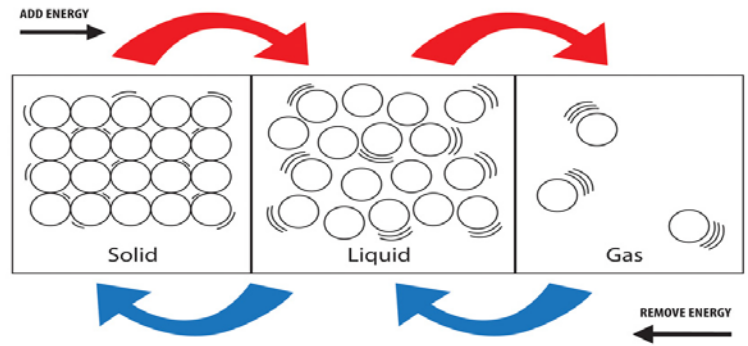


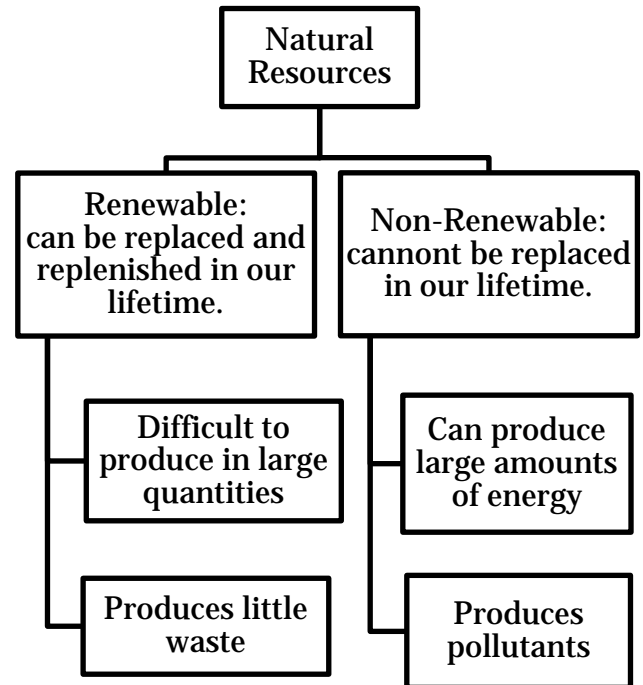
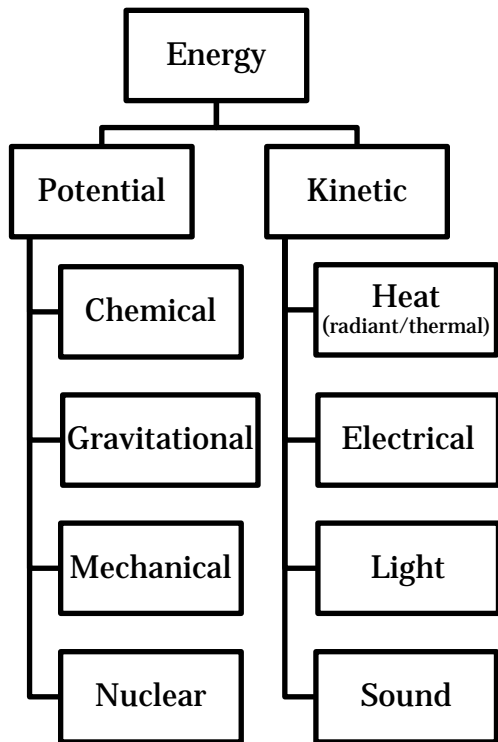
Properties of Matter

Characteristics of Gases, Liquids, and Solids		
Gas	Liquid	Solid
Assumes the shape of its container. Has no definite volume. Lots of free space between particles.	Assumes the shape of its container. Has a definite volume. Little free space between particles.	Retains a fixed shape. Has a definite volume. Little free space between particles.



*As its temperature *increases*, many kinds of matter change from a solid to a liquid to a gas.
 *As its temperature *decreases*, that matter changes from a gas to a liquid to a solid.

Energy and Resources



- Potential energy is stored: energy that *could do* work.
- Kinetic energy is movement: energy that *does* work.
- Energy cannot be created or destroyed, only changed.

- Renewable Resources: solar, wind, water [hydropower/tidal/waves, biofuels, geothermal, and biomass.
- Non-renewable Resources: coal, petroleum, natural gas, nuclear power.

