrepreneur was born on a farm in Dearborn, Michigan. He found work as an apprentice in a machine shop in Detroit, where he learned about internal combustion engines. Later he worked for the Westinghouse Engine Company, and then moved back to Detroit as chief engineer at the Edison Company in the city. He experimented with several vehicles, including the semi-successful Quadricycle before he formed his own automobile company and sold the popular "Model T" Ford. Because his vehicles were so much in demand, he later invented the assembly line in 1913 and paid his employees a minimum wage, which was revolutionary at the time.

Ben Franklin - Also known as a popular printer, the first American Postmaster General, a statesman, and an ambassador during the Revolutionary War, this eminent colonist conducted extensive research on static electricity and engineered numerous additional inventions. He is well known for flying a kite during an electrical storm. He invented the Franklin Stove, and bifocal eyeglasses.

Robert Fulton - Originally an artist specializing in portraits, he is credited as the inventor of the steamboat that revolutionized the way Americans used our interior waterways, as well as the way the early Post Office delivered mail. His first successful steamboat, the Clermont, was launched on the Hudson River in New York in 1807.

Robert Goddard - He is called "The Father of the Modern Rocket." In 1926, he engineered the first liquid fuel rocket. He also worked on a multi-stage rocket and assisted the U.S. Government during both World Wars in developing new defense technology.

Johann Gutenberg -This 1400's German invented the moveable type method of printing. He gained his reputation by using this method to print many Bibles.

Elias Howe – Howe was a sickly man who was married to a seamstress. He invented the sewing machine to relieve his wife from her long days of labor by hand sewing, as she struggled to keep them afloat financially.

Steve Jobs & Steve Wozniak -Together, these veterans of Hewlett Packard invented the first personal computer and co-founded Apple Computer Company.

Samuel Morse - His magnetic telegraph was the first step in the climb toward instant communication. It eventually led to transatlantic cables, wireless phones, and radio signals. The Pony Express became obsolete once the telegraph was invented.

Elisha Graves Otis - He invented the elevator brake.

Isaac Merritt Singer - He pirated Howe's initial design for a sewing machine that met with widespread success due to his business savvy as well as his ability to increase its user-friendliness.

Eli Whitney - In 1793, his cotton gin revolutionized Southern agriculture. He also invented the notion of interchangeable parts. Interchangeable parts were later used in all areas of technology.

Wright, Wilbur and Orville - Although they had opposite temperaments (Wilbur was methodical while Orville was impetuous), they joined together to build the first workable aircraft. Originally the co-owners of a bike shop, they capitalized on Wilbur's initial experiments on a five-foot biplane and a full-scale glider. They combined ideas to create the original ancestor of the modern airplane. Their first flight occurred at Kitty Hawk, North Carolina in 1903.

Mathematicians:

Archimedes - This Greek mathematician of the 3rd century B.C. used Euclid's system to prove many of his own geometric and physical science discoveries, including the formula for the volume of a sphere, the law of the lever, the Archimedean screw, and the principle of buoyancy.

Albert Einstein - This eminent scientist fled Germany and immigrated to the United States when the Nazi party rose to power. His equation for the theory of relativity, $E = mc^2$, led to the development of atomic energy and earned him a Nobel Prize in 1921. The element, Einsteinium, was named after him.

Euclid - This mathematician studied under Plato in Alexandria in 300 B.C. He wrote The Elements in which he proved various longstanding mathematical and geometrical premises, using his axiomatic method, which emphasized the use of successive proofs.

Isaac Newton - This graduate of Cambridge had the honor of being the Lucasian Professor of Mathematics at Trinity College, a position he held for 27 years until 1696. His famous book, Opticks, discussed his discoveries on the subject of refracted light in prisms. His other best-known work was Principia, which concentrated on his discoveries regarding gravitational force and his three laws of motion.

Pascal - He was known for his theorem pertaining to hexagons, his arithmetical triangle publicized in 1653, and some aspects of the theory of relativity. Another of his laws states that when pressure is applied to a fluid, it is exerted equally in all directions.

Pythagoras - As one of the earliest mathematicians, he devised the Pythagorean theorem that states that the sum of the squares of two sides of a triangle are equal the square of the hypotenuse.

Medical Pioneers:

Marie Curie - This Polish woman who was nicknamed Madame Curie, discovered the radioactive elements radium and polonium. She won two Nobel Prizes, one in 1903 that was awarded jointly with her husband, and a second in 1911. Because of her research, the unit that's used to measure a substance's radioactivity, has been named the Curie. She died from a cancer caused by excessive exposure to radiation.

Alexander Fleming - This medical researcher discovered penicillin by accident, as well as another important antibacterial substance called lysozyme. He was awarded a Nobel Prize for his contribution to the medical world.

Sigmund Freud is known as "The Father of Modern Psychoanalysis." An Austrian who fled to England during the 1930's, he specialized in dream analysis and the role of the unconscious in behavior. He coined the theory of the Oedipus Complex and wrote much about the war between the superego, ego, and id.

Hippocrates - This ancient Greek doctor is known as "The Father of Medicine." The Hippocratic Oath, a pledge of ethics that is taken by modern doctors, was named after him.

Robert Koch - This 1900's German physician discovered the bacteria that caused anthrax, tuberculosis, and cholera, and was rewarded for his discovery with a 1905 Nobel Prize.

Louis Pasteur - This French microbiologist discovered that bacteria contribute to widespread disease, and that sterilization should be increased in society. He also discovered a vaccine to combat rabies, and most notably, the process of heating milk (and other liquids) to kill invisible germs, rendering it safe for consumption.

Ivan Pavlov - This Russian scientist experimented with training dogs to salivate at the sound of a bell that signaled "suppertime." Eventually, the dogs salivated every time the bell rang, regardless of whether or not they were given food. Pavlov called this a "conditioned reflex." His work gave rise to the behaviorism school of psychology. His work is often cited in studies concerning learning techniques..

Jonas Salk - This medical researcher was best-known for his discovery of a polio vaccine, which wiped out a polio epidemic.

Oceanographers:

Eugenie Clark - This ichthyologist has won numerous awards and honors for her research and dives to investigate sharks. She is so recognized as an expert in the field that she has been dubbed "The Shark Lady."

Jacques Cousteau - This 20th century deep-sea diver was a former member of the French navy. He co-developed the aqualung, which enabled him to do detailed explorations underwater. He documented his underwater explorations for the American people in short films, two of which won Academy Awards for best documentary.

Physicists:

Niels Bohr - This Holland-born physicist is known for his discoveries about the structure of the atom. In 1922 he won a Nobel Prize for his proposal that electromagnetic radiation is emitted by atoms when electrons move between energy levels. He later investigated fission, and proved that uranium 235 is an isotope. He was one of the scientists who developed the first atomic bomb during World War II. Ironically, he later

received an Atoms of Peace Award for his instigation of the first Atoms for Peace Conference in 1955.

George Caruthers - This notable astrophysicist invented the ultraviolet camera that the NASA Apollo 16 crew used to bring back photographic footage from their mission to the moon.

Michael Faraday - This former bookbinder became involved in studies of magnetism and electricity. In 1831, he discovered electromagnetic induction. Many of his findings were published in his book Experimental Researches in Electricity. He is credited with the 1845 discovery of a magnetic force field composed of "lines of force."

Enrico Fermi - This Italian was one of the engineers on the atomic bomb project in New Mexico during World War II, which created the first fission reaction. His efforts with artificial radioactivity earned him a Nobel Prize in 1938. A scientific research center in Batavia, Illinois has been named after him.

Werner Karl Heisenberg - This physicist began his experimentation with matrix mechanics in which he studied the discrepancy between the mathematical behavior of electrons in an atom and classic laws of physics. During this enterprise, he discovered two types of molecular hydrogen, and his matrix mechanics became known as Quantum Mechanics. He also advocated his "uncertainty principle," which stated that both velocity and position cannot be measured accurately at the same time in a particle, but must be measured at different times. In 1932, he won a Nobel Prize in physics for his role in the emergence of quantum mechanics and other scientific breakthroughs. Although he was not an advocate of the Nazi cause, he remains a controversial figure, because he worked with Otto Hahn on the country's atomic research team during World War II.

Robert Hooke - This 17th century Englishman discovered cells, through his early microscope. He also proposed a scientific law that stated that "the change of an elastic object's length is in proportion to the stress applied to it."

Lord Kelvin (Williams Thomson) - This 19th century Englishman developed the scale of absolute temperatures.

Gregor Johann Mendel - This Austrian's 19th century studies on pea plants were actually the ancestor of the modern study of genetics and trait inheritance. Mendel is called "The Father of Genetics."

Max Planck - This German scientist received a Nobel Prize in 1918 for his discovery of Quantum Physics, in which he asserted that a quantum is the smallest unit into which energy can be broken.

Wilhelm Roentgen - This German physicist was awarded the very first Nobel Prize in 1901 for his discovery of X rays.

Ernest Rutherford - This New Zealand physicist proposed the "Theory of Atomic Structure," in which he defined the atom as a nucleus around which electrons orbit. He also engineered one of the first nuclear reactions, and discovered and named the three primary elements of radiation: alpha, beta, and gamma rays. A unit of radioactivity, the Rutherford, was named after him, as was a chemical element, Rutherfordium (Rf.). He won the Nobel Prize in 1908 for his discovery of radioactive decay that occurs when certain radioactive substances give off alpha particles or beta rays. In 1911, he published his "Theory of Atoms," upon which Neils Bohr based his later discoveries.

Nikola Tesla - This visionary was responsible for many electrical improvements that have affected our modern world. His discovery of the rotating magnetic field led to his idea of using alternating current (AC power) to create a rotating magnetic field that was capable of powering a motor. He later built the first induction motor while he was employed at the Continental Edison Company. He even worked with Edison, but the two had professional differences, and Edison believed Tesla's system was potentially dangerous. However, his system was used successfully during the 1893 World Columbian Exposition in Chicago, and his career was launched! One year later, he was commissioned to install patented power machinery at Niagara Falls to supply Buffalo with power. He also invented the "Tesla Coil" which is still used in television broadcasting and long-distance radios.

Sir Joseph John Thomson - He discovered the electron.

Allesandro Volta - This 18th century physicist is best known for inventing the first electric battery. The unit of electrical energy called the "volt" was named in his honor.

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STUDY GUIDE:
HUMAN ANATOMY I

The smallest unit part of any living organism is the cell. In multicellular organisms, such as the human, cells of the same type join together to form tissues. For example, skin cells form skin tissue.

THERE ARE FOUR BASIC DIFFERENT TYPES OF TISSUE IN THE HUMAN BODY:

1. muscle tissue
2. connective tissue
3. nerve tissue
4. epithelial tissue

Muscle tissue is the only type of tissue that can contract, or shorten. Connective tissue provides support for the body and connects all its parts. Bones, blood and fat are examples of connective tissue. Nerve tissue carries messages back and forth between the brain, spinal cord, and the rest of the body. Epithelial tissue forms a protective surface on the body. Skin is epithelial tissue. Epithelial tissue also lines the mouth, nasal cavities, and throat and provides a protective covering for the stomach and other body parts.

Different types of tissues are then combined to create organs. An organ is a group of different tissues working together to perform a job. The stomach, lungs, eyes, and pancreas are examples of organs. The heart is also an organ. Although it contains mainly muscle tissue, it also contains connective and nerve tissue, and is covered and protected by epithelial tissue.

Organs combine with other organs to create organ systems. Each system of organs has a particular function. There are eleven major systems in the human body. Six of these systems will be discussed in this study guide. The remaining five systems will be dealt with in an upcoming guide. All eleven systems are listed in the next section.

THE 11 MAJOR SYSTEMS OF THE HUMAN BODY

1. Skeletal: Supports the body and gives it shape, protects inner organs, produces blood cells, allows movement, and stores some minerals.
2. Muscular: Allows for body movement and controls posture.
3. Digestive: Breaks down food and absorbs the nutrients.
4. Circulatory: Carries nutrients to all parts of the body.
5. Respiratory: Exchanges oxygen and carbon dioxide between the blood and air.
6. Excretory (or urinary): Removes solid and liquid wastes from the body.
7. Nervous: Carries messages from the brain to all parts of the body, detects sensations, and controls any other functions.
8. Endocrine: Regulates the body chemistry, controls metabolism, and maintains integration of other body functions.
9. Reproductive: Performs reproduction and regulates the secondary sex characteristics.
10. Immune (or lymphatic): Fights diseases.
11. Integumentary: Protects the body, helps regulate body temperatures, and receives outside stimuli.

THE SKELETAL SYSTEM

The skeletal system is composed of the 206 bones in the body, cartilage, nerve tissue, blood vessels, and connective tissues. Cartilage is a dense, fibrous connective tissue that can be bent. It is found in the nose and outer ears. It is also located at the ends of bones and serves as a slippery surface to reduce friction at the joints.

JOINTS: A joint is a place in the body where two or more bones are connected. Movement occurs at a joint. There are several types of joints.

1. Hinge joints: examples-knee and elbow allows movement in a forward and backward direction.

2. Ball-and-socket joints: examples- shoulder and hip, provides for circular motion of bone, and consists of a round bone that fits into a cup like pocket of another bone.

3. Fixed joints (or immovable joints): examples- bones of the skull. Permits no movement.

4. Pivot joints: examples- first two vertebrae in the neck, allows for rotation of one bone around another.

5. Sliding joints: example- carpals or wrist, allows one or more bones to roll over other bones.

STRUCTURE OF BONES:

The outer covering of a bone is called the pericardium. Beneath the pericardium is the hard, compact bone. Within the shaft of a long bone is a hollow cavity or space filled with marrow. Marrow is a soft, yellow material that contains fat and blood vessels. Red marrow is found in the inner areas of the skull, ribs, breastbone, and vertebral columns. Red marrow produces the body's blood cells. At each end of the bone shaft is a knob that contains spongy bone. It is actually quite strong and adds strength to the bone without adding mass. Bones need calcium and phosphorus to maintain their strength. Dairy products are an excellent source of calcium.

SKELETAL SYSTEM TRIVIA FACTS:

1. The backbone is composed of 26 bones called vertebrae (singular-vertebra) that are separated from one another by pads of cartilage.
2. The femur is the longest single bone in the entire body.
3. Ligaments are stringy tissues that attach bones to other bones.
4. Tendons attach muscles to the bones.
5. There are a total of 12 pairs of ribs (24 ribs). The bottom two pairs of ribs are attached to the back, but are not attached to the sternum at all. They're called floating ribs.
6. The bones in the fingers are called phalanges. Each finger has 3 phalanges and each thumb has two, making a total of 14 phalanges on each hand.
7. The knee joint is protected by the kneecap. It's scientific name is the patella.
8. Seven round bones are found at the wrists. They are called carpals.

The major bones are labeled on the skeleton found at the end of this study guide.

THE MUSCULAR SYSTEM

THREE MAIN TYPES OF MUSCLES IN THE HUMAN BODY:

1. Skeletal: These muscles attach directly to the bones and move the bones. They are called voluntary muscles, because you can move them whenever you want. These muscles are striated. This means they are composed of bands of muscle tissue that are connected together. Skeletal muscles are attached to the bones by TENDONS.

2. Smooth muscles: These muscles are involuntary, and move or contract without your direction. They help to control breathing, blood pressure, and the movement of food throughout the digestive system.

3. Cardiac muscle: This type of muscle is found only in the heart. Cardiac muscles are involuntary. Your heart beats when your cardiac muscle contracts.

MAJOR MUSCLES AND THEIR LOCATION WITHIN THE BODY:

1. Biceps and triceps: These muscles are found in the upper arm. The biceps is on the top of the humerus and the triceps is on the bottom. They work in a pair. When the biceps contract, the triceps relax.

2. Deltoid: Located at the shoulder, it allows you to raise your arm to the front, side, or back.

3. Pectoralis major: This large fan-shaped muscle of your upper chest pulls your arm toward your body.

4. Gastrocnemius: This is the calf muscle. It is attached to the heel bone by the Achilles Tendon.

5. Trapezius: This muscle is located at the back of the neck and in the upper back region.

6. Gluteus Maximus: These muscles are located in the buttocks region, and you sit on them.

A muscle that bends, or flexes a joint is called a FLEXOR muscle. If a muscle straightens a joint, it's called an EXTENSOR.

THE DIGESTIVE SYSTEM

The digestive system breaks down the food into simpler substances that can be used by the human body. These simple nutrients are then carried by the blood to all the cells in the body. Here is the basic path the food takes as it makes its way through the digestive system..

1. Mouth
2. Esophagus
3. Stomach
4. Small Intestine
5. Large Intestine
6. Rectum
7. Anus

The liver, gall bladder, and pancreas are also digestive organs, but the food does not actually pass through them.

Digestion begins in the mouth. Saliva mixes with the food in the mouth. An enzyme called ptyalin is in the saliva. It breaks down the starches in foods and begins to change them to sugars. The saliva also makes the food slippery so it can be easily swallowed.

When the food is swallowed, it goes down a tube that connects the back of the throat (pharynx) with the stomach. Muscular contractions of the esophagus help push the food downward. These muscular contractions are called peristalsis.

The food then enters the stomach. The walls of the stomach release gastric juices that help to break up the food and make it runnier. These juices contain the enzyme pepsin, hydrochloric acid, and a thick mucus. The stomach muscles contract to churn the food. Then the food is pushed by peristalsis to the small intestine.

Most digestion occurs in the small intestine. More digestive juices are secreted by the walls of the small intestine. The liver produces a substance called bile that helps to break up fatty foods. Bile is stored in the gall bladder until it is needed. Then it is released into the small intestine. THE LIVER IS THE BODY'S HEAVIEST ORGAN. It is also the second largest organ. Only the skin is a larger organ!

The pancreas produces insulin that is sent into the small intestine to control the body's use of sugar.

After a period of five hours, most of the food in the small intestine is digested. It then passes through finger like structures called villi that are found in the walls of the small intestine. The villi contain small blood vessels that absorb and carry away the digested food.

The undigested food is pushed by peristalsis to the large intestine. The excess water is absorbed from these wastes in the large intestine. The solid wastes that remain are pushed through a short tube at the end of the large intestine, called the rectum, and then pushed through an opening at the end of the rectum called the anus.

THE CIRCULATORY SYSTEM

The circulatory system is composed of three main parts: the heart, the blood, and the blood vessels. Its main job is to deliver food and oxygen to all body cells and to carry away waste products and carbon dioxide from the cells.

There are three main types of blood vessels through which the blood travels:

1. **ARTERIES**: These carry blood away from the heart. The aorta is the largest artery in the human body.

2. **VEINS**: These carry blood from all parts of the body back to the heart.

3. **CAPILLARIES**: These are the smallest of the blood vessels. The walls of the capillaries are so thin that food and oxygen leak through them to the body cells, and wastes from the body cells enter the blood through these walls. They also connect the arteries to the veins.

There are four main components of the blood: PLASMA, RED BLOOD CELLS, WHITE BLOOD CELLS, and PLATELETS. Plasma is the liquid portion of the blood. It consists mainly of water. The other three blood components float in the plasma.

Red blood cells, or Erythrocytes, float in the plasma. They carry oxygen from the lungs to the body cells, where oxygen is the exchanged for carbon dioxide. These doughnut shaped components are made in the bone marrow and contain hemoglobin, a protein that contains iron. Hemoglobin easily combines with oxygen when the oxygen

content is high, and easily releases the oxygen again when the oxygen again when the oxygen content is low.

White blood cells, or Leukocytes, are larger than red blood cells, but there are fewer of them in the blood. Their job is to protect the body against infection and to fight infection when it occurs in the body.

Platelets, or Thrombocytes, are the smallest of the blood components. They cause the blood to clot.

There are four main blood types: A, B, AB, and O.
Type O is called the universal donor, because type O blood can be safely given to everyone. Type AB is the universal receiver. People having this type of blood can safely receive blood from any donor. A blood transfusion is the name for the process of taking blood from one persona and giving it to another person.

THE CIRCULATION OF THE BLOOD:

The blood leaves the heart, travels to the lungs, returns to the heart, is sent to all parts of the body, and is again returned to the heart. The heart is muscular organ that is composed of four distinct chambers, or parts. The two top chambers of the heart are each called an atrium (plural: atria). The two bottom chambers of the heart are each called ventricles. The entire heart is enclosed in a protective bag called the pericardium.

The heart is divided into two sides by a strong, thick, muscular was called the septum. Here are the basic steps that occur in the circulation of blood through the heart.

1. The blood enters the RIGHT ATRIUM of the heart through two main veins called the SUPERIOR VENA CAVA AND INFERIOR VENA CAVA.
2. It passes through the TRICUSPID VALVE to the RIGHT VENTRICLE.
3. The RIGHT VENTRICLE pumps the blood to the lungs through the PULMONARY ARTERIES.
4. The blood receives oxygen form the alveoli in the lungs, and loses the carbon dioxide that it has been carrying.
5. The newly oxygenated blood is sent back to the heart through the PULMONARY VEINS. It reenters the heart in the LEFT ATRIUM.
6. It then passes through the BICUSPID VALVE (also called the MITRAL VALVE) to the LEFT VENTRICLE.
7. The LEFT VENTRICLE then pumps the blood through the AORTA and then to all the tissues in the body. It is returned to the heart and reenters the RIGHT ATRIUM where the cycle once again continues.

THE RESPIRATORY SYSTEM

The main job of the respiratory system is to bring oxygen into the body and to remove carbon dioxide and water from the body. The main respiratory organs are the

NOSE, PHARYNX, TRACHEA, BRONCHIAL TUBES, LUNGS, BRONCHI, ALVEOLI, and DIAPHRAGM.

Air enters the NOSE where it is both warmed and filtered. It then passes down the back of the throat, called the PHARYNCS, and down the wind-pipe, or TRACHEA. The trachea divides at the end into two BRONCHIAL TUES that each lead to a LUNG. When the air enters the lungs, it flows into smaller branches called BRONCHI, and then into tiny air sacs called ALVEOLI. Each alveoli is surrounded by thousands of tiny blood vessels called capillaries. Oxygen and carbon dioxide are exchanged in the alveoli. As blood moves through the capillaries, it picks up oxygen and carries it to cells throughout the body.

A strong muscle called the DIAPHRAGM contracts to bring the air into your chest area. When you exhale, the diaphragm relaxes, causing the space inside the chest cavity to decrease, thus sending the air out the body.

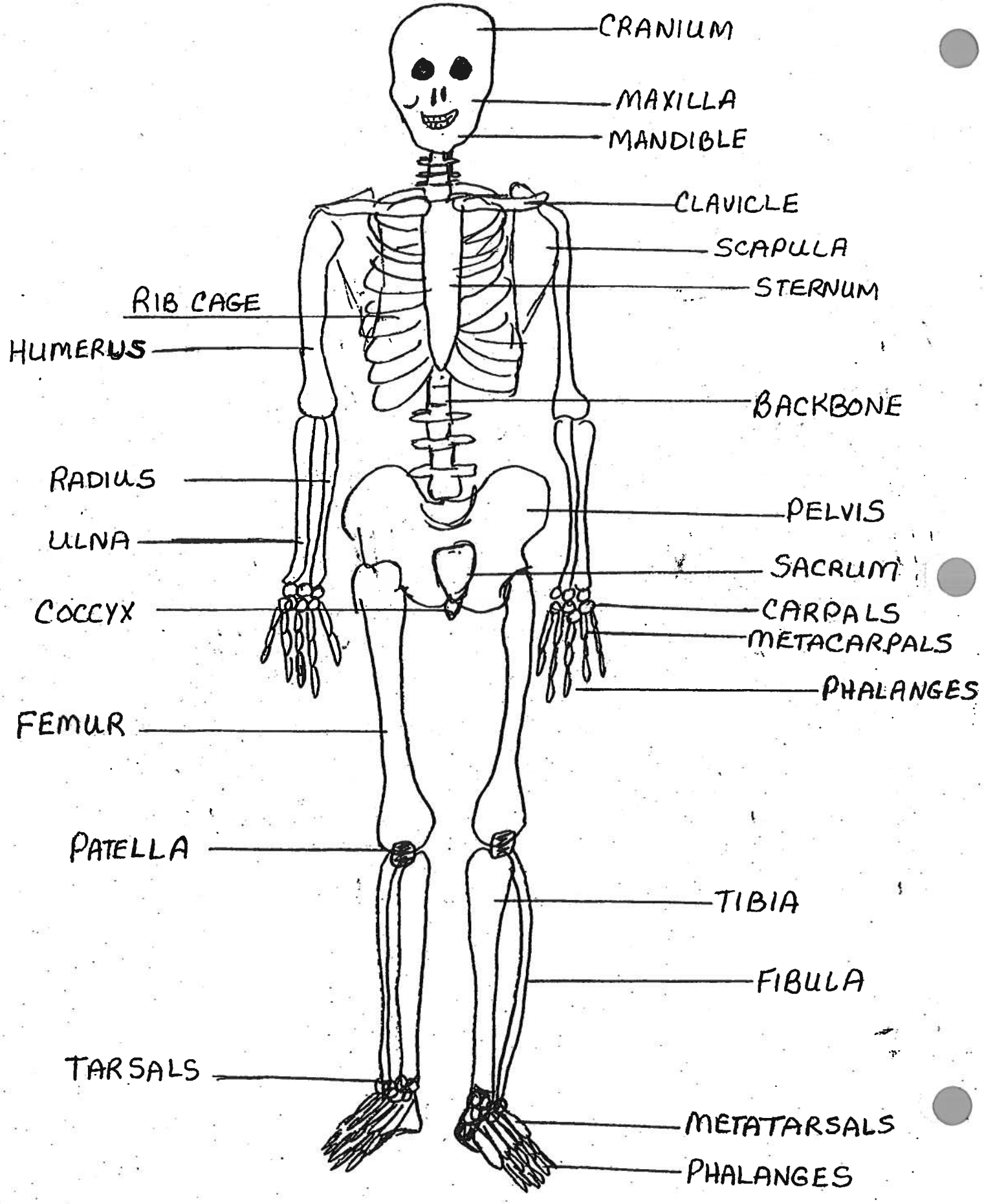
THE EXCRETORY SYSTEM

The job of the excretory system is to remove wastes form the body. Since the lungs remove carbon dioxide and water from the body, they are also considered part of the excretory system. Other organs in the excretory system are the KIDNEYS, LIVER, SKIN, and URINARY BLADDER.

The KIDNEYS are the main organ in this system. They filter nearly one liter of blood per minute. The filtering takes place in the NEPHRONS, which are a network of tubes that are enclosed in a complex network of capillaries. The nephrons filter out water, salts, urea, and nutrients, which are reabsorbed into the blood. The liquid that remains is called urine. It is composed mainly of water with some excess urea and salts. This urine is sent through two narrow tubes called URETERS to a muscular sac called the URINARY BLADDER. The urine is stored in the bladder until it is released from the body through another small tube called the URETHRA.

The LIVER also helps to filter the blood. It removes excess amino acids, and cleanses the blood by removing most of the bacteria that enters it.

The SKIN removes wastes through perspiration. The skin is composed of two layers. The upper layer is called the epidermis and the lower layer is called the dermis.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STUDY GUIDE:
FAMOUS ASTRONOMERS, ASTRONAUTS, and GEOLOGISTS

FAMOUS ASTRONOMERS

- **PTOLEMY** (Tol uh mee) An ancient Greek astronomer who calculated that the earth was the Center of the solar system, and the sun, planets, moon, and stars revolved around the earth.

- **ARISTOTLE** (384 – 322 B.C) Provided proof that the earth had a spherical shape.

- **TYCHO BRAHE** (1572) Spotted the first supernova, thus proving that the heavens do change over time.

- **NICOLAUS COPERNICUS** (1473 – 1543) A Polish astronomer who developed the theory that the sun is the center of the solar system, and that all the other heavenly bodies revolve around the sun. He's considered THE FOUNDER OF MODERN ASTRONOMY.

- **GALILEO GALILEI** (1564 – 1642) Italian scientist and mathematician who was called the first modern scientist, and who is best known for his mathematical study of motion and other bodies.

  1. Contributions to the field of astronomy.

     A. He improved (BUT DID NOT INVENT) the telescope. He developed the FIRST <u>REFRACTING</u> TELESCOPE.
     B. His discoveries in Astronomy:
        1. The moon's surface was rough and irregular.
        2. The moons of Jupiter.
        3. The rings of Saturn.
        4. The phases of Venus, similar to our moon.

5. Sunspots
6. Confirmed the idea of Copernicus – that the sun is the center of the solar system, and the earth moves around the sun.

2. Other inventions:
   A. The first thermometer
   B. Hydrostatic balance that found the specific gravity of any object by weighing it in water.

- **ROBERT H. GODDARD**: Built the first rocket in 1926 by combining gasoline with liquid oxygen, and burning this mixture. The rocket went straight up for 184 feet at 60 mph for 2 and ½ minutes. It was 10 feet long. He continued to build larger rockets, and drew up plans for multistage rockets. In 1935, he designed a rocket that reached a speed of 500 mph and an altitude of 7,200 feet. He was called the FATHER OF MODERN ROCKETRY.

- **EDMUND HALLEY** (1656 – 1742) An English astronomer who is best known for predicting the return of a comet, HALLEY's Comet, which bears his name. HE DID NOT DISCOVER THIS COMET, but was the first to realize that this same comet had previously appeared in 1456, 1531, 1607, and 1682. He thus predicted that the comet would reappear in 1759, which it did. The comet appears every 75 to 79 years. It was seen in 1986, and is due back in 2062.

  A. Other contributions:

  1. Compiled a catalog of the stars seen in the Southern Hemisphere.
  2. Published a book called Synopsis of the Astronomy of Comets.
  3. Discovered an accurate way to measure the distance from the sun to the earth.
  4. Produced the first meteorological weather chart of the world to show prevailing winds.
  5. Made the first charts of the Atlantic and Pacific Oceans.

- **EJNAR HERTZSPRUNG** (Danish Astronomer) and HENRY NORRIS RUSSELL (American Astronomer) early 1900's: discovered that as the magnitude of a star increases, the temperature of that star also increases. They developed a diagram in which the surface face temperature of stars is plotted along the horizontal axis, while the absolute temperature is plotted along the vertical axis. This chart, called the HERTZSPRING –RUSSELL (H-R) DIAGRAM, is still used today by astronomers.

- **EDWIN HUBBLE**: An American astronomer of the twentieth century. He was the first to show that galaxies other than the Milky Way did exist. He also was the first to notice that objects which are moving away from an observer tend to have a reddish cast. He called this phenomena the RED SHIFT, and used it as a basis for the expansion of the universe by a means similar to the Big Bang Theory.

The HUBBLE Telescope was named after him. This large, optical telescope was placed into orbit in 1989 and was the first permanent observatory located above the Earth's atmosphere.

- **IMMANUEL KANT**: Theorized that he sun was part of a vast galaxy, but that there were other galaxies scattered throughout space, too. He also suggested that the sun and planets were formed from the same elements and in the same way.

- **JOHANNES KEPLER**: German astronomer and mathematician who discovered that the planets orbit the sun in elliptical, or oval orbits, not in perfect circles.

- **MARIA MITCHELL** (1847) American Astronomer who discovered a new comet. First woman member of the American Academy of Arts and Sciences in 1848. Taught astronomy at Vassar College.

- **SIR ISAAC NEWTON**: Theorized that planets maintained their orbits because of two factors: inertia and gravity. Inertia causes the planet to move in a straight line, while gravity pulls the planet toward the sun, thus causing an elliptical orbit.

- **HERMANN OBERTH**: Born in Romania, but did most of his rocket research in Germany. In 1942, he and Dr. Von Braun built a V-2 rocket that flew 60 miles into space. After World War I I, he worked in Huntsville, Alabama on rocket research, but retired and went back to Germany in 1958.

- **DAVID RITTENHOUSE**: 1770, Built a precise model of the solar system.

- **HARLOW SHAPLEY**: Theorized that the entire universe could be found in one huge galaxy.

<u>DISOVERY OF THE PLANETS OR OTHER HEAVENLY BODIES</u>:

JUPITER: Galileo discovered 4 of Jupiter's moons.

SATURN: Galileo discovered the rings of Saturn.

URANUS: Sir William Herschel (1781) English Astronomer, discovered the planet, Uranus.

NEPTUNE: John Couch Adams: (1845) English astronomer, calculated where Neptune should be in space, based upon the orbital path of Uranus, which appeared to be affected by the gravitational force of another body.

Johann Galle: German astronomer, located Neptune from Germany's Berlin Observatory, exactly where Adam's had predicted.

PLUTO: Percival Lowell: suggested that another planet's gravity was pulling on both Neptune and Uranus.

Clyde Tombaugh: originally from Illinois, discovered Pluto in 1930 exactly where Lowell suggested.

James Christy: (1978) discovered Charon, Pluto's moon.

FAMOUS ASTRONAUTS

- **YURI GAGARIN:** A Russian cosmonaut, FIRST HUMAN PUT INTO SPACE, first person to orbit the earth (1961)
- **ALAN B. SHEPARD, JR:** First American in space (1961)
- **JOHN H. GLENN:** First American to circle the earth (1962)
- **VALENTINA TERESHKOVA:** Russian, first woman in space (1963)
- **VIRGIL (GUS) GRISSOM, EDWARD H. WHITE, ROGER B. CHAFFEE:** (1967) All three astronauts were being trained for the first mission in NASA's Apollo Program. While sitting atop a Saturn Rocket on the Cape Canaveral launch pad a fire broke out in the cockpit. THE 3 ASTRONAUTS ALL DIED OF BURNS AND SOFFOCATION before the technicians could rescue them.
- **VLADIMIR KOMAROV:** (1967) Russian cosmonaut, died when the parachute of the Soyuz 1 space capsule did not open, and the capsule crashed upon reentry.
- **NEIL ARMSTRONG:** First person to step onto the moon's surface. Famous Quotation associated with this venture: "That's one small step for man, one gian leap for mankind." (1969)
- **EDWIN (BUZZ) ALDRIN:** Second man to step onto the moon's surface right behind Neil Armstrong (1969)
- **MICHAEL COLLINS:** (1969) Remained in orbit around the moon in the Apollo Command Module, the Columbia, while Armstrong and Aldrin stayed on the moon.
- **JOHN YOUND AND ROGER DRIPPEN:** (1981) Piloted the United States first space shuttle, the Columbia.

- **SALLY RIDE**: (1983) First American female astronaut in space. She traveled on the Challenger.

- **GUION BLUFORD**: (1983) First Black American in space. He traveled on the Chellenger.

- **BRUCE McCANDLESS and ROBERT STEWART**: (1984) First humans to fly free of the spacecraft with jet-propelled backpacks. This was during the fourth flight of the Challenger.

- **JAKE GARN**: (1985) Utah Senator, first congressman in space. He traveled aboard the Discovery.

ASTRONAUTS ABOARD THE CHALLENGER WHEN IT EXPLODED IN 1986: (THERE WERE NO SURVIVORS)

1. **MICHAEL J. SMITH**: Challenger Pilot
2. **FRANCIS R. SCOBEE**: Challenger Commander
3. **CHRISTA McAULIFFE**: Social Studies Teacher from Concord, New Hampshire
4. **JUDITH A. RESNIK**: Mission specialist, Second American Woman in Space when she flew earlier on the Discovery in 1984.
5. **RONALD E. McNAIR**: Mission Specialist who was an expert laser physicist. Second American, African American to travel in space.
6. **ELLISON S. ONIZUKA**: Mission Specialist
7. **GREGORY B. JARVIS**: Payload Specialist

THE NASA MERCURY PROJECT ASTRONAUTS:

Seven men were chosen by NASA to become part of the first manned space flights. They were:

ALAN SHEPARD
JOHN GLENN
VIRGIL (GUS) GRISSOM
SCOTT CARPENTER
WALTER SCHIRRA
GORDON COOPER
DONALD SLAYTON.

