

## Steps of a Scientific Investigation

**Prediction** – a forecast about what may happen in some future situation. It is based on the application of scientific principles and factual information.

**Hypothesis** – a predication about the relationship between variables.

**Experiment** – a fair test driven by a hypothesis with which only one variable is compared.

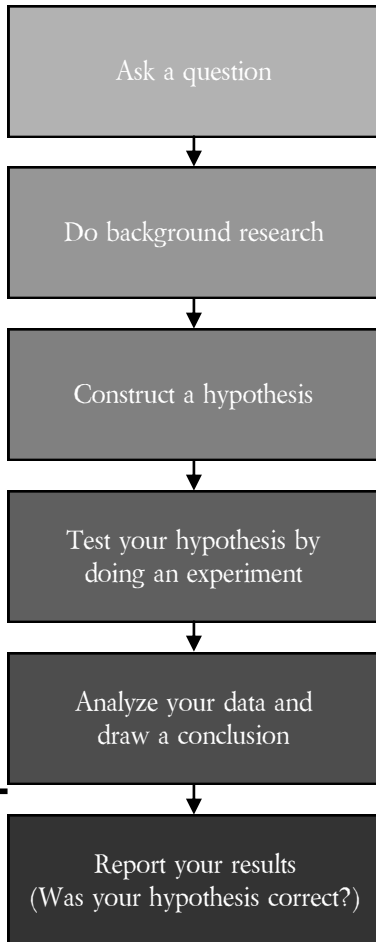
**Observations** – provides a clear description of exactly what is observed and nothing more.

People conducting investigations need to understand the difference between what is seen and what is an inference.

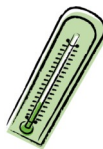
**Inference** – a conclusion based on evidence about events that have already occurred. Accurate observations and evidence are necessary to draw realistic and possible conclusions.



## Steps in the Scientific Method



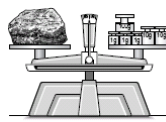
## Scientific Measuring Tools



**THERMOMETER**—a tool that measures temperature



**RULER, YARD STICK, METER STICK**— tool used to measure length, height, or width of an object.



**BALANCE, PAN SCALE** —a tool that measures the mass (how much matter) of an object



**GRADUATED CYLINDER**— tool used to measure liquid volume (amount of liquid)

## Scientific Measuring Units

Meters, Yards, Feet, Inches, and Centimeters

measures length

Pounds, Ounces, Tons, Grams, and Kilograms

measures weight

Fahrenheit and Celsius

measures temperature

Fluid Ounces, Cups, Milliliters, and Liters

measures capacity

# SOL 4.2&4.3- Forces, Motion, and Energy

**POSITION**—described by the relative location of another object. Tracing and measuring an object's position over time can describe its motion.

**SPEED**—Describes how fast an object is moving

**FORCE**—Any push or pull that causes an object to stop, change speed, or direction.

**FRICTION**—The resistance of motion (often creates HEAT)

The greater the force, the greater the change in motion. The bigger the object, the less effect a force will have upon it.



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Electrical Energy can be transformed into heat, light, or mechanical energy.

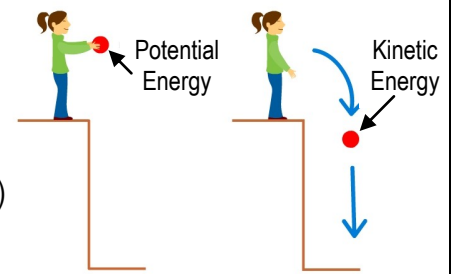


Electricity causes the small metal in a light bulb to heat up and give off light (heat and light energy)



Electricity causes the blades to turn (mechanical energy)

**POTENTIAL ENERGY**—"Stored Energy" (an object is not in motion)



**KINETIC ENERGY**—"Motion Energy" (an object that is in motion.)

## STATIC ELECTRICITY

Atoms—tiny material within all objects. Within atoms are protons (+ charge), electrons (- charge), and neutrons (no charge)



Rubbing together certain items causes static electricity.

Static electricity in the clouds is seen as lightning.