Watersheds

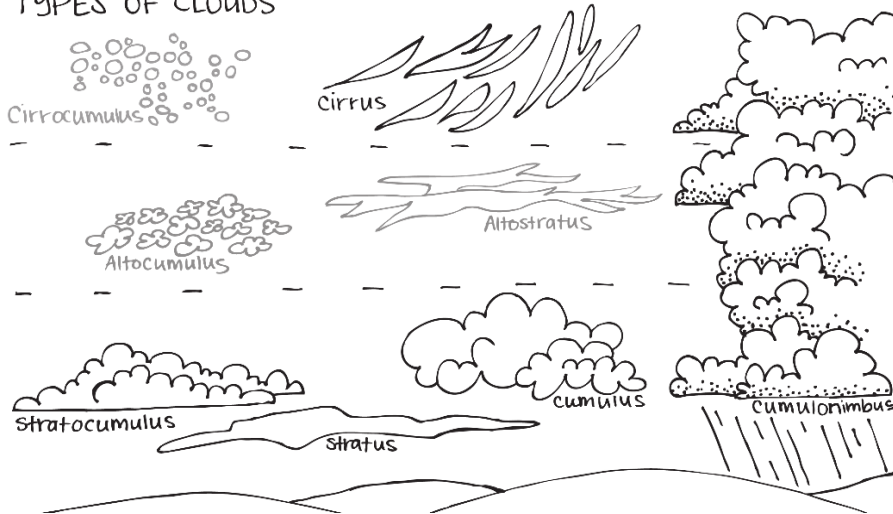
Terminology	Definition/Description
Watershed	An area of land where water flows to a single collection place. Flows from upstream → downstream.
Tributaries	A small river or stream flowing into a larger river or lake.
Divide	A ridgeline (i.e. mountain) that separates drainage basins.
Estuary	An enclosed body of water where the river (freshwater) meets the sea (salt water). Has <i>brackish</i> (fresh + salt) water.
Wetland	A land area that is saturated with water.
Salinity	Amount of salt dissolved in water.
Turbidity	Measures clarity of water (High turbidity = Very cloudy/hazy).
Weathering	The <i>breaking down or dissolving</i> of rocks and minerals on Earth's surface. May be a physical weathering or chemical weathering.
Erosion	The <i>movement</i> of rocks and minerals on Earth's surface.
Aquifers	The underground layer of water-bearing permeable (porous) rock.
Irrigation	Artificial provision of water to sustain growing plants.
Point Source Pollution	Any single identifiable source of pollution from which pollutants are discharged. May be caused by factories/sewage treatment.
Nonpoint Source Pollution	Comes from many diffuse sources. May caused by rainfall or snowmelt moving over and through the ground.
Macroinvertebrate Organisms	Organisms used as indicators to assess water quality.

*Major watersheds: Chesapeake Bay (our watershed), Gulf of Mexico and the North Carolina Sounds.

Atmosphere and Weather

As altitude (height) increases: • Air pressure decreases • Density decreases • Temperature changes per layer	Atmospheric Layers	Characteristics
	Exosphere	Outer space. Most satellites are here.
	Thermosphere	Hottest layer. International Space Station and Aurora Borealis are here.
	Mesosphere	Coldest layer. Meteors burn up here.
	Stratosphere	Jetstream and Ozone Layer is here.
	Troposphere	All weather happens here.

TYPES OF CLOUDS



- Cirrus clouds are made of ice crystals and bring fair weather.
- Cumulonimbus clouds bring heavy rain/snow/hail/lightning and even tornadoes.
- Cumulus clouds are fluffy and bring pleasant weather.
- Stratus clouds form gray layers and bring rain/snow.

Space

Ancient Astronomers and Geo/Heliocentric Models		
	Geocentric Model	Heliocentric Model
	Geo = Earth	Helio = Sun
Definition	<ul style="list-style-type: none"> • Earth-centered model. • This model was incorrect. Ancient model. 	<ul style="list-style-type: none"> • Sun-centered model. • This model is correct. Current model.
Astronomers	<p>Aristotle: Discovered the Geocentric Model.</p> <p>Ptolemy: Developed the math to support the Geocentric model.</p>	<p>Copernicus: Discovered the Heliocentric Model.</p> <p>Galileo: Used the telescope to prove the Heliocentric model to be correct.</p>