FAMOUS GEOLOGISTS IN EARTH SCIENCE

- **LOUIS AGASSIZ** (1840) Theorized that huge sheets of ice once extended from the North Pole to Central Europe, and changed the surface of the earth as they slowly moved over it.

- **RACHEL CARSON** (1962) Published Silent Spring to awaken the public to the dangers and problems of pollution.

- **JAMES HUTTON** (1775) Developed the idea of uniformitarianism, which said that features on the earth were formed by gradual change, and not by explosions or other drastic methods. Rivers and canyons were formed by weathering, erosion, and other elements that had always been present in that area.

- **CHARLES LYELL** (1830-1833) Published the first geology textbook called Principles of Geology. In this book he expressed his firm beliefs that the earth's surface has changed slowly over time.

- **FRIEDRICH MOHS**: Developed a hardness scale for the camparison of mineral hardness. Talc, the softest mineral, was listed as a 1 on the scale, and a diamond, the hardest mineral, was listed as a 10.

- **CHARLES RICHTER**: Developed a scale that measures the strength of an earthquake, based upon observations. The scale measures how much energy an earthquake releases by assigning a number from 1 to 10. The more energy that is released, the higher its number on the scale.

- **ERNEST RUTHERFORD** (1905) Theorized that the half life of radioactive minerals could be used to determine the age of the mineral.

- **ALFRED WEGENER**: Developed the theory of Continental Drift, which stated that at one time, the continents were all formed together into a giant continent, or super-continent called Pangaea. Over time, the continents drifted apart to their present locations.

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STUDY GUIDE:
OUR SOLAR SYSTEM

The solar system contains the sun, the nine planets that revolve around the sun, and the moons that revolve around the planets. Comets, asteroids, and meteoroids are also found in our solar system.

THE SUN:

The sun composes 98% of the mass of the solar system and is located in the center of the solar system. It is a star made mainly from hydrogen and helium gases. It produces energy and light for the solar system. This energy is released during a nuclear reaction called **fusion** that occurs when hydrogen atoms fuse into helium atoms.

The sun is the largest object in our solar system. Approximately 1.3 million Earths would fit into the interior of the sun. However, the sun is only a medium-sized star compared to other stars in the universe, and is yellow in color.

The sun's atmosphere is divided into three layers, and another layer makes up its interior. This interior layer of the sun is called the **core**. The **fusion** of the hydrogen atoms into helium atoms occurs within the core, which is the hottest part of the sun, having an average temperature of 15 million degrees Celsius.

THE THREE LAYERS OF THE SUN'S ATMOSPHERE: The **corona, chromosphere,** and **photosphere.**

1) The **corona** is the outermost layer of the sun's atmosphere. It is the second-hottest area of the sun after the core, with temperatures that reach 1,700,000 degrees Celsius. This area of the sun becomes visible during a total solar eclipse.

2) The **chromosphere** lies beneath the corona and above the photosphere. It is the middle layer of the sun's atmosphere. The average temperature of this layer is about 27,000 degrees Celsius. Violent sun storms start in the chromosphere.

3) The **photosphere** is the innermost layer of the sun's atmosphere. It is the coolest area of the sun. Seldom do the temperatures in this layer exceed 6,000 degrees Celsius. Since this layer is directly above the core, it's often called the sun's surface.

There are three main types of **sun storms**, or **solar storms** that occur on the sun.

1) **Prominences**—Hot gases from the chromosphere burst through the corona and shoot outward before looping back onto the sun, sending much energy and gas into space.

2) **Solar flares**—Gases erupt suddenly from the sun's surface, causing an immediate increase in the temperature around this area. They are short-lived, but do release a huge amount of energy into space during their eruption.

3) **Solar wind**—The solar wind is caused by the escape of high-energy particles from the corona.

The dark areas that appear on the sun are **sunspots**. Sunspots are cooler areas on the surface of the sun.

THE PLANETS:

There are **nine planets** that orbit the sun.

Order of planets from the sun:

1. Mercury
2. Venus
3. Earth
4. Mars
5. Jupiter
6. Saturn
7. Uranus
8. Neptune
9. Pluto

Size of the planets from smallest to largest:

1. Pluto
2. Mercury
3. Mars
4. Venus
5. Earth
6. Neptune
7. Uranus
8. Saturn
9. Jupiter

The inner planets: Mercury, Venus, Earth, Mars
The outer planets: Jupiter, Saturn, Uranus, Neptune, Pluto
The Jovian (gas giant) planets: Jupiter, Saturn, Uranus, and Neptune. All Jovian planets have a ring system.
The terrestrial planets: Mercury, Venus, Earth, Mars, and Pluto

<u>Mercury</u>

Mercury is the planet closest to the sun and the planet having the shortest orbit. It takes Mercury 88 days to revolve one time around the sun. Because it takes such a short time to revolve around the sun, the planet was named after Mercury, the Roman winged-foot messenger of the gods.

Mercury is the densest of all the planets other than the Earth. It has a huge metal core surrounded by rock. Its surface is bare and rocky and is covered with craters and lava plains.

Most of the craters were formed by meteorites striking the planet's surface. The Caloris Basin is the largest impact feature on the planet.

Mercury is so small that it has little gravity, and is thus unable to hold an atmosphere around it. Therefore, there is no weather or winds on Mercury.

Mercury does spin on its axis. A day on Mercury is equal to nearly 59 Earth days.

The only spacecraft to visit Mercury was Mariner 10, which flew by in 1974 and 1975.

Venus

Venus is the second planet from the sun. It takes 224.7 days to revolve once around the sun. Because Venus is nearly the same size as Earth, it has been nicknamed "Earth's Twin," although it has very few other things in common with the Earth.

The surface of the planet is rocky, and the large number of lava plains and volcanic uplands suggest much prior volcanic activity on the planet. Maxwell Montes, a volcanic mountain, is the highest mountain on the planet and the second highest mountain in the entire solar system. Winds create fields of dunes and "wind streaks" on the surface.

Venus is surrounded by clouds of sulfuric acid. Its atmosphere is composed mostly of carbon dioxide. Infrared rays penetrate this dense carbon dioxide atmosphere and are unable to escape, creating an overwhelming greenhouse effect. Venus is the hottest planet in the solar system with surface temperatures that often exceed 900 degrees Fahrenheit. Because its cloud cover reflects light, it is also the brightest planet, and the second-brightest object in the solar system after our Moon. The Romans named this bright planet after Venus, the goddess of love and beauty.

Venus has no moons, and is the only planet to rotate clockwise on its axis. This type of motion is called **retrograde rotation**. It takes 243 Earth years to rotate once, so a day on Venus is longer than a year on Venus!

Since it is often visible in the early morning and early evening hours, Venus is known as the "evening star" or "morning star."

The Magellan space probe was launched in 1989. While orbiting the planet, it mapped the surface of Venus by emitting radio signals that bounced off the surface to the probe.

Earth

Earth is the third planet from the sun and takes 365.26 days (365 days) to complete one revolution. It spins once on its axis every 24 hours and has one moon.

Earth's atmosphere is composed mainly of nitrogen. Oxygen and water vapor are also components of the planet's atmosphere. An entire study guide has been written about the Earth and its Moon.

Mars

Mars is the fourth planet from the sun and takes 687 days to make a complete revolution around the sun. The surface of Mars is rocky, and dotted with many craters. Huge amounts of iron oxide, or rust, in the soil cause Mars to appear red when viewed through a telescope, so Mars has been nicknamed "The Red Planet." Because of its red color, the planet was named after the Roman God of War.

Valles Marineris, an extremely large canyon that would stretch from Los Angeles to New York, is located on Mars. This canyon is deeper than American's Grand Canyon. Olympus Mons, a large volcano on Mars, is the highest peak in the entire solar system. Many valleys and channels on the planet's surface were probably carved by running water, but running water is no longer found on Mars. However, carbon dioxide ice and ice formed from water is found on the surface of Mars in its polar icecaps. Many of the clouds that surround the planet have also been formed from ice crystals.

Two small moons, Phobos and Deimos, circle the planet. Their names were derived from the Greek words for fear and terror. It is very possible that both were asteroids that were captured by the planet's gravity.

Mars Pathfinder landed on Mars in 1997 with a small robotic rover named Sojourner. The rover failed to find any indication of life on the planet.

Jupiter

Jupiter is the fifth planet from the sun. It takes 11.9 years to revolve once around the sun. Twenty-eight moons revolve around Jupiter. The four largest moons were discovered by Galileo in 1610 and are called the Galilean moons or Galilean satellites. The Galilean satellites in order of their size are Ganymede, Callisto, Io, and Europa. All four of these moons are larger than the planet Pluto.

Ganymede is the largest moon of Jupiter and the largest moon in the entire solar system. It is composed of rock and water ice, and has craters and possible earthquakes.

Callisto is the most heavily cratered object in the solar system. It has a huge bull's-eye crater called Valhalla, and its surface is also made of rock and ice.

Io is the innermost of Jupiter's large moons. Large deposits of sulfur on its surface cause it to appear brilliant orange, yellow, and red. Io is also covered with active volcanoes.

Europa's surface consists of ice sheets that continually melt and resolidify.

Jupiter is called a gas giant. Although it may have a small solid core, the dense clouds surrounding the core are composed of hydrogen that may be liquefied in places. Its outer area is made mainly of hydrogen and helium gases and so it has no solid surface. Jupiter revolves very quickly, having a day of 9.8 hours. Jupiter bulges at the equator due to its rapid rotation and this rapid rotation may also be responsible for the continual storms on the planet. The Great Red Spot is Jupiter's most dominant feature. The Great Red Spot is a storm three times larger than the Earth. Astronomers believe that it has been raging for over 300 years on Jupiter.

Jupiter is the largest planet in the solar system. Because of its size, it was named after the Roman King of the Gods.

Jupiter has a faint ring system that is made from pieces of dust. These rings were discovered by the Voyager spacecraft.

Saturn

Saturn is the sixth planet from the sun and takes 29.5 years to revolve once around the sun. This planet was first observed by Italian astronomer Galileo during the 17th century. It has

flattened poles, storm spots, and a banded atmosphere composed mainly of hydrogen and helium gases. These gas clouds form colored bands around the planet.

Saturn has 30 moons—more moons than any other planet in the solar system. Its largest moon is Titan. Titan is the second largest moon in the solar system. Only Jupiter's Ganymede is larger. Titan has been described as "a mini earth in a state of deep freeze," because Titan is the only moon in the solar system with a thick atmosphere of mainly nitrogen. This atmosphere is very similar to Earth's. All of Saturn's moons are composed of ice mixed with silicate rock.

Saturn is known for its magnificent ring system composed of more than 1,000 rings made from billions of pieces of ice and rock. Galileo discovered Saturn's rings. Three of these rings can be detected from Earth. Its outer ring is called the A ring. The widest and brightest of these three rings is the B ring. The Voyager 2 space probes actually discovered that there were many rings surrounding the planet instead of just a few.

Although Saturn is the second largest planet in the solar system, it is the least dense, and would float in a huge body of water.

Saturn was named after the Roman father of Jupiter.

Uranus

Uranus is the seventh planet from the sun and takes 84 years to make one complete revolution. Sir William Herschel, an amateur German astronomer, discovered Uranus in 1781. It was the first planet to be discovered with a microscope. Uranus is very unusual because it is tilted at a 98-degree angle and thus revolves around the sun on its side while it also rotates. During its 84-year revolution, the two poles take turns facing the sun.

Uranus has 21 moons. The five largest moons listed in order of their size are Oberon, Titania, Umbriel, Ariel, and Miranda. Oberon has many large craters, while Titania has no visible ones. Umbriel is covered with craters, one of which is a very large white crater called Wunda. Ariel shows very few craters or other old features. Pictures from Voyager 2 revealed that Miranda's landscape looks as if it has been patched together. It is very possible that Miranda was once broken up and then fused back together.

This planet is covered by a thick atmosphere composed of hydrogen, helium, and methane gases, which gives it a blue-green color. At least 11 faint rings circle the planet from top to bottom. Each ring is approximately 6 miles wide and is made of black ice.

Uranus was named after the Greek God of the Sky. According to Greek and Roman mythology, Uranus was the husband of Gaea, the earth, and became the father of the Titans.

Neptune

Neptune is the next to the last planet from the sun. At times it appears farther from the sun than Pluto because the two orbits cross each other. It takes Neptune 164.8 years to revolve once around the sun.

The planet was discovered in 1846 by German astronomer Johann Galle. A few days later, Triton, the largest of Neptune's 8 moons was also discovered. Strangely enough, Triton orbits Neptune in the opposite direction of Neptune's rotation. The moon has an icy surface.

Neptune was named after the Roman God of the Sea because of its distinctive blue color. Triton was named for the son of Neptune, whom the Greeks called Poseidon. It is believed that Triton was formed elsewhere and was captured by Neptune's gravity.

Triton has a small rocky core surrounded by an ocean of warm water and thick clouds of methane and ammonia. Its atmosphere is composed mainly of hydrogen and helium.

Five rings encircle the planet. They appear to be made of dark, icy particles that range in size from minute pieces of dust to refrigerator sized boulders. At one time a Great Dark Spot was visible on the surface of the planet. It was believed to be a large hurricane-like storm. It is no longer visible.

Voyager 2 has provided astronomers with most of their knowledge of Neptune.

Pluto

Pluto is the ninth, and last planet from the sun. Its orbit crosses inside Neptune's orbit for 20 of the 248 years in its revolution around the sun. The planet was discovered by an amateur American astronomer named Clyde Tombaugh in 1930. Pluto is the smallest and coldest planet in the solar system. Since it is located so far away, very little is actually known about Pluto. It is the only outer planet that has not been visited by Voyager 2, and since no space probe has ever visited the planet, astronomers can only guess what it looks like.

Another American astronomer, Jim Christy discovered Pluto's one moon in 1978. Pluto's moon, called Charon, is just over half of Pluto's size and both of their orbits seem to be "locked together." Charon orbits Pluto with the same hemisphere always facing the same hemisphere on Pluto. For this reason, they are sometimes called a "double planet." Astronomers believe that Pluto and Charon both have large rocky cores covered by dirty water ice. Their surfaces are probably made of ice that is a mixture of nitrogen, carbon monoxide, and methane, thus giving them a slightly red color. Polar caps and dark spots appear near Pluto's equator.

Because the planet is a dark, icy body, it was named after the Roman God of the Underworld.

FACTS ABOUT THE PLANETS:

Largest planet: Jupiter
Smallest planet: Pluto
Planet closest to the Sun: Mercury
Planet that comes closest to Earth: Venus
Fastest-moving planet: Mercury
Slowest planet: Pluto
Warmest planet: Venus
Coldest planet: Pluto
Longest day: Mercury
Shortest day: Jupiter
Least dense planet: Saturn

Other Interesting Facts:

1. Jupiter has a gigantic magnetic field called the **magnetosphere.**
2. Jupiter gives off more heat than it absorbs from the sun.
3. All four of the gas giants have a ring system.

4. All the planets orbit the sun in the same direction.

5. The orbits of all the planets lie in a flat plane except for the orbit of Pluto, which is tilted compared to the other orbits.

6. Mercury and Venus are the only two planets that do not have at least one moon.

7. Mars looks like a red star in the sky.

8. Jupiter has a striped appearance when viewed through a telescope. These stripes are due to its rapid rotation.

9. Some of Jupiter's and Saturn's moons are very similar in size to the planet Pluto.

Asteroids

Asteroids are defined as small, irregular bodies that are covered with craters. The largest asteroids are often referred to as minor planets. Most of the asteroids lie in the **asteroid belt**, which is located between the orbits of Mars and Jupiter. The largest asteroid is **Ceres**, which was discovered in 1801. Apollo, Icarus, and Adonis are three asteroids that actually pass inside Earth's orbit. Occasionally, pieces of asteroids fall to the Earth. Those that do not burn up from the friction and heat as they pass through the atmosphere are then called **meteorites**. Many scientists believe that the extinction of the dinosaurs was caused by a huge meteorite hitting the earth. If asteroids or grains of dust burn up in the earth's atmosphere, they are then called **meteors**. The common name for a meteor is a shooting star.

Comets

Comets are balls of dust and ice that orbit the Sun. A comet has three basic parts: the **nucleus, coma,** and the **tail**. The **nucleus** is the core of a comet. Gas that evaporates from the nucleus forms a cloud of dust called the **coma**, which spins around the nucleus. Together, the nucleus and the coma make up the head of the comet. Solar wind blows the coma outward into a long tail which streams away from the sun. This **tail** is actually composed of two separate tails, a straight gas tail and a broader, curved dust tail.

Edmond Halley was the first astronomer to discover the regular orbiting patterns of comets. He observed a comet in 1682 and predicted its return in 1758. This comet, which did indeed return, came to be known as **Halley's Comet**.

The comet called Shoemaker-Levy smashed into Jupiter in 1994. The Hale-Bopp comet could be easily viewed from Earth in 1997.

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STUDY GUIDE:
STARS

Facts You Should Know:

Stars are created in swirling masses of gas and dust particles called a **nebula**. A star is fueled by internal **nuclear energy**, in a process called **thermonuclear fusion**, and stays together due to the forces of its own **gravitation**. The hotter a star's **core**, or center, the more reactions it produces. A star's gravity depends upon the **mass** of the materials inside its core. Most stars are composed primarily of **hydrogen**. The rest of a star's content is **helium**. In the core of a star, hydrogen **fuses** to form helium, thereby releasing nuclear energy. In **Main sequence** stars, the greater a star's mass, the brighter its **luminosity** will be.

Stars vary greatly in mass, temperature, and luminosity.

Astronomers have categorized visible stars into six different **magnitudes**, depending upon their **apparent brightness**. Apparent magnitude refers to how bright a star appears when seen from the Earth. The first magnitude is a **relative measurement** because it often depends on the star's distance from us. Closer stars often appear brighter than some of the farther stars, even though the farther stars are actually brighter.

Luminosity is the measure of the total amount of light a particular star emits. To measure luminosity, astronomers must measure the u-v rays that are emitted, but this is sometimes difficult, because our atmosphere blocks these rays from visibility.

Astronomers use a star's light rays to calculate its **spectral type**, which indicates its approximate temperature. To do this, these use a **spectroscope**. Since the color of a star is correlated with its surface temperature, this measurement, which breaks the star's light into color bands, helps to determine the star's temperature. Astronomers classify stars according to their temperatures into seven spectral classes. In order from hottest to coldest, these spectral classes are **O, B, A, F, G, K,** and **M**. The hottest stars are placed

in the O and B class and are blue. The next hottest are classified in the A class and are white. F and G are yellow. Those in the K class are orange, and the M class contains the red stars, which are the coolest of the stars.

A graph developed by Ejnar Hertzsprung and Henry Norris Russell, now known as the Hertzsprung-Russell diagram, plots the relation of absolute brightness to its spectral type. When the stars are plotted, most of the stars fall along a "Main Sequence" diagonal from the top left to the bottom right. This chart portrays surface temperatures horizontally and plots luminosity vertically, so that the brightest stars fall at the top of the chart, and the hottest stars congregate on the left. The faintest stars are found at the bottom.

The sun is a star! In fact, it is the closest star to Earth, only 150 million kilometers (93 million miles) away. This may seem like a long way, but it's still 250,000 times closer to us than the next closest star, which is Proxima Centauri. The Sun is 4.6 billion years old and its light only takes 8 minutes to reach Earth, while the light of many other stars takes billions of years. **Red giants**, the biggest tars, are hundreds of times larger than the sun. **White dwarfs** are approximately the size of the Earth.

The earliest astronomers thought stars were motionless and formed fixed patterns in the night sky that became known as **constellations**. Now we know that stars do move, but do so very slowly. This factor is known as **proper motion**. The motion we see of stars across the night sky is called **apparent motion**, and is actually a by-product of the Earth's rotation.

The universe contains countless **galaxies**, each composed of billions of stars that orbit around one central location. Galaxies are classified according to their shape. The three main types of galaxies are **elliptical, spiral, and irregular**. All the visible stars in relation to us are in the **Milky Way**, our galaxy, which contains the sun and our solar system of planets as well. The Milky Way is a spiral galaxy.

Star clusters can be **open** (also called **galactic**) or **globular**. There are fewer and more sparse stars found in an open cluster than globular one. Stars in an open cluster are usually about the same age. One of the more famous visible open clusters is the **Pleiades** (also known as the Seven Sisters) in Taurus, which contains approximately 500 stars. The brightest star is the Pleiades is Alcyone. One of the most well-known open clusters in the Southern Hemispheres is the Jewel Box, which contains stars of many colors.

Globular clusters are more common. They are symmetrical, spherical, and closely bound. They surround the Galaxy in a "galactic halo." They can contain millions of stars that are bunched together in a "glob." In comparison, open clusters are shapeless and contain relatively few stars. There are approximately 120 known globular clusters in the Milky Way. Most are found near Scorpio and Sagittarius.

Phases of Stars

Stars go through several phases as they age. Once they are formed in a nebula from gas and dust, they continue to survive by burning hydrogen for billions of years. This phase is called the **main-sequence.**

When a star runs out of hydrogen, the star is out of balance and the core shrinks. However, the star itself expands, becoming a **red supergiant**. As the core shrinks, the internal pressure rises, making it hot enough to begin another nuclear reaction, at which point the core stops shrinking and the atmosphere begins to consolidate.

When supergiants contract, they often form **neutron stars**, dense, compact stars that spin rapidly.

Extremely massive supergiants may repeat this process, condensing even further to become **black holes**, whose gravitational fields are strong enough to block light.

A **white dwarf** occurs when a small to middle-mass star uses up its fuel, and collapses. As it collapses, much of its atmosphere disburses into space as gas and dust from which new stars will be formed. After about a billion years, this type of star will lose its fuel, and change into a **black dwarf.**

Unique Types of Stars

Binary stars are actually two stars that orbit each other, which means every so often one of the stars passes behind the other star and is hidden for a short time.

Variable stars alternate between brightness and dimness. Two important variable stars are Delta Cephei in the Northern Hemisphere and R Centaiuro in the southern Hemisphere.

Flare stars are red dwarfs that suddenly release brief bursts of light.

Pulsars emit radio waves and magnetic fields and are created when neutron stars collapse.

Novas occur when a main-sequence star and a white dwarf star in a binary star system explode in the course of a day. Temporarily, this can make their system 300,000 times brighter than the sun. This brightness lasts for a few days or weeks, and then lessens gradually, leaving the stars about the same as they were before. In 1992, Nova Cygni, in the northern constellation Cygnus, became one of the brightest novas visible during this century.

A **supernova** occurs on rare occasions. It happens when a star explodes, giving off light, and typically destroying itself. The most notable recent supernova, because it was the first to be visible to us on Earth in 300 years, was SN 1987 A, which erupted near the Milky Way in a galaxy known as the Magellanic Cloud.

THE BRIGHTEST STARS IN THE SKY IN ORDER OF BRIGHTNESS:

1. Sirius
2. Canopus
3. Alpha Centauri
4. Arcturus
5. Vega

The next brightness stars are Capella, Rigel, Procyon, Archernar, and Betelgeuse. Vega is the brightest star in the northern hemisphere.

THE CLOSEST STARS TO EARTH, IN ORDER:

1. The Sun
2. Proxima Centauri/Alpha Cen C
3. Rigil Kentaurus/Alpha Cen A
4. Alpha Centauri B
5. Barnard's Star

THE CONSTELLATIONS:

Stars form patterns in the sky called constellations. The constellations in the northern sky that circle Polaris, the north star, are called the north circumpolar constellations. The five most popular north circumpolar constellations are Ursa Major, Ursa Minor, Draco, Cassiopea, and Cepheus.

Ursa Major is known as the Big Bear and contains the seven stars that compose the Big Dipper. The front stars of the big Dipper are called the pointer stars because they point to Polaris, located at the end of the handle of the Little dipper, which is found within Ursa Minor, the Little Bear. Draco is a dragon, and Cassiopea is a queen, whose shape resembles a wide "w" in the sky. Cepheus, the king of Ethiopia, also sits beside Cassiopea in the northern sky. This constellation appears as a simple picture of a house, and is often upside-down in the sky. These north circumpolar constellations can be found at any time of the night.

THE ZODIAC CONSTELLATIONS:

The zodiac constellations are 12 constellations that appear to encircle the earth. A list of these constellations and pictures associated with each constellation are given below.

CONSTELLATION	PICTURE THAT IT FORMS
1. Capricorn	Goat
2. Aquarius	Water bearer
3. Pisces	Two Fish
4. Aries	Ram
5. Taurus	Bull
6. Gemini	The Twins
7. Cancer	Crab
8. Leo	Lion
9. Virgo	Virgin
10. Libra	Measuring Scales
11. Scorpio	Scorpion
12. Sagittarius	Archer

OTHER STAR CONSTELLATIONS:

CONSTELLATION	PICTURE THAT IT FORMS
1. Bootes	Herdsman
2. Corvus	Crow
3. Crater	Cup
4. Hydra	Sea serpent
5. Aquila	Eagle
6. Corona Australis	Southern Crown
7. Corona Borealis	Northern Crown
8. Cygnus	Swan
9. Hercules	Hercules
10. Lacerta	Lizard
11. Lupus	Wolf
12. Lyra	Lyre
13. Vulpecula	Fox
14. Andromeda	Princess of Ethiopia
15. Cetus	Sea Monster (Whale)
16. Delphinus	Porpoise or Dolphin
17. Equuleus	Little Horse
18. Pegasus	Winged Horse
19. Perseus	Perseus
20. Triangulum	Triangle
21. Auriga	Charioteer
22. Camelopardus	Giraffe
23. Canis Major	Large Dog
24. Canis Minor	Small Dog
25. Columba	Dove
26. Lepus	Hare
27. Orion	Hunter
28. Apus	Bird of Paradise
29. Crux	Southern Cross
30. Musca	Fly
31. Pavo	Peacock
32. Reticulum	Net
33. Triangulum Australe	Southern Triangle
34. Tucana	Toucan
35. Volans	Flying Fish

SELECTED CONSTELLATIONS	BRIGHT STARS IN CONSTELLATION

Within a star constellation there is sometimes a star that shines brighter than the rest. You will be given the bright stars in the following constellations.

1. Bootes	Arcturus
2. Ursa Minor	Polaris
3. Leo	Regulus
4. Virgo	Spica
5. Cygnus	Deneb
6. Lyra	Vega
7. Aquila	Altair
8. Perseus	Algol
9. Auriga	Capella
10. Gemini	Castor and Pollux
11. Taurus	Aldebaran
12. Canis Major	Sirius
13. Canis Minor	Procyon
14. Orion	Rigel and Betelgeuse

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STUDY GUIDE:
PLANTS

The study of plants is called **botany**, and the scientist who studies plants is called a **botanist**.

Plants have five main characteristics:

1. They are **multicellular organisms**. This means that they are composed of several cells instead of just one cell.
2. They do not move by themselves.
3. They have a **cell wall** surrounding the **cell membrane** of each cell.
4. They are **autotrophs**, which means they produce their own food by a process called **photosynthesis**. Photosynthesis is the scientific process whereby plants produce food by utilizing solar energy. Chlorophyll in the leaves traps the sunlight's energy to produce carbohydrates for its own nourishment.
5. They have **chloroplasts** within their cells that contain **chlorophyll** to aid in photosynthesis. Besides aiding in photosynthesis, chlorophyll gives plants their green color.

Plants are divided into two main groups according to their structure. They may be nonvascular or vascular plants.

Nonvascular plants are plants that have no internal tube-like structures to carry the sugar, water, and minerals throughout the plant. They also lack true roots, stems, and leaves.

There are two main types of nonvascular plants:
MOSSES and LIVERWORTS

Vascular Plants are plants that have a system of tube-like cells that carry materials throughout the plant. There are two types of vascular tissue in a vascular plant. The **phloem** carries food from one part of a plant to another. Food is produced in the leaf

and travels downward to the root and to other parts of the plant through phloem. The other type of vascular tissue is the **xylem**. The xylem carries water and dissolved minerals upward from the roots to the stem and leaves. Vascular plants do have true roots, stem, and leaves. Vascular plants tend to be taller than nonvascular plants, because they are able to transport materials longer distances through their tube-like vascular systems.

All plants EXCEPT mosses and liverworts are vascular plants.

Because they have a simpler structure, let's examine the **nonvascular plants** first. Mosses and liverworts are nonvascular plants that belong to the phylum **bryophyta**. Bryophytes are small land plants that produce spores and live in a moist environment. Bryophytes do not have true roots. They are held in the ground by a mass of root-like threads called **rhizoids**. Water travels through the rhizoids and to all parts of the plant by **osmosis**. The rhizoids are connected to the green, stalk-like part of the plant. Surrounding the stalk are green, leaf-like parts that contain the chloroplasts and carry on the photosynthesis. Once the food is manufactured, it is carried to the other parts of the plant by **diffusion**. Both osmosis and diffusion are very slow processes. A capsule is located at the top of each stalk. This is the spore case of the moss.

The life cycle of **moss** is unique. Moss undergoes an asexual stage as well as a sexual stage during its life cycle. During the asexual stage, the moss capsule produces spores. When these are scattered by natural forces, such as wind and water, they sometimes land in moist soil. If so, they **germinate**, meaning they sprout into a new plant. When this new plant matures, it develops sex organs at the top of the leaf-like parts and begins the sexual phase of its life. The male sex organ produces the sperm, which swims through the inherent moisture, such as rainwater or dew, and fertilizes the egg of a nearby female sex organ. This fertilized egg is called a **zygote**. It develops into an **embryo** that remains in the moist female sex organs for protection. Here it develops a stalk and a capsule, and the process starts over again.

OTHER VOCABULARY RELATED TO MOSSES:

1. **Gametes** are the sex cells.
2. **Gametophytes** are the stage in the life cycle that produces the gametes.
3. **Sporophytes** are the stage in the life cycle that produces spores, the cells which are capable of reproducing into a new entity.

Liverworts are another nonvascular plant and are very similar to mosses.

Vascular plants are divided into **two main types**: those that are **seedless**, such as club mosses, horsetails, and ferns, and those that have **seeds**, which are then subdivided into the **gymnosperms** and **angiosperms**. Gymnosperms include conifers, cycads, and gingkoes, and **angiosperms** include the flowering plants.

The club moss is a **vascular seedless plant**. It lives in tropical regions or on forest floors in the cooler climates. It reproduces by producing spores called gametes. It is not a true moss because it has scale-like leaves, and mosses do not have leaves. Horsetail are very similar to club mosses. Both were much more widespread in the past.

Another **vascular seedless plant** is the fern. Like all vascular plants, ferns have true leaves, stems, and roots. They are often grown as houseplants. The other parts of a fern are the:

Rhizomes: The part of the plant between the roots and the young leaves.
Fronds: The large feathery leaves.
Fiddleheads: The young leaves that are coiled up. They uncoil and become mature fronds and the plant ages.
Sporanzia: The structure in which reproductive cells are produced.
Sori (Sorus): The term for the clusters of spore cases that develop on the underside of a fern frond. Spores released from the sori are carried by the wind and water.

Ferns were the first plants to evolve vascular tissue and the first to evolve true roots, stems, and leaves.

Vascular plants with seeds are subdivided into the **gymnosperms** and the **angiosperms**. Gymnosperms are plants that produce seeds but do not have flowers. Most trees and shrubs are gymnosperms. Like all vascular plants, gymnosperms have true roots, stems, and leaves. **Conifers** are gymnosperms that have needle-like leaves and produce seeds in cones. Pines, spruces, and sequoias are examples of conifers.

Reproduction in Conifers:

1. The small, male cones produce pollen, a yellow powder that produces sperm.
2. The wider female cone has two ovules near its base that produce one or more eggs. The ovules protect the eggs.
3. Pollen is released from the male cones in the spring.
4. The pollen is carried to female cones by the wind, other weather conditions, or animals.
5. The pollen lands on the female cone. It slides down the scales of the female cone and is caught in the sticky substance released by the ovules. Pollination has occurred, and the sperm fertilizes the egg.
6. The fertilized egg grows into an embryo that becomes a seed.
7. The seed coat is a tough, outer covering that protects the seed, which is finally released in the second autumn after pollination.

Cycads and ginkgoes are also gymnosperms.

Angiosperms are **vascular plants with seeds** that produce flowers. There are two types of **angiosperms**.

1. The first type is **monocotyledons** (monocots). Monocots have the following distinctive characteristics:

   a. One seed leaf (cotyledon).
   b. Parallel leaf veins.
   c. Scattered vascular bundles inside its stems.
   d. Fibrous roots.
   e. Flowers that occur in multiples of three parts.

2. The second type is **dicotyledons (dicots).** Dicots have the following distinctive characteristics:

   a. Two seed leafs (cotyledon).
   b. Veins that have a netlike pattern or are palmates.
   c. Vascular bundles that form a ring pattern in the stems.
   d. Tap roots.
   e. Flowers that occur in multiples of four or five.

ANGIOSPERMS have eight distinct parts.

1. **Stamens** are the male reproductive organs of the flower.
2. **Pistils** are the female reproductive parts.
3. **Stigma** refers to the sticky surface on the pistil that traps the pollen.
4. **Sepals** are usually green. They are leaf-like and are found at the base of the flower. They enclose the flower before it blooms and protect it.
5. **Filaments** are the long stalk-like parts of the stamen that support the knob-like anthers where the pollen is produced.
6. The **style** is the section of the pistil that links the stigma to the ovary.
7. **Ovules** are the female reproductive organs of the flower that produce the eggs.
8. **Ovaries** contain the ovules.

Angiosperms are grouped according to the length of their growing periods. They can be **annuals, biennials,** or **perennials**. Annuals are plants that complete their life cycle in one year. Biennials are plants that require two years to complete their growth and life cycle. Perennials are plants that grow year after year and reproduce many times.

ROOTS

There are two main types of roots: **fibrous roots** and **tap roots**. Both types of roots are covered with **root hairs**. Root hairs are tiny hairs that gather water and nutrients from the soil. They also help anchor the plant into the ground. The roots of some plants store food.

Fibrous roots are slender and branch out in many directions. They are often found in such food crops as wheat, barley, and beans.

A taproot is a single, large root that grows straight down into the ground. It has tiny root hairs that shoot out form its core. Its purpose is to store a large amount of food. The carrot is an example of taproot.

ROOT STRUCTURE

The **epidermis**, an outer layer of cells, protects the root. Inside this layer is **vascular tissue**, which includes two types of cells, the **phloem** and the **xylem**. The function of the phloem is to transport food from one part of the plant to another. The function of the xylem is to carry water upward from the roots to the rest of the plant.

STEMS

There are two main types of stems: **herbaceous** and **woody**. An herbaceous stem is soft, green, and flexible. Woody stems are hard, strong, and firm.

The purpose of stems is to transport the food from the leaves to the roots, and to hold the plants erect, so the leaves can capture light, and thus undergo photosynthesis.

Stems are composed of **xylem**, **phloem**, and **cambium**. Xylem is found towards the core of the stem, and phloem is found closer to the outside. The cambium is a layer of cells that manufactures new xylem and phloem. When you look at the growth rings of a tree, you are actually looking at its xylem! **Bark** is the outer protective layer found on woody stems.