**CURRENT ELECTRICITY**—continuous flow of electrons

**CIRCUIT**—the path of electric current



**OPEN CIRCUIT**—does not allow electricity to flow (like an open bridge)

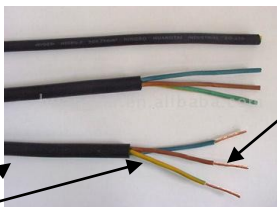


**CLOSED CIRCUIT**—allows electricity to flow (like a closed bridge)

**CONDUCTORS**—materials that allow electricity to pass through such as metal (wires)

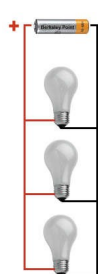
**INSULATORS**—materials that DO NOT allow electricity to pass through such as rubber, plastic, and wood

The rubber or plastic around the wires are **INSULATORS** so that it is safe to touch the wires (and no fires get started!)

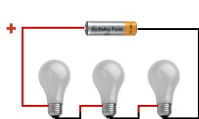


The copper wires are **CONDUCTORS** to carry the electricity through the wire

**PARALLEL CIRCUIT**—has more than one pathway so that if one light goes out, the other circuit light stays on



**SERIES CIRCUIT**—Has only one path. If one light goes out, they all go out.

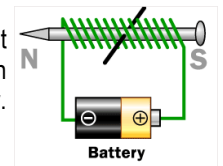


## MAGNETISM

Certain metals such as Iron, Nickel, and Cobalt are magnetic

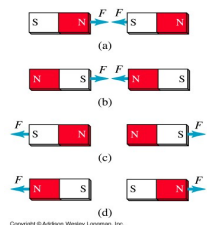


**ELECTROMAGNET**—a non-permanent magnet created by wrapping a wire around certain iron materials (nail). Discovered by Michael Faraday.



**MAGNETIC POLES**—The strongest point on a magnet (usually North and South)

**MAGNETIC FIELD**—the lines of force extended from the poles of a magnet in an arched pattern showing where the magnetic force occurs.



When you put magnetic poles together...

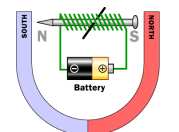
**Like charges REPEL** (push against)

**Opposite charges ATTRACT** (come together)

## FAMOUS SCIENTISTS



**Michael Faraday**—Invented the electromagnet which is a non permanent but powerful magnet.



**Benjamin Franklin**—Discovered lightning (electricity) during a kite and key experiment.

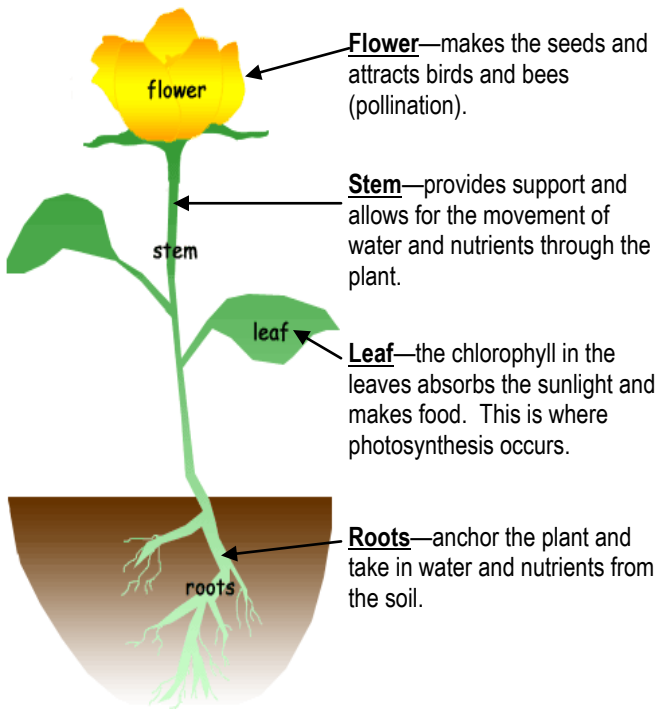


**Thomas Edison**—Inventor of the light bulb

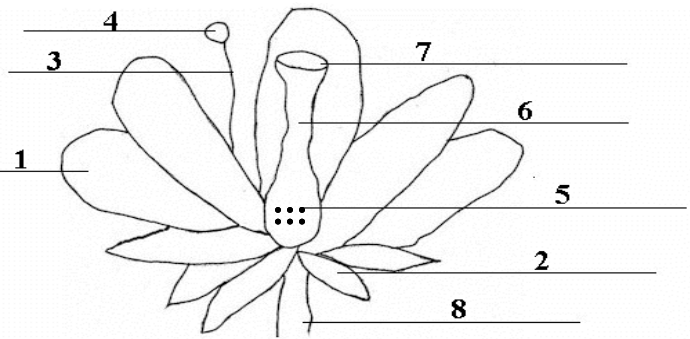


The plant kingdom is divided into **TWO** groups:

- **Plants with seeds** (trees, flowers, green plants)
- **Plants with spores** (ferns and mosses)



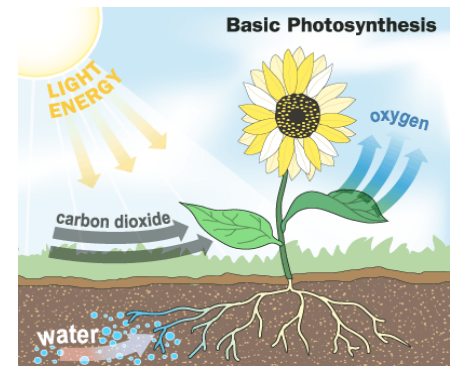
## PARTS OF A FLOWER



1. **Petal**—the colorful scented part of the flower that attracts birds and bees so that pollination can occur
2. **Sepal**—the small leaves that protect the developing flower.
3. **Stamen**—the male part of the flower involved in reproduction
4. **Pollen**—the orange/yellow dusty substance produced by the stamen (which is carried around during pollination)
5. **Seeds/Ovule**—these form in the ovary after being fertilized by the pollen
6. **Pistil**—the female part of the flower involved in reproduction
7. **Stigma**—the sticky uppermost part of the pistil
8. **Stem**—gives support to the flower and transports nutrients and water

## PHOTOSYNTHESIS

The process by which the plant uses the sun's energy, carbon dioxide, and water to make food (glucose and oxygen)



## POLLINATION

**Pollination**—the transfer of pollen from the stamen to the stigma. Pollination is part of the reproductive process of flowering plants.

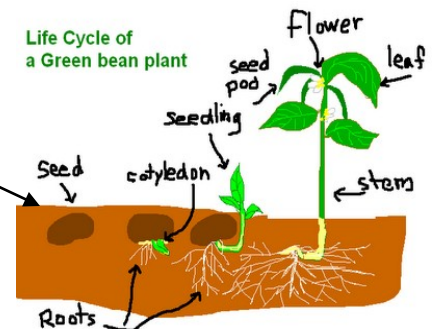


Birds and bees land on a flower and pollen clings to their bodies. When the birds and bees visit other flowers, they spread the pollen.

Once a flower gets the right pollen, new seeds will start to grow and the flowers will reproduce.

**DORMANCY**—the period of suspended life process brought on by change in the environment.

For example, a seed will stay **DORMANT** until it gets what it needs to start growing. Most seeds need sunlight, water, and soil to start growing.



**CHLOROPHYLL**—the green pigment (color) in the plant. Chlorophyll is used during photosynthesis to make food for the plant.

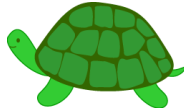


# SOL 4.5- Living Systems

## ANIMAL ADAPTATIONS

In order for animals to survive they must adapt to their individual and environmental needs. Animals can have **STRUCTURAL ADAPTATIONS** and/or **BEHAVIORAL ADAPTATIONS**.

**STRUCTURAL ADAPTATIONS**—Physical attributes that help animals meet a life need. Examples— camouflage, monkey's tail and turtle shell.



**BEHAVIORAL ADAPTATIONS**—certain types of activities animals perform, which help them meet a life need. Examples— migration and hibernation.

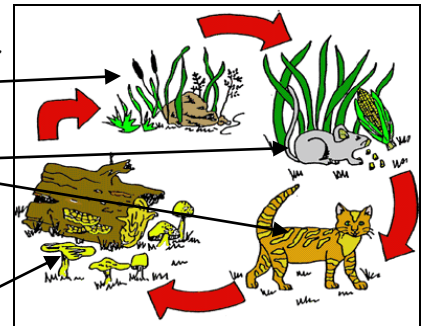


## FOOD CHAINS

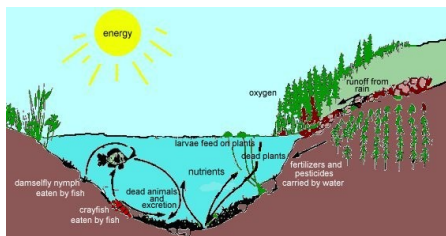
**PRODUCERS**—organisms that get their energy directly from the sun (can make their own food) (plants). Producers are often the start of the food chain.