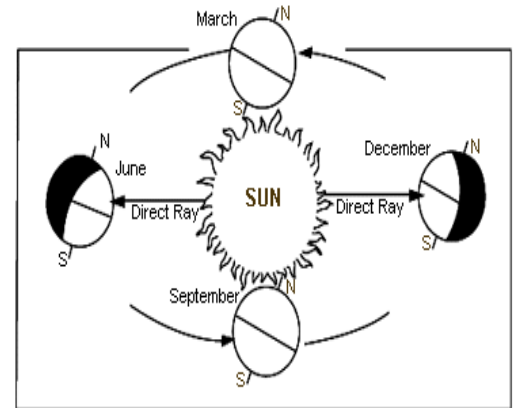
Axis: Imaginary line around which an object rotates, or spins. Earth's axis is tilted by 23.5 degrees.

	Rotation	Revolution
Definition	When an objects moves in a circular motion around an axis.	When an object moves in a circular path around another object.
Example	Earth rotates on its axis.	Earth revolves around the Sun. Moon revolves around the Earth.
Earth	Earth's rotation on its axis takes <u>24 hours and causes day and night.</u>	Earth's revolution around the Sun takes <u>one year (365 days) and causes seasons.</u> Earth revolves in a counter-clockwise direction.

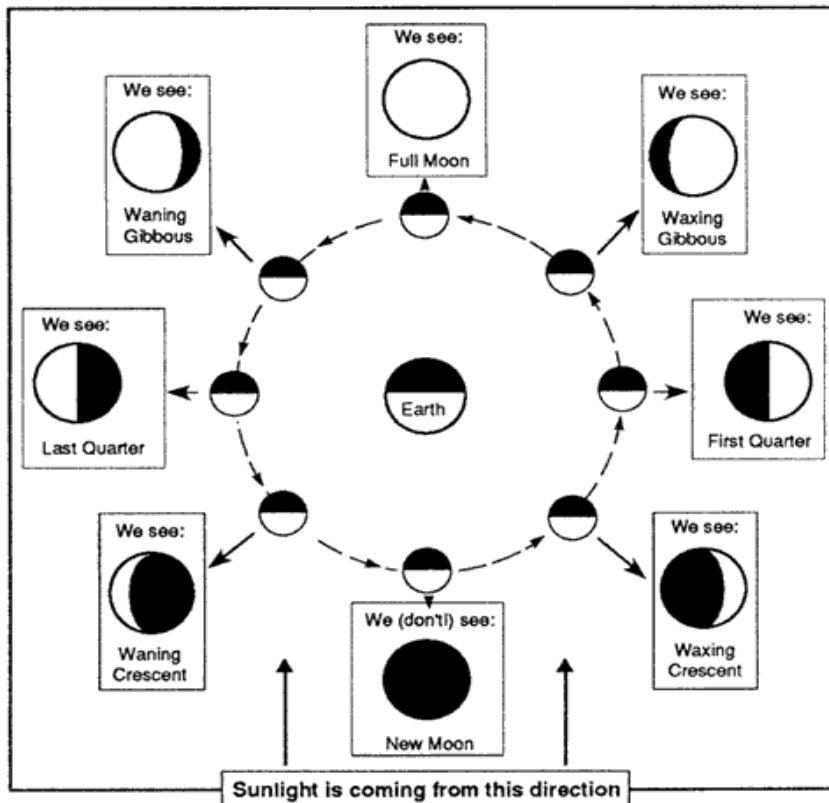
Seasons: caused by the Earth's tilt and its revolution around the Sun!

*As Earth orbits the Sun, its tilted axis **ALWAYS** points in the **same** direction. Therefore, different parts of the Earth get the Sun's rays.

Months	Northern Hemisphere	Southern Hemisphere
December to March	Winter – Axis points away from Sun, receiving indirect sunlight.	Summer – Axis points toward the Sun, receiving direct sunlight.
March to June	Spring – Axis is pointing parallel to the Sun. Sun shines equally on both hemispheres.	Fall- Axis is pointing parallel to the Sun. Sun shines equally on both hemispheres.
June to September	Summer – Axis points toward the Sun, receiving direct sunlight.	Winter – Axis points away from Sun, receiving indirect sunlight.
September to March	Fall – Axis is pointing parallel to the Sun. Sun shines equally on both hemispheres.	Spring – Axis is pointing parallel to the Sun. Sun shines equally on both hemispheres.