LEAVES

Leaves are the part of the plant that manufacture the food. The flat part of the leaf is called the **blade**, and the **veins** are actually bundles of xylem and phloem.

OTHER LEAF PARTS INCLUDE:

A. The **epidermis** is the outer protective coating of cells on the leaf.
B. The **mesophyll**: the middle part of the leaf containing the chlorophyll and the part of the leaf where most of the food is actually made.

C. The **cuticle** is the waxy layer found on some leaves that keeps the plant from losing water through evaporation.
D. The **palisade layer** contains long cells under the epidermis (in the mesophyll) that aid in the process of photosynthesis.
E. The **spongy layer** contains irregularly shaped cells that also help during photosynthesis.
F. **Stomata (Stomates)** are the openings on the underside of the leaf where carbon dioxide enters the leaf and oxygen exits the leaf during photosynthesis.
G. **Petioles** are stalk-like particles that attach the leaves to the stem.

LEAF VEIN PATTERNS

There are three main leaf vein patterns:

1. **Pinnate**: The veins in a pinnate leaf pattern resemble the veins in a feather. One main vein, called the midrib, goes up the center of the leaf. Several smaller veins branch off from the midrib. Elm leaves have a pinnate leaf pattern.
2. **Parallel**: Grass has a parallel vein pattern. The veins tend to run parallel to each other. They never touch or intersect each other until they get to the very tip where they taper toward the point of the leaf.
3. **Palmate**: There is not one main midrib in the palmate vein pattern. Three to five larger veins branch outward from one point near the bottom of the leaf, resembling fingers on a hand. Other small veins then branch from these larger veins. Maple leaves have palmate leaf patterns.

PHOTOSYNTHESIS

Photosynthesis is the food-making process in the plant. The four things needed for photosynthesis are carbon dioxide, chlorophyll, water, and light energy. Photosynthesis takes place in the leaf of the plant. Carbon dioxide is brought into the plant through the stomata on the leaves, and the roots gather water and transport it upward to the leaves. The following steps then occur.

1. The chlorophyll captures and traps the light from the sun.
2. The captured energy is split into two parts. One part is stored in the compound ATP and will be used for other cell purposes. The other part is split apart to release the hydrogen and oxygen. The oxygen is released into the air through the stomates, or tiny holes, on the underside of the leaf. The hydrogen remains in the chloroplasts.
3. Enzymes and energy that has been stored as ATP then combine with carbon dioxide to create a simple sugar, called glucose that is used by the plant to perform its life processes.

RESPIRATION

Respiration is the process where the energy stored within the newly manufactured glucose is released from the glucose. Contrary to photosynthesis, which occurs only during the daylight, respiration occurs continuously. It is the opposite of photosynthesis in that it uses some of the oxygen produced in photosynthesis and releases carbon dioxide and water.

TROPISMS

Tropisms are the processes in which a plant grows toward a particular stimulus.

There are four different types of tropisms:

Phototropism: The plant responds and grows toward a **light** source.
Geotropism: The plant responds to **downward gravity**. If a plant is placed upside down, with the roots extending upward, those same roots with gradually turn and grow downward due to gravity.
Thigmotropism: Plants respond and grow toward **touch**. They may wind around a wooden stake, or grow along a wall.
Hydrotropism means that the plants respond and grow toward **water**.

OTHER PLANT VOCABULARY TERMS

Auxins are hormones that determine stem growth. They are connected with tropisms.
Bulbs are the underground portions of the plant that put down roots.
Cross-pollination occurs when pollen is transferred from the anther of one flower to the stigma of another flower by the action of weather conditions or insects.
Dormancy is the time period during which a plant does not grow.
Embryo is a term for the young plant that develops from the zygote.
Endosperm is the material which turns into stored food for the seed.
Epiphytes are plants that grow on trees but do not leech food from the tree or harm the tree in any way. For example, in some tropical forests, ferns may grow on the sides of taller trees.
Fruit is the name given to the ripened ovary that surrounds and protects the seeds.
Germination refers to the beginning of growth.
Gnetophytes are a group of plants that possess characteristics of both gymnosperms and angiosperms. Included in this category are tropical vines and several desert plants.
Grafting is the science through which a bud of one plant is inserted into an existing stem or trunk of another, where it grows as a permanent part of that plant.
Hydroponics is the science of growing plants in water as opposed to the traditional method of planting them in soil.
Pollination is the process by which pollen is transferred from the male reproductive structure (stamen) to the female reproductive structure (ovule).
The **Radicle** is the root part of an embryo seedling.
The **Seed Coat** is the outer casing that protects the seed.
Self-pollination occurs when pollen from the stamen is transported to the pistil in the same flower.
Tuber refers to the short, fleshy part of an underground stem from which new plants develop.
Vegetative reproduction occurs when a new plant grows from the root, stem, or leaf of another parent plant.

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STUDY GUIDE:
AGRICULTURE: CROPS

MAIN FIELD CROPS GROWN IN THE UNITED STATES:

1. Corn
2. Soybeans
3. Wheat
4. Rice

The United States produces more corn than any of the other main field crops. However, we export more wheat than any of the other crops.

CORN

Corn is an important agricultural crop. It is grown on every continent of the world except Antarctica.

The Corn Belt is the name given to the area in our country that grows the most corn. Illinois, Iowa, Nebraska, and Minnesota are the four states in the Corn Belt that produce the most corn. Other states in the Corn Belt are: Ohio, Indiana, Missouri, Kansas, and South Dakota. Iowa usually leads in the production of corn and is followed closely by Illinois.

Approximately 61% of the corn grown by U.S. farmers is used for feeding livestock, and about 22% is exported.

There are four main types of corn grown in the state of Illinois. The four main types of corn grown in Illinois are **seed corn, sweet corn, field corn,** and **popcorn.**

Corn is measured in bushels. One bushel weighs approximately 56 pounds. Each piece of corn is called a KERNEL. The elongated oval in the center of the corn kernel is called the GERM. The germ contains most of the oil and some of the protein in the corn kernel. This is the part of the kernel that is used in cooking oils, margarine, mayonnaise and salad dressing. The fibrous outer layer of a corn kernel is the HULL.

Corn is attacked by a variety of parasites and fungi. Corn smut, a parasitic fungus, produces a large mass of black spores on ears, stalks, or tassels. The corn rootworm, a larva of the cucumber beetle, feeds on the root system of corn plants. The European corn borer attacks the stem of the plants.

SOYBEANS

Soybeans originated in China, but today the United States leads the world in the production of soybeans. Brazil and China are also important soybean producers. Illinois is usually the leading soybean-producing state, and is followed closely by Iowa. Indiana, Minnesota, and Missouri are the next three largest soybean producers.

Soybeans are usually planted in the Midwest in May or June. After six to eight weeks, small flowers appear on the soybean plant. The flowers may be purple, white, or pink. About two weeks later, the pods are produced. Each pod usually contains two or three soybean seeds, which are also called beans. It takes 30 to 40 days for the beans to mature. During this time, the plant continues to grow until it stands from two to four feet tall. The leaves turn yellow and fall to the ground. Combines are used to harvest the beans in late summer or early fall.

Soybeans are legumes and belong to the same family as the pea. They thrive in fertile, well-drained soil, and require at least 20 inches of rain per year. Because they obtain nitrogen from the air, they do not require nitrogen fertilizers.

Soybeans are the nation's largest source of vegetable oil and protein meal for livestock. Forty percent of the soybean is protein, and 20% is oil. Soybean oil is cholesterol-free and is the number-one edible oil in the world, and the most frequently consumed oil in our country. Each bushel of soybeans can be crushed to yield over 10 pounds of soybean oil, and 39 pounds of soy flour can be obtained from one bushel of beans.

Soybeans are attacked by many different diseases. Diaporthe pod and stem blight is a fungal disease that attacks the pods and stems of the plant. Other pests, such as the bean leaf beetle, stinkbug, velvetbean caterpillar, and tiny worms called nematodes also attack the soybean plants.

We export soybeans to many countries, but more soybeans are exported to the following countries than any others: Canada, Mexico, Venezuela, Saudi Arabia, China, and the Philippines.

WHEAT

Wheat is grown in many countries of the world. The countries producing the most wheat are listed below in order of their production.

1. Russia
2. China
3. United States
4. India
5. Canada
6. France

The two main types of wheat are winter wheat and spring wheat. Winter wheat is planted in the fall and harvested in the spring or early summer of the next year. It accounts for 70 to 80% of the U.S. wheat production. Spring wheat is planted in the spring and harvested in the summer of the same year. It is usually grown in cool, dry regions where the soil quality is poor. The wheat is usually planted by using a drill. The plant turns a golden brown when ready for harvesting.

There are six major classes of wheat that are classified according to their hardness, color, and shape of their kernels.

1. Hard Red Winter Wheat
2. Hard Red Spring Wheat
3. Soft Red Winter Wheat
4. Durum
5. Hard White Wheat
6. Soft White Wheat

Hard Red Winter Wheat is the largest class of wheat produced each year in the United States. It is grown mainly in the Great Plains states. Hard Red Spring Wheat contains the highest percentage of protein. It is grown mainly in Montana, North Dakota, South Dakota, and Minnesota. Hard White Wheat is the newest class of wheat grown in the United States.

Wheat is grown mainly for flour that is used for breads and pastries. Many breakfast cereals are made from wheat, as well as tortillas and other snack foods.

The wheat kernel contains three parts that are separated during the milling process to produce the flour. These three parts are the **endosperm**, **bran**, and the **germ**.

The leading wheat-producing states in our country are North Dakota, Kansas, Montana, and Oklahoma.

The principal diseases of wheat are RUST and SMUT.

RICE

Rice requires warm temperatures and at least 40 inches of rainfall per year to grow. The rice is planted by low-flying airplanes and grown in flooded fields called rice paddies. Rice grows to be about one meter tall. It has perfect flowers with six stamens and one pistil. The rice grain is actually the fruit of the plant, and is produced in spikelets at the top of the stalk. The white endosperm is enclosed by a layer of bran and surrounded by a brown husk.

In the United States, a flooded field, called a paddy, is seeded by an airplane. The field is kept flooded during most of the growing season. The crop is harvested and threshed by machine, producing brown rice. If white rice is desired, the bran is removed from the rice, leaving the white endosperm intact. This white internal kernel is polished with glucose and talc to improve its appearance.

The four main rice-growing states in our country are Arkansas, California, Texas, and Louisiana. Rice is also grown in Florida, Missouri and Mississippi.

China is the leading rice producer in the world. It is followed closely by India.

The main rice diseases are seedling blight, leaf smut, stem rot, and kernel spots. Most of these diseases are caused by fungi. Seedling blight occurs when a fungus infects the seedlings. Leaf smut, another fungus, is very prevalent in Arkansas, Louisiana, and Texas. Stem rot attacks the stalks of rice, causing them to weaken and break.

FARM MACHINERY:

Tractor: The tractor is the most important implement used on a farm because it pulls many other types of farm machinery.

Plow: The plow is used to break the ground and prepare the soil. It has bladelike plowshares that cut into the soil, lift it up, and turn it over. Harrows are then used to cover the seeds.

Disk harrows: These are sometimes used before plowing to chop up crop residues that have been left in the field from the previous crop.

Corn planters: Corn planters are used to plant corn seeds in rows. A special wheel picks up small amounts of corn seed and places them in the ground.

Manure spreader: This wagon has a conveyor belt that carries the manure to a beater attachment where it is pulverized and then scattered on the ground to serve as a natural fertilizer.

Cultivator: This machine destroys weeds and loosens the soil, thus allowing air to enter.

Combine: This machine harvests corn, soybeans, and several other crops. It removes the fruiting heads, beats the grain kernels, and cleans the grain. Corn is also picked with a corn picker, which strips the ears from the stalks.

Auger: This is a spiral device on a shaft. It resembles a giant, rotating screw that is used to move grain through a tube.

Hay baler: This machine compresses the cut hay into bales and secures them with heavy twine.

Cotton gin: It twists the cotton fibers from the boll and removes the seeds.

Chisel plow: This machinery is pulled behind a tractor to break up very hard soil.

Drill: This piece of machinery pokes holes in the soil for the seeds, plants the seeds, and covers them up.

Float: This device is pulled behind a tractor to level or smooth the soil.

Header: The header is the part of the combine that cuts the talks and conveys them to the threshing part of the combine.

TYPES OF FARMING METHODS:

Strip cropping: Farmers grow clover crops in strips between other crops to help hold the soil in place.

No- Till: Fields are not plowed or tilled after the crops have been harvested. Stalks and other parts from the crop are left in the ground until the spring. This helps prevent wind and water erosion.

Crop rotation: Because different crops use different nutrients from the soil, one crop is grown in a field the first year and a different crop is grown in the same field the next year. Plants, such as legumes, can revitalize the soil and help maintain good yields.

Dry farming (or dry land farming): Crops are grown without irrigation.

Contour plowing: Furrows are plowed at right angles to a slope to help catch the rainwater and retain runoff, thus halting erosion. Rows are made around a hill instead of vertically up and down.

Terraces: A flat, wide ledge is cut into the side of a hill or mountain to create a level place for crops to be grown.

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STUDY GUIDE: AGRICULTURE: LIVESTOCK, PART 1
CATTLE and SHEEP

CATTLE: GENERAL CHARACTERISTICS OF CATTLE

Cattle have one stomach that is divided into four compartments: the rumen, the reticulum, the omasum, and the abomasum.

They are ruminants. The animals chew the food and swallow it. The food goes into the rumen and is then regurgitated. This regurgitated food, called the CUD, is again chewed in the mouth before it is swallowed and passed once again through the rumen and the other three stomach parts.

They have a total of 32 teeth. Eight incisor teeth are located on the bottom front jaw, but no teeth are found on the top front. There are six strong, flat molars on the back of both sides of each jaw.

They are even-toed hoofed mammals. Some cattle are polled. This means that they have no horns. Others have hollow, unbranched horns that are never shed.

The average gestation period is 281 days. The gestation period refers to the actual number of days in the pregnancy from conception to birth.

Cattle are divided into two main categories—**beef cattle** and **dairy cattle**. Beef cattle are cattle that are produced for their meat, while dairy cattle are cattle that provide milk for drinking or for the manufacturing of other dairy products.

BEEF CATTLE

THE FIVE MAIN TYPES OF BEEF CATTLE RAISED IN AMERICA ARE:

1. Angus (Black Angus or Aberdeen Angus)—Black in color and polled (no horns). They originated in Northeastern Scotland.
2. Herefords—Brown or red in color with white faces and white spots on the crest, brisket, and below the knees on the hock. They originated in England.
3. Charolais—White or cream-colored cattle that originated in Europe.
4. Shorthorn—Red or white in color, or a mixture of the two colors. They originated in Northeastern England and are sometimes called "Durhams."
5. Brahma or Brahman—White or gray in color with loose, hanging skin. This breed is able to tolerate high heat levels because they have sweat glands, and sweat freely from pores in their skin. They are humpbacked with large droopy ears and a large dewlap (loose skin hanging from the neck area). They originated in Asia.

THE TEN LEADING BEEF CATTLE STATES IN AMERICA ARE:

1. Texas	2. Missouri	3. Oklahoma
4. Nebraska	5. South Dakota	6. Montana
7. Kansas	8. Iowa	9. Florida
10. Kentucky		

Most beef available in today's supermarkets has been graded by the U.S. Department of Agriculture. The grad eof beef is determined by the amount of marbeling (fat) that the meat contains. The three most common grades of beef are PRIME, CHOICE, AND SELECT, with prime being the superior grade.

DAIRY CATTLE

Dairy cattle do not produce any milk until after they have born a calf. The dairy farmer usually feeds the calf soon after its birth, so that the cow can be milked. Most cattle are milked twice a day for ten months. The average amount of milk produced annually by a cow is 15,000 pounds, with good milk-producing cows providing up to 30,000 pounds of milk per year.

THE FIVE MAJOR BRANDS OF DAIRY CATTLE RAISED IN AMERICA ARE:

1. Holstein-Friesian (or Holstein)—Most are black and white, but a few are red and white. This breed produces the largest volume of milk. They originated in the Netherlands.
2. Ayershire—Red, brown or mahogany color with white. They originated in Scotland, are medium in size, and are good "hill grazers."
3. Brown Swiss—Light brown to medium brown in color. They originated in Switzerland.
4. Guernsey—Fawn or creamy white in color. They originated in France.
5. Jersey—Color ranges from fawn through shades of gray, brown, or even black. They originated in Jersey, which is one of the Channel Islands located off the northern coast of France. They're one of the smallest breeds of dairy cattle, and their milk has the highest percentage of butterfat.

THE NINE LEADING DAIRY CATTLE STATES IN AMERICA ARE:

1. California	2. Wisconsin	3. New York
4. Minnesota	5. Pennsylvania	6. Texas
7. Michigan	8. Ohio	9. Iowa

Although Wisconsin is nicknamed "The Dairy State," California is actually the leading dairy producing state in our country, producing an average of 27 billion pounds of milk and cheese per year. Fresno is the top-producing dairy county within California.

THE COMPOSITION OF MILK: The following materials are found in milk. The listed percentages are the average percentages for each ingredient.

1. Water—87.1%
2. Fat (butterfat)—3.9%
3. Casein—2.5% (This is a milk protein that is white in color and rich in calcium.)
4. Lactose—5.1%
5. Albumin-- .7%
6. Mineral matter--.7%

Milk is pasteurized. This means that it is treated with heat to kill the germs. Homogenized milk is milk that is well mixed so that the cream and water in the milk do not separate. Vitamin D or Vitamin A has been added fortified milk to make it healthier. Different types of milk can be purchased in the stores, depending upon the fat content. The amount of fat in the milk is called butterfat.

1. Whole milk—contains 3.5% butterfat
2. 2% milk—low fat
3. 1% milk
4. Skim milk—all butterfat removed
5. Buttermilk—cultured milk that has been soured by certain small organisms
6. Half & Half—contains 10 to 12% butterfat.

CATTLE TERMINOLOGY:

Bovine: A scientific term referring to all cattle.

Bull:	A mature male bovine.
By-products:	The other products that are obtained from the animal besides beef or milk.
Calf:	The name for a young bovine up to one year of age.
Cow:	The mature female bovine.
Cud:	Food that has been regurgitated by the cattle for further chewing.
Dogie:	A stray motherless calf (usually found on the range).
Heifer:	A female calf that is younger than three years old, and has not born a calf.
Eartag:	A metal or plastic tag attached to the ear of an animal for identification purposes.
Foot rot:	A common inflammation caused by fungus and bacteria that invade the hooves of cattle, causing swelling and limping.
Forage:	Plants used as food for the livestock.
Hide:	The skin of the cattle.
Lactation Period:	The length of time that the female gives milk after the birth of an offspring.
Maverick:	The name given to an unbranded cow on the range.
Polled:	Having no horns.

Udder: The group of mammary glands that produces the milk.

Weaning: The process of separating the young calves from their mothers so they can no longer obtain their mother's milk.

SHEEP

Cattle are the number-one animal raised on U.S. farms. Sheep rank second to cattle. They are raised mainly for their meat and wool. However, they are also the source of lanolin, oil that is obtained from their wool, as well as a source of feta cheese. Meat that is obtained from a sheep that is less than one year of age is called lamb. Meat obtained from older sheep is called mutton.

GENERAL CHARACTERISTICS OF SHEEP:

Sheep, like cattle, are ruminants, and have four stomach parts. Their upper incisor teeth are also missing. They are grazing animals that eat mainly grasses, and live in groups called flocks. Sometimes large flocks are subdivided into smaller groups called bands.

They are even-toed, hoofed mammals that have a pair of hollow horns that are not shed. The horns on the male are large and curved, while the horns on the female are short and only slightly curved.

Female sheep bear one to three young at a time. Their gestation period is 150 days. Lambs are born in the spring. Their fleece is sheared once a year.

Sheep belong to the scientific family of Bovidae and the genus, Ovis.

THE SIX LEADING SHEEP-RAISING COUNTRIES (IN ORDER) ARE:

1. Australia
2. Russia
3. China
4. New Zealand
5. India
6. Turkey

The United States raises about 1% of the sheep raised in the world. Most of the sheep raised in the United States are raised in the semiarid western states.

THE FIVE LEADING U.S. SHEEP STATES (IN ORDER) ARE:

1. Texas
2. California
3. Wyoming
4. South Dakota
5. New Mexico

Other major sheep-producing states are Colorado, Utah, Montana, Arizona, Oregon, and Iowa. Denver, Colorado has the largest sheep marketing center in our country.

Sheep are usually grazed on the open range. Shepherds maintain control of the flocks, and sheep dogs (mainly border collies) are used to herd the sheep.

BREEDS OF SHEEP:

There are 914 different breeds of sheep in the world, and 35 different breeds that are raised in the United States. The five most popular U.S. breeds are the Rambouillet, Columbia, Suffolk, Merino, and Hampshire.

Major wool breeding sheep: Rambouillet and the Merino.

Major mutton breeding sheep: Suffolk, Merino, and Hampshire.

Other breeds of sheep raised mainly in other countries:

Dorset	Cheviot	Oxford	Leicester
Lincoln	Romney Marsh		

Suffolk and Hampshire breeds have black faces, while most other breeds have white faces.

SHEEP TERMINOLOGY:

Carding: Combing the wool to straighten the fibers.

Dipping: Submerging an animal in a vat of liquid insecticide to control parasites.

Docking: Cutting off the tails of young sheep to about three inches for sanitation purposes.

Ewe: The adult female sheep.

Feeders: Sheep that are ready for market and usually weigh between 60 and 70 pounds.

Fleece: Shorn wool.

Jug (or jail): A small birthing pen that holds the ewe and her newly born lambs.

Lamb: A sheep that is less than one year old.

Lambing: The name given to the birthing process.

Lanolin: A wax that is secreted by the sheep to protect the wool. It is used by humans in cosmetics.

Pelt: The skin and wool from a slaughtered sheep.

Ram: The adult male sheep.

Shearing: The process of removing the fleece.

Shepherd: The herdsman who cares for the sheep.

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STUDY GUIDE:
GEOLOGY: ROCKS AND MINERALS

This study guide will introduce the three basic types of rocks and will give examples of each kind. It will define a mineral, tell the basic properties of minerals, give examples, and tell ways to identify one mineral from another.

The study of rocks and the earth is called **geology**, and the person who studies these topics is a **geologist**.

The study of minerals is called **mineralogy**, and the scientist who specialized in the study of minerals is called a **mineralogist**.

ROCKS

Geologists divide all rocks into three types or groups, based upon how they were formed. The three basic rock types are:

1. Sedimentary Rocks
2. Igneous Rocks
3. Metamorphic Rocks

Sedimentary rocks are formed when dirt, dust, pebbles, and other sediments are deposited by either wind or by water. These rocks often form under water. One layer of sediment drops to the bottom of the lake or river. Another layer is deposited on top of the first. Pressure from the layers above causes heat, which causes the particles to merge to form sedimentary rocks. Minerals found in the water also help to cement the particles together. When animal remains are trapped between the layers, **fossils** are often formed, as the particles harden into rocks. Because most sedimentary rocks are formed under a body of water, **fossils are commonly found in sedimentary rock layers**. Layers are usually visible in this type of rock.

Igneous rocks are formed by the eruption of a volcano. They were all originally hot, liquid magma beneath the Earth's surface. Once the magma reaches the earth's surface, it is called **lava**. If an igneous rock is formed when hot magma reaches the Earth's surface, and then hardens into a rock as it cools on the surface of the earth, it is called an **extrusive rock**.

If the magma becomes trapped **below** the earth's surface, and the igneous rock is formed in a pocket deep within the earth, the rock is called an **intrusive rock**.

Metamorphic rocks were all either sedimentary rocks or igneous rocks at first. Then something happened to these rocks to change them. In most cases, the sedimentary or igneous rocks were subjected to heat or pressure for long periods of time. The heat and pressure caused the rocks to change to a different rock, which is then classified as a metamorphic rock.

Types of Sedimentary Rocks

Name of the Rock	The Material that has been Cemented Together to Create the Rock
1. **Sandstone** (This rock feels gritty to touch. Particles of sand can often be rubbed off the rock.)	**Small Pieces of Sand**
2. **Shale** (This rock is usually brown, black, tan, or reddish-brown in color, depending upon the type of dirt or mud that was deposited. If you wet the rock and smell it, the rock will smell just like mud.)	**Dirt and Mud**
3. **Conglomerate**	**Tiny Pebbles**
4. **Limestone** (Limestone is often light gray in color. If a drop of vinegar is put on a piece of the limestone, the acid in the vinegar will cause a bubbling and slight popping sound. In regular limestone, the bones and shells have been ground up so fine that they are not visible. All limestones have a large quantity of the mineral calcite in them because this mineral is found within the shells and bones.)	**Shells and Bones of Sea Animals**
5. **Coquina** (Coquina is a special type of limestone. The shells **have not been ground up into fine pieces**. You can actually see shells that have been cemented together by minerals in the water.)	**Shells of Animals**
6. **Chalk** (Chalk is another type of limestone. The shells have been broken up into fine pieces cemented together loosely.)	**Shells of Sea Animals**

7. **Rock Salt**	**The Mineral, Halite**
8. **Coal**	**Plant Materials Such as Mosses, Ferns, or Parts of Trees.**

(All coal contains the elements **carbon**, **hydrogen**, and **oxygen**. When the plant materials are buried under mud or other sediment, most of the hydrogen and oxygen escape, leaving the black carbon. There are four types of coal, based upon how long the materials were pressed together.

Peat is coal in which the twigs and remains can still be seen. It has only been pressed slightly.

Lignite is soft brown coal that is formed when peat is heated and pressed. It is only about 40% carbon. It is not a good energy source because it burns too rapidly.

Bituminous coal is called soft coal. It has been compressed longer than lignite, and contains about 85% carbon. It burns easily but creates much smoke.

Anthracite is the hardest type of coal. It is about 95% carbon and has been pressed into a hard rock. It burns for a long time, and it provides the best type of energy. However, it is the most expensive type.)

Other examples of sedimentary rocks that are less common include the following: flint, chert, breccia, stalactites, and potash ore

Types of Igneous Rocks

1. **Basalt**: This extrusive rock is formed on the surface of the earth. It makes up many of the volcanic cones, and it is dark gray or dull black in color. It has very fine grains that are hard to distinguish. The Hawaiian Islands and much of Iceland have been formed from basalt.

2. **Gabbro**: This intrusive rock was formed under the surface of the earth. It cooled more slowly than basalt, and thus has larger grains or crystals. It is also very dark in color.

3. **Obsidian**: This is a very shiny black or dark brown rock, and it appears to look like black glass. It is hard and brittle and often has lava swirl marks on its surface.

4. **Granite**: This is the most common intrusive rock. It is made of three minerals: feldspar, mica, and quartz. It is usually pink or gray in color, with black specks and white shiny crystals. Granite is usually used for buildings and tombstones.

5. **Pumice**: The steam and gases that come from the volcano cool to form pumice, which resembles a sponge because of all its air holes. Pumice is sometimes light enough to float in water.

6. **Scoria**: Scoria is a piece of basalt that hardened so quickly that it hardened right around the air bubbles. It has more holes than a piece of Swiss cheese, but is much heavier and darker in color than pumice.

7. **Tuff**: Tuff is similar to pumice, but is usually darker in color because particles of dust and dirt were trapped in the steam and lava when it hardened.

Other less common types of igneous rocks are the following:
diorite, pegmatite, dolerite, and syenite

Types of Metamorphic Rocks

Remember that metamorphic rocks are rocks that began as either sedimentary or igneous and were changed into a new and different rock.

Metamorphic Rock Name	Type of Rock That was Changed to Create This New Rock
1. **Slate**	**Shale** (sedimentary rock made from mud and dirt.)
2. **Marble**	**Limestone** (sedimentary rock made from shells and bones of sea animals.)
3. **Gneiss (pronounced NICE)**	**Granite** (igneous rock which was pressed so much that the black mica specks lines up in nice straight lines.)
4. **Quartzite**	**Sandstone** (sedimentary rock made from sand grains.)

MINERALS

A mineral is defined as a "naturally occurring, inorganic solid that has a definite chemical composition and crystal shape." Let's look at these four characteristics of all minerals more closely.

1. A mineral must occur naturally in nature. Cement is **not** a mineral because it has been created by man.

2. A mineral must be **inorganic**. This means that it is **not made from living things or from the remains of living things**. Quartz is a mineral, but coal is not a mineral because coal was made from decaying plants.

3. A mineral has a definite chemical composition. This means that it is made from one or more elements that have been joined together to form a compound.

4. The atoms of a mineral are arranged into a definite pattern called **crystals**. Every mineral has a specific crystal shape.

There are so many different kinds of minerals that it is hard to tell them apart. Mineralogists use eight main properties of minerals to help in identification. Below is a list of the eight main properties used in mineral identification.

1. Color
2. Luster
3. Hardness
4. Streak
5. Crystal Shape
6. Density
7. Cleavage or Fracture
8. Specific Gravity

Some minerals are easily identified by their colors. **Cinnabar**, which contains the ore of mercury, is red. **Malachite**, which contains the ore of copper, is green. **Azurite** is blue, and often occurs with Malachite. **Quartz** can be different colors. **Pure quartz** is clear or white in color. Quartz with a grey cast is called **smoky quartz**. Purple quartz is called **amethyst**, which is February" birthstone. Yellow quartz is called **citrine**. Pink quartz is called **rose quartz**. **Topaz** is usually yellow.

Luster refers to the mineral's shine, or how it reflects light. Certain minerals, such as silver, copper, gold, and pyrite shine brightly when light hits them. We say they have a **metallic luster**. Nonmetals appear to be glassy, pearly, or dull. They have little luster.

Hardness is a valuable way to identify minerals. Fredrich Mohs, a German mineralogist, developed a scale of hardness for minerals. He took ten minerals and arranged them in order from softest to hardest. Number 1 was assigned to the softest mineral, Talc, and number 10 was assigned to the hardest mineral, the Diamond. A mineral will scratch any other mineral having a lower number. Here is a list of the minerals on Moh's Scale of Hardness with their accompanying numbers.

1. Talc
2. Gypsum
3. Calcite
4. Fluorite
5. Apatite
6. Feldspar
7. Quartz
8. Topaz
9. Corundum
10. Diamond

The streak test is also used to identify minerals. A mineral sample is rubbed across a small glazed piece of porcelain called a "streak plate." A color is rubbed from the rock onto the plate, which has a hardness of about 7, and can thus be used to test any mineral that is softer than a 7 on the hardness scale. Each mineral makes a particular color streak when rubbed on the plate. All nonmetallic minerals produce a white or colorless streak. Hematite, which contains iron, always has a reddish-brown streak. Iron pyrite's streak is greenish-black in color.

Crystal shape can sometimes help identify a mineral. There are six basic types of crystal shapes that most minerals can have. You will be given a list of these six basic crystal shapes, and the name of a mineral that has this particular shape.

Basic Crystal Shape	Mineral Example
1. Cubic	Fluorite
2. Hexagonal	Tourmaline
3. Orthorhombic	Topaz
4. Monoclinic	Malachite
5. Tetragonal	Wulfenite
6. Triclinic	Amazonite

The exact characteristics of these crystals shapes will be covered more thoroughly in upcoming guides.

Density is the "amount of matter in a given space." It can also be expressed as "mass per unit volume." The density of any mineral is the same, regardless of how big the piece of mineral is. Every mineral has a specific density. You can determine the density of a mineral by finding its mass on a balance scale and dividing this mass by its volume.

Cleavage is the way a mineral breaks. If it breaks along smooth, definite lines, it has cleavage. Halite always breaks into neat cubes. Mica always breaks into thin sheets. In fact, you can peel off layers of mica that are so thin you can read through them!

Fracture also refers to the way a mineral breaks. However, it is just the opposite from cleavage. If a mineral does not break along visible lines, it fractures. The majority of all minerals tend to fracture.

Specific gravity is another property that can be helpful in naming a mineral. Specific gravity is "the ratio of the weight of a mineral to the weight of an equal volume of water." It tells us how many times denser the mineral is than water. Most minerals are denser than water and will sink when emerged in the same volume of water. For example, feldspar has a specific gravity of 3. This means it is 3 times denser than water. Many metallic elements have a specific gravity of about 5. Pure gold is 19.3 times denser than an equal volume of water.

Here are a few other hints to help you identify particular minerals:

1. Sulfur is a soft, yellow rock. It smells like rotten eggs!
2. Magnetite is a fairly heavy rock. It is magnetic!
3. Halite always breaks into cubes. It tastes salty, and looks clear or slightly foggy square ice cubes.
4. Talc feels soapy and will easily rub off on your hands.
5. Galena is a very bright, shiny, silver rock, which feels quite heavy when held in your hand.

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STUDY GUIDE: WEATHER

The study of weather is called **meteorology**, and the scientist who studies the weather is a **meteorologist**. Weather is defined as the "condition of the earth's atmosphere."

Scientists divide the earth's atmosphere into four layers.

1. **Troposphere**: The lowest layer nearest the earth, approximately 18 kilometers thick. Weather occurs in the troposphere.
2. **Stratosphere**: The second layer which reaches from the troposphere to about 50 kilometers above the earth's surface. Jets usually fly in the stratosphere.
3. **Mesosphere**: The third layer.
4. **Thermosphere**: The uppermost layer extending to about 500 kilometers from the earth's surface.

FOUR MAIN ATMOSPHERIC FACTORS AFFECT THE WEATHER AND CAUSE IT TO CHANGE.

1. temperature 2. air pressure 3. wind (moving air) 4. humidity

Temperature is a measure of the heat energy. The majority of our heat energy comes form the sun, and it is called radiant energy. Part of the sun's energy is reflected away from the earth by the ozone layer in the stratosphere. The rest of the sun's energy is absorbed by the earth, and it is spread through the atmosphere. There are three basic ways the sun's energy is spread throughout the atmosphere:

1. **Conduction**: Heat energy is directly transferred from the warm ground to the air directly above it.
2. **Convection**: Heat is transferred within the air or other fluids. The warmed air near the earth's surface becomes less dense and rises. Cooler air moves in

toward the earth's surface. As it becomes heated, it also rises, causing convection currents.

3. **Radiation**: Heat is transferred through empty space from the sun to the earth.

Temperature is measured in degrees by using a thermometer. On the Celsius scale, water freezes at 0 degrees and boils at 100 degrees. On the Fahrenheit scale, water freezes at 32 degrees and boils at 212 degrees.

The wind chill index (wind chill factor) measures how cold it feels, and the heat index indicates how warm the air temperature feels.

Isotherms: Lines drawn on a weather map that connect places with the same temperatures.

Air pressure is a measure of the force of air that's pushing down on the earth's surface. Denser air exerts more air pressure than less dense air.

Three Main Factors that Affect Air Pressure:

1. **Temperature**: Warm air is less dense than cold air. The molecules are spread farther apart, and therefore, the mass of a volume of warm air is less than the mass of a similar volume of cold air.
2. **The Amount of Water Vapor in the Air**: As the amount of the water vapor in the air increases, the mass of the air decreases, and the air becomes less dense.
3. **Elevation (Altitude)**: Air becomes thinner and less dense as the altitude increases. The air pressure decreases as one travels higher into the atmosphere.

In most cases, **high air pressure** usually means **fair weather**. **Low air pressure** usually brings **cloudy, rainy weather**.

Isobars: These are curved lines on a weather map that connect places having the same air pressure.

Winds are moving air. Winds flow from areas of high pressure to an area of lower pressure. A large body of air having approximately the same temperature and moisture content is called an **air mass**. The boundary between two air masses is called a **front**.

Four Types of Fronts

1. **Warm Front**: Warm air moves into a cold air mass. Because the density of the warm air is less than that of the cold, the warm air mass slides up over the cold air mass. Rain and showers are common. The weather becomes hot and humid. Warm fronts are marked on a weather map by placing semi-circles above a line.

2. **Cold Front**: Cold air moves toward a warm air mass, forcing the warm air up over the colder air. Violent storms accompany cold fronts. Cold fronts are shown on a weather map by putting triangles under a line.
3. **Stationary Front**: Two air masses meet, and neither mass moves. Such fronts may cause several days of rain.
4. **Occluded Front**: A cold front overtakes a warm front and pushes the warm front upward. As it does, the cold front comes in contact with cool air, and the two masses merge.

Four Major Types of Air Masses that Affect U.S. Weather

1. **Maritime Tropical Air Mass**: Forms over the ocean near the equator and contains warm moist air that causes high humidity.
2. **Maritime Polar Air Mass**: Forms over the Pacific Ocean and the North Atlantic waters, causing fog in California, and cooler temperatures to eastern sections of our country.
3. **Continental Tropical Air Mass**: Forms over Mexico in the summer and brings hot, dry air to the southwestern United States.
4. **Continental Polar Air Mass**: Forms over land in northern Canada, and brings extremely cold air and temperatures to the United States in the winter.

Humidity is the amount of moisture, or water vapor, in the air. Warm air can hold more water vapor than cold air. **Relative humidity** is the percentage of moisture that is in the air, compared to the amount that same air could hold at a particular temperature. If a volume of air is holding all the water vapor that it can hold at that temperature, the relative humidity is 100%.

Clouds are formed when water vapor begins to condense. The temperature at which the vapor condenses is called the **dew point**.

Four Basic Types of Clouds

1. **Cumulus Clouds**: These are thick, puffy, white clouds that resembles piles of cotton in the sky. They are usually associated with fair weather.
2. **Stratus Clouds**: These clouds appear in layers. They cover the entire sky, and often block the light from the sun, causing it to be overcast. Light rain accompanies these clouds.
3. **Cirrus Clouds**: These high curly clouds are usually filled with ice crystals. They were once called "mare's tails" because of their curved shape. They are most often associated with rain or snow.
4. **Nimbus Clouds**: These are the black, rolling, rain clouds that develop when cumulus clouds get dark on the bottom, forming thunderheads that are often called cumulonimbus clouds.

Precipitation is moisture that falls from the clouds to the earth. There are four main types of precipitation: **rain, snow, sleet, and hail**.

Frost is water vapor that turns to ice on an object.

Acid rain is caused when water vapor condenses on sulfate and nitrate particles in the atmosphere. These sulfate particles come from sulfur dioxide, which is released when fuels are burned. Nitrates are added to the atmosphere through the release of automobile exhaust and natural sources like volcanoes. When water vapor attaches to these particles, they fall to the ground as acid rain, causing the soil and water to become acidic.

BASIC WEATHER INSTRUMENTS:

1. **Thermometer**: Measures the temperature of the air.
2. **Anemometer**: Measures the wind speed.
3. **Barometer**: Measures the air pressure.
4. **Wind Vane**: Identifies the direction the wind is moving.
5. **Hygrometer**: Measures the relative humidity by measuring the amount of stretch in a human hair.
6. **Psychrometer**: A special type of hygrometer that uses the differences between the readings on a wet and dry bulb thermometer to determine the relative humidity.
7. **Rain Gauge**: Measures the amount of precipitation.

INTERESTING WEATHER FACTS AND ADDITIONAL TRIVIA

1. The hottest temperature ever recorded in the United States was 134 degrees in Death Valley, California on July 10, 1913.
2. To convert a Fahrenheit temperature to the Celsius scale, subtract 32 degrees from the Fahrenheit temperature, and then multiply the results by 5/9.
3. A tornado is a whirling wind that moves over land. Most tornadoes occur in the late afternoon or early evening hours. More tornadoes occur in the United States than any other country. Winds have reached speeds up to 300 miles per hour in a tornado.

4. July is the warmest month in the Northern Hemisphere. January is the coldest month in this hemisphere.

5. Although Chicago is called the Windy City, it is not the windiest place in the United States. Mt. Washington, New Hampshire is considered the windiest location in our country, having an average wind speed of 35.3 miles per hour. At one time, winds were clocked at 231 miles per hour at Mt. Washington.

6. The least windy city in the United States is Oak Ridge, Tennessee, which has an average wind speed of 4.4 miles per hour.

7. According to daily temperatures, the two hottest cities in our country are Yuma, Arizona and Phoenix, Arizona.

8. Hilo, Hawaii has the record for the most number of rainy days in a year, with 278.

9. April is the only month that tropical storm has not formed on the Atlantic Ocean.

10. The national groundhog appears every year on February 2. His name is Punxsutawney Phil. According to American tradition, the groundhog leaves his burrow where it has been hibernating to see if cold weather will continue. If he sees his shadow, there will be six more weeks of cold weather, and he returns to his burrow. The national groundhog is fed a regular diet of dog food.

11. The Gulf Stream is a warm ocean current in the Atlantic Ocean which flows from the tip of Florida to the outer edge of North Carolina, where it turns toward Europe.

12. The jet stream usually blows from west to east.

13. The cricket can help predict the temperature of the air. To determine the air temperature, count the number of chirps a cricket makes in 15 seconds. Add this number to 67 degrees Fahrenheit, and you will have an accurate estimate of the air temperature.

14. January is the only month of the year that a 100 degree temperature has not been recorded in any U.S. state. The highest January temperature that has been recorded is 98 degrees Fahrenheit in Laredo, Texas.

15. David Letterman was a TV forecaster and meteorologist during his early career years.

16. The foggiest location in our country is Cape Disappointment, Washington. It has three and a half months of dense fog each year.

17. In 1953, we began to name hurricanes after women!

18. The amount of electricity in a single bolt of lighting would cost about $30 if purchased from your power company.

19. The average speed of a snowflake is ½ mile per hour.

20. Strangely enough, it is usually warm and sunny in California just prior to an earthquake.

21. The first weather satellite was called Tiros I, and it was launched from Cape Canaveral, Florida in 1960. It raveled about 500 miles above the earth's surface.

22. On a typical summer day, the relative humidity is at its highest at about 6 a.m.

23. Sir Edmund Halley discovered more than just his comet. He also discovered the Gulf Stream near England.

24. Spiders survive the winter by creating a chemical compound within their circulatory system that keeps their bodies from freezing during the winter. It works in a similar way to antifreeze.

25. In Antarctica, almost all the mountains are snow covered, but Mount Erebus, which stands nearly 12,000 feet, has no snow-capped top. It is an active volcano, and its crater is filled with hot lava, which melts all snow!

26. One million cloud droplets are needed to make one average-sized raindrop.

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STUDY GUIDE:
AUTHORS and THEIR MAJOR WORKS

This is a listing of some of the more important authors and their works. Many of the books will be the names of books that you will probably read by the time you graduate from eighth grade. Other books are for older students, but have been included because they were written by famous authors, and most people who write questions for scholastic bowl teams, include these books and authors in their questions.

To simplify this guide, all poems or short stories will be enclosed within quotation marks to distinguish them from books.

AUTHOR	LITERARY WORK
Joy Adamson	Born Free
Louisa May Alcott	Little Women Little Men
C.W. Anderson	The Blaze horse books: Billy and Blaze, Blaze and the Gypsies, Blaze and Thunderbolt
Hans Christian Andersen	"The Ugly Duckling" "The Princess and the Pea" "The Emperor's New Clothes" "The Little Match Girl" "The Little Mermaid"
Maya Angelou	"Still I Rise" "I know Why the Caged Bird Sings"
William Armstrong	Sounder

Ann Nolan Clark	Secret of the Andes
Beverly Cleary	Henry and Beezus, The Ramona Quimby Series Freckle Juice Dear Mr. Henshaw
Vera and Bill Cleaver	Where the Lilies Bloom
Elizabeth Coatsworth	The Cat Who Went to Heaven
Jane Conly	Crazy Lady!
James Fennimore Cooper	The Last of the Mohicans The Deerslayer
Bruce Coville	Jennifer Murdley's Toad
Stephen Crane	Red Badge of Courage
Sharon Creech	Walk Two Moons
Roald Dahl	The BFG Charlie and the Chocolate Factory Charlie and the Glass Elevator James and the Giant Peach
Marguerite de Angeli	The Door in the Wall
Daniel Defoe	Robinson Crusoe
Carl Deuker	Heart of a Champion
Charles Dickens	A Christmas Carol David Copperfield Great Expectations Oliver Twist A Tale of Two Cities
Franklin W. Dixon	The Hardy Boys Mystery Book Series
Sir Arthur Conan Doyle	Sherlock Holmes
Allan W. Eckert	Incident at Hawk's Hill
Elizabeth Enright	Thimble Summer

Homer	The Iliad The Odyssey
Johanna Hurwitz	Aldo Applesauce
Aldous Huxley	Brave New World
Washington Irving	The Legend of Sleepy Hollow Rip Van Winkle
Mary James	Shoebag
Norton Juster	The Phantom Tollbooth
Carolyn Keene	The Nancy Drew Mystery Book Series
Peg Kehret	Horror at the Haunted House
John F. Kennedy	Profiles in Courage
Alexander Key	Escape to Witch Mountain
Rudyard Kipling	The Jungle Book Captains Courageous Just So Stories How the Leopard Got Its Spots
Jim Kjelgaard	Big Red (and many other dog books)
Joseph Krumgold	...And Now Miguel Onion John
Jane Langston	The Fledgling
Robert Lawson	Rabbit Hill
Emma Lazarus	"The New Colossus"- poem on the Statue of Liberty's base
Edward Lear	"The Owl and the Pussycat" (also known for his many Limericks)
Madeline L'Engle	A Wrinkle in Time
Lois Lenski	Strawberry Girl
C.S. Lewis	The Chronicles of Narnia, including: The Lion, the Witch, and the Wardrobe

Mary Norton	The Borrowers The Borrowers Afloat
Robert C. O'Brien	Mrs. Frisby and the Rats of NIMH
Scott O'Dell	Island of the Blue Dolphins
Thomas Paine	"Common Sense" pamphlet
Peggy Parish	The Amelia Bedelia series
Katherine Patterson	Bridge to Terabithia Jacob Have I Loved
David Patneaude	Someone Was Watching
Gary Paulsen	Woodsong Canyons
Patricia Pendergraft	Miracle at Clement's Pond
William Pene du Bois	The Twenty-One Balloons
Edgar Allan Poe	"The Raven" "Annabelle Lee" "The Tell-Tale Heart"
Eleanor Porter	Pollyanna
Beatrix Potter	Tales of Peter Rabbit
Ellen Raskin	The Westing Game
Marjorie Rawlings	The Yearling
Wilson Rawls	Where the Red Fern Grows
Conrad Richter	The Light in the Forest
Keith Robertson	Henry Reed
Mary Rodgers	Freaky Friday
Carl Sandburg	Biography of Abraham Lincoln
Sir Walter Scott	Ivanhoe

Mildred Taylor	Roll of Thunder, Hear My Cry
Theodore Taylor	The Cay
Henry David Thoreau	Walden
J.R.R. Tokien	The Hobbit and The Lord of the Rings Series
Pamela (P. L.) Travers	Mary Poppins
Mark Twain (Samuel Clemens)	The Adventures of Tom Sawyer The Adventures of Huckleberry Finn Puddin' Head Wilson Connecticut Yankee in King Arthur's Court
John Updike	Rabbit Run Series
Jules Verne	Journey to the Center of the Earth
E.B. White	Charlotte's Web Stuart Little
Laura Ingalls Wilder	The Little House on the Prairie Series
Vera B. Williams	Scooter
Elvira Woodruff	George Washington's Socks
Richard Wright	Native Son
Lawrence Yep	Dragonwings

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STUDY GUIDE:
FAMOUS POETS AND THEIR WORKS

William Blake

This predecessor of the Romantic Movement began as a painter, but later began to write poetry, which he illustrated himself. He wrote Songs of Experience and Songs of Innocence, in which he is best remembered for his poems, "The Tyger" and "The Lamb." He lived from 1757-1827.

Elizabeth Barrett Browning

Elizabeth Barrett Browning, born in 1806, was an invalid with a spinal cord injury and a lung disease. She lived with her domineering father until she met and married Robert Browning, a prominent poet. Her best-known book of poetry is Sonnets From the Portuguese. The following poem from that book is one of her more famous poems.

How do I love thee? Let me count the ways.
I love thee to the depth and breadth and height
My soul can reach, when feeling out of sight
For the ends of Being and ideal Grace.
I love thee to the level of everyday's
Most quiet need, by sun and candlelight.
I love thee freely, as men strive for Right;
I love thee purely, as they turn from Praise.
I love thee with the passion put to use
In my old griefs, and with my childhood's faith.
I love thee with a love I seemed to lose
With my lost saints,--I love thee with the breath,
Smiles, tears, of all my life!--and, if God chooses,
I shall but love thee better after death.

Her poem "Aurora Leigh" was adapted by feminists since it defends women's rights to intellectual independence. She died in 1861.

Lewis Carroll

Lewis Carroll was the pseudonym adopted by Charles Lutwidge Dodgson, an English writer born in 1832. His parents had strong ties to the Anglican Church and the

Army. He was educated at Rugby College and Christ Church in Oxford. He is best-known for his book Alice's Adventures in Wonderland, and its sequel, Through the Looking Glass and What Alice Found There. Two of his notorious poems, "The Walrus and the Carpenter"and "Jabberwocky" are found in it. He has had other poetry published in volumes including "Phantasmagoria and Other Poems," "The Hunting of the Snark," and "Rhyme? And Reason?" He died in 1898.

"The Walrus and the Carpenter" and a few lines of "Jabberwocky" are included below.

The Walrus and the Carpenter

The sun was shining on the sea,
Shining with all his might;
He did his very best to make
The billows smooth and bright—
And this was odd, because it was
The middle of the night.
The moon was shining sulkily,
Because she thought the sun
Had got no business to be there
After the day was done—
"It's very rude of him,"she said,
"To come and spoil the fun!"
The sea was wet as wet could be,
The sands were dry as dry.
You could not see a cloud because
No cloud was in the sky:
No birds were flying overhead—
There were no birds to fly.
The Walrus and the Carpenter
Were walking close at hand;
They wept like anything to see
Such quantities of sand:
"If this were only cleared away,"
They said, "It would be grand!"
"If seven maids with seven mops
Swept it for half a year,
Do you suppose," the Walrus said,
"That they could get it clear?"
"I doubt it," said the Carpenter,
And shed a bitter tear.
"O Oysters, come and walk with us!"
The Walrus did beseech.
"A pleasant walk, a pleasant talk,
Along the briny beach:
We cannot do with more than four,
To give a hand to each."
The eldest Oyster looked at him,
But never a word he said:
The eldest Oyster winked his eye,
And shook his heavy head—
Meaning to say he did not choose
To leave the oyster-bed.
But four young Oysters hurried up,
All eager for the treat:
Their coats were brushed, their faces washed,
Their shoes were clean and neat—
And this was odd, because, you know,
They hadn't any feet.
Four other Oysters followed them,
And yet another four,
And thick and fast they came at last,
And more, and more, and more—
All hopping through the frothy waves,
And scrambling to the shore.
The Walrus and the Carpenter
Walked on a mile or so,
And then they rested on a rock
Conveniently low:
And all the little Oysters stood
And waited in a row.
"The time has come," the Walrus said,
"To talk of many things:
Of shoes—and ships—and sealing wax
Of cabbages—and kings—
And why the sea is boiling hot—
And whether pigs have wings."
"But wait a bit," the Oysters cried,
"Before we have our chat;
For some of us are out of breath,
And all of us are fat!"
"No Hurry!" said the Carpenter
They thanked him much for that.
"A loaf of bread," the Walrus said,
"Is what we chiefly need:
Pepper and vinegar besides
Are very good indeed—
Now if you're ready, Oysters dear,
We can begin to feed."
"But not on us!" the Oysters cried,
Turning a little blue.
"After such kindness, that would be
A dismal thing to do!"
"The night is fine," the Walrus said
"Do you admire the view?"
"It was so kind of you to come!
And you are very nice!"

The Carpenter said nothing, but
"Cut us another slice:
I wish you were not quite so deaf—
I've had to ask you twice!"
"It seems a shame," the Walrus said,
"To play them such a trick
After we've brought them out so far,
And made them trot so quick!"
The Carpenter said nothing but
"The butter's spread too thick!"
"I weep for you," the Walrus said:
"I deeply sympathize."
With sobs and tears he sorted out
Those of the largest size
Holding his pocket-handkerchief
Before his streaming eyes
"O Oysters," said the Carpenter
"You've had a pleasant run!
Shall we be trotting home again?"
But answer came there none—
And this was scarcely odd, because
They'd eaten every one.

Jabberwocky

'Twas brillig, and the slithy toves
Did gyre and gimble in the wabe:
All mimsy were the borogoves,
And the mome raths outgrabe.
"Beware the Jabberwock, my son!

Samuel Taylor Coleridge

Coleridge was born in England in 1772. He attended Cambridge, but never graduated. A lyrical poet and member of the Romantic Movement, he was a contemporary and close friend of Wordsworth. Together they published Lyrical Ballads, in which his best-known poem, "The Rime of the Ancient Mariner," was included. Other popular poems of his include "Kubla Khan" and "The Nightingale."

e.e. Cummings

Educated at Harvard, this World War I veteran was known for his experimental break with traditional styles of poetry. He was the first poet to disregard capitalization rules in his poems and to opt for slang and colloquial word usage.

Emily Dickinson

Emily Dickinson was nicknamed "The Belle of Amherst" by one Broadway playwright. She was born in Amherst, Massachusetts in 1830 to a good family in New England. She had a sister and a brother. Her father was Treasurer of Amherst College and a prominent lawyer in the town. He also became a Massachusetts Congressman. Emily attended Amherst Academy for her formative schooling and went away to Mount Holyoke Seminary until she returned home in 1948. She never married and rarely left her parents' house. She died of Bright's Disease in 1886. Over her lifetime she wrote 1,775 poems, many of them nature riddles and some of them that focused on themes of love, war, religion, death, and immortality. Her best-known poems include, "A Bird Came Down the Walk," "Safe in Their Alabaster Chambers," "Dying," and "My Life Closed Twice Before its Close."

T.S. Eliot

T.S. Eliot was born in St. Louis in 1888. He attended Harvard, and then the prestigious Sorbonne in Paris. He later settled in London and ultimately opted to become a British citizen. In London, he met and was influenced by Ezra Pound. He wrote plays, including Murder In the Cathedral, prose, and poetry, including "Ash Wednesday" and "The Sacred Wood." His compilation of poems based on cats, Old Possum's Book of Practical Cats, is a classic upon which the Broadway musical "Cats!" was based. In 1948, he was awarded the Nobel Prize for Literature, and he died in 1965.

Ralph Waldo Emerson

Emerson was born in 1803 in Boston. He was the son of a minister, and after graduating from Harvard, he also became a minister, but resigned during a crisis of faith. He became a vital part of the Transcendentalist Movement and is best known as a lecturer and essayist, particularly on abolition. He wrote "The Conduct of Life" as well as the poems "Give All to Love" and "Concord Hymn" before he died in 1882.

Eugene Field

Eugene Field was born in St. Louis. He established himself as a writer with his long-running column in the *Chicago Morning News.* His best-known children's poems include the nursery rhymes "Little Boy Blue" and "Wynken, Blynken, and Nod." Another popular poem of Field's is "The Duel" about the gingham dog and the calico cat, which starts:

> "The gingham dog and the calico cat
> Side by side on the mantle sat;
> 'Twas half-past twelve and (what do you think!)
> Nor one nor t'other had slept a wink!
> The old Dutch clock and the Chinese plate
> Appeared to know as sure as fate
> There was going to be a terrible spat.
> (I wasn't there; I simply state
> What was told to me by the Chinese plate!)"

Robert Frost

Robert Frost was born in San Francisco in 1874. His father died when he was 11 and the family moved to Massachusetts, where he dabbled at both Dartmouth and Harvard, but never obtained a degree from either institution. In 1912, he moved to England with his wife to establish his writing career. There he met Ezra Pound who became an encouraging influence and a good friend. After he attained success, he moved back to New England, where he died in 1963. He won four Pulitzer Prizes for poetry and published multiple poetry books including New Hampshire and In the Clearing. He wrote in a traditional style of poetry and refused to use the form of free verse. His best-loved poems include "Stopping by the Woods on a Snowy Evening," "The Death of the Hired Hand," and "The Road Not Taken."

The Road Not Taken

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;
Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,
And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.
I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood and I—
I took the one less traveled by,
And that has made all the difference.

Oliver Wendell Holmes

Holmes was born in Boston and educated at Harvard. He became a physician and dabbled in light verse for the *Atlantic Monthly*. His best-known poem is "Old Ironsides."

John Keats

Keats was born in London in 1795. Both his parents died during his childhood. He ultimately forsook his apprenticeship to a surgeon in favor of his literary aspirations. Before he died of consumption in 1821, he became a major poet of the Romantic Movement. His most popular poems include "La Bell Dame Sans Merci," "To Autumn," "Hyperion," "Ode to a Nightingale," "Ode on a Grecian Urn," and "On First Looking into Chapman's Homer." He left a significant legacy to the realm of poetry.

Joyce Kilmer

Joyce Kilmer was born in 1886 in New Jersey. He attended Rutgers and Columbia Colleges, and then worked briefly as an editor for the *Standard Dictionary* and for the *New York Times*. He adopted the Catholic faith, which figured prominently in his creative work along with his love of nature. He went into the National Guard with the intent of writing a book about war, but was killed in the military in 1918. His most familiar poem is "Trees."

Trees

I think that I shall never see
A poem lovely as a tree.
A tree whose hungry mouth is prest
Against the earth's sweet flowing breast;
A tree that looks at God all day,
And lifts her leafy arms to pray;
A tree that may in Summer wear
A nest of robins in her hair;
Upon whose bosom snow has lain;
Who intimately lives with rain.
Poems are made by fools like me,
But only God can make a tree.

Rudyard Kipling

This British Imperialist author was born in India in 1865 and educated in England. He won the Nobel Prize for literature in 1907. He is best-known for his books The

Jungle Book, Just So Stories For Little Children, and Captains Courageous. He also wrote poems such as "Gunga Din" and "Mandalay."

Emma Lazarus

Emma Lazarus was born in 1849 in New York City to a rich Jewish family. She showed many of her early poems to Ralph Waldo Emerson, with whom she developed a life-long correspondence. Her books of poetry include Admetus and Other Poems, The Spagnoletto, and Songs of a Semite. In 1881, she began working to advance the cause of Jewish immigrants to the U.S. One of her poems, "The New Colossus," was chosen for the base of the Statue of Liberty. She died in 1887.

The New Colossus
Not like the brazen giant of Greek fame,
With conquering limbs astride from land to land;
Here at our sea-washed, sunset gates shall stand
A mighty woman with a torch, whose flame
Is the imprisoned lightning, and her name
Mother of Exiles. From her beacon-hand
Glows world-wide welcome; her mild eyes command
The air-bridged harbor that twin cities frame.
"Keep, ancient lands, your storied pomp!" cries she
With silent lips. "Give me your tired, your poor,
Your huddled masses yearning to breathe free,
The wretched refuse of your teeming shore.
Send these, the homeless, tempest-tost to me,
I lift my lamp beside the golden door!"

Edward Lear

Edward Lear was born in London in 1812. He traveled frequently and was known for his travel books as well as his ornithological drawings for The London Zoological Society. However, he found his primary fame as a master of limericks and verse, particularly for children and he is best known as the author of several nonsense poems including "The Owl and the Pussycat," and "the Jumblies." His poems have been compiled in books including A Book of Nonsense, Nonsense Songs, and Laughable Lyrics.

The first verse of "**The Owl and the Pussy-Cat**" begins with the familiar words:

The Owl and the Pussy-cat went to sea
In a beautiful pea-green boat,
They took some honey, and plenty of money,
Wrapped up in a five-pound note.
The Owl looked up to the stars above,
And sang to a small guitar,
"O lovely Pussy! O Pussy, my love,
What a beautiful Pussy you are,
You are,
You are!
What a beautiful Pussy you are!"

Henry Wadsworth Longfellow

Longfellow was born in Maine and educated at Bowdoin College where he later taught. He also worked as a professor at Harvard, but retired to devote himself to his poetry. His lengthy recognizable poems include "Paul Revere's Ride," "The Song of Hiawatha," "The Courtship of Miles Standish," and "The Children's Hour."

"**Paul Revere's Ride**" begins:

"Listen my children and you shall hear
Of the midnight ride of Paul Revere.
On the 18th of April in '75
Hardly a man is now alive
Who remembers that famous day and year.
He said to his friends,
"If the British come by land or sea from the town tonight
Hang a lantern aloft in the belfry arch
Of the Old North Church as a signal light.
One if by land and two if by sea
And I on the opposite shore shall be
Ready to ride and spread the alarm
Through every Middlesex village and farm
For the country folk to be up and to arm."

Clement C. Moore

Clement C. Moore was born in 1779 and educated at Columbia College where his father was president. He became a professor of Oriental and Greek languages at the Episcopal General Theological Seminary in New York City. Supposedly he wrote the traditional Christmas Poem, "A Visit From St. Nicholas" for his own children, and many scholastic bowl questions have been written about this literary work.

A Visit from St. Nicholas

'Twas the night before Christmas, when all through the house
Not a creature was stirring, not even a mouse,
The stockings were hung by the chimney with care,
In hopes that St. Nicholas soon would be there.
The children were nestled all snug in their beds,
While visions of sugarplums danced in their heads,
And mamma in her 'kerchief, and I in my cap,
Had just settled our brains for a long winter's nap...
When out on the lawn there arose such a clatter,
I sprang from the bed to see what was the matter.
Away to the window I flew like a flash,
Tore open the shutters and threw up the sash.
The moon on the breast of the new-fallen snow
Gave the luster of mid-day to objects below,
When, what to my wondering eyes should appear,
But a miniature sleigh, and eight tiny reindeer,
With a little old driver, so lively and quick,
I knew in a moment it must be St. Nick.
More rapid than eagles his coursers they came,
And he whistled, and shouted, and called them by name:
"Now, Dasher! now, Dancer! now Prancer and Vixen!
On, Comet! on Cupid! on, Donder and Blitzen!
To the top of the porch! To the top of the wall!

Now dash away! dash away! dash away all!"
As dry leaves that before the wild hurricane fly,
When they meet with an obstacle, mount to the sky,
So up to the house-top the coursers they flew,
With the sleigh full of toys, and St. Nicholas too.
And then, in a twinkling, I heard on the roof
The prancing and pawing of each little hoof.
As I drew in my head, and was turning around,
Down the chimney St. Nicholas came with a bound.
He was dressed all in fur, from his head to his foot,
And his clothes were all tarnished with ashes and soot.
A bundle of toys he had flung on his back,
And he looked like a peddler just opening his pack.
His eyes -- how they twinkled -- his dimples how merry!
His cheeks were like roses, his nose like a cherry!
His droll little mouth was drawn up like a bow,
And the beard of his chin was as white as the snow.
The stump of a pipe he held tight in his teeth, .
And the smoke it encircled his head like a wreath.
He had a broad face and a little round belly
That shook, when he laughed, like a bowl full of jelly.
He was chubby and plump, a right jolly old elf,
And I laughed when I saw him, in spite of myself.
A wink of his eye and a twist of his head
Soon gave me to know I had nothing to dread.
He spoke not a word, but went straight to his work,
And filled all the stockings; then turned with a jerk,
And laying his finger aside of his nose,
And giving a nod, up the chimney he rose.
He sprang to his sleigh, to his teams gave a whistle,
And away they all flew like the down of a thistle.
But I heard him exclaim, ere he drove out of sight,
"Happy Christmas to all, and to all a good-night!"

Edgar Allen Poe

Edgar Allen Poe was born in Boston to a pair of actors. When he was orphaned, he was adopted by the Allan family who sent him to private schools in England and in the United States. Poe's irresponsible personal habits caused a falling out with his foster father and ended with a brief stint in the Army. Later he got married and worked as an editor. His first love was poetry. He published several books of poetry such as Tamerlane and Other Poems, Al Aaraaf, and Poems, but he achieved the most fame (and profit) from his macabre short stories such as "The Pit and the Pendulum," "The Fall of the House of Usher," and "The Tell-Tale Heart." "Annabel Lee," "The Bells," "Lenore," and "The Raven" are four of his easily recognized poems.

The Raven begins:

Once upon a midnight dreary, while I pondered, weak and weary,
Over many a quaint and curious volume of forgotten lore,
While I nodded, nearly napping, suddenly there came a tapping,
As of some one gently rapping, rapping at my chamber door.
"'Tis some visiter," I muttered, "tapping at my chamber door —
Only this, and nothing more."

Carl Sandburg

Carl Sandburg was born in 1868 in Galesburg, Illinois. He worked for the *Chicago Daily News* writing editorials. He soon became noted as a writer, gaining a Pulitzer Prize for his biographies of Abraham Lincoln in 1940 and another in 1951 for his Complete Poems. He was known for his unrhymed free verse and colloquial truth. His most famous poem is "Chicago." He died in 1967. Below is just an excerpt from "Chicago."

Chicago
HOG Butcher for the World,
Tool Maker, Stacker of Wheat, Player with Railroads and the Nation's Freight Handler;
Stormy, husky, brawling,
City of the Big Shoulders:

Percy Bysshe Shelley

Shelley was born in 1792 in Sussex, England. He studied at Eton and Oxford. He is considered one of the Romantic Poets. "Ozymandus" is one of his major sonnets. He drowned in 1822.

Shel Silverstein

Born in Chicago in 1930, Shel Silverstein began his career making cartoons for a military publication, and was also a musician. However, he gained fame as a writer and illustrator of children's books and poetry. He began writing short fiction in 1963, including Lafcadio, the Lion Who Shot Back, The Giving Tree, The Missing Piece, and the Missing Piece Meets the Big O. Later he gained even greater fame with his poetry publications Falling Up, A Giraffe and a Half, A Light in the Attic, and Where the Sidewalk Ends. Some of his most familiar poems are "Sick" and "Sarah Cynthia Sylvia Stout." "Sarah Cynthia Sylvia Stout" is a poem about a girl who would not take the garbage out. The garbage covered the floor and piled up to the ceilings.

The last part of "**Sarah Cynthia Sylvia Stout**" reads:
"At last the garbage reached so high
That finally it touched the sky.
And all the neighbors moved away,
And none of her friends would come to play.
And finally Sarah Cynthia Stout said,
'OK, I'll take the garbage out!'
But then, of course, it was too late...
The garbage reached across the state,
From New York to the Golden Gate.
And there, in the garbage she did hate,
Poor Sarah met an awful fate,
That I cannot right now relate
Because the hour is much too late.
But children, remember Sarah Stout.
And always take the garbage out!"

Gertrude Stein

Born in 1874 to an upper-middle class family in Allegheny, Pennsylvania, Gertrude Stein lived in Paris, California, and Baltimore when she was growing up and attended Radcliffe College where she was taught by William James. She went on to John Hopkins Medical School, and then lived for the rest of her life in Paris with Alice B. Toklas, another eminent American author of the time. Their home became a creative salon hosting literary and artistic artists such as Hemingway, Matisse, Picasso, and Thornton Wilder. Her first novel was entitled Things as They Are. She entitled her own autobiography The Autobiography of Alice B. Toklas, and published other works including Three Lives and Tender Buttons, a collection of verse that emphasizes sound over syntax. She was the first to label the Post-World War I generation of disillusioned artists as "The Lost Generation."

Alfred Tennyson

Born in 1809, Tennyson was heavily influenced by Lord Byron, and succeeded in making a name for himself, and even becoming poet laureate of Great Britain. His notorious contribution to literature includes the poems, "The Lady of Shallot," "Oenone," and "Morte d'Arthur."

Ernest L. Thayer

Thayer began his "literary" career working for the Harvard Lampoon. Later he worked for William Randolph Hearst's *Examiner*. His poem, "Casey at the Bat," first appeared in this venue, but wasn't popularized until it was read orally by the popular comedian De Wolf Hooper.

This poem tells the story of a baseball player from Mudville named Casey, who finds himself at the plate with two outs and Mudville trailing four to two. The crowd cheers on the proud, arrogant player as he takes two strikes. The pitcher winds up for the next pitch and Casey swings. The last verse of the poem says:

> Oh, somewhere in this favored land the sun is shining bright,
> The band is playing somewhere, and somewhere hearts are light,
> And somewhere men are laughing, and little children shout;
> But there is no joy in Mudville -- mighty Casey has struck out."

Walt Whitman

Walt Whitman was born in rural New York in 1819. His family moved to Brooklyn. He later taught in Long Island, and then returned to the city as a printer and a journalist. He wrote a revolutionary volume of poetry, Leaves of Grass, which he revised many times in his lifetime. It was largely written in free verse and contained many of his best-known poems, "O Captain! My Captain!," (an ode to Abraham Lincoln after his assassination), "I Sing the Body Electric," "Song of Myself," "When I Heard the Learn'd Astronomer," and "Crossing Brooklyn Ferry." He later cared for wounded soldiers during the Civil War and died in 1892.

William Wordsworth

Wordsworth was born in 1770 and educated at Cambridge. He was a key poet of the Romantic Movement, and co-authored lyrical ballads with Samuel Taylor Coleridge. One of his contributions to that volume was his well-known poem "Tintern Abbey." He wrote volumes of sonnets and free verse, many that focused on themes of God and nature. Wordsworth died in 1850.

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STUDY GUIDE:
NEWBERY MEDAL WINNERS

INTRODUCTION

The John Newbery Award is presented each year to the author of the most outstanding children's literature book that was published during the previous year. The award was established in 1921 by Frederic Melcher, and named for John Newbery, an English publisher and bookseller. The award was first presented in 1922. Here is a complete list of the authors who have won this award and the books for which they were honored.