Moon Phases

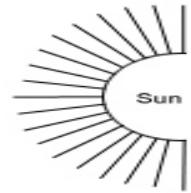
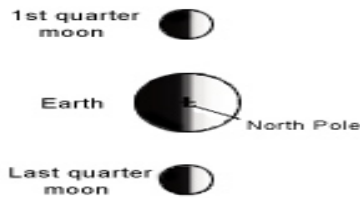


- Phases of the Moon are caused by its position relative to the Earth and the Sun.
- **Waxing** = increasing, or growing bigger (light is on the right).
- **Waning** = decreasing, or growing smaller (light is on the left).
- **Gibbous** = more than half lighted.
- **Crescent** = less than half lighted.
- Moon revolves around the Earth in a counter-clockwise direction.
- It takes the Moon around 30 days to revolve around the Earth.
- The moon is a natural satellite.

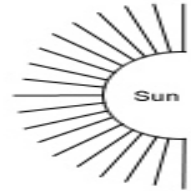
Tides

- Tides are the rise and fall of the levels of the oceans.
- Caused by the gravitational pull between Sun/Earth/Moon.
- Tidal range = difference between low tide and high tide.

NEAP TIDE CONFIGURATION



SPRING TIDE CONFIGURATION



Type of Tide	Spring Tide	Neap Tide
Alignment	Sun and Moon are aligned. Strong tide. Occur twice a month.	Sun and Moon form a right angle with the Earth. Weak tide. Occur twice a month.
Moon	Occurs during the New and Full Moons.	Occurs during First and Last Quarter Moons.




Planets: revolve around the Sun, and moons revolve around planets. A planet rotates on its axis.

Type of Planet	Terrestrial Planets	Gas Giants	Dwarf Planets
Characteristics	Called rocky or inner planets. Made of rock and metal.	Has a gaseous composition (made of gas). Much larger than the terrestrial planets.	Dwarf planets revolve around the Sun and have a round shape as other planets do. They CANNOT move other objects away from their orbital paths. They are rocky.
Names	Mercury, Venus, Earth, and Mars	Jupiter, Saturn, Uranus, and Neptune	Pluto, Haumea, Makemake, Eris, Ceres

Order of the Planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune

Mnemonic to help you remember: My Very Educated Mother Just Served Us Nachos

Celestial Bodies:

	Comets	Asteroids	Meteors
Composition	Chunks of ice, dust, and rock that orbit the Sun.	Large chunks of rock and metal that orbit the Sun.	Made of rock and metal
Characteristics	As comet comes closer to the Sun, it melts, causing a cloud to form around the nucleus called the coma. It also has a tail which points away from the Sun.	Thousands of asteroids orbit between Mars and Jupiter in the Asteroid Belt. Also known as minor planets.	It is a meteoroid (a small particle from an asteroid or comet) that burns up in the Earth's atmosphere (in the mesosphere). Also called a shooting star.
Picture			

Earth: About 4.5 billion years old. It is a rocky planet.

What makes Earth unique?

- It is the “Goldilocks” planet: Just the right location in the Solar System (habitable zone)
- Blue Planet: More than 70% of Earth is covered in water. Water exists in all 3 states of matter.
- It has an oxygen rich atmosphere: 78% Nitrogen and 21% Oxygen.
- Has a magnetic field to shield its surface from harmful solar radiation
- Has plate tectonics
- Only planet known to sustain life.

Gravity	<ul style="list-style-type: none"> • Force that keeps the planets in motion around the Sun. • Anything that has mass also has a gravitational pull. • The more massive an object is, the stronger its gravitational pull. • Ex. Sun’s gravitational field is greater than Jupiter’s.
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Scientific Investigation Vocabulary