Year	Book	Author
1922	*The Story of Mankind*	Hendrik Willem Van Loon
1923	*The Voyages of Doctor Doolittle*	Hugh Lofting
1924	*The Dark Frigate*	Charles Hawes
1925	*Tales from Silver Lands*	Charles Finger
1926	*Shen of the Sea*	Arthur Bowie Chrisman
1927	*Smoky, the Cowhorse*	Will James
1928	*Gay Neck, the Story of a Pigeon*	Dhan Gopal Mukerji
1929	*The Trumpeter of Krakow*	Eric P. Kelly
1930	*Hitty, Her First Hundred Years*	Rachel Field
1931	*The Cat Who Went to Heaven*	Elizabeth Coatsworth

1932	*Waterless Mountain*	Laura Adams Armer
1933	*Young Fu of the Upper Yangtze*	Elizabeth Lewis
1934	*Invincible Louisa: The Story of the Author of Little Women*	Cornelia Meigs
1935	*Dobry*	Monica Shannon
1936	*Caddie Woodlawn*	Carol Ryrie Brink
1937	*Roller Skates*	Ruth Sawyer
1938	*The White Stag*	Kate Seredy
1939	*Thimble Summer*	Elizabeth Enright
1940	*Daniel Boone*	James Daugherty
1941	*Call It Courage*	Armstrong Sperry
1942	*The Matchlock Gun*	Walter Edmonds
1943	*Adam of the Road*	Elizabeth Janet Gray
1944	*Johnny Tremain*	Esther Forbes
1945	*Rabbit Hill*	Robert Lawson
1946	*Strawberry Girl*	Lois Lenski
1947	*Miss Hickory*	Carolyn Sherwin Bailey
1948	*The Twenty-One Balloons*	William Pene du Bois
1949	*King of the Wind*	Marguerite Henry
1950	*The Door in the Wall*	Marguerite de Angeli
1951	*Amos Fortune, Free Man*	Elizabeth Yates
1952	*Ginger Pye*	Eleanor Estes
1953	*Secret of the Andes*	Ann Nolan Clark
1954	*...And Now Miguel*	Joseph Krumgold

1955	*The Wheel on the School*	Meindert DeJong
1956	*Carry On, Mr. Bowditch*	Jean Lee Latham
1957	*Miracles on Maple Hill*	Virginia Sorenson
1958	*Rifles for Watie*	Harold Keith
1959	*The Witch of Blackbird Pond*	Elizabeth George Speare
1960	*Onion John*	Joseph Krumgold
1961	*Island of the Blue Dolphins*	Scott O'Dell
1962	*The Bronze Bow*	Elizabeth George Speare
1963	*A Wrinkle in Time*	Madeleine L'Engle
1964	*It's Like This, Cat*	Emily Neville
1965	*Shadow of a Bull*	Maia Wojciechowska
1966	*I, Juan de Pareja*	Elizabeth Borton de Trevino
1967	*Up a Road Slowly*	Irene Hunt
1968	*From the Mixed Up Files of Mrs. Basil E. Frankweiler*	E. L. Konigsburg
1969	*The High King*	Lloyd Alexander
1970	*Sounder*	William H. Armstrong
1971	*Summer of the Swans*	Betsy Byars
1972	*Mrs. Frisby and the Rats of NIMH*	Robert C. O'Brien
1973	*Julie of the Wolves*	Jean Craighead George
1974	*The Slave Dancer*	Paula Fox
1975	*M.C. Higgins, the Great*	Virginia Hamilton
1976	*The Grey King*	Susan Cooper
1977	*Roll of Thunder, Hear My Cry*	Mildred D. Taylor

1978	*Bridge to Terabithia*	Katherine Paterson
1979	*The Westing Game*	Ellen Raskin
1980	*A Gathering of Days: A New England Girl's Journal, 1830-1832*	Joan W. Blos
1981	*Jacob Have I Loved*	Katherine Paterson
1982	*A Visit to William Blake's Inn: Poems for Innocent and Experienced Travelers*	Nancy Willard
1983	*Dicey's Song*	Cynthia Voigt
1984	*Dear Mr. Henshaw*	Beverly Cleary
1985	*The Hero and the Crown*	Robin McKinley
1986	*Sarah, Plain and Tall*	Patricia MacLachlan
1987	*The Whipping Boy*	Sid Fleischman
1988	*Lincoln: A Photobiography*	Russell Freedman
1989	*Joyful Noise: Poems for Two Voices*	Paul Fleischman
1990	*Number the Stars*	Lois Lowry
1991	*Maniac Magee*	Jerry Spinelli
1992	*Shiloh*	Phyllis Reynolds Naylor
1993	*Missing May*	Cynthia Rylant
1994	*The Giver*	Lois Lowry
1995	*Walk Two Moons*	Sharon Creech
1996	*The Midwife's Apprentice*	Karen Cushman
1997	*The View from Saturday*	E.L. Konigsburg
1998	*Out of the Dust*	Karen Hesse
1999	*Holes*	Louis Sachar

2000	*Bud, Not Buddy*	Christopher Paul Curtis
2001	*A Year Down Yonder*	Richard Peck
2002	*A Single Shard*	Linda Sue Park
2003	*Crispin, The Cross of Lead*	Avi
2004	*The Tale of Desperaux: Being the Story of a Mouse, a Princess, Some Soup, and a Spool of Thread*	Kate DiCamillo
2005	*Kira-Kira*	Cynthia Kadohata

BRIEF SUMMARIES OF SELECTED WINNERS

2004 *The Tale of Desperaux: Being the Story of a Mouse, a Princess, Some Soup, and a Spool of Thread* by Kate DiCamillo

The Tale of Desperaux is a story about a small mouse that was the last born in his family. He was a very small mouse with huge ears and open eyes. This is not normal for a mouse. This unusual mouse was born in a castle and fell in love with the princess, a human! The mouse likes to read, and loves light and music. He reveals himself to the Princess, and allows her to touch him. He even speaks to her. The Prince is also allowed to touch the mouse. Despereaux's father reports his son's behavior to the mouse council. When they hear about his behavior, they sentence him to death in the castle's dungeon. A red thread of death is attached to his neck, and he is thrown into the dark dungeon. Despereaux earns his life back by telling a story to Gregory, the Jailer.

2003 *Crispin, The Cross of Lead* by Avi

This book tells the story of a thirteen-year-old peasant, known as Asta's son, who lived in medieval England during the 14th century. His life is completely changed when his mother dies, his dwelling is burnt, and he is accused of a crime he didn't commit. He fled his village, alone and frightened, after being declared "a wolf's head" and was pursued by those he once trusted. He took nothing with him except his mother's cross and his newly discovered name of Crispin.

During his flight, he encountered Bear, a juggler who became his new "master," and who encouraged him to think and to learn survival skills. When Bear was captured and tortured by the enemy, Crispin fought to free his master and friend.

As the plot evolves, Crispin learns why he is being pursued, and uses this knowledge to his advantage.

2002 *A Single Shard* by Linda Sue Park

This book is set in twelfth-century Korea and tells the story of Tree-ear, an orphan, who lives under a bridge with a crippled man called Crane-man. The boy and the man survive by sharing bits of food from the rubbish heaps.

Their lives change drastically when Tree-ear accidentally drops a piece of pottery made by Min, a master potter. He offers to work for the potter to repay the cost of the broken pottery, and is given several hard tasks to perform. Min's wife provides him with a free meal during the day and Tree-ear saves some of each meal for his friend, Crane-man.

Tree-ear yearns to work at the pottery wheel, but is denied the privilege. He continues to work for Min and helps the potter by taking a special order to the Royal Court for examination, in hopes of obtaining a royal commission to make more pottery.
He must travel many miles by foot with the prized pottery and is robbed along his route. The robbers toss the pottery over a cliff. Tree-ear finds a single shard of pottery and continues on with it to the Royal Court, where the shard is examined. A commission is granted to Min.

Upon returning to the potter's village, Tree-ear learns that Crane-man has died. Min and his wife give Tree-ear a home and he learns the potter's trade.

2001 *A Year Down Yonder* by Richard Peck

This award-winning book is a sequel to the 1999 Newbery Honor Book, *A Long Way from Chicago.* This first book introduces us to two Chicago children, Joey and Mary Alice, who spend each summer at their Grandma Dowdel's house in rural Illinois.

In the second book, *A Year Down Yonder,* only Mary Alice is featured. Joey has taken a job with the Civilian Conservation Corps and has moved westward. Their father lost his job during the depression, and Mary Alice is sent to live with Grandma Dowdel in her "hick-town." Her cat Bootsie accompanies her.

Mary Alice dreads living with her large, unconventional Grandmother, who is not a popular person in the small community due to her unpredictable mannerisms and her cold, "matter-of-fact" ways. However, the year provides much entertainment as Grandma frightens away the boys who attempt to knock over her outhouse on Halloween, embarrasses and ridicules some of the more elite members of the community, and crashes into a pecan tree with a tractor to jar the pecans from their branches.

Mary Alice grows to love her Grandmother more with each passing day, and they form a strong emotional bond. At the conclusion of the book, Mary Alice marries Royce McNabb in Grandma's house in rural Illinois, and Grandma Dowdel gives her away in marriage.

The author, Richard Peck, was born and raised in Decatur, Illinois. He now lives in New York City.

2000 *Bud, Not Buddy* by Christopher Paul Curtis:

Set in the 1930's in Michigan, Bud (Not Buddy) is a ten-year old orphan on the run from a succession of abusive foster homes. Armed with his own book, *Bud Caldwell's Rules and Things for Having a Funner Life and Making a Better Liar Out of Yourself,* an advertisement for a jazz band, and the belief that the legendary stand-up bass player, Herman E. Calloway, is his real father, he sets out on an adventurous pilgrimage to find his father.

1999 *Holes* by Louis Sachar

Stanley Yelnats is sent to Camp Green Lake, a juvenile detention center. Ironically, there is no lake, and he is innocent in the first place. While he is there, the warden makes him dig a five-foot by five-foot hole with the rest of the detainees. This assignment is based upon the philosophy that hard labor will convert delinquents into upstanding citizens. Ultimately, he discovers that this is only a cover. The warden really has them digging for loot buried on the detention center grounds by the legendary Kissin' Kate.

1998 *Out of the Dust* by Karen Hesse

This book centers around its 14-year old narrator, Billie Jo, who documents her trials during the Depression in her journal, which is written in free form poetic style. Her mother dies in an accident while her father is on an alcoholic binge. Billie Jo blames her father and herself for her mother's death. Billie Jo's hands are also badly burned during the accident, and she becomes reluctant to pursue her musical talent on her piano. She faces unspeakable grief with stoic courage and ultimately jumps a train west, but soon discovers that the "Oklahoma Dust" remains within her, and she must return to her home.

1997 *The View from Saturday* by E.L. Konigsburg

This book tells the story of a group of sixth-graders who were chosen as members of the Academic Bowl team. They win the sixth grade contest and go on to be winners during the seventh and eighth grades, too. Throughout the process, they learn more about themselves and each other, as well as scholastic bowl facts, trivia, and concepts.

1996 *The Midwife's Apprentice* by Karen Cushman

Brat, a poor homeless girl in medieval England, gets a lucky break and rises to the rank of apprentice to the rude midwife, Jane Sharp. Finally she discovers a caring family and becomes known as Alyce. Thinking that she knows as much as the midwife, she attempts a delivery, but she fails on this first delivery attempt. Instead of confronting her failure, she runs from the town. This is the story of her struggles, her mistakes, and her self-realizations.

1995 *Walk Two Moons* by Sharon Creech

Salamanca Tree Hiddle is 13. Her mother has disappeared. She tells the story of her trip with her grandparents from Ohio to Idaho to Phoebe, a friend whose mother has also vanished. Phoebe claims to be receiving intermittent notes from her missing mother. One of these notes said, "Don't judge a man until you have walked two moons in his moccasins." Over the course of their interaction, Salamanca embraces her Native American ancestry and discovers the truth of her mother's disappearance.

1994 *The Giver* by Lois Lowry

This story is based upon a futuristic utopian society in which there is no poverty, sickness, unhappiness, or unemployment. Twelve-year-old Jonas is named the official Receiver of Memories. In time, he discovers the truth of his society's hypocrisy and chooses to stand up for what is right.

1993 *Missing May* by Cynthia Rylant

May, one of Summer's adoptive parents has died, and Summer and her adoptive father, Ob, are preoccupied with their grief over May's absence. Cletus, one of Summer's playmates, tries to help Summer and Ob contact May's spirit. Although they will always miss May, they discover that their togetherness lessens the pain of their loss.

1992 *Shiloh* by Phyllis Reynolds Naylor

Marty Preston, an 11-year-old boy, finds a hungry beagle near Shiloh school. He brings him home and names him after the school. Later he discovers that the dog belongs to Judd Travers, who mistreats the dog and he's forced to return the dog to Judd. The book tells of Marty's adventures and emotions as he tries to save the dog from his cruel master.

1991 *Maniac Magee* by Jerry Spinelli

Jeffrey Lionel "Maniac Magee" ran away from his aunt and uncle's house after his parents died. He ended up in a town named Two Mills, where the blacks and whites refused to intermingle due to their mutual fear and distrust. He shook things up in this small town and calmed down some of the tensions. He performs some amazing feats and learns much about racism.

1990 *Number the Stars* by Lois Lowry

This is a story of two friends, Ellen and Anne Marie, during World War II. It takes place in 1943. Ellen is Jewish, and Anne Marie is not. When Ellen has to flee the Nazis, she stays in Anne Marie's apartment for a short time and pretends to be Anne Marie's sister when the guards arrive. Anne Marie shows much courage and persistent when trying to help her friend.

1989 *Joyful Noise: Poems for Two Voices* by Paul Fleischman

This comical book of poetry is designed with two separate columns on each page so that children can alternate reading the verse aloud. The poems consist of stories about insects and are accompanied by vivid illustrations and large text.

1988 *Lincoln: A Photobiography* by Russell Freedman

This biography combines photographs, art, and written text to recreate the story of Abraham Lincoln's life and career.

1987 *The Whipping Boy* by Sid Fleischman

This is the story of the relationship between Prince Brat, the royal heir, and an orphan named Jemmy. Since royal heirs could not be spanked, Jemmy was appointed to take the Prince's whippings. Jemmy intended to run away, but the Prince ran away first, and took Jemmy with him. The authorities then charged Jemmy with kidnapping the Prince.

1986 *Sarah, Plain and Tall* by Patricia MacLachlan

Sarah lives in Maine. She answers an advertisement from a widowed Midwestern farmer named Caleb, who is searching for a new wife and a mother for his two children. She travels to Kansas to meet Caleb and his family. At first she is homesick and the children worry that she will abandon them, but in the end, Sarah decides to stay. She realizes that she would miss Caleb and his children more than she misses Maine.

1985 *The Hero and the Crown* by Robin McKinley

Aerin has been an outcast all her life because she is the daughter of the notorious "witchwoman" who was mistress to the king. Aerin's mother died of grief, because Aerin was a girl instead of the son the king so desperately wanted. Despite her gender, Aerin was destined to become a hero, and was ultimately endowed with the power of the Blue Sword. She became a legendary dragon slayer and was known throughout the land as Lady Aerin, Dragon-Killer.

1984 *Dear Mr. Henshaw* by Beverly Cleary

Leigh Botts, a second grade boy, writes to his favorite author, Mr. Henshaw, in the pages of his diary. He shares his activities, inner thoughts, and actual feelings that reveal truths about his painful and awkward transition from childhood to adolescence.

1979 *The Westing Game* by Ellen Raskin

This book is about a group of sixteen potential inheritors who gather for the reading of Mr. Samuel W. Westing's will. To their surprise, the will prescribes a contest whose outcome will determine the disbursement of the murdered man's fortune. One of them is his murderer and the group is challenged to discovery the murder's identity. The possible inheritors are each paired up with a "perfect" partner, given $10,000, and provided with some clues. The question is, can they solve the mystery and reveal the name of the murderer before someone gets hurt?

1972 *Mrs. Frisby and the Rats of NIMH* by Robert C. O'Brien

The central character, Mrs. Frisby, is a widowed mouse. She needs to move her four children to summer quarters immediately to escape death. Unfortunately, it is not so easy. Her youngest, Timothy, has pneumonia and can't be moved. Luckily, she meets the rats of NIMH, who are extremely intelligent escapees from a laboratory experiment. They help her solve her problem and several other problems that occur within the plot.

1971 *Summer of the Swans* by Betsy Byars

A young girl, Sara, and Charlie, her mentally disturbed brother, have been living with their aunt after their mother's death. The story begins during summer vacation. During this season, swans frequent a lake near their home, and Sara and Charlie visit them during the day. One day the brother runs away. Sara assumes that he has gone to visit the swans. During the frantic search for the retarded child, Sara realizes how much Charlie really means to her.

1970 *Sounder* by William H. Armstrong

This book centers around a Southern African-American family during the 1800's. The mother is a maid for a rich family. The father is a sharecropper. They have three boys and a mongrel dog named Sounder. The father is taken to jail for stealing a hog to feed his family. At this point, Sounder is shot and can't be found. Ultimately, a battered Sounder returns, but in the meantime, the oldest son has to take on the father's work to feed the family, thus quickly transforming him from a child to an adult.

1967 *Up a Road Slowly* by Irene Hunt

This is the story of a young protagonist named Julie, whose mother dies when she is seven. She goes to live with her Aunt Cordelia, who is a spinster. The book chronicles the many growing changes and emotional traumas that she undergoes between the ages of seven to eighteen.

1957 *Miracles on Maple Hill* by Virginia Sorenson

In this book we meet Marly, Joe, Mr. Chris, and Margie, as well as other family members and friends. It's based upon the experiences of a family that helps old friends with their maple syrup crop, and is told from the view of a small girl. They live in the countryside where miracles do happen, and each chapter of this book depicts a separate miracle of nature, thus inspiring the reader to appreciate the everyday miracles.

1956 *Carry on, Mr. Bowditch* by Jean Lee Latham

This biography centers around the figure of Nat Bowditch, a historical mathematician, astronomer, and sailor. Nat fulfilled his dream of becoming a captain and was the author of The American Practical Navigator. Action and adventure intersperse with historical detail in this exciting book.

1946 *Strawberry Girl* by Lois Lenski

This book is about a girl and her family who move to a new house. They struggle to produce crops, relate to their "not-so-nice" new neighbors, who are consumed with feuding, and triumph over other life's other hardships.

1942 *The Matchlock Gun* by Walter Edmunds

This short book centers around Edward, a young boy who lived during the French and Indian War. His father left home to go fight against the Indians in the war, but he left an old Spanish gun with Edward, and told him to use the gun, if necessary, to protect his mother and sister. The gun was so large and awkward that Edward wondered if he would be able to use it to defend their home if the situation occurred.

1939 *Thimble Summer* by Elizabeth Enright

This book is about a girl named Garnet who finds a silver thimble in the ground. Shortly afterwards, a slew of lucky occurrences ensue. A rain finally comes to end the drought that prevented her father from making a living. The government loans their family some money to build a new barn, and they adopt Eric, a nice orphan. She also adopts a pig that she names Timmy. She takes care of Timmy all summer and wins a blue ribbon and prize money for him at the fair in September. She concludes that the thimble must have been magical, and spends the rest of the summer exuberant.

1935 *Dobry* by Monica Shannon

This book is about a young boy, Dobry, who grows up on a farm in Bulgaria in the 1920's and 30's. As he gets older, he realizes that his true dream is to be a sculptor.

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STUDY GUIDE:
COMPUTER BASICS, TERMS & ACRONYMS

A computer is defined as "a machine that takes in information, processes it, stores it, and gives it back on request."

There are three main parts of a computer:

1. **PROCESSOR** (or CPU… Central Processing Unit)
   This unit is the "brains of the computer." It takes in information which it uses to perform calculations or to process information.

2. **MEMORY**
   This is the storage unit for all information that is put into the computer. Information is held here until it is retrieved at a later time.

3. **INPUT AND OUTPUT DEVICES**
   Input devices enable the user to put information into the computer. The two most commonly used input devices are the keyboard and the mouse. Joysticks, and modems are also input devices.
   Output devices display or print the information that has been stored by the computer. The monitor and the printer are the most common output devices.

For a computer to work, three things are necessary:

1. **HARDWARE**: the actual pieces of equipment that make up the computer system
   EXAMPLES: computer, monitor, modem, printer, disks, and disk drives.

2. **SOFTWARE**: programs and instructions that direct the computer and tell it how to perform various tasks.

3. **A USER OR OPERATOR**: You or another person who can enter data into the computer.

PARTS OF A COMPUTER

1. **CPU**: Central Processing Unit: It's the computer chip that acts as the brain of the computer to process the information. Sometimes the casing that holds this unit is also called the CPU.

2. **Monitor**: The screen upon which the information is shown.

3. **Keyboard**: An input device that resembles a typewriter.

4. **Printer**: A mechanical output device that can print text or graphics onto paper. The three main types or printers that have been used throughout computer history are the dot matrix, ink jet, and laser.

5. **Mouse**: An input device that moves on a ball to move the cursor and select menu programs.

6. **Modem**: A device that allows information to ravel over telephone lines. A modem is necessary for accessing the Internet, and for e-mail correspondences.

7. **Disk-Drives**: The slots into which the disks are inserted. They read from and write to a floppy disk or hard disk. The **CD-ROM** drive allows you to insert special disks called CD-ROM's. The hard drive is composed of a metal disk that can not be removed. It holds more information than a floppy disk.

A computer doesn't comprehend English. Each piece of information is changed into a binary code, which uses the digits 0 and 1. For example, the letter "a" is 01000001. Every other letter in the alphabet is assigned a different combination of 0 and 1. Each 0 and 1 is called a BIT. This is the smallest piece of computer information that computers can handle. Bits are joined together into longer strings called BYTES. Eight bits make one byte.

1,024 Bytes = 1 Kilobyte

1,024 Kilobytes = 1 Megabyte

1,000 Megabytes = Gigabyte

GENERAL COMPUTER TERMS

Backspace/delete Key: The key on the computer keyboard that moves the cursor one space to the left, and will delete any characters located to the left of the cursor.

Baud rate: A measurement of how fast a modem transfers data.

Boot: To start up a computer by loading a program into the memory from an outside source, such as a disk.

Bug: An error or glitch in a program.

Caps Lock Key: A key on the computer keyboard that creates all capital letters when the key is pressed.

Catalog: A list of all the files stored on a disk. It's a synonym for a "directory."

Character: Each individual letter, number, punctuation mark, or other symbol used in printing or displaying information that can be read by humans.

Chip: The small piece of material on which the integrated circuit is fabricated. Silicon is the material from which most computer chips are made.

Cursor: A line or small block that appears on the monitor screen to show where the next information will be placed.

Command: A communication from the user to the computer system. Usually the commands are typed on the keyboard.

Database: A large collection of information, such as a library, newspaper, or list of names, that the computer can easily read and retrieve as output.

Default: The setting that is automatically used by a computer if the user has not specified a different setting or action.

Disk: A flat, circular magnetic surface on which information can be stored.

DOS: Disk Operating System: A software system that allows the computer to communicate with the disk drives.

Edit: To change the text by adding, deleting, cutting, or pasting.

E-Mail: Electronic mail which has been sent from one computer system to another via telephone lines.

Expansion Slot: A connector inside the computer into which a peripheral card can be placed.

File: A collection of information stored together on a disk, similar to the information that would be placed into one file folder of a file cabinet.

Font: They type of design used for letters or other characters.

Format: To prepare a blank disk so it's ready to receive information. It's a synonym for "initialize."

Expansion Slot: A connector inside the computer into which a peripheral card can be placed.

File: A collection of information stored together on a disk, similar to the information that would be placed into one file folder of a file cabinet.

Font: The type of design used for letters or other characters.

Format: To prepare a blank disk so it's ready to receive information. It's a synonym for "initialize."

Hardcopy: The printed copy of the computer information.

Input: The information that is fed into the computer.

Insert Key: A key on the computer keyboard that is used to add text without deleting the text that has already been written.

Interface: A type of equipment that is used to connect the computer to the other hardware.

I/O: Input/Output: The transfer of information into the computer and then out of it.

Internet: A network of thousands of computers that are connected together.

Joystick: A lever that's used to move the cursor, especially in some computer games.

Load: To enter information (such as a program) from a storage disk into the main memory.

Mainframe: A large computer used by the government and large businesses that stores vast amounts of information, and can be used by many people at the same time.

Memory: A hardware component of the computer that stores information for later retrieval.

Menu: A list of choices offered by a program.

Output: The information that a computer feeds out, which is usually shown on the monitor or in printed form.

Password: A secret code that protects computer information, and allows only certain people to use a computer or program.

Piracy: The reproduction and distribution of software that has been copyright protected.

Public Domain Programs: Software that can be copied by anyone and used without charge.

Personal Computer: PC, A microcomputer small enough to be used in homes and small businesses.

Program: A set of instructions that tells the computer the actions necessary to accomplish a particular task. As a verb, this word means to write these computer instructions.

RAM: Random Access Memory: A type of memory within the computer that allows the user to change the programs and information in RAM. However, this information is lost when the computer's power is shut off.

Return or Enter Key: A key on the computer keyboard that is used to enter information, and that also returns the cursor to the beginning of a new line.

ROM: Read Only Memory: The type of memory within the computer that can not be changed. It remains permanently, even when the computer is shut off.

Save: To place the contents of a file on a disk or the hard drive for future use.

Scanner: A device that can transfer a printed page and pictures into the computer without using the keyboard or mouse. They are also used in stores to scan prices.

Shift Key: The key on the computer keyboard that is used to capitalize letters and type the upper symbol on the number keys.

Space Bar: The longest key on the computer keyboard. It's used to produce a blank space between words, and to advance the cursor.

Spreadsheet: A type of software that is used in the field of accounting to perform quick mathematical calculations.

Slot: An opening inside the computer into which the peripheral cards are inserted.

User-friendly: A term signifying that a computer or computer program is easy to use.

Video Display Terminal: Another name for the monitor.

Virus: A program that causes damage to other computer programs.

Word Processor: A program used to create and modify text, thus creating professional documents.

COMPUTER ACRONYMS

IBM: International Business Machines
DOS: Disk Operating System
ProDOS: Professional Disk Operating System
RAM: Random Access Memory
ROM: Read Only Memory
CPU: Central Processing Unit
BASIC: Beginner's All Purpose Symbolic Instruction Code
MB: Megabytes
GB: Gigabytes
VR: Virtual Reality
VIOS: Basic Input/Output System
CRT: Cathode ray Tube
GDI: Graphic Device Interface
MCI: Media Control Interface
LCD: Liquid Crystal Display

INTERNET TERMS AND ACRONYMS

AOL: America On Line

BBS: Bulletin Board Service

Bounced Message: An e0mail message that is returned to you because it did not reach its destination.

Browser: A client software program that's used to explore information on the Internet. Netscape Navigator is the top selling browser, followed by Mosaic and Microsoft Internet Explorer.

BTW: By the way

Chat: A program that enables people to type messages to a server who displays the messages immediately so that others who are logged on can respond at once.

Crash: An unexpected shut-down of a program or an entire system. This results in a loss of all work that was not saved.

Cyberspace: The imaginary space on the Internet where you go when you're on-line, or where your e-mail goes.

Domain name: The name in an e-mail address that identifies the Internet host. In the address jray@erienet.net, erienet.net is the domain name.

Dot: The period used in a URL.

Downloading: The transferring of information from the server to your computer.

E-Mail: (Electronic Mail) Messages sent from one computer to another over the Internet.

Emoticons: Often called smileys, these are special characters that represent human faces when turned sideways. They attempt to express the writer's emotions and gestures. For example: : -) represents the ☺.

FAQ: Frequently Asked Questions

FTP: File Transport Protocol

Flame: An angry or insulting message sent by one person to another by e-mail.

FWIW: For What It's Worth

Gopher: An Internet service that locates and delivers electronic files.

Hacker: A computer enthusiast who taps into closed networks.

Home page: The opening page of a document on the Web.

HTML: Hypertext Markup Language

http: Hypertext transfer protocol

IMO: In My Opinion

IOW: In Other Words

IP: Internet Protocol

ISP: Internet Service Provider

Lurker: A person who goes to electronic meetings and doesn't say anything and also breaks into other computers.

Microsoft: The computer industry giant responsible for DOS, Windows and Windows 95.

Netiquette: The correct form of behavior to be used on the Internet.

Online: It's when you're connected to the Internet, and your computer is ready to accept data.

PPP: Point to point protocol.

Search Egine: A tool that matches key words with titles and descriptions on the Internet, Yahoo, Alta Vista, and Infoseek are examples of search engines.

Server: The company that proveds the netword operations for other computer users.

Surfing: Crusing the net, and aimlessly exploring various web pages and sites.

URL: Universal Resource Locator

www: World Wide Web

YAHOO: Yet Another Hierarchically Officious Oracle

The last few letters in an e-mail address usually indicate the type of organization or country that is associated with the sender.

ORGANIZATIONS	COUNTRIES
com commercial	au Australia
gov government	ca Canada
net network	it Italy
edu education	jp Japan
mil military	us United States
org organization	

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STUDY GUIDE:
GEOMETRY: TERMS AND FORMULAS

Geometry is the branch of mathematics that deals with lines, solids, angles, surfaces, shapes, and measurements. An ancient Greek mathematician named Euclid, was the founder of geometry.

BASIC VOCABULARY TERMS:

1. Angle: two rays that are joined together with a common endpoint.
2. Area: the measure of the space within a two-dimensional figure; expressed in square units.
3. Bisect: to divide equally into two congruent pieces or parts.
4. Chord: a straight line segment that touches two different points upon a circle, but does NOT go through the center of the circle.
5. Circle: the set of points that are equidistant from a central point of a plane figure.
6. Circumference: the distance around a circle; its perimeter.
7. Compass: a geometric tool used to draw circles, or construct other geometric constructions.
8. Cone: a space figure that is formed by connecting a circle to a point that is not in the same plane.
9. Congruent figures: figures that are exactly the same size and shape.

10. Counterclockwise: the direction around a circle that is opposite to the way the hands on a clock move.

11. Cube: a three-dimensional figure having 6 sides, called faces, where each face is in the shape of a square.

12. Cylinder: a space figure with two circular bases that are identical in size and shape, and parallel to one another.

13. Degree: a unit of measurement used to measure angles and revolutions; there are 360 degrees in one complete circle.

14. Diagonal: any straight line that connects two vertices of a polygon, but is not a side of that polygon.

15. Diameter of a circle: the distance from one side of a circle to the opposite side, when traveling through the center of the circle.

16. Edge: the segment where two outermost sides of a three-dimensional figure meet and join.

17. Endpoint: the starting point of a line segment or ray.

18. Faces: the sides of a three-dimensional figure of solid.

19. Hypotenuse: the side opposite the right angle in a right triangle.

20. Intersect: to cross one another.

21. Legs: the two sides of a right triangle that are not the hypotenuse.

22. Line: a set of points that continue without end in both directions.

23. Line segment: the two endpoints and the straight line distance between these two points; a portion of a line that begins at a specific point and ends at a different specific point.

24. Midpoint: a point that divides a segment into exactly two segments of equal length.

25. Opposite rays: rays that have the same endpoint, but travel in opposite directions to form a line.

26. Parallel lines: two lines in the same plane that are equidistant from each other, have no points in common, and never intersect or cross each other.

27. Perimeter: the distance around the outer edges of a polygon; the sum of the sides of that polygon.

28. Perpendicular lines: lines that meet or intersect to form right angles.

29. Pi: the number obtained by dividing the circumference of a circle by its diameter; commonly accepted as 3.14

30. Polygon: a closed figure made from straight line segments and having three or more sides.

31. Protractor: a geometric tool used to measure angles using the unit of degrees.

32. Pythagorean Theorem: in a right triangle, the sum of the squares of the legs equals the square of the hypothesis; a squared + b squared = c squared.

33. Quadrant: ¼ of a circle or other plane figure.

34. Radius of a circle: the distance from the center of the circle to any point on the circle; one half the length of the circle's diameter.

35. Ray: a part of a line that begins at a specified point and travels forever in a particular direction.

36. Revolution: one 360 degree turn.

37. Semicircle: one half of a circle; 180 degrees of the circle.

38. Similar figures: two figures that have the same shape and look alike, but are not always the same size.

39. Skew lines: lines that are in two different planes.

40. Sphere: a set of points in space that are a given distance from a specified point.

41. Surface area: the sum of the areas of the faces of a solid figure.

42. Transversal: a line that intersects two or more other lines.

43. Triangle sum property: the fact that the measures of all of the angles in a triangle add up to 180 degrees.

44. Vertex: the point where two line segments, or rays, join.

45. Vertices: the plural form of the word vertex.

46. Volume: the measure of the space within a three-dimensional figure; the amount of space occupied by a figure.

ANGLES: the geometric figures formed by two rays joining at one point, or vertex.

TYPES OF ANGLES

1. Acute angle: an angle whose measure is less than 90 degrees.
2. Right angle: an angle whose measure is exactly 90 degrees.
3. Obtuse angle: an angle whose measure is larger than 90 degrees but less than 180 degrees.
4. Straight angle: an angle whose measure is exactly 180 degrees, and thus creates a straight line.
5. Complementary angles: two angles that share a common vertex and a common side, and whose sums equal 90 degrees.
6. Supplementary angles: two angles that share a common vertex and a common side, and whose combined sums equal 180 degrees.
7. Alternate interior angles: two angles that are formed by two lines and a transversal that are between the two lines, and on opposite sides of that transversal.
8. Central angle of a circle: an angle who vertex is the center point of a circle.
9. Corresponding angles: any pair of angles that are in similar positions after two lines have been cut by a transversal.
10. Exterior angles: any angles formed when two lines are cut by a transversal, but the angles are not between the two lines.
11. Interior angles: any angles formed by two lines that have been cut by a transversal and the angles are between the two lines.
12. Vertical angles: angles that are formed by two intersecting lines, but do not make a linear pair.

POLYGONS: These are closed plane figures that are created by straight line segments. They have three or more sides. POLYGONS ARE NAMED BY THE NUMBER OF SIDES THAT THEY HAVE.

NAMES OF POLYGONS

Number of Sides	Polygon Name
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon
11	11-gon
12	Dodecagon

TRIANGLES: Triangles are polygons having three sides, and therefore, three angles.
Angle A + Angle B + Angle C = 180 degrees.

TYPES OF TRIANGLES

1. Acute Triangle: A triangle having three acute angles.
2. Right Triangle: A triangle having one right angle.
3. Obtuse Triangle: A triangle having one obtuse angle.
4. Scalene Triangle: A triangle with no congruent sides.
5. Isosceles Triangle: A triangle with at least two congruent sides.
6. Equilateral Triangle: A triangle with 3 congruent sides and three equal angles.

The height of the triangle (also called the altitude) is determined by drawing a perpendicular line from a vertex to the base, which is the bottom of the triangle.

TO FIND THE AREA OF A TRIANGLE: A = ½ hb

Area equals ½ the height of the triangle times the base. It is expressed in square units.

If the height of a triangle was 8 centimeters and the base of that triangle was 24 centimeters, the area of the triangle would be ½ times 8 times 24, or 96 square cm.

TO FIND THE PERIMETER OF A TRIANGLE, ADD THE LENGTH OF EACH SIDE. If the sides of a triangle measured 9 ft., 6 ft, and 14 ft., the perimeter of that triangle would be 9 + 6 + 14, or 29 feet.

QUADRILATERALS: These polygons have 4 sides, and therefore, four angles.

TYPES OF QUADRILATERALS

1. PARALLELOGRAM: A quadrilateral with opposite sides parallel.
2. RECTANGLE: A parallelogram with four right angles.
3. SQUARE: A rectangle in which all four sides are congruent.
4. RHOMBUS: A parallelogram with four congruent sides.
5. TRAPEZOID: A quadrilateral with exactly two parallel sides.

Every square is a rectangle, because a rectangle has 4 right angles, and every square has four right angles. However, not every rectangle is a square, because most rectangles have a different length and a width, whereas the length of all the sides in a square are equal.

TO FIND THE PERIMETER OF ANY QUADRILATERAL : Add the length of every side together.

TO FIND THE AREA OF A RECTANGLE: A = lw

Area = the length times the width. It is expressed in square units.

If the length of a triangle was 19 meters and the width was 4 meters, the area would be 19 x 4, or 76 square meters.

TO FIND THE AREA OF A SQUARE: A = s squared

Area = the length of one side squared. If a side was 6 cm, the area would be 6 x 6, or 36 sq. cm.

CIRCLES:

The distance around the outside of a circle is called its CIRCUMFERENCE.

TO FIND THE CIRCUMFERENCE OF A CIRCLE: C = Pi x d
The circumference equals pi times the diameter.

Pi has an accepted value of 3.14, or in its fractional form, its value is 22/7.

If the diameter of a circle is 9 meters, the circumference of that circle would be 3.14 times 9, or 28.26 meters.
TO FIND THE AREA OF A CIRCLE: A = pi r squared
The area equals pi times the radius squared. It is always expressed in square units.

If the radius of a circle was 4 meters, the area would be 3.14 times 16 (because 4 squared is 16), or 50.24 square meters.

TO FIND THE VOLUME OF A PRISM OR RECTANGULAR BOX:

V = l x w x h

The volume equals the length times the width times the height. It is always expressed in cubic units.

If a box had a length of 5 centimeters, a width of 3 centimeters, and a height of 8 centimeters, its volume would be 5 x 3 x 8, or 120 cubic centimeters. (120 centimeters cubed)

OTHER VOLUME FORMULAS:

VOLUME OF A CYLINDER: V = pi r squared h, where r is the radius and h is the height.

VOLUME OF A CONE: V = 1/3 pi r squared h, where r is the radius and h is the height.

VOLUME OF A SPHERE: V = 4/3 pi r cubed, where r is the radius.

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STUDY GUIDE:
1990-1994

1990 WORLD EVENTS:

THE GULF WAR began on August 2, 1990 after Iraq invaded Kuwait. At first, the operation was known as Operation Desert Shield and was intended to protect neighboring countries. The main goal at this time was to convince Saddam Hussein to withdraw from Kuwait. However, Hussein did not withdraw, thus causing the start of Operation Desert Storm.

Ethnic cleansing began in Croatia. UN peacekeepers tried to intervene.

Nelson Mandela was released from prison and spoke to his people against apartheid at Cape Town in South Africa.

Margaret Thatcher stepped down as the British Prime Minister, after serving longer than any other Prime Minister.

Mikhail Gorbachev won the Nobel Prize for Peace for his innovations "perestroika" and "glasnost."

McDonald's opened its first restaurant in the U.S.S.R.

1990 U.S. EVENTS:

The Keating Five Hearings by the Senate Ethics Committee began to investigate the involvement of five Senators with a corrupt savings and loan scandal, involving Charles Keating. Alan Cranston was found guilty, while the other four were given small fines.

Dr. Kevorkian and the Right to Die were controversial topics in the news.

Judge David H. Souter was appointed to the U.S. Supreme Court to replace the retiring William Brennan.

Science:

"Sue," an almost perfectly intact dinosaur skeleton of a Tyrannosaurus Rex was discovered in South Dakota. (This skeleton is now displayed at the Museum of Natural History in Chicago, Illinois.)

The Hubble telescope went up into space.

Consumer Events:

The Ford Explorer (an SUV) was introduced on the market and sold twice as many models as the Jeep Cherokee.

Television:

"Seinfeld" began its prime time run on NBC. Three years later, after moving to Thursday nights, it became extremely popular, winning many Emmy awards, as well as People's Choice Awards and a Peabody Award over the course of its nine seasons and 178 episodes. It starred Julia Louis-Dreyfus as Elaine, Michael Richards as Kramer, and Jason Alexander as George, as well as Jerry Seinfeld as himself.

Movies:

The NC-17 rating came into use. This rating was attached to movies that were not acceptable for children under the age of 17.

"Dances With Wolves," directed by Kevin Costner, was a success, winning 7 Academy Awards, including one for Costner as Best Director.

"Driving Miss Daisy" won four Oscars.

Other important films of 1990 include, "Pretty Woman," starring Richard Gere and Julia Roberts, "Home Alone," starring Macaulay Culkin and Joe Pesci, and "Total Recall," starring Arnold Schwarzenegger and Sharon Stone.

Sports:

At the Super Bowl, the San Francisco 49ers, led by Joe Montana, beat the Denver Broncos.

The Cincinnati Reds beat the Oakland A's in the World Series.

The International Olympic Committee announced that the 1996 Summre Olympic Games would be held in Atlanta, Georgia.

Notable Obituaries:

Sammy Davis, Jr. -- a singer, dancer, actor, musician, and mime who died from throat cancer.

Greta Garbo--an early twentieth century movie star known for her beauty and portrayal of moody characters, and for her starring role in "Grand Hotel."

Roald Dahl--a popular children's author whose works include "James and the Giant Peach," and "Matilda."

Leonard Bernstein--a famous American composer and conductor of the twentieth century known for his music in "West Side Story."

Pearl Bailey--a popular U.S. nightclub singer who starred in the first all-black version of "Hello Dolly."

B.F. Skinner--an American psychologist who devised a box (Skinner Box) in which an animal learned to press a lever in order to get food or water.

1991 WORLD EVENTS:

Latvia, Estonia, and Lithuania obtained their independence from the Soviet Union.

Operation Desert Storm began on January 17, 1991. The United States engaged in air strikes as well as ground forces, led by General Norman Schwartzkopf. On February 28, 1991 U.S. forces liberated Kuwait. Notably, much of this war was telecast on CNN.

1991 U.S. EVENTS:

On July 22, 1991 Jeffrey Dahmer was finally apprehended and arrested for multiple slayings and cannibalism in a series of serial killings.

The minimum wage was raised from $3.80 to $4.25 per hour.

President Bush was admitted to the hospital for irregular heart rhythms.

Four Los Angeles police officers were indicted following the March 3rd beating of 25-year old Rodney King, a black motorist.

Thurgood Marshall, the first black to ever serve on the U.S. Supreme Court, retired after 24 years of service at the age of 84.

The Clarence Thomas hearings took place, and investigated the accusations of Anita Hill who claimed to have been sexually harassed ten years before by her boss, Clarence Thomas. In the end, Thomas was cleared and nominated for the U.S. Supreme Court.

President Bush refused a loan of $10 billion to Israel, which was targeted for housing developments in the Occupied Territories.

Movies:

"The Silence of the Lamb" and "Thelma & Louise" debuted this year.

"JFK," directed by Oliver Stone, reinstated public controversy and conspiracy theories on the results of the Warren Commission findings of 1964, which determined that Lee Harvey Oswald was the culprit in the JFK assassination. Other top movies included: "Robin Hood: Prince of Thieves," starring Kevin Costner, Morgan Freeman, and Christian Slater, and "Terminator 2," starring Arnold Schwarzenegger, and Linda Hamilton.

Sports:

In the Super Bowl, the New York Giants beat the Buffalo Bills.

The Minnesota Twins won the World Series against the Atlanta Braves 4-3.

In tennis, Monica Seles won the U.S., French, and Australian Open Tournaments.

Magic Johnson was diagnosed with HIV.

Carl Lewis set the world record for the 100-meter sprint at the World Track and Field Championships, finishing with a time of 9.86 seconds.

Notable Obituaries:

Frank Capra--a motion picture director for movies like "It's a Wonderful Life"

Dr. Seuss--an author of children's books such as "The Cat in the Hat," and "How the Grinch Stole Christmas."

Martha Graham--an American modern dancer and dance director, who founded the Martha Graham School of Contemporary Dance in New York City.

Michael Landon--an actor who starred in "Bonanza" and "Little House on the Prairie."

Isaac Bashevis Singer--Nobel-winning novelist who wrote about the heritage of Polish Jews and is best known for Gimpel the Fool and The Magician of Lublin.

1992 WORLD EVENTS:

The president of Serbia, Slobodan Milosevic, led Bosnian Serbs to attack and take over parts of Bosnia Herzegovina, resulting in the bloodiest conflict in Europe after WWII.

"Ethnic cleansing" continued, checked somewhat by UN sanctions and relief efforts.

Canadians voted 54% against granting Quebec its independence.

Anarchy raged in Somalia, a starving country entrenched in Civil War. Clinton sent troops in, and several Americans were killed before the troops were finally withdrawn.

The "no-fly" zone was imposed in Iraq. UN inspectors determined that nuclear weapons were not an issue there.

Boris Yeltsin maintained power in Russia.

Disney opened the $4 billion Euro Disney theme park just outside of Paris.

General Noriega, former leader of Panama, was sentenced to 40 years in prison for drug trafficking.

1992 U.S. EVENTS:

Hurricane Andrew devastated Florida and Louisiana.

An all-white jury acquitted four Los Angeles police officers (also all white) of beating Rodney King, a black man. Riots began in South Central Los Angeles and continued for three days. Several black men beat up a white truck driver, Reginald Denny. (These men were later convicted.) A curfew was instituted in many towns to prevent the riots from spreading.

Serial killer Jeffrey Dahmer was sentenced to 15 consecutive terms of life in prison with no possibility of parole.

Science:

Nicoderm patches were approved as a possible solution to the "stop smoking" problem.

Theater:

Tony Kushne's "Angels in America," a two-volume epic play, debuted in England. By 1993 it was also popular on Broadway.

Television:

After 30 years at the "Tonight Show" host, Johnny Carson resigned, leaving it to Jay Leno.

Movies:

Top movies of the year were "Basic Instinct," "Wayne's World," and "Batman Returns."

Sports:

The Washington Redskins beat the Buffalo Bills in the Super Bowl.
The Toronto Blue Jays beat the Atlanta Braves 4-2 in the World Series.
Al Unser, Jr. won the Indy 500.
Larry Bird retired from basketball and the Boston Celtics.
Former tennis champ Arthur Ashe announced he was HIV-positive.
Michael Jordan, Magic Johnson, and fell Dream Team members celebrated their Olympic victory in Barcelona.

Notable Obituaries:

Isaac Asimov--a science-fiction writer who published Pebble in the Sky and Opus 200.
John Cage--an American composer who invented the Prepared piano.
Alex Haley--the Pulitzer Prize-willing author of Roots.
Anthony Perkins--an actor who starred in the original "Psycho" movie series.
Lawrence Welk--a Big Band conductor, composer, and singer who hosted his own weekly television hour of Big Band music.
Sam Walton--the founder and chairman of Wal-Mart who died of cancer at the age of 74.

1993 WORLD EVENTS:

On September 13, 1993 Yitzhak Rabin, Prime Minister of Israel, and Yasir Arafat, chairman of the PLO, shook hands in a ceremony supervised by Bill Clinton on the lawn of the White House.

The Czechoslovakian Republic split into two countries with different languages, governments, and cultures: the Czech and Slovak Republics.

1993 U.S. EVENTS:

Bill Clinton, a Democrat, and his First Lady, Hillary Clinton, took office in January, thus ending twelve years of Republican rule of the Presidency.

Janet Reno became the first female Attorney General.

Ruth Bader Ginsburg became the second woman on the Supreme Court.

The Senate enacted a bill that imposed a five-day waiting period for background checks for anyone making a handgun purchase.

An explosion in the World Trade Center, spearheaded by Muslim fundamentalists living in New Jersey, trapped many employees in the Twin Towers, killed others, and caused extensive damage on February 26.

NAFTA (The North American Free Trade Agreement) was signed and ratified by the U.S., Mexico, and Canada. It phased out trade barriers and tariffs over a 15-year time span.

The Bureau of Alcohol, Tobacco and Firearms attacked the Branch Davidian commune, led by David Koresh, in Waco, Texas on April 19.

The Mississippi River flooded, causing The Great Flood of 1993 that resulted in $12 billion in damages.

Culture:

AmeriCorps was created in this year so that students could pay for college by volunteering community service.

The Information Superhighway came into common usage.

Toni Morrison won the Nobel Prize for Literature.

Nelson Mandela and F.W. de Klerk won the Nobel Prize for Peace, for their efforts and contribution in ending apartheid.

Theater:

On Broadway, Andrew Lloyd Weber's creation "Sunset Boulevard" and Harold Prince's "Kiss of the Spider Woman" gained acclaim.

Television:

The final episode of "Cheers" was shown on May 20th. This popular show ran for 11 years, won 26 Emmy awards, and was seen in 38 countries.

Movies:

"Jurassic Park," directed by Steven Spielberg, was a hit. It won 3 Academy Awards, for best Sound, Sound Effects Editing, and Visual Editing.

"Schindler's List," also directed by Steven Spielberg, was awarded 7 Oscars, including Best Director and Best Picture, as were "Philadelphia" and "Sleepless in Seattle," which starred Tom Hanks. Other top movies included: "The Fugitive," "The Firm," and "Aladdin."

Sports:

At the Super Bowl, the Dallas Cowboys defeated the Buffalo Bills.

In the World Series, the Toronto Blue Jays beat the Philadelphia Phillies.

Michael Jordan retired from basketball and switched to playing baseball in the minor leagues, but returned to the Chicago Bulls a little more than a year and a half later.

The Chicago Bulls won their third straight N.B.A. championship after defeating the Phoenix Suns.

Notable Obituaries:

Marian Anderson--the first black person to sing with the Metropolitan Opera of New York City.

Arthur Ashe--a tennis champion and human rights activist who was the first black athlete to ever win a Grand Slam event, which he accomplished in the first U.S. Open in 1968.

Raymond Burr--the actor known as TV's Perry Mason, who died of cancer at age 76.

Cesar Chavez--the organizer and founder of the United Farm Workers, who organized food harvesters in California, many of which were Mexican-Americans.

Agnes de Mille--a choreographer, dancer, and author, who was best-known for her choreography in the musical play "Oklahoma."

Helen Hayes--a stage and screen actress born in 1900, who was married to playwright Charles MacArthur.

William Randolph Hearst--a journalist and newspaper publisher of the late nineteenth and early twentieth centuries, who pioneered in the sensational reporting technique called "yellow journalism."

Audrey Hepburn--a famous actress known for her roles in "My Fair Lady," and "Breakfast at Tiffany's."

Thurgood Marshall--the first black associate justice of the Supreme Court of the United States.

Dizzy Gillespie--a famous trumpeter who helped create bebop and introduced Cuban rhythms into jazz.

1994 WORLD EVENTS:

The 1994 election near Johannesburg, South Africa was the first ever open to all races in that nation. Nelson Mandela was elected president of South Africa.

On September 19 the United States invaded Haiti. The United Nations had approved the invasion to drive out the military government and to restore the president, Jean-Bertrand Aristide, who had been exiled, back to the presidency. This was accomplished without firing a shot.

1994 U.S. EVENTS:

The Whitewater scandal emerged, with Special Prosecutor Robert Fiske appointed by Janet Reno to investigate Bill and Hillary Clinton's possible involvement in a savings and loan scandal.

Parts of Los Angeles were devastated by an earthquake centered in Northridge on January 18.

On June 17, O.J. Simpson attempted to evade police in a chase in his white Ford Bronco as television captured the live drama.

Former first lady Jacqueline Kennedy Onassis died of lymphatic cancer at the age of 64.

Former President Richard M. Nixon died at the age of 81. He was president during the Viet Nam War and later resigned from the presidency due to the Watergate scandal.

Science:

The Hubble Telescope discovered incontrovertible evidence of the existence of Black Holes.

Culture:

Yasir Arafat and Yitzhak Rabin were awarded Nobel Prizes for Peace.

Theater:

Composer Stephen Sondheim's "Passion" was onstage as was Anna Deavere Smith's epic drama "Twilight: Los Angeles, 1992."

Movies:

"Forrest Gump," directed by Robert Zemeckis, "Pulp Fiction," directed by Quentin Tarantino, and "Quiz Show," directed by Robert Redford were all in theaters. Other popular movies included: "Four Weddings and A Funeral" and "The Lion King."

Sports:

In the Super Bowl, the Dallas Cowboys beat the Buffalo Bills.
The World Series was canceled this year because the players were on strike.

The U.S. hosted the World Cup for the first time. In this competition, Italy was defeated by Brazil.

Houston Rockets defeated New York Knicks to win the NBA championships.

The Olympics were ongoing in Lillehammer.

Tanya Harding had competitor Nancy Kerrigan attacked. However, she was still able to compete, as was Harding, who sued to avoid disqualification. Iksana Baiul, a Ukrainian skater, won the gold, with Kerrigan placing behind her for second.

Forty-five year old George Foreman beat Michael Moorer to retake the world heavyweight boxing title.

Notable Obituaries:

Cab Calloway--a Big Band leader.

Kurt Cobain--the lead singer for the rock group Nirvana.

Ralph Ellison--a black American author noted for his book "The Invisible Man," a novel about blacks in America.

Kim II Sung--the President of North Korea

Eugene Ionesco--a Romanian born French playwright who wrote "The Bald Soprano."

Burt Lancaster--a movie star involved in movies like "From Here to Eternity."

Richard Nixon--the former President involved in the Watergate scandal.

Jacqueline Kennedy Onassis--First Lady, who was previously married to President John F. Kennedy and later married to shipping magnate, Aristotle Onassis.

Roy J. Plunkett--an inventor who appears in the Inventor's Hall of Fame for Teflon.

Wilma Rudolph--a black track and field star who was the first American woman to win three gold medals in the Olympic Games.

Jessica Tandy--a stage and screen actress who won an Oscar for "Driving Miss Daisy."

Telly Savalas--the star of the television show "Kojak."

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STUDY GUIDE:
1995-1999

1995 WORLD EVENTS:

Conflict continues in Rwanda, Bosnia, and Croatia.

France invites worldwide censure after detonating a nuclear device in the Pacific Ocean.

Yitzhak Rabin is assassinated at a peace rally by a Jewish extremist.

1995 US EVENTS:

The Jury in the O.J. Simpson trial declared him "not guilty" in the slaying of Nicole Simpson and Ronald Goldman, thus ending a much-talked about and thoroughly televised trial.

Pope John Paul II toured the United States.

On April 19th, a car bomb tore a nine-story hole in the Alfred Murrah Federal Building in Oklahoma City, Oklahoma. The blast killed 167 people.

President Clinton created a $20 billion dollar line of credit to help save the peso.

Bobbi McCaughey gave birth to septuplets.

Louis Farrakhan led his "Million Man March" on Washington with good intentions. However, his exclusion of women or white sympathizers caused much controversy. The march fell short of a million but did have 600,000 participants.

The space probe Galileo launched a capsule into Jupiter's atmosphere, resulting in close-up pictures of Jupiter's atmosphere and the first close-up pictures of the planet's surface.

Actor Christopher Reeves, who played Superman, was paralyzed in a horseback riding accident.

Cultural:
The Rock and Roll Hall of Fame opened in Cleveland, Ohio.

Movies:
"Batman Forever," "Babe," "Braveheart," "Leaving Las Vegas," "The Usual Suspects," and "Dead Man Walking" were popular movies.

Sports:
San Francisco beat San Diego in the Super Bowl. The Atlanta Braves beat Cleveland at the World Series. Steffi Graf won at Wimbledon.

Notable Obituaries:
Jerry Garcia, leader of the Grateful Dead.

Mickey Mantle, a famous New York Yankees baseball player and Hall of Fame member.

Ginger Rogers, noted dance partner of Fred Astaire.

Rose Fitzgerald Kennedy, mother of John F. Kennedy, who died of pneumonia at the age of 104.

1996 WORLD EVENTS:
Mad Cow Disease emerged in Europe.

The Chechnya treaty was signed.

South Africa adopted a new constitution.

1996 U.S. EVENTS:
Ted Kaczynski was arrested as the (Harvard-educated) Unabomber. He was charged with making bombs that he used to attack universities, airlines, and computer stores, resulting in the deaths of three people and in additional injuries to 23 others.

Madeleine Albright becomes the first female Secretary of State.

Congress passed the Welfare Reform bill, which was approved by Clinton.

Timothy McVeigh, a Persian Gulf War Veteran, was indicted by a grand jury for his role in the terrorist attack on the Oklahoma City Federal Building on April 19th, the anniversary of the blast of the WACO commune in 1993.

The Clinton-Gore team was nominated for the presidential candidacy at the Democratic Convention. The Republican Convention nominated Bob Dole and Jack Kemp.

The Olympic Games in Atlanta, Georgia were disrupted when a pipe bomb destroyed a sound tower, killing two people and injuring an additional 111 people.

Consumer Events:
Remember! A postage stamp still only cost $.32 this year.

Theater:
The Pulitzer Prize in Drama was given to "Rent," a musical that was actually based on "La Boheme," a century-old opera by Puccini.

Movies:
The top-grossing films this year were "Independence Day," "Twister," and "Mission Impossible." "The English Patient," "Fargo," "Jerry Maguire," and "Shine" were also popular movies.

Sports:
The nineties saw the beginning of two professional leagues of women's basketball: the ABL (American Basketball League) in 1996, and the WNBA (Women's National Basketball Association) in 1997. Steffi Graf won at Wimbledon. Dallas beat Pittsburgh in the Super Bowl. The New York Yankees beat the Atlanta Braves in the World Series.

Americans at the Atlanta Olympics:
The women's gymnastic team won the gold medal.

Carl Lewis won his fourth gold medal in the long jump competition.

Michael Johnson won the 200-meter race, with a world record time of 19.32 seconds.

Notable Obituaries:
Ella Fitzgerald, an American jazz singer of the twentieth century.

Spiro Agnew, vice-president under Richard Nixon who resigned after being charged with income tax evasion.

Gene Kelly, an actor, dancer, choreographer, and director who starred in many movies including the 1952 movie, "Singin' in the Rain."

George Burns, an early comedian who became famous for comic bantering with his wife, Gracie Allen.

Carl Sagan, a noted astronomer.

Timothy Leary, a psychologist who researched LSD and wrote the controversial book, The Psychedelic Experience.

1997 WORLD EVENTS:

Princess Diana was killed in a tragic car crash while being pursued by the paparazzi. The world mourned her passing.

Mother Theresa died only a week later.

1997 U.S. EVENTS:

Timothy McVeigh was sentenced to death for his role in the Oklahoma City bombing.

The World Trade Center perpetrators were convicted.

Clinton used the line-item veto for the first time.

The members of a cult known as Heaven's Gate in California committed a mass suicide.

Science:
Scottish embryologist cloned a sheep he named Dolly from a single cell.

Comet Hale-Bopp came the closest it would to Earth before the year 4397.

Movies:

The film "Titanic" was successful, and won 11 Academy Awards. It starred Leonardo DiCaprio and Kate Winslet. Other popular movies included "As Good As It Gets," "The Full Monty," and "Good Will Hunting."

Sports:

Green Bay beat New England in the Super Bowl. At the World Series, the Florida Marlins were victorious over Cleveland.

Tiger Woods, at the age of 21, became the youngest player to win the U.S. Master's Golf Tournament. He established the largest record ever for his margin of victory, winning by a 12-stroke lead with 22 under par.

Notable Obituaries:

John Denver, a popular singer, songwriter, performer, actor and environmentalist.

Gianni Versace, a noted fashion designer who was murdered at his Miami Beach mansion.

Jacques Cousteau, marine biologist and underwater explorer who helped develop the aqualung.

James A. Michener, a well-known author.

Michael Kennedy, 39 year-old son of the late Robert F. Kennedy, who died in a skiing accident.

1998 WORLD EVENTS:

Ethnic conflict occurred between the Serbs and Albanians in Kosovo.

Europeans agreed to adopt the Euro as their standard currency.

Clinton ordered air strikes after Iraq stopped cooperating with UN weapons inspectors.

1998 U.S. EVENTS:

President Bill Clinton was accused of having sexual relations with an intern, Monica Lewinsky.

Al Gore announced himself as a candidate for the Democratic presidential nomination.

Terry Nichols was convicted in the Oklahoma City bombing.

The Unabomber was sentenced to four consecutive life sentences.

Science:

John Glenn became the oldest astronaut in space by serving on the space shuttle "Discovery" at the age of 77. (Fun fact: After his early space career ended in 1964, John Glenn served as an Ohio Senator from 1975 until 1998, when he went back into space.)

Television:

The last episode of "Seinfeld" aired.

Movies:

"Shakespeare in Love," and "American History X" did well in theaters.

Sports:

Denver beat Green Bay in the Super Bowl. The New York Yankees defeated San Diego in the World Series.

Cal Ripken (known as the "Iron Man") set a record in Major League Baseball this year, for playing 2,632 consecutive games. This beat Lou Gehrig's record for 2,130 games, which was set in 1939.

In this same year, Mark McGwire set a new record for 70 home runs in a season, breaking Roger Maris's record of 61, set back in 1961. Sammy Sosa broke this record this year, with 66 home runs.

Notable Obituaries:
Frank Sinatra, a well-known singer and actor.

Sonny Bono, Cher's former husband and singing partner who later served as a Congressman.

Gene Autry, an actor who became known as America's "singing cowboy."

Florence Griffith Joyner, a track star and sprinter, nicknamed "Flo-Jo," who won several Olympic gold medals in track competitions.

1999 WORLD EVENTS:

Nelson Mandela stepped down and Thabo Mbeki took over as President of South Africa.

A severe earthquake killed many in Turkey.

1999 U.S. EVENTS:

Many feared the new millennium and potential consequences of the Y2K bug.

The Senate opened impeachment hearings against President Clinton, but did not convict him.

Students at Columbine High School took the lives of 12 of their peers and one teacher, before taking their own lives.

Culture:
Woodstock '99 took place in the state of New York.

Consumer:
The cost of a stamp rose by one cent to $.33 cents this year.

The Melissa virus attacked many computers.

Movies:
"The Blair Witch Project" became the most profitable movie in history.

Sports:
Denver beat Atlanta at the Super Bowl.

During the Winter Olympics in Japan, Tara Lipinski became the youngest person to ever win an individual gold medal.

The Chicago Bulls won the NBA Championship.

Notable Obituaries:
Joe DiMaggio, the New York Yankees baseball star who married Marilyn Monroe.

George C. Scott, an actor especially noted for his starring role in "Patton."

Alan Shephard, the first American to travel into space.

John F. Kennedy, Jr., the 38 year-old son of John F. Kennedy and the founder of "George," a politically-based magazine, died in an air crash with his wife and his wife's sister.

OTHER 90'S TRENDS:

SUV's more than doubled in popularity. The Ford Explorer was the best-selling sport utility vehicle in the 1990's. Among other popular models were the Jeep Cherokee, the Toyota 4Runner, and the Nissan Pathfinder.

Rollerblades (also known as inline skates) became popular.

The Internet (also known as the Information Superhighway), as well as E-mail, became more widely used.

Coffee, particularly the gourmet varieties, became an increasingly popular beverage. Cybercafes, coffee shops where patrons could surf the web, were also a nineties phenomenon.

Cell phone sales burgeoned and Virtual Reality Technology was introduced.

Women's professional basketball established itself. In addition, "extreme sports," such as rock climbing gained popularity.

Many employees began to telecommute, or web-commute from offices in their homes.

Many researchers and scientists continued to study genes and DNA.

The AIDS epidemic grew.

Computers increased their presence in many American homes. Bill Gates and the presence of Microsoft (partnered with IBM) grew.

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STUDY GUIDE: FAMOUS AMERICANS, PART 2

Historical and Political Figures Before 1865

Boone, Daniel
This frontier settler from the late 1700's and early 1800's is most closely associated with Kentucky. He established a fort at Boonesborough, Kentucky and later led many settlers through the Cumberland Gap.

Brown, John
This 1800's abolitionist tried to incite uprisings among the slaves and free them by military force. He was best known for his attack on Harpers Ferry in Virginia. He was tried, convicted, and hanged for treason.

Burr, Aaron
He served as vice-president to Thomas Jefferson from 1801 to 1805. He killed Alexander Hamilton in a duel, and was later involved in a conspiracy to separate the western states from the Union. Burr was tried, but acquitted, for treason.

Calhoun, John C.
This southerner served as Vice-President under Andrew Jackson and later as a Senator for South Carolina. He was pro-slavery and pro-states' rights.

Carson, Kit
He was a skilled frontier guide, known for opening the territory of California for settlement.

Clay, Henry
This man served in the House of Representatives as well as the Senate on behalf of Kentucky, but he lost the election for the presidency twice. He was known for his involvement in the "Missouri Compromise" and the "Compromise of 1850." He is often associated with his famous quote: "I would rather be right than president."

Crockett, Davy

This frontier settler was known for his coonskin cap and outdoors image, but he also represented the state of Tennessee in Congress while Andrew Jackson was President. He died at the Alamo in 1836.

Davis, Jefferson

This man left the Senate and served as president of the Confederacy when the South seceded from the Union.

Douglas, Stephen A.

This man engaged in frequent debates with Abraham Lincoln. He beat Lincoln for the Illinois Senate position in 1858, but lost the Presidency to Lincoln in 1860. Douglas was nicknamed the "Little Giant."

Douglass, Frederick W.

This escaped slave made his living as a public speaker and abolitionist. His autobiography, Narrative of the Life of Frederick Douglass, is still a widely read account of life as a black man.

Franklin, Benjamin

Although he is better known for his work as a diplomat, scientist, printer, and inventor, this man was also a founding father of the United States. He was one of the signers of the Declaration of Independence and the oldest participant at the Constitutional Convention. He was the author of Poor Richard's Almanac and is infamous for his research on electrical currents. He served as the first Postmaster General of our country.

Hale, Nathan

This American spy was hung by the British during the Revolutionary War. He is often associated with his famous quotation: "I only regret that I have one life to lose for my country."

Hamilton, Alexander

This founding father served as adviser to George Washington during the Revolutionary War, was active in drafting the Constitution, and wrote various essays in The Federalist Papers. He became the first Secretary of the Treasury for our country. Thomas Jefferson disagreed with him politically, as did Aaron Burr, who eventually killed Hamilton in a duel.

Hancock, John

He served as president of the Constitutional Congress and was the first to sign the historical Declaration of Independence.

Henry, Patrick

This Virginia statesman served in the Continental Congress and is associated with his fiery speech that ended with the words, " Give me liberty or give me death."

Houston, Sam

He led Texas in the battle for its independence from Mexico and served as president of The Republic of Texas. Once Texas was recognized as a state, he represented the state in the Senate. He also served as its governor for a time, but opposed its desire for secession, and was consequently removed from office.

Jackson, Stonewall

This man was a prominent Confederate general in the Civil War. He earned his nickname at the First Battle of Bull Run, because he and his troops "stood like a stone wall." Ironically, Confederate soldiers who mistook him for a Union soldier later killed him.

Lee, Robert E.

This man was in charge of the Confederate troops during the Civil War. He surrendered to Grant at Appomatax Courthouse at the conclusion of the war.

Madison, Dolly

She was the first lady during James Madison's administration, and was a gracious hostess. When the residents vacated the White House during the War of 1812, she saved many important documents, as well as Gilbert Stuart's famous portrait of George Washington.

Mann, Horace

As an educational reformer, he campaigned for free, nondenominational public schools. He founded the American public school system.

Paine, Thomas

This patriot advocated American independence in his famous pamphlet, Common Sense.

Penn, William

He led the Quakers to the Philadelphia, Pennsylvania area, and founded an early colony there that was originally called "Penn's Woods."

Pocahontas

This Native American saved Captain John Smith's life. She later married John Rolfe, the man who introduced tobacco to the Jamestown colony.

Revere, Paul

This Boston silversmith became a Revolutionary War hero when he crossed Massachusetts on horseback one night to warn all the colonists to prepare for the British invasion.

Ross, Betsy
It is speculated that this celebrated seamstress sewed the first American flag.

Smith, Captain John
This man was one of the first colonists and early leaders of the Jamestown Colony.

Truth, Sojurner
This escaped slave became a notable abolitionist speaker during the nineteenth century.

Tubman, Harriet
Nicknamed Moses, this abolitionist helped hundreds of slaves escape via the Underground Railroad. She also served as a spy for the Union during the Civil War. Rewards as high as $12,000 were offered for her as either "dead or alive."

Turner, Nat
This slave was hung in 1831 for leading the only effective revolt among the slaves in America. During this revolt, this black preacher led 65 slaves in a violent uprising against plantation owners in Virginia.

Webster, Daniel
This member of the Whig party lost the nomination for presidency three times. He was best known for his debate and oratory during his service as Senator of Massachusetts.

Webster, Noah
Noah Webster compiled the *American Dictionary of the English Language.*

Williams, Roger
This Puritan founded Rhode Island after he was expelled from Massachusetts because he refused to follow the strict religious customs of the Puritans.

Historical and Political Figures After 1865

Addams, Jane
Jane Addams founded Hull House, a settlement house in Chicago. She also won the Nobel Peace Prize in 1931 for her efforts to improve conditions for women.

Agnew, Spiro
He was Nixon's vice-president and a strong advocate of U.S. involvement in Vietnam. He became the first person to resign from the Vice-Presidency after being accused of income tax evasion.

Anthony, Susan B.

She was one of the main leaders for women's suffrage, and was arrested when she tried to vote in an election before women had been given the right to vote. She was the first woman to be honored on an American coin. Unfortunately she died before the Nineteenth Amendment gave women the right to vote.

Barton, Clara

This woman founded the American Red Cross and served as a nurse to Union soldiers during the Civil War.

Bryan, William Jennings

This politician and fundamentalist helped prosecute the advocates of Darwin's theory at the Scopes trial.

Calamity Jane

This frontier woman was a Pony Express rider who became legendary for her accurate marksmanship.

Carver, George Washington

The son of slaves, this agricultural innovator was the first black scientist to attain nationwide recognition. He became head of the Agriculutral Research branch of Tuskegee Institute in Alabama. It was here that his research uncovered hundreds of uses for peanuts.

Daley, Richard

Daley was the mayor of Chicago throughout the 50's, 60's, and 70's.

Darrow, Clarence

This famous lawyer defended many unpopular individuals and controversial cases, including the teacher in the Scopes trial, and Eugene V. Debs, presidential candidate of the Socialist Party.

DuBois, W.E.B.

He authored many books that advocated black advancement, and also founded the NAACP, the National Association for the Advancement of Colored People.

Earhart, Amelia

This female aviator was the first to fly a plane across the Atlantic. She was last cited flying over the Pacific in the 1930's. Her death remains a mystery.

Ferraro, Geraldine

This politician was the first female to run as a vice-presidential candidate on a major party ticket.

Friedan, Betty

This feminist wrote *The Feminine Mystique* in 1963, which promoted women's liberation. She was also one of the founders of NOW, the National Organization for Women.

Gehrig, Lou

This major league baseball player set the first record for playing in over 2,000 consecutive games. He died in his early thirties from a rare nerve disease that has become known as "Lou Gehrig's Disease."

Goldwater, Barry

This Arizona Senator ran against Lyndon Johnson for the presidency in 1964 and lost. As a republican, he was noted for gaining majorities in several southern states that had been predominanantly democratic.

Graham, Billy

This evangelist calls his meetings "Crusades for Christ." He has led revivals in nearly every state and has appeared on national television.

Halsey, William F.

Nicknamed "Bull," this admiral commanded the Navy in the Pacific Ocean during World War II. He is primarily known for his successes on the Japanese coast.

Hearst, William Randolph

Hearst was a journalist and newspaper publisher at the turn of the century. He was known for his sensational reporting, which became known as "yellow journalism." The propaganda published in his newspapers actually led to our conflict in the Spanish-American War in the 1890's.

Hickock, Wild Bill

This frontier settler and Pony Express Rider was also a U.S. marshal who pursued many notorious old west outlaws.

Holmes, Oliver Wendell, Jr.

This man served as a Supreme Court judge from 1902 to 1932. He strongly believed in freedom of speech unless it caused a "clear and present danger."

Hoover, J. Edgar

J. Edgar Hoover headed the FBI from 1924 to 1972. He was known for his success in capturing and prosecuting gangsters and spies Some critics feel that he abused his power during FBI investigations.

Jackson, Jesse

This man was, and is still, a leader in the Civil Rights Movement and campaigns continuously for the advancement of African Americans. He ran in the presidential primaries of 1984 and 1988.

James, Jesse

This legendary outlaw of the old west and his brother, Frank, committed many bank and train robberies.