- **Abstract** - a brief overview of the investigation
- **Analyze** - to examine methodically by separating into parts and studying their interrelations
- **Bar Graph** - a type of graph used for descriptive data that comes from research questions asking about variables that will be counted
- **Conclusion** - summarizes the important parts of your experiment and is a discussion of what the data, patterns, and relationships mean
- **Dependent (Responding) Variable** - the response to the independent variable that can be observed (qualitative) and measured (quantitative)
- **Hypothesis** - a special kind of prediction that forecasts how the independent variable will affect the dependent variable. A cause and effect statement. If.....then.....
- **Independent (Manipulated) Variable** - variable changed by the scientist; what the investigator is testing
- **Line Graph** - a type of graph used when data has taken place over time
- **Constant Variable** - a variable that is not changed.
- **Controlled Variable (Constants)** - a constant variable that is part of the experiment that is not being tested and is used for comparison
- **Data** - factual information, especially information organized for analysis or used to reason or make decisions. Can include mean, median, mode, range.
- **Data Analysis (interpretation)** - making sense of observations and data collected during an experiment using appropriate measures of central tendency (mean, median, mode, range) and by looking at patterns and relationships between the independent variable and the dependent variable
- **Data Table** - organizes data into rows and columns
- **Observations** - anything noticed about the problem written to conduct an investigation and to identify what data will be collected
- **Scientific method** - a series of steps used by scientists/people to help find solutions to problems and/or questions
- **Qualitative Data** - Descriptive data not easily measured such as color.
- **Quantitative Data** – Data that can be measured with standard units of measurement such as temperature, length, width, mass, density, and volume.
- **Validity** – repeated trials – a good experiment repeats the trials at least 3 times.

Steps of Scientific Investigation

Make an observation
 Ask a question
 Research your question
 Make a hypothesis
 Design an experiment
 Collect data
 Analyze data
 Form a conclusion

Identifying Variables and Hypothesis

Types of Variables

- Independent Variable (IV): the variable that is manipulated by the scientist. The variable that “I” change.
- Dependent Variable (DV): the variable that responds to the change the scientist made. The variable that is being measured or observed.
- Controlled/Constant Variables (CV): the variables that stay the same during the entire experiment. The variables that are controlled on purpose by the scientist.

Hypothesis: a prediction that states how the independent variable will affect the dependent variable.

- Describes a cause and effect relationship.
- Your hypothesis can tell you what your variables are!
- Example: If I drink soda before bed, then I will not sleep very much.

IV: drinking soda before bed

DV: amount of sleep

CV: type of soda; bedtime; amount of soda

Variables and Hypothesis Practice

1. If I leave the lights on all day, then my electric bill will be expensive.

IV: _____

DV: _____

CV: _____

2. One tank of gold fish is fed the normal amount of food once a day, a 2nd tank is fed twice a day, and a 3rd tank is fed four times a day during a six-week study. The fish’s weight is recorded daily.

Hypothesis: _____

IV: _____

DV: _____

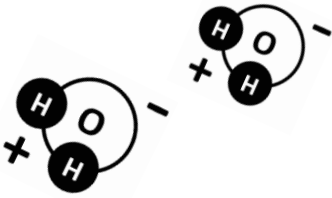
CV: _____



Properties of Water: Terminology

Term	Definition/Description
Capillary Action	Water molecules flowing up against gravity with the assistance of cohesion and adhesion.
Meniscus	Formed when liquid "climbs" and adheres to the sides of a graduated cylinder.
Polar Molecule	Unequal sharing of electrons; difference in charges on opposite ends.
Universal Solvent	Can almost dissolve everything on Earth over time.
Mixture	Combination of two or more substances that can be easily separated.
Surfactant	Compounds that reduce the surface tension of a liquid.
Solution	The new substance formed after combining the solute and solvent.
Solute	The substance that gets dissolved in a solution.
Solvent	The substance that does the dissolving.
Solid, Liquid, and Gas	The three states of matter where water can exist: ice, water, vapor.
2 Hydrogen and 1 Oxygen	Chemical makeup of a water molecule.
Adhesion	Water molecules stick to other materials.
Cohesion	Water molecules sticking together. This cohesive force creates surface tension.
Miscibility	The degree of how well two substances can be mixed together.
*Molecule	When TWO or more atoms are chemically bonded.
*Compound	When TWO or more DIFFERENT types of atoms are chemically bonded.

Structure of the water molecule:



- Water is a *polar* molecule: The Hydrogen end is slightly *positive* relative to the Oxygen end, which is slightly *negative*. Opposite charges attract, like a little magnet.
- It has an unequal sharing of electrons: 2 electrons from Hydrogen and 8 electrons from Oxygen.

Parts of the Water Cycle

- Precipitation: water (in any form) **falling** from the sky (rain, snow, hail)
- Condensation: water **vapor** turning into **liquid** water
- Runoff: water **flowing** on or under the surface of Earth
- Collection: anywhere water collects or **accumulates** (puddles, ponds, oceans)
- Transpiration: water **evaporates** from the **leaves** of plants into the atmosphere
- Evaporation: **liquid** water from the surface turns into **gas** water vapor