Keller, Helen

This lady was blind and deaf at an early age, but overcame her handicap and was eventually able to communicate by reading, writing, and using sign language. William Gibson dramatized the early years of her life in his famous play, *The Miracle Worker*.

Kennedy, Robert

Robert Kennedy was the younger brother of John Fitzgerald Kennedy and held the office of Attorney General during his Presidency. He was assassinated because of his views concerning the Arab-Israeli conflict.

King, Martin Luther

He was the dominant leader of the Civil Rights Movement during the 50's and 60's and utilized Ghandi's principle of non-violent resistance to stage his boycotts, marches, and protests. He received the Nobel Prize for Peace in 1964. He authored the famous "I Have a Dream" speech, and was assassinated in 1968.

Kissinger, Henry

This man served as a prominent advisor, and later as the Secretary of State under Nixon. He received the Nobel Prize for peace in 1973 for his negotiations with the North Vietnamese during the Vietnam War.

Lindbergh, Charles A.

This aviator made the first nonstop flight across the Atlantic Ocean, which was also the first solo flight across that ocean.

MacArthur, Douglas

This general commanded the Allied forces in the Pacific during World War II. He also commanded UN troops during the Korean War, but was removed from his position by President Truman.

Malcom X

This Black Muslim leader of the African American Rights Movement was assassinated in 1965.

Marshall, George C.

This man was a leading strategist for the Allies during World War II. He later served as Secretary of State and was awarded the Nobel Peace Prize.

McCarthy, Joseph R.

This Wisconsin Senator led a controversial campaign to weed out and punish Americans that might be communists. He accused people of being communists if they had communistic friends or were otherwise "guilty by association."

McGovern, George

This presidential candidate lost to Nixon in 1972. He was known for his political opposition to the U.S. involvement in Vietnam.

Mondale, Walter

This twentieth-century politician served as a Senator and later as Vice-President under Carter.

Nation, Carry

This female social reformer advocated abstinence and supported prohibition. She was known for her unorthodox method of protest. She broke down saloon doors with her hatchet, entered the saloons, and destroyed the liquor bottles.

Oswald, Lee Harvey

This man allegedly assassinated John F. Kennedy, and was then shot by Jack Ruby before he could be tried for Kennedy's assassination.

Parks, Rosa

This black woman refused to give up her seat on a bus in Montgomery, Alabama in 1965. The incident became the first major event of the Civil Rights Movement.

Patton, George

This World War II general led the Battle of the Bulge and was nicknamed "Old Blood and Guts."

Peary, Robert E.

Robert Peary was the first person to reach the North Pole in 1909.

Rockefeller, Nelson

The grandson of John D. Rockefeller, this New York governor later served as vice-president under Gerald Ford.

Roosevelt, Eleanor

Eleanor Roosevelt was the wife of Franklin D. Roosevelt and our country's first lady during his administration. She was highly respected as a humanitarian, and was active in the General Assembly of the United Nations from 1949 to 1952.

Seward, William H.

This Secretary of State became famous for his decision to purchase Alaska from Russia for $7.2 million dollars in 1867. In fact, Alaska became known as Seward's Folly!

Stevenson, Adlai

This Illinois governor and U.S. ambassador to the United Nations ran for the presidency twice, but lost both times to Dwight D. Eisenhower.

Wallace, George.

This Alabama governor during the 1960's opposed integration, and insisted on barring black students from attending the University of Alabama. He ran twice for the presidency on the Populist ticket, but was defeated both times. During his second campaign for the office, he was shot and paralyzed by a would-be assassin.

Warren, Earl

This governor of California served on the Supreme Court from 1953 to 1969. He also led the government commission that investigated the John F. Kennedy assassination.

Washington, Booker T.

This man founded Tuskegee Institute, a college for African Americans in Alabama. He also wrote the book *Up From Slavery* that encouraged his people to concentrate on the more tangible goal of economic equality, rather than social and political equality.

Scientists and Philosophers

Carnegie, Dale

This author of the popular book, How to Win Friends and Influence People sold millions of copies. The book is a practical guide for achieving success.

James, William

This American philosopher proposed that human behavior is grounded in instinct.

Mead, Margaret

This anthropologist is best known for her courageous field research, as well as for authoring the 1928 book, Coming of Age in Samoa.

Skinner, B.F.

This psychologist is famous for his Skinner box experiment, which increased our understanding of the learning process as well as the impact of conditioning on behavior.

Sports Figures

Aaron, Henry (Hank)

Hank Aaron beat Babe Ruth's home run record by hitting 755 home runs during his major league career.

Ali, Muhammad

Born as Cassius Clay, this boxer was the world champion heavyweight boxer from 1964 and 1979. However, his title was revoked because he was a conscientious objector to the draft, but he regained it later. His boxing style became associated with the simile, "float like a butterfly and sting like a bee."

Louis, Joe

This twentieth-century boxer was nicknamed the "Brown Bomber," and he held the world championship title as a heavyweight from 1937 to 1949.

Owens, Jesse

This black track and field athlete won four gold medals at the 1936 Olympics which were held in Germany during Hitler's reign. His victories served as an embarrassment to the Nazis, who considered themselves the "master race."

Robinson, Jackie

This talented athlete was the first African American to play major league baseball.

Ruth, Babe

This major league baseball player hit 60 home runs in 1927, setting a longstanding record that was first beaten by Roger Maris. Born as George Herman Ruth, baseball fans soon nicknamed him "The Babe."

Thorpe, Jim

This Native American athlete performed well in many track and field events in the 1912 Olympics.

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STUDY GUIDE

STUDY GUIDES: WOMEN IN AMERICAN HISTORY

JANE ADDAMS

She founded Hull House in Chicago in 1889. It provided social services for poor women and immigrants, and offered education, day care for children, and recreational facilities.

From 1915 to 1929, she served as president for the Women's International League for Peace and Freedom. In 1931, she was awarded the Nobel Prize for her efforts to promote peace.

LOUISA MAY ALCOTT

She was one of the most widely read authors of the late 1800's. Her main works were Little Women and Little Men.

SUSAN B. ANTHONY

She was a powerful organizer and leader of the women's suffrage movement. Along with Elizabeth Cady Stanton, she organized the National Women's Suffrage Association which fought for the right of women to vote.

She also worked to secure equal pay for women teachers and for the right of women to hold property.

Her picture was placed on a $1 coin minted by the U.S. Government, and she was the first woman to be pictured on a coin that was put into general circulation.

She died in 1906, just 14 years before the 19th Amendment gave women the right to vote.

SARAH BAGLEY

She organized the textile workers of Lowell, Massachusetts into the Federal Labor Reform Association,

which was the first American women's group to work for improved labor conditions.

CLARA BARTON

She helped nurse the sick and wounded during the Civil War, and also organized supplies and nursing services for the North.

She organized the American Red Cross in 1881 to aid victims of disaster.

MARY McLEOD BETHUNE

She was the child of a former slave. She opened a school for women in Daytona Beach, Florida in 1903. The school joined with a school for men in 1923, and became Bethune-Cookman College.

She set up the National Council of Negro Women and was appointed as an advisor to President Franklin D. Roosevelt.

ELIZABETH BLACKWELL

She set up a training program for nurses during the Civil War, and became the first woman doctor in America.

ANNE BRADSTREET

She was a Puritan who lived in the Massachusetts Bay Colony, and was the first American poet to publish a book of poetry in America. Her book was titled "The Tenth Muse Lately Sprung Up in America," and was published in 1650.

JANE BYRNE

She was the first woman mayor of Chicago from 1979-1983.

RACHEL CARSON

RACHEL CARSON –

This woman scientist warned Americans about over-using pesticides. Her book, entitled Silent Spring (1962) inspired a law against DDT and other harmful poisons.

MARY CASSATT

She was an American painter of the late 1800's, who explored the theme of Mothers and their children.

WILLA CATHER

She was an author of the 1920's who wrote about the courage of Americans in the Midwest.

SHIRLEY CHISHOLM

She became the first black woman elected to the U.S. House of Representatives in 1968, and she was reelected 6 times.

She wrote two books: Unbought and Unbossed in 1970, and The Good Fight in 1973.

MARGARET CORBIN

During the Revolutionary war, she took over her husband's cannon when he was killed in battle in 1776 in New York.

VIRGINIA DARE

She was the first English child born in American in Roanoke Colony.

EMILY DICKINSON

This New England woman wrote hundreds of short, witty poems that were mostly unknown until after her death.

DORTHEA DIX

DORTHEA DIX -

She persuaded President Lincoln to use nurses during the Civil War, and became the director of nursing for the Union.

In the the early 1800's, Dorthea Dix helped improve the conditions in both mental hospitals, and in prisons, where she stressed the rehabilitation of prisoners.

ELIZABETH DOLE

She was appointed Secretary of Transportation by President Ronald Reagan in January of 1983.

AMELIA EARHART

This American aviator was the first woman to cross the Atlantic Ocean by air. She wrote 20 Hours. 40 Minutes in 1928, which described this transatlantic flight. Later, in 1931, she also wrote The Fun of It.

In 1932, she became the first woman to fly over the Atlantic alone, and in 1935, she was the first woman to fly the Pacific Ocean from Hawaii to California.

In 1937, she attempted to fly around the world. During this flight, her plane disappeared and was never discovered.

GERTRUDE EDERLE

She was the first woman to swim the English channel in August of 1926.

GERALDINE FERRARO

This Congresswoman from New York ran as Walter Mondale's running mate in the 1984 presidential campaign. She was the first woman ever nominated for the Vice-Presidency by any major political party.

BETTY FRIEDAN

She led the National Organization for Women (NOW), and worked to pass more laws during the 1960's to gain equal rights for women. Her book, The Feminine Mystique, accused

society of forcing women to be housewives instead of career ladies.

ELLA GRASSO

She was elected Governor of Connecticut in 1974.

PATRICIA HARRIS

She was appointed ambassador to Luxembourg in 1965 by President Lyndon B. Johnson, and became the first black woman to receive such an appointment.

In 1976, she was appointed by President Jimmy Carter as the head of Housing and Urban Development. Later she became Secretary of Health and Human Services.

MARY LUDWIG HAYS (Better known as MOLLY PITCHER)

She carried pitchers of water to soldiers during a battle at Monmouth, New Jersey during the Revolutionary War, and took over her husband's cannon when he collapsed due to heatstroke.

JANE EDNA HUNTER

She was a black nurse from South Carolina who established the Working Girls Home Asssociation in Cleveland, Ohio to help black women obtain jobs in the city.

ANNE HUTCHINSON

She was forced to leave the Massachusetts Bay Colony in 1637 because she expressed her idea that personal religious experience was more important that formal religion and church attendance.

She fled to Rhode Island where she founded the settlement of Portsmouth, which gave complete religious freedom to its settlers.

HELEN HUNT JACKSON

HELEN HUNT JACKSON -

She was one of the first citizens to speak out against the government's poor treatment of Indians. In 1881 she wrote a documented history of such treatment in a book called A Century of Dishonor.

Her novel, Ramona, published in 1884, also protested poor treatment of the Indians.

EMMA LAZARUS

She wrote the poem called "The New Colossus," which is inscribed on the pedestal of the Statue of Liberty.

CHRISTA McAULIFFE

She was the social studies teacher who died upon the Challenger shuttle when it exploded one minute after liftoff from Cape Canaveral.

LUCRETIA MOTT

She, with the help of Elizabeth Cady Stanton, launched a vigorous campaign for women's rights and suffrage. They organized the first national women's rights convention at Seneca Falls, New York. Here they adopted a plan of action called the Seneca Falls Declaration, which stated that all men and women were created equal and should be treated accordingly.

CARRIE NATION

She became well-known for her violent attempts to stop the sale of alcoholic liquors, and was arrested many times for disturbing the peace when she smashed saloons with her hatchet during the 1880's and 1890's.

ANNIE OAKLEY

She was a famous sharpshooter who appeared in Buffalo Bill's Wild West Show, where she shot a dime from her husband's hand. Other times she shot a cigarette from his mouth.

The popular musical comedy "Annie Get Your Gun," which features songs by Irving Berlin, is based upon Annie Oakley's life.

SANDA DAY O'CONNOR

In 1981, President Ronald Reagan appointed her as a judge of the Supreme Court. She was the first woman justice to serve on the bench of the Supreme Court.

GEORGIA O'KEEFFE

This early American painter specialized in painting Southwestern desert scenes.

ROSA PARKS

In December, 1955, this black woman refused to give up her seat on a Montgomery, Alabama bus to a white man. She was arrested, and this event led to a boycotting by blacks of the buses in Montgomery until equal treatment was given to both blacks and whites. The boycott lasted one year.

POCAHONTAS

She was the Powhatan princess who married John Rolfe from the Jamestown colony. She supposedly saved the life of Captain John Smith when he was held captive by the Indians.

JEANETTE RANKIN

She was the first woman to be elected to the U.S. Congress in 1917 and again in 1919, from the state of Montana.

MARY LOU RETTON

In the Summer Olympics of 1984, she scored a perfect 10 on the vault.

SALLY RIDE

She was the first woman astronaut in space. (June 1993, on the Challenger).

BETSY ROSS

She was the seamstress who made the first American flag having the stars and stripes.

NELLIE TAYLOR ROSS

She was the first woman to be elected as a state governor, when she was elected to succeed her husband as governor of Wyoming after his death in 1924.

SACAJAWEA

This Shoshoni Indian guided Lewis and Clark on their exploration of the Louisiana Purchase.

DEBORAH SAMPSON

During the Revolutionary War, she disguised herself as a man and joined the Continental Army. She was wounded outside of Philadelphia.

BESSIE SMITH

This Blue's Singer of the 1920's recorded "Down Hearted Blues," which sold over 800,000 copies in 1923. She became known as the Empress of the Blues.

ELIZABETH CADY STANTON

She worked with Lucretia Mott to fight for women's rights and suffrage. They organized the first women's rights convention in Seneca Falls, New York in 1848.

ELLEN STARR

ELLEN STARR -

She helped Jane Addams found Hull House in Chicago.

HARRIET BEECHER STOWE

This author wrote Uncle Tom's Cabin, which dramatized the story of slave life. It sold over 300,000 copies during its first year in print, causing many people to join the fight to end slavery.

GERTRUDE STEIN

She wrote very critical material about the American Society in the 1920's. She finally left America and went to Paris, France to live.

MARGARET THATCHER

Although she was not an American, Margaret Thatcher was the first woman to become the Prime Minister of England in 1979. She strongly supported the NATO plan and said that Great Britain would use force against Argentina during the Falkland Crisis.

SOJOURNER TRUTH

She was the first black woman to speak publicly against slavery. She, herself, was born a slave, but gained her freedom when New York abolished slavery. She then travelled all over the North, telling the truth about slavery.

SALLY LOUISA TOMPKINS

During the Civil War, she used her own money to open a hospital in Richmond, Virginia. Jefferson Davis made her a captain in the Confederate Army.

HARRIET TUBMAN

She was a runaway slave who returned to the South many times, and helped over 300 slaves escape by the Underground Railroad. She was one of the most famous conductors of the Underground Railroad, which earned her the nickname "Moses."

A U.S. postage stamp bearing her portrait was issued in 1978.

MARIE AND BESS VAN VORST

These sisters were writers of the 1900's who focused on the problems of women workers. They disguised themselves as common workers in order to gather information for their book, The Woman who Toils.

LILLIAN WALD

She started the Henry House Settlement in New York, which provides free nursing care for the needy.

VANESSA WILLIAMS

She was the first black Miss America.

SARAH WINNEMUCCA

Along with Helen Jackson, she spoke out against the government's treatment of Indians. She criticized the U.S. government's handling of Indian affairs in her book called Life Among the Paiutes: Their Claims and Wrongs.

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STUDY GUIDE:
FAMOUS 20th CENTURY FIGURES

Albright, Madeleine. This 64th Secretary of State was the highest ranking woman in the Clinton Administration, as well as the first female to hold that office. She held her position from January, 1997 until January of 2001. She is known for her role in the war against ethnic cleansing in Kosovo.

Anderson, Marian. She became the first African American to sing at the Metropolitan Opera in New York City in 1955, and was given the Presidential Medal of Freedom by Lyndon B. Johnson in 1963.

Arafat, Yasir. As the chairman of the PLO (Palestine Liberation Organization), he called for a Palestinian state to be established on the West Bank. Arafat died on November 11, 2004.

Armstrong, Neil. This astronaut commanded the Apollo 11 excursion and became the first person to walk on the moon, with Buzz Aldrin following right behind him. He is noted for saying, "That's one small step for man, one giant leap for mankind."

Castro, Fidel. This Cuban dictator used guerilla warfare to overthrow the previous dictator, Batista, in the 1959 Revolution. Since he was a Marxist, the new regime was openly Communistic.

Chaplin, Charlie. This comic genius starred in many Hollywood silent films and created his most famous vaudeville-style character, "The Tramp."

Chavez, Cesar. This president of the National Farm Workers Association fought to improve conditions for farm workers, especially Mexican-Americans. He fasted for 36 days to draw attention to the link between pesticides in grapes and cancer in children of farm workers.

Churchill, Winston. This statesman became Prime Minister of Britain during Hitler's rise to power and served through the end of the war. He was determined to fight the Nazi takeover and lead his people and the world in a rally against Nazi tyranny. He coined the phrase "The Iron Curtain." He was also an author and is best remembered for his two books, A History of the English-Speaking People and The Second World War. He later returned to the post of Prime Minister for a few years during the 1950's and is known for his famous quote, "I have nothing to offer but blood, toil, tears, and sweat."

Clinton, Hillary Rodham. She was born in Chicago, Illinois on October 26, 1946, and graduated from Yale Law School. She married Bill Clinton in 1975 and had one daughter, Chelsea in 1980. During her husbands Presidency she headed a Task Force on National Health Care Reform as well as spoke out for women's rights at home and abroad. Clinton was elected to the United States Senate on November 7, 2000.

Cousteau, Jacques. This famous French diver helped to develop the Aqua Lung which made exploration possible in the realm of the sea. He made a documentary entitled *The Silent World*, which won an Academy Award for the best documentary in 1056. He also founded the Cousteau Society, an agency to protect sea life.

Curie, Marie. This groundbreaking female scientist won the Nobel Prize in both physics and chemistry and discovered both radium and plutonium with the help of her husband, Pierre.

Disney, Walt. This legendary artist was first known for his creation of Mickey Mouse, an animated cartoon character who paved the way for animation as a full-scale category of entertainment. He opened his cartoon studio in Hollywood in 1923 and the Disneyland Theme Park in 1955. His first full-length animated film was *Snow White and the Seven Dwarfs*. He also designed Disney World in Florida and the Epcot Center, which was completed just two years before his death in 1966.

Edison, Thomas. Known as the "Wizard of Menlo Park," this American inventor is best-known for inventing the light bulb and the phonograph. However, he patented more than a thousand devices, and is known for the quote "Genius is about 2% inspiration and 98% perspiration."

Einstein, Albert. This scientist developed the Theory of Relativity as well as premises which led to the development of the atomic bomb. Then he educated the public on the bomb's destructive potential. He was selected as Time Magazine's Man of the Century.

Ferraro, Geraldine. She became the first woman nominated for the Vice-Presidency by a major political party in 1984, when she ran as Walter Mondale's running mate.

Ford, Henry. He invented the Model T car in 1908, and established the first assembly line at his Detroit plant. He died in 1947, leaving a fortune that was valued at more than $500 million.

Freud, Sigmund. This prominent psychologist first proposed the theory of the Oedipus Complex as well as that of the id, ego and super-ego. His theories served as the foundation for modern psychiatry.

Gates, Bill. This 1975 Harvard drop-out co-founded Microsoft. He licensed MS-DOS to IBM for its first personal computer in 1980, and released the popular Windows 3.0 in 1995. He is currently the chairman and chief software architect for Microsoft. Gates wrote two best selling books: The Road Ahead and Business at the Speed of Thought. 2005 marks the 12th year in a row that Gates heads the Forbes Magazine list of richest Americans.

Ghandi, Idira. The daughter of Nehru, she became the first female Prime Minister of India in 1966, and was eventually assassinated by her own bodyguards.

Ghandi, Mohandas. This Indian activist protested English dominion over India through the means of nonviolent civil disobedience. Martin Luther King, Jr. studied his theories in college and later implemented them in his battle for Civil Rights within the U.S.

Gibson, Althea. This black tennis player was the first to compete in the U.S. Lawn Tennis Association National Championships in New York. She won both the Wimbledon and U.S. National Singles Championships, published an autobiography, and was appointed to the National Lawn Tennis Hall of Fame. Gibson died in 2003.

Goddard, Robert H. This American physicist designed and launched the first liquid fuel rocket in 1926. Because the American space program was based upon his work, Goddard has been nicknamed "The Father of Modern Rocketry."

Gorbachev, Mikhail. This Russian leader modernized the USSR when he became head of the Communist party in 1985. He instituted his concepts of glastnost and perestroika. In 1990, he won the Nobel Peace Prize. He resigned in 1991 when the USSR was dismantled.

Hitler, Adolf. This man rose to power as a Nazi dictator of Germany in 1933. This skilled orator used propaganda and force to spread Anti-Semitism, and ordered the widespread persecution of the Jews in concentration camps. He began to conquer European countries and enact this program designed to create the "master race." He invaded Poland in 1939. This act led to the Second World War. Before the war was over, over six million Jews and other minorities were slaughtered under his regime. He committed suicide in 1945 when it became apparent that Germany was going to be defeated.

Jackson, Jesse. This African American clergyman and civil rights leader ran for the U.S. Presidency in both the 1984 and 1988 primaries. The Founder and President of the Rainbow/PUSH Coalition Inc. On August 9, 2000, President Bill Clinton awarded Jackson with the Presidential Medal of Freedom, the nation's highest civilian honor, for his work in human and civil rights and for nonviolent social change.

Jinnah, Mohammed Ali. He was the head of the Muslim League in India, and worked to found Pakistan. He then became the first-governor-general of Pakistan.

Jung, Carl. This Swiss psychologist is most noted for his Theory of the Collective Unconscious, as well as the presence of recurring archetypes in personality. He was the first psychologist to classify humans as introverts or extroverts.

Johnson, Earvin "Magic." This basketball player was the MVP of the NBA in 1987, 1989, and 1990. One year later, he publicly announced that he had contracted the HIV virus. He proceeded to win the Gold Medal at the Barcelona Olympics the next year and played the 1996 season with his team, the LA Lakers.

Kenyata, Jomo. This Kenyan politician led the nationalist movement and became its first president, from 1964-1978.

King, Martin Luther, Jr. He founded the Southern Christian Leadership Conference which advocated nonviolent ways to deal with racism. In 1963, he delivered his "I Have a Dream" speech in Washington, D.C. One year later he won the Nobel Peace Prize for his attempts to end racism in America. He was assassinated in 1968.

Lindbergh, Charles. He completed the first non-stop flight across the Atlantic Ocean in 1927 in his monoplane, *The Sprit of St. Louis.* The flight from Long Island to Paris took 33 hours, 29 minutes. Tragedy struck his family in 1932 when his son, Charles, was kidnapped and found dead.

Mandela, Nelson. He served as head of the African National Congress, which fought against the government to end apartheid. As a result of his involvement, he served a 28 year prison sentence, and ultimately became President of South Africa in 1994.

Marshall, Thurgood. Before he was appointed to the Supreme Court, this NAACP lawyer won a landmark ruling against segregation in schools in the case of *Brown v. Board of Education*, which determined that "separate but equal" schooling was a violation of the Constitutional rights of African Americans.

Marx, Karl. This man founded the theory of Marxism, closely associated with communism. He authored many treaties warning of the class struggle and exploitation.

Meir, Golda. This lady was born into poverty and discrimination in Russia. She lived much of her life in the United States. She later became the Prime Minister of Israel in 1969 and led Israel in the war against Egypt.

Minh, Ho Chi. This leader of the Communist party in Vietnam organized the movement for Vietnamese Independence, the Viet Minh. He declared Vietnam a republic, and became its president. Subsequently, the republic was involved in the Indochina War that resulted in the division between North and South Vietnam. He was president of North Vietnam and organized the guerilla armies in South Vietnam during the Vietnamese War.

Morrison, Toni. This writer was the first African-American woman to win the Nobel Prize for Literature. Her books The Bluest Eye and Beloved are internationally known for the poignant portrayal of the painful legacy of prejudice.

Mother Teresa. This Catholic nun is famous for her humanitarian efforts among the poor of Calcutta. She won the Nobel Peace Prize in 1979. In 1985, Mother Teresa established the first hospice for AIDS victims in New York. Mother Teresa was awarded the Medal of Freedom, the highest U.S. civilian award. Mother Teresa died in 1997.

Nehru, Jawaharial. He was a leader in India's struggle for independence from Britain. He became India's first prime minister in 1947, and was also three-time president of the Indian National Congress.

O'Connor, Sandra Day. This American was the first female to be appointed as a Supreme Court Justice in 1981. On July 1, 2005 Associate Justice O'Connor announced her retirement from the Supreme Court after 24 years of service.

Oppenheimer, J. Robert. This scientist's research led to the development of the atomic bomb. He was accused of communist involvement, thought, and was no .longer allowed to do his scientific research for the government.

Perkins, Frances. This woman served as the first female Cabinet member, under Franklin Roosevelt's presidency, where she served as the U.S. Secretary of Labor from 1933 to 1945.

Picasso, Pablo. This distinguished artist is notorious for breaking the confines of traditional art. He is best known for his concepts of abstraction and distortion, and is considered one of the founders of Cubism.

Princess Diana of Wales. This princess was known for her compassion and her grace, and was continually in the public eye. Born as Diana Spencer, she married Charles, the future king of England in 1981, and bore him two sons, William and Harry. She became known as "The People's Princess," and her death in a 1997 car crash is still regarded as a worldwide tragedy.

Queen Elizabeth II . This monarch was appointed queen of England in 1952 and still reigns.

Robinson, Jackie. This talented athlete became the first African American to play on a major league baseball team. He signed with the Brooklyn Dodgers' farm team in Montreal in 1945 and played hi first professional game for the Dodgers in 1947. Two years later he won the National League's Most Valuable Player award.

Sadat, Anwar. This Egyptian President attended the Camp David Peace Accords in 1978, where President Carter negotiated for peace in the Middle East. Sadat won the Nobel Peace Prize for his efforts to create peace between Egypt and Israel. Sadat was assassinated in 1981.

Salk, Jonas. This scientist invented a vaccine for polio.

Stalin, Joseph. He helped to convert communism in the USSR from an egalitarian, revolutionary movement into an authoritarian, bureaucratic governmental system. This Soviet dictator prevented Hitler from conquering Russia during World War II.

Taylor, Anna Edson. In 1901, she was the first person to go over Niagara Falls in a wooden barrel.

Teller, Edward. This American scientist helped create nuclear weapons for defense purposes. He was nicknamed "The Father of the H-Bomb."

Thatcher, Margaret. She became Prime Minister of England in 1979, and was not only the first woman to head the British government, but also the first female leader of a major western country.

Tutu, Archbishop Desmond. This Anglican Bishop of South Africa won the Nobel Peace Prize in 1984 for his efforts to end Apartheid. In 1978 he became the first black General Secretary of the South African Council of Churches. Tutu is an honorary doctor of a number of leading universities in the USA, Britain and Germany.

Wright, Orville. This man and his brother, Wilbur, made the first successful human flight in the primitive handmade airplane. They performed their first flight at Kitty Hawk, North Carolina in 1903.

Zedong, Mao. He was the chairman of the Communist Party of China from 1943 and the chairman of the Central Committee of the Communist Party of China from 1945 until his death in 1976. Mao has been credited for converting the country to full-scale Communism.

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STUDY GUIDE:
THE REVOLUTIONARY WAR

Events Leading Up to the Revolution

Post Office Act – 1710: The English Parliament set up a mail system in the colonies controlled by the London Postmaster General and his New York deputy.
Molasses Act 1733: The English Parliament began taxing molasses, rum, and sugar that the colonists imported from any place that was not under English rule.
French and Indian War 1754-1763: This war arose as a territory dispute over portions of the Ohio River Valley. Washington led the Americans against the French. The English, under General Braddock, assisted the colonists against the French and the Indians. England declared war on France and then Spain, who had threatened to join France. This Seven Years' War ended with a treaty that required France to surrender all territory east of the Mississippi, excluding New Orleans. Spain gave Florida to the English but was allowed to keep Cuba.
Sugar Act – 1764: This tax doubled the tax that was already being paid on sugar, wine, coffee, and dyes that were imported from England. The colonists were also forbidden to purchase these products and other goods from foreign countries.
Currency Act – 1764: This act stated that the colonists could not issue their own paper money and required them to pay all debts with gold or silver.
Quartering Act – March, 1765: This act mandated that colonists must provide housing and food to English troops living in America.
Stamp Act – March, 1765: This taxed all printed materials, such as bills, legal papers, newspapers, almanacs, playing cards, and brochures. Once the tax was paid, a stamp was affixed to the document. As with many of the previous acts, the colonists refused to comply and boycotted the supplies that were being taxed. An underground organization, The Sons of Liberty, was formed. These colonists harassed British stamp officials and caused confrontation in the colonies. The colonial government asked the king to repeal this act as well as the Quartering Act. Benjamin Franklin even appeared in Parliament to warn about potential revolutions that might surface if the Stamp Act was not repealed.

Repeal of Stamp Act/Declaratory Act – March, 1766: King George III repealed the Stamp Act but passed the Declaratory Act on the same day. The Declaratory Act granted the English Parliament the power to make governing laws in the colonies "in all cases whatsoever."

Townshend Acts – 1767: These acts created taxes, called duties, on all luxury items such as tea, lead, glass, paper, and paint. These duties were collected at the ports by British officials. They were called the Townshend Acts because Charles Townshend, the British finance minister, proposed them.

Samuel Adams' Circular Letter – February, 1768: Samuel Adams drafted a circular that called for resistance against the British taxes and against the taxation without representation. The action angered the English, who sent more troops, and the Sons of Liberty mobilized and instigated several minor skirmishes.

Virginia Resolves – May, 1769: The House of Burgesses in Virginia condemned the English actions and joined in the colonial opposition to taxation without representation.

Boston Massacre – March 5, 1770: A mob of colonists harassed British troops stationed in Boston, who responded by firing their muskets into the crowd, killing three, wounding two others fatally, and injuring several. Crispus Attucks, an African-American sailor and crowd leader, was one of the first to lose his life during this confrontation. British troops were withdrawn, and the British repealed the Townshend Acts except for the tax on tea.

Gaspee – June 1772: A British customs boat was intentionally attacked by multiple Rhode Island colonists who removed the soldiers from the ship, and then they set the ship on fire. The English government threatened to try the perpetrators in England if they were captured. This caused more anti-British sentiment in the colonies.

Tea Act – May 10, 1773: Another tax on tea gave the British East India Company a monopoly on the product.

Boston Tea Party – December 16, 1773: The colonists tried to send back three British ships carrying tea without paying the taxes, but the Massachusetts Royal Governor insisted they pay the taxes. The Sons of Liberty then disguised themselves as Indians and boarded the boat in the middle of the night. They proceeded to dump its entire load of tea into the Boston Harbor.

Coercive Act/Broadened Quartering Act – 1774: In response to the colonial action, these acts effectively punished Massachusetts in various ways, giving British officials almost absolute power, extending the border of Canada into the colonies and shutting down Boston Harbor to imports until they paid for both the tax and the tea that was destroyed. They also expanded the powers of the Quartering Act.

First Continental Congress – 1774: Every colony except for Georgia sent representatives to this convention in Philadelphia. The colonists declared their resistance to the British and began forming small bands of militia to defend the colonies.

"Give Me Liberty or Give Me Death": The English declared Massachusetts in a state of insurrection and ordered Governor Gage to enforce the Coercive Acts. British soldiers began seizing Boston ammunition. Patrick Henry expressed his opinion about these events in his famous speech before the Virginia convention of delegates on March 23,

1775. He believed a revolution was inevitable, and he encouraged his countrymen to join him in the fight for independence when he stated, "Give me liberty, or give me death."
New England Restraining Act – 1775: The English forbade the colonists to trade with any other country or even among themselves.
Lexington and Concord – April 19, 1775: General Gage ordered British soldiers to destroy the Americans' ammunition supply that was kept at Concord and to capture the colonists' outspoken leaders, Samuel Adams and John Hancock. James Warren sent Paul Revere and William Dawes to mobilize their Minutemen, warn the colonists, and hide Hancock and Adams. The colonists met the British at Lexington, where the first shot of the Revolutionary War was fired as a stray "shot heard round the world" came from a British gun. Immediately both sides began shooting. The British moved on to Concord and succeeded in destroying a few war supplies. However, they were surprised when American Minutemen and rebels attacked them from behind trees, bridges, and bushes. The real significance of this battle was that it convinced many undecided American citizens to support the Revolutionary War.

People of the Revolution

John Adams: This Harvard graduate and lawyer became an important mediator, statesman, and ambassador during the Revolution. As a member of the Continental Congress, he was active in campaigning for the passage of the Declaration of Independence. He ran for the presidency on the Federalist Party ticket and won the election, becoming the second president of the United States. His son, John Quincy Adams, followed in his footsteps and became the sixth president of the United States.
Samuel Adams: This cousin of John Adams did not share his moderation. He was the leader of the Sons of Liberty, who opposed many of the English Acts and taxes.
Ethan Allen: Born in the wilderness, but sent to Yale, this patriot led the Green Mountain Boys and the army at Ticonderoga. He was captured in Canada and was sent to England. The English returned Allen to America because they feared colonial retribution if he was punished. Washington later gave him the title of colonel. He devoted his post-war activities to obtaining statehood for Vermont.
Benedict Arnold: This notorious traitor was a major general who was influential at the victory at Saratoga. When he fell into debt, he allowed the British to convince him to become a traitor. When the plot was discovered, he escaped with the British Army, where he was appointed a brigadier general. He then lived the remainder of his life in Canada and England.
Major John Buttrick: This American leader told the soldiers at Concord not to fire unless fired upon.
Benjamin Franklin: This newspaper publisher and author of *Poor Richard's Almanac*, was also known for his inventions, scientific discoveries, and service in the Pennsylvania Assembly. He started the first public library in Philadelphia and invented many helpful inventions, including the Franklin stove and the lightning rod. During the Revolutionary

War, he was often sent to England on extended stays to negotiate with the British Parliament.

Nathanael Greene: He was one of Washington's greatest generals who fought at Trenton, Brandywine, Germantown, Monmouth, and Rhode Island. He even donated his fortune to the cause, which prompted Georgia to give him a Savannah plantation when he retired.

Nathan Hale: He became a martyr when he was executed without a trial for spying on British troops and is remembered for the quote, "I only regret that I have but one life to lose for my country."

Alexander Hamilton: This signer of the original Constitution became the first Secretary of the Treasury. He fought in the Continental Army at Princeton, White Plains, Trenton, and Yorktown. After the war, he pursued law, and then he was chosen as a representative at both Continental Congresses, the Annapolis Convention, and the Constitutional Convention. Hamilton served as the first Secretary of the Treasury. He angered many with his essays in *The Federalist Papers*, where he proposed a government that was basically controlled by a few rich men. This concept enraged the Secretary of State, Thomas Jefferson. The friction between the two caused the development of two political parties, the Federalists and the Democratic-Republicans. John Adams appointed Hamilton as major general when America became involved in the war between France and England. He ultimately died from a gunshot wound in a duel with Vice President Aaron Burr.

John Hancock: This Harvard graduate became a close friend of Samuel Adams. He was the first person to sign the Declaration of Independence, and he signed his name large enough that the king could see it without wearing his spectacles!

Patrick Henry: He was a well-reputed lawyer and speaker that became a prominent member of the Virginia House of Burgesses. He proposed various moves of opposition to the unfair acts passed by the British Parliament and advocated taking up arms in resistance. He is most famous for his quotation, "Give me liberty, or give me death!" He also attended the 1st and 2nd Continental Congresses. He refused to attend the 1787 Constitutional Convention because he did not want to expand the powers of the central national government. He was elected governor of Virginia and crusaded for the Bill of Rights and several other Constitutional Amendments.

Thomas Jefferson: This graduate of the College of William and Mary was initially a representative in the Virginia House of Burgesses. As a member of the Continental Congress, he drafted the Declaration of Independence. He later became the governor of Virginia, then Secretary of State under Washington, and finally vice president under John Adams. He ran against Aaron Burr for the presidency in 1800. Although both received equal electoral votes, the House of Representatives declared Jefferson president. In office, he became known for the Louisiana Purchase and the Lewis and Clark expedition.

John Paul Jones: He rose quickly from the rank of lieutenant to captain to commodore in the new Continental Navy. When a British commander ordered him to give up his ship, he supposedly replied, **"I have not yet begun to fight,"** and he actually did win that battle. He engineered one of the most successful naval engagements in U.S. history

against the British ship, *Serapis*, in 1779. Congress honored his heroic deeds by bestowing him with the only gold medal ever given to a Navy sailor.

- **Marquis de Lafayette**: This wealthy Frenchman refused payment for his services in the American Revolution. He became a major general and a close advisor and friend to George Washington. He helped Americans gain financial support and additional backing from France and helped fight in the battles at Brandywine, Monmouth, and Yorktown.

Thomas Paine: This friend of Patrick Henry, Samuel Adams, Thomas Jefferson, and John Adams became famous for his pamphlet, *Common Sense,* which encouraged the Americans to assert their independence. His quote, "These are the times that try men's souls," came from this pamphlet. He also fought in the war, and he wrote many other articles that boosted morale within the ranks. He later wrote a book entitled The Age of Reason, and served as a member of Thomas Jefferson's cabinet.

Molly Pitcher - This was the nickname for Mary Ludwig Hays, who followed her husband to the army camps and devoted herself to cooking and cleaning for him. She even went onto the battlefields to bring him pitchers of water, and she hauled pitchers to the other soldiers as well, which is how she earned her nickname. When her husband passed out at his cannon, she fired it for him. She was later given a pension for her services during the war.

Betsy Ross: This woman took over her husband's upholstery business when he died. According to legend, George Washington and other statesmen made a visit to her in 1776 and asked that she fulfill their specifications for the new American flag. Supposedly, they wanted a six-pointed star, but Betsy suggested using a five-pointed one instead. She then stitched the first "Stars and Stripes" flag that was adopted by the Continental Congress in 1777. The house from which she ran her upholstery business is now restored as a historical site.

Deborah Samson: Allegedly, this woman enlisted in the Army under the alias Robert Shirtliffe, and served for three years, even after being treated for two injuries, without discovery of her sex. When she came down with brain fever, typical in the ranks, her doctor discovered her identity. He told her commanding officer, who ordered her to deliver a letter to George Washington. Washington handed her a discharge and enough money to get home. After the war, he granted her a pension and some land in return for her services in the war.

Joseph Warren: He discovered the British plans to capture both the ammunition supply at Concord, and the patriots, Hancock and Adams. He dispatched William Dawes and Paul Revere to warn the colonists.

George Washington "The Father of our Country": Washington was the major leader during the Revolutionary War and was elected the first president of the United States.

British Leaders

John Burgoyne: He led the campaign that captured Ticonderoga, but later he surrendered his army to General Gates after two battles near Saratoga. He went back to England in embarrassment and became a playwright.

General Henry Clinton: He had served in the French and Indian War. In the Revolution he fought with Howe, Burgoyne, and Gage. He was promoted after his victories at the Battle of Bunker Hill and the Battle of Long Island, but he was later forced to retreat through New Jersey where he fought in the Battle of Monmouth.
General Cornwallis: After several major victories, this British general surrendered to George Washington at the final battle in Yorktown in 1781, thus ending the major confrontations of the Revolution.
General Howe: He led the charge up Bunker's Hill and later succeeded General Gage as commander-in-chief on the British side. He successfully drove American forces out of New York and into Pennsylvania while Cornwallis captured Philadelphia.

Events and Battles of the Revolution

Second Continental Congress – May 10, 1775: This convention met in Philadelphia. The representatives at this convention elected John Hancock its president, and they appointed George Washington commander-in-chief of the Continental Army. It began to formalize the war plans.
Battle of Bunker Hill – June 17, 1775: Gage placed America under martial law, but the Americans began to fortify Bunker Hill and Breed's Hill. British troops, under Mark Howe, subdued the Americans after three charges. The Americans had been ordered by William Prescott not to fire until they could "see the whites of their eyes," but they finally ran out of ammunition. Although they ultimately lost, they were encouraged by the fact they held out so long and inflicted so many casualties on the British.
Olive Branch – July 5, 1775: The Americans declared their loyalty to England in a petition to the king, but he refused to read it and declared the colonies officially in a state of insurrection. In response, Congress began building a Navy, established a colonial post office under Ben Franklin, and also tried to make friends with the Indians in an attempt to recruit them as allies against the British.
***Common Sense* – January 9, 1776**: Thomas Paine wrote this best-selling pamphlet that was published in Philadelphia. It criticized the monarchial intervention and urged the Americans to fight for their independence.
Declaration of Independence: The Continental Congress appointed Thomas Jefferson to draft the Declaration of Independence, which was endorsed by the colonies on July 4, 1776. The document declared that the colonies were free and independent from Great Britain and offered reasons for this separation.
Battle of Long Island – August 27-29, 1776: British General Howe, who withdrew from Boston, headed to New York instead, where he outnumbered Washington's army two to one. Washington's army scattered to Manhattan Island and Brooklyn Heights.
Battle of White Plains – October 28, 1776: General Howe succeeded in capturing this important New York fort and causing Washington's army to retreat again, this time across the Delaware River into Pennsylvania.

Battle of Trenton – December 26, 1776: Washington led his men across the river in boats where they surprised the sleeping German mercenary soldiers (Hessians) on Christmas night at Trenton. The German soldiers surrendered.
Battle of Princeton – January 3, 1777: Washington mastered another surprise attack and defeated British troops in New Jersey.
Flag – June 14, 1777: Congress decided on a prototype for the U.S. flag: thirteen red and white stripes in alternation and thirteen white stars on a background of blue.
Battle of Brandywine/Germantown – September 11, 1777: English forces, under Howe and Cornwallis, attacked at Brandywine and took Philadelphia, the temporary capitol, from which Congress was forced to escape. Washington surprised their army at dawn, but major confusion resulted, and his troops were forced to retreat.
Saratoga – October 7, 1777: Howe, Clinton, and Burgoyne were victorious at Ticonderoga. At the first battle of Saratoga, Burgoyne was successful over Gates and Arnold, but at the second battle of Saratoga, Gate's forces defended successfully against an attack by Burgoyne's tired forces. Arnold (at this point on the American side) went even further and attacked the forces once they were down. After this battle, Burgoyne retreated and asked for terms of surrender, which involved his retreat all the way to England. This battle was a significant turning point in the war.
Valley Forge: Washington's troops endured a freezing winter and starvation conditions.
France enters the War: Benjamin Franklin convinced the French to ally with the Americans. Four months later, England and France were also at war.
British Attempt at Peace: The English Parliament tried to pacify colonists by repealing the Tea Act and the Coercive Acts, but would not recognize America as independent, which was now the most prominent issue for colonists.
Battle of Monmouth – June 28, 1778: Clinton had been ordered from abroad to evacuate Philadelphia and go to New York. Washington, Lee, and Lafayette pursued his troops.
Spain joins the war: Spain offered their alliance to England in return for territory, but the British declined, so Spain entered on the French side, even though they didn't acknowledge the American cause.
Charleston: The British captured many American soldiers in Charleston as well as four American ships. This battle was the worst defeat for the colonial side during the Revolution.
Difficulty supplying the Army: Congress had difficulty providing food and supplies to its army.
Benedict Arnold: This American general became a traitor by making a deal with Clinton to lose the Battle at West Point. After his scheme was revealed, he fled to the British army, where he was made a brigadier general.
Department of Finance created: Congress tried to correct its financial problems by creating a Department of Finance.
Articles of Confederation Ratified – 1781: The Articles, which had been under debate for four years, were finally ratified. Their powers were weak, but they did create a national government.

Battle of Yorktown -October, 1781: The French and American forces allied to defeat the British under Cornwallis, who surrendered his army of 8,000 on October 19, 1781. This was the final turning point in the American victory.

Results of the Revolution

Treaty of Paris – January 14, 1784: Under the terms of the agreement, England withdrew its troops from colonial soil, recognized America's independence, and surrendered the territory between the Allegheny Mountains and the Mississippi River.
Shay's Rebellion – August 31, 1786: Many farmers had been imprisoned because they were unable to pay their debts. Before the war, they were able to sell their goods in the West Indies, but they were left with little marketing power when these markets were taken away. Daniel Shays, a former captain and now a bankrupt farmer, led a force of farmers in a charge against a Springfield arsenal. They planned to use the guns to protect their property from the state militia. Their plan was crushed by the militia, but it upset many Americans.
New York Capitol: New York was agreed upon as the temporary capitol.
Virginia Statute for Religious Freedom: Thomas Jefferson drafted this 1786 declaration which maintained that no citizen should have to endure religious discrimination. This was the predecessor of the First Amendment.
Attempts to Revise the Articles of Confederation: Congress needed power to control commerce, so a convention was called to discuss the matter, but the first attempt, the Annapolis Convention, was poorly attended. Hamilton drafted an invitation to the Constitutional Convention in 1787 where he hoped to revamp the Articles of Confederation with other statesmen.
Constitutional Convention – May 25, 1787: This Convention was attended by representatives from every state except Rhode Island. George Washington was elected as president of the Convention. Madison drafted "the Virginia Plan" which proposed a government containing three branches: executive, judiciary, and a bicameral legislative with two houses based on population. The small states were concerned over representation, and some states were concerned over giving up powers to a national government that could become just as tyrannical as the previous British rule. Roger Sherman countered this plan with his "Connecticut Compromise" which involved representation based on a state's population in one house, and equal representation in the other house. Southern states were pacified by the decision that slaves would count as 3/5 of a person for representation purposes. The ideas within the Connecticut Compromise were adapted into the Constitution.
Northwest Ordinance – July 13, 1787: Under this ordinance, the western territories north of the Ohio River were accepted as states with equal rights as the original colonies. They would also have a free public education, trial by jury, religious freedom, and no slavery.

The Federalist – 1787: Multiple essays were published supporting and denouncing the prospective Constitution by both Federalists and anti-federalists. Alexander Hamilton, James Madison, and John Jay were three of the most notable writers for the Federalist cause. The anti-Federalists were concerned that the government would be overrun by a rich elite that would forget the rights of the common person. The Federalists argued that they had built in checks and balances, and they promised to add a Bill of Rights.
The Constitution is Ratified – June 21, 1788: Delaware, Pennsylvania, New Jersey, Georgia, Connecticut, Massachusetts, Maryland, South Carolina, and New Hampshire ratified the new Constitution making the necessary majority. Virginia, New York, and North Carolina followed suit, with Rhode Island joining two years later.
New York City: New York City was temporarily designated the center of the government and became our first U.S. capitol.
George Washington 1st President – April 6, 1789: George Washington was elected as our first president and John Adams became his vice president.
Bill of Rights – September 25, 1789: This stipulation was passed in 1791. These rights became the first 10 amendments to the Constitution.
The Potomac Capitol: The House of Representatives voted to set aside land on the Potomac River for the site of the new national capitol.

Weapons and Military War Terms

Artillery

Bayonet: These small swords were attached to rifles.
Cannons: Cannons were used in open field battles and were used to defend ships and forts. They weighed almost a ton and fired solid iron projectiles.
Grenadiers: At first this term referred to the soldiers who threw grenades, but later it came to mean the elite troops who performed the most hazardous assignments.
Light Infantry: These soldiers carried less equipment so they could move faster.
Militia: These soldiers were the lowest in training and fought with muskets.
Minutemen: These soldiers were well-trained, rural reserves that got their nickname because they had to be ready to fight on a minute's notice.
Musket: This type of "muzzle-loaded" gun became obsolete because it was laborious to load and only accurate at close ranges. Bullets, called rounds, were stuffed into the gun after gunpowder and a rag were inserted. Reloading was time-consuming, and rifles eventually replaced the muskets.
Pistols: These were small, short-range weapons that could be easily carried in an officer's belt (holster).

Other Revolutionary War Terms

Blockade: To close off a city or port, so that no ships can enter or leave.
Boycott: To refuse to purchase goods or services from somebody as a means of protest.
Duty: A tax or tariff placed upon imported goods.
Federalist Party: A political party formed in 1792 that emphasized a strong federal government.
Founding Fathers: This title referred to all males who fought for their freedom during the Revolutionary War. It specifically targeted those who drafted the Declaration of Independence and the Constitution.
Intolerable Acts: The four laws that were passed by the British government after the Boston Tea Party as a form of punishment.
Loyalists: American colonists who did not want to break away from Britain.
Mercenary: A soldier that was paid to fight in a foreign army.
Patriots: Colonists who engaged in activities that were designed to gain freedom for the colonies.
Tories: Another name for the loyalists who wanted to remain loyal subjects of Great Britain.
Treaty: A written agreement.
Writ of Assistance: A legal paper that gave British officers the right to search a colonial building or property.

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STUDY GUIDE:
PRESIDENTIAL FACTS I

George Washington: First President **Two terms: 1798-1797**

Born: February 22, 1732 in Wakefield, VA
Death: December 14, 1799 at age 67.
Wife: Martha Custis
Occupation: Planter
Plantation Name: Mount Vernon
Military Career: Fought in the French and Indian War. Commander-in-Chief of the Continental Army during the Revolutionary War.

Most Famous Revolutionary War Events:
1. Washington and his troops crossed the Delaware River on Christmas Day, 1776, to surprise a group of 1,400 Hessian soldiers.
2. The winter at Valley Forge 1777-1778.
3. Washington forced General Cornwallis to surrender at Yorktown in 1781 to end the fighting.

His Presidency:
Elected **unanimously**, with John Adams as Vice President.
Age at Inauguration: 57
Inaugurated in Federal Hall (1789) in New York City, where the nation's first capitol was located.

Important Actions and Events During his Term:
1. Congress passed the Bill of Rights.
2. The Federal Court System was established.
3. The President's Cabinet was established. He chose Thomas Jefferson as the first Secretary of State, and Alexander Hamilton as the First Secretary of the Treasury.
4. The cornerstone for the new capitol in Washington D.C. was laid.
5. First U.S. census was authorized.

6. The following Governmental Departments were established: Department of Foreign Affairs, Department of War, Treasury Department, Post Office, Office of the Attorney General.

HE SERVED TWO TERMS AND RETIRED TO MOUNT VERNON IN 1789.

John Adams: Second President **One term from 1797-1801**

Born: October 30, 1735 in Braintree, Massachusetts
Death: July 4, 1826 at age 91
Wife: Abigail Adams
Occupation: Lawyer with a degree from Harvard
Home: Quincy, Massachusetts
Political Party: Federalist

Important Actions and Events during his Term:
1. Navy Department and Marine Corps were created.
2. Amendment 11, limiting the powers of the federal courts, was passed.
3. Congress established the Library of Congress.
4. The capitol became Washington D.C., and he was the first president to live in the White House.

Thomas Jefferson: Third President **Two Terms from 1801-1809**

Born: April 13, 1743 in Shadwell, VA
Death: July 4, 1826 at age 83
Wife: Martha Jefferson
Occupation: Planter and Lawyer
Plantation Name: Monticello
Political Party: Democratic-Republican

Pre-Presidential Experience:
1. Delegate to the Continental Congress.
2. Writer of the Declaration of Independence
3. Governor of Virginia.
4. Secretary of State under George Washington.
5. Vice-President under John Adams.

Important Actions and Events during his Terms:
1. Louisiana Purchase from France for $15 million.
2. Lewis and Clark sent to explore this purchase.
3. U.S. Military Academy was established.

4. Illinois Territory was established.
5. Amendment 12 passed, which provided that the President and the Vice-President be elected separately.
6. Robert Fulton's steamboat, the **Clermont**, made its first trip up the Hudson River.

THERE WAS NO FIRST LADY IN THE WHITE HOUSE DURING HIS TERMS. His wife had died before his presidency during childbirth.

James Madison: Fourth President **Two Terms from 1809-1817**

Born: March 16, 1751 in Port Conway, VA
Death: June 28, 1836 at age 85
Wife: Dolly Madison, a very popular first lady
Occupation: Lawyer with a degree from Princeton
Plantation Name: Montpelier
Political Party: Democratic-Republican

Pre-Presidential Experience:
1. He created the Constitution and urged its adoption.
2. Delegate to the Continental Congress.
3. Secretary of State under Jefferson.

Important Actions and Events during his Terms:
1. War of 1812 against Great Britain.
2. Burning of the White House during the war.
3. The Cumberland Road was started.
4. Francis Scott Key Wrote the "Star-spangled Banner."
5. The first saving banks were established at Philadelphia and Boston.

Dolly Madison was a popular hostess and First Lady. She hosted many parties and introduced his guests to **ice cream**, a new desert.
After his second term, James Madison retired to his home in Montpelier, where he helped Jefferson found the University of Virginia, and was also active in the composition of a new Constitution for the state of Virginia.

James Monroe: Fifth President **Two Terms from 1817-1825**

Born: April 28, 1758 in Westmoreland, VA
Death: July 4, 1831 at age 73.
Wife: Elizabeth Monroe
Occupation: Lawyer
Political Party: Democratic-Republican

Pre-Presidential Experiences:
1. Lieutenant during the Revolutionary War.
2. Fought with Washington at Valley Forge.
3. Delegate to the Continental Congress.
4. U.S. Senator from Virginia
5. Negotiated the Louisiana Purchase.
6. Governor of Virginia.
7. Secretary of State under Madison.

HE WAS ELECTED TO THE PRESIDENCY ALMOST UNANIMOUSLY, with an electoral vote of 231 to 1. (George Washington was the only president to be elected unanimously.)

Important Actions and Events during his Terms:
1. Spain ceded Florida to the United States.
2. First American Steamship, the SAVANNAH, crossed the Atlantic.
3. MONROE DOCTRINE: He declared that the United States would allow no foreign interference or colonization in the New World. He is best remembered for this doctrine.

John Quincy Adams: Sixth President **One Term from 1825-1829**

Born: July 11, 1767 in Braintree, MA
Death: February 23, 1848 at age 80.
Wife: Louisa Adams
Occupation: Lawyer with a degree from Harvard
Political Party: Democratic Republican

HE WAS THE SON OF THE 2ND PRESIDENT, JOHN ADAMS.

Pre-Presidential Experiences:
1. Secretary of State under Monroe.
2. Senator from Massachusetts.

HIS ELECTION WAS DIFFERENT THAN MOST. Four candidates ran for the election, none of which received a majority of the electoral votes. Adams was selected as President by the House of Representatives, but in actuality, Andrew Jackson received more electoral and popular votes.

Important Actions and Events during His Term:
1. The Smithsonian Institution was established.
2. The Erie Canal was completed.
3. The Baltimore and Ohio Railroad began to lay tracks.

Andrew Jackson: Seventh President **Two Terms from 1829-1837**

Born: March 15, 1767, in Waxhaw District, SC in a log cabin.
Death: June 8, 1845 at age 78.
Wife: Rachel Jackson
Occupation: Planter and Lawyer
Plantation Name: The Hermitage (in Tennessee)
Political Party: Democratic

Military Career during the War of 1812:
1. Commanded the Defense of New Orleans against the British.
2. Led the troops against the Seminole Indians in Florida, which was then owned by Spain.
3. Became nicknamed "OLD HICKORY."

Pre-Presidential Experiences:
1. Senator of South Carolina.
2. Governor of South Carolina

Important Actions and Events during His Terms:
1. Black Hawk War was waged in Illinois against the Sauk and Fox Indians.
2. The first American Made locomotive, "The Tom Thumb," began operation.

Martin Van Buren: Eighth President **One Term from 1837-1841**

Born: December 5, 1782 in Kinderhook, NY
Death: July 24, 1862 at age 80
Wife: Hannah Van Buren
Occupation: Lawyer
Estate Name: Lindenwald (in New York)
Political Party: Democratic

Pre-Presidential Experiences:
1. U.S. Senator
2. Governor of New York
3. Secretary of State under Jackson in his second term.

NICKNAMED "Little Magician" because of his skill in attaining political goals.

Important Actions and Events during his Term:
1. The Depression of 1837
2. Charles Goodyear was issued a patent for the manufacture of rubber.

William Henry Harrison: Ninth President **One Term in 1841**

Born: February 9, 1773 in Berkeley, VA
Death: April 4, 1841 at age 68
Wife: Anna Harrison
Occupation: Soldier
Political Party: Whig

FIRSTS FOR HARRISON:

1. He was the oldest president to be inaugurated at the age of 68. (Ronald Reagan later became the oldest at the age of 69).
2. He was the first president to die in office, dying only 32 days after his inauguration from pneumonia.
3. He held the shortest presidential term.

THERE WERE NO IMPORTANT EVENTS OR ACTIONS DURING HIS TERM.

John Tyler: Tenth President **One Term from 1841-1845**

Born: March 29, 1790 in Charles City County, VA
Death: January 18, 1862 at age 72
Wife: Letitia Tyler, who died in 1842.
Second Wife: Julia Tyler. They were married in the White House. (Between his wives, he had 15 children.)
Occupation: Lawyer
Political Party: Whig

Pre-Presidential Experiences:

1. Senator from Virginia.
2. Vice President under William Henry Harrison. Due to Harrison's early death in office, TYLER WAS THE FIRST VICE PRESIDENT TO EARN THE OFFICE.

Important Actions and Events during His Term:

1. Samuel Morse invented the telegraph.
2. He signed a treaty with China, who opened its ports to world trade.

James Polk: Eleventh President **One Term from 1845-1849**

Born: November 2, 1795 near Pineville, NC
Death: June 15, 1849 at age 54
Wife: Sarah Polk
Occupation: Lawyer
Political Party: Democratic

HE IS BEST KNOWN FOR:
1. Settling the Oregon border by the treaty with Great Britain.
2. The War with Mexico was waged during his term. The land in Texas, California, Nevada, Arizona, Colorado, New Mexico, and Wyoming were made into territories.
3. Gold was discovered in California during his term.

Zachary Taylor: Twelfth President **One Term from 1849-1850**

Born: November 24, 1784 in Montebello, VA
Death: July 9, 1850 at age 66
Wife: Margaret Taylor
Occupation: Soldier
Political Party: Whig

HE WAS THE FIRST MILITARY LEADER TO BE ELECTED PRESIDENT WITHOUT HOLDING ANY GOVERNMENTAL POSITIONS. He fought in the War of 1812, the Black Hawk War, the Florida Seminole War, and he became a hero in the Mexican War of 1846. Because of his military successes, he was nicknamed "Old Rough and Ready."

The main accomplishment during his term was the CLAY COMPROMISE, which admitted California to the U.S. as a free state.

Taylor died of sunstroke just 16 months after taking office.

Millard Fillmore: Thirteenth President **One Term from 1850-1853**

Born: January 7, 1800 in Summerhill, NY
Death: March 8, 1874 at age 74.
Wife: Abigail Fillmore
Occupation: Lawyer
Political Party: Whig

Fillmore, Vice President under Taylor; became President upon Taylor's death.

Major Accomplishments during His Term:
1. Modernization of the White House and the start of a library in the White House.
2. Passage of the Fugitive Slave Act, which made federal officials responsible for returning runaway slaves to their owners.
3. Commodore Perry left for Japan to open that country to world trade.

Franklin Pierce: Fourteenth President **One Term from 1853-1857**

Born: November 23, 1804 in Hillsborough, NH
Death: October 8, 1869 at age 65
Wife: Jane Pierce
Occupation: Lawyer
Political Party: Democratic

BEST KNOWN FOR THE PASSAGE OF THE KANSAS-NEBRASKA ACT, which allowed new settlers in that area to vote whether or not to have slavery. The Su Canal was also opened to shipping, and the Gadsden Purchase was made, which helped acquire more territory from Mexico.

James Buchanan: Fifteenth President **One Term from 1857-1861**

Born: April 23, 1791 in Cove Gap, PA
Death: June 1, 1868 at age 77
Wife: None, no first lady during his term
Occupation: Lawyer
Political Party: Democratic

Important Actions and Events during His Term:
1. THE DRED SCOTT DECISION was made by the Supreme Court, which said that Congress had no power to interfere with slavery.
2. The Pony Express was started between St. Joseph Missouri, and Sacramento, CA.
3. South Carolina seceded from the Union and set up the Confederacy with six other states.

Abraham Lincoln: Sixteenth President **One Term from 1861 to 1865**

Born: February 12, 1809 in Hardin County, KY
Death: April 15, 1865 at age 56
Wife: Mary Todd
Occupation: Lawyer
Political Party: Republican: first Republican elected.

Important Actions and Events during His Term:
1. Civil War
2. The Emancipation Proclamation, issued by Lincoln, declared that the slaves in the Confederacy were free.
3. Dedication of the Gettysburg, PA battlefield with his Gettysburg Address.

4. Signing of the Homestead Act, which allowed settlers to have 160 acres of public land without cost.
5. Passage of the first draft law.
6. THE FIRST PRESIDENTIAL ASSASSINATION. Lincoln was shot by John Wilkes booth while watching a play in Ford's Theatre. He was buried in Springfield, IL.

Andrew Johnson: Seventeenth President **One Term from 1865 to 1869**

Born: December 29, 1808 in Raleigh, NC
Death: July 31, 1875 at age 67.
Wife: Eliza Johnson
Occupation: Tailor
Political Party: Democratic

Johnson, Vice President under Lincoln, became president upon the assassination of Lincoln. JOHNSON NEVER ATTENDED PUBLIC SCHOOL AND WAS SELF-TAUGHT. His wife later taught him to write.

Important Actions and Events during His Term:
1. The reconstruction of the South began.
2. President Johnson dismissed Secretary of War, Stanton, from his cabinet without the consent of Congress. CONGRESS TRIED TO IMPEACH HIM. The House voted for impeachment, but the Senate lacked one vote for the 2/3 majority that was needed to remove the president from office.
3. The 13th Amendment was added to the Constitution, which abolished slavery.
4. The 14th Amendment was added also, which made former slaves U.S. citizens.
5. Secretary of State William Seward purchased Alaska from Russia.

Ulysses S. Grant: Eighteenth President **Two Terms from 1869 to 1877**

Born: April 27, 1822 in Point Pleasant, OH
Death: July 23, 1885 at the age of 63.
Wife: Julia Grant
Occupation: Soldier
Political Party: Republican

He graduated from West Point, fought in the Mexican War, and became the General for the Union forces in the Civil War, thus emerging as a national hero.

LITTLE OF NATIONAL IMPORTANCE WAS ACCOMPLISHED DURING HIS TERM. The 15th Amendment was passed, which assured that all citizens had the right to vote, regardless of race or color.

Grant died from throat cancer. He had lost all his money and was near poverty at that time.

Rutherford B. Hayes: Nineteenth President **One Term from 1877 to 1881**

Born: October 4, 1882 in Delaware, OH
Death: January 17, 1873 at the age of 71
Wife: Lucy Hayes, known as "Lemonade Lucy" because she did not allow alcoholic beverages in the White House.
Occupation: Lawyer
Political Party: Republican

Important Actions and Events during His Term:
1. The first phone was installed in the White House.
2. Reconstruction was ended, and troops were withdrawn from the South.
3. Hayes attempted to appoint people to the governmental positions according to their qualifications.

James Garfield: Twentieth President **One Term in 1881**

Born: November 18, 1831 in Orange, OH
Death: September 19, 1881 at the age of 50.
Wife: Lucretia Garfield
Occupation: Lawyer
Political Party: Republican

GARFIELD WAS ASSASSINATED by CHARLES GUITEAU as he was waiting for a train in Washington. Guiteau had asked for a governmental position, but there was no position available to give him at the time.

Garfield held office for only four months. The American Red Cross was organized, but little else was accomplished.

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STUDY GUIDE:
ILLINOIS: FACTS AND TRIVIA

STATE SYMBOLS

State Flower:	Violet	**State Mineral**:	Fluorite
State Animal:	White-tailed Deer	**State Bird**:	Cardinal
State Insect:	Monarch Butterfly	**State Fish**:	Bluegill
State Tree:	White Oak	**State Fossil**:	Tully Monster
State Prairie Grass:	Big Bluestem	**State Snack Food**:	Popcorn
State Dance:	Square Dance	**State Soil**:	Drummer Series
State Slogan:	"Land of Lincoln"	**State Song**:	"Illinois"
State Nickname:	"Prairie State"		

STATE HISTORY

Illinois became a state on December 3, 1818. It was the 21st state to enter the Union.

Illinois had been a part of the Northwest Territory. After the Revolutionary War, more American settlers began moving into the areas west of the Appalachian Mountains, which collectively had been termed "The Frontier."

The government had this large area of land surveyed and divided into 36 sections that were each sold to a single buyer. Because few individuals could afford to purchase entire sections, land companies bought up much of this land and sold smaller portions to individual settlers.

The government also established guidelines by which a territory could petition the government for statehood. Each territory needed 5,000 free, adult males of voting age living within the territory before they could elect a legislature to decide local matters. When there were 60,000 free settlers in the territory, the people could apply to Congress for statehood. This is the procedure that was followed to obtain statehood in Illinois.

Illinois has had three different capital cities.

1. Kaskaskia (1818—first capital city)
2. Vandalia (1820)
3. Springfield (1838)

STATE GOVERNMENT

The government of the state is divided into three main branches:

1. Legislative
2. Executive
3. Judicial

The legislative branch makes the laws. It is composed of The House of Representatives and the Senate, which are known as THE GENERAL ASSEMBLY.

Number of representatives in the Illinois House: 118
Term of office: Two years
Current Speaker of the House: J. Dennis Hastert
Number of senators in the Illinois Senate: 59
Term of office: Four years

The executive branch enforces the laws. The following public officials are members of the executive branch.

Governor – Rod Blagojevich
Lieutenant Governor – Pat Quinn
Attorney General – Lisa Madigan
Secretary of State – Jesse White
Comptroller – Daniel Hynes
Treasurer – Judy Baar Topinka

JOB DESCRIPTIONS OF THE ABOVE POSITIONS:

Governor: Heads the executive branch.
Prepares the state budget.
Appoints the state department directors.
Reviews, signs, or vetoes all legislation that passes the General Assembly.
Elected for a four-year term and may serve an unlimited number of terms.

Lieutenant Governor: Main assistant to the governor.
Elected with the governor for a four-year term.

Attorney General: The state's chief lawyer.
Protects the people from things such as pollution, fraud, and crime.

Secretary of State: Maintains all official state records and the state seal.
Issues driver's licenses, license plates, and stickers.
Maintains the state library.

Comptroller: Chief financial officer of the state.
Keeps a record of the state's money.

State Treasurer: The state's banker.
Makes decisions about where the state's money should be invested.

The judicial branch interprets and judges the laws. This branch is composed of three different types of courts:

1. Circuit Court
2. Appellate Court
3. Supreme Court

The Supreme Court is the highest court of the state. It interprets the Illinois Constitution and Illinois laws. Seven Supreme Court justices sit on the Illinois Supreme Court bench.

REPRESENTATIVES SENT TO THE U.S. CONGRESS:

18 Representatives
2 Senators

ILLINOIS HAS 20 ELECTORAL VOTES.

ILLINOIS HAS BEEN DIVIDED INTO 102 COUNTIES.

The county that contains the city of Chicago is Cook County. Cook County has the most residents and McLean County is the largest county in terms of land area.

POPULATION AND LARGEST CITIES:

The population of Illinois is approximately 12.4 million people, making it the sixth largest state in the nation according to population.

The five largest cities in the state in order of their population are:

1. Chicago
2. Rockford
3. Aurora
4. Naperville
5. Peoria

ILLINOIS IS RECOGNIZED AS AN AGRICULTURAL LEADER IN OUR NATION.

In 2000, there were 78,000 farms in the state, located on 28.9 million acres. Approximately 80% of the total land area of the state was used for growing crops.

Illinois ranks first in the nation in the production of soybeans, and second in the production of corn, surpassed only by Iowa. The state is fourth in hog production.

It is generally ranked as one of the top five states in cash farm income, cash crop receipts, and in the total value of farm real estate.

The six main crops grown on Illinois farms during 2003 were:

1. Soybeans
2. Corn
3. Wheat
4. Oats
5. Hay
6. Sorghum

THREE PRESIDENTS ARE ASSOCIATED WITH THE STATE OF ILLINOIS.

1. Abraham Lincoln: New Salem is a reconstructed village where Lincoln spent six years as a youngster. Lincoln's tomb is located in Oak Ridge Cemetery in Springfield.

2. Ulysses S. Grant: His home is a tourist attraction in Galena, Illinois.

3. Ronald Reagan: He was born in Tampico, Illinois and attended high school in Dixon, Illinois.

INTERESTING ILLINOIS TRIVIA:

1. The state's largest inland water system is Carlyle Lake, which covers nearly 26,000 acres in the southern part of the state.

2. The name Illinois comes from an Indian term that means "tribe of superior men."

3. The Sears Tower in Chicago was the tallest building in the world until 1996. It still ranks as the tallest building in North America, standing ¼ mile high.

4. Peoria, Illinois is the home of the world headquarters for Caterpillar, Incorporated.

5. Oak Park, Illinois is noted for the many Prairie Style Houses designed by Frank Lloyd Wright.

6. The site of the former Fort Kaskaskia can be seen in Ellis Grove, Illinois.

7. Nauvoo, Illinois is the site of the Mormon settlement established by Joseph Smith. The Mormon Temple has recently been rebuilt in Nauvoo. The jail in which Joseph Smith was killed is located in neighboring Carthage, Illinois.

8. Galesburg, Illinois was the home of author Carl Sandburg.

OTHER INTERESTING ILLINOIS ATTRACTIONS

1. Bishop Hill: This is the original colony of a group of Swedish settlers who were searching for a new "religious home."

2. Cahokia Mounds: This is the only prehistoric Indian city located north of Mexico. It's located in Collinsville.

3. Dickson Mounds Museum: This museum in Lewistown, Illinois houses many Indian artifacts and other archaeological discoveries.

PROFESSIONAL SPORTS TEAMS LOCATED IN ILLINOIS:

Baseball:	Chicago Cubs Chicago White Sox	Hockey:	Chicago Blackhawks
Basketball:	Chicago Bulls	Football:	Chicago Bears

FAMOUS ILLINOISANS:

Abraham Lincoln	Ulysses S. Grant	Ronald Reagan
Marshall Field	A. Montgomery Ward	Jane Addams
Wild Bill Hickok	Enrico Fermi	Hillary Clinton
Stephen A. Douglas	Oscar Mayer	John Deere
Cyrus McCormick	George Pullman	George Ferris
Edgar Lee Masters	Carl Sandburg	