**CONSUMERS**—organisms that get their energy from other plants and animals (cannot make their own food).

**DECOMPOSERS**—organisms that use dead and decaying organisms and animals



**HABITAT**—the place in which an animal or plant naturally lives. Remember that an animal or plant needs food, water, shelter, and space to live. The size of the habitat depends on the organism's need.



**ORGANISM**—any living thing

**ECOSYSTEM**—the ways living things interact with other living and non-living things



**COMMUNITY**—a group of organisms that share an environment

**LIFE CYCLE**—the various stages of life (egg, tadpole, frog)

## NICHE

A **NICHE** (rhymes with "ditch" or "leash", depending on how you say it) is the function (job) that an organism performs in the food web of that community.



The vulture's **NICHE** is to clean up the dead animals. That is the service it provides to the community. If there were no animals to clean up, there would be a mess.

The zebra's **NICHE** was to eat the grass. If the zebras and other animals didn't eat the grass, the grass would grow too tall.

The lion's **NICHE** is to keep the population of other animals balanced. If the lions didn't kill zebras and other animals, there would be too many.

Humans have a MAJOR Impact on ecosystems but it is up to the humans to decide if the impact is POSITIVE or NEGATIVE



## HUMAN IMPACT ON ECOSYSTEMS



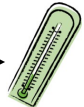

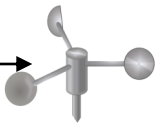
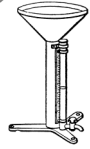

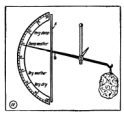
**POSITIVE**



**NEGATIVE**



# SOL 4.6- Weather

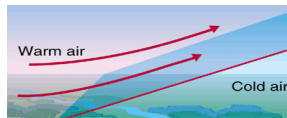
<u>WEATHER TERMS</u>	<u>MEASURED WITH...</u>	<u>WEATHER TOOLS</u>
<b>TEMPERATURE</b> —the measure of the amount of heat energy in the atmosphere	⇒	<b>THERMOMETER</b> → 
<b>AIR PRESSURE</b> —the weight of the air, which is determined by several factors including the temperature	⇒	<b>BAROMETER</b> → 
<b>WIND SPEED</b> —how fast the wind is blowing	⇒	<b>ANEMOMETER</b> → 
<b>PRECIPITATION</b> —the amount of water that falls from the sky	⇒	<b>RAIN GAUGE</b> → 
<b>WIND DIRECTION</b> —The direction in which the wind blows	⇒	<b>WIND VANE</b> → 
<b>HUMIDITY</b> —the amount of moisture in the air	⇒	<b>HYGROMETER</b> → 



Meteorologists, like me, use weather instruments to predict weather

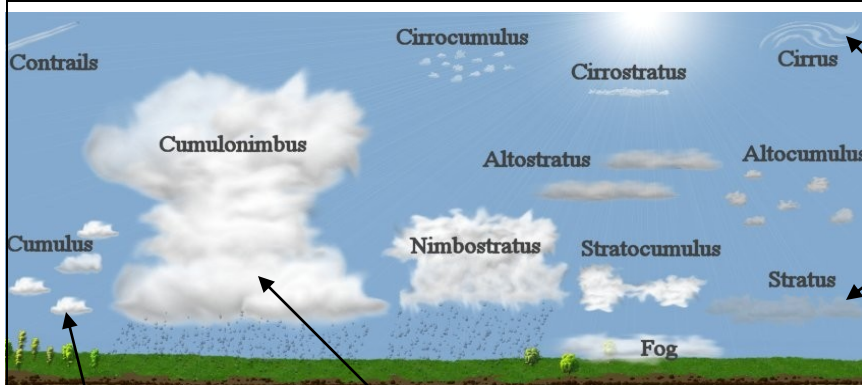
There are 4 types of precipitation: rain, snow, sleet, and hail. Snow, rain, and sleet are based on the temperature in the atmosphere.

**WEATHER FRONTS**—the boundary between air masses of different temperature and humidity



**HIGH PRESSURE**—fair weather and light winds

**LOW PRESSURE**—cloudy/rainy with strong winds



## CLOUD TYPES

**CIRRUS**—feathery clouds usually associated with fair weather but often indicates rain or snowfall in several hours

**STRATUS**—gray, smooth clouds that cover the whole sky and block all sunlight. Light rain and drizzle usually occur.

**CUMULUS**—white, fluffy clouds with flat bottom usually indicating fair weather

**CUMULONIMBUS**—dark, tall, billowing cloud that produces rain and thunderstorms

## EXTREME STORMS

**THUNDERSTORMS**—a common storm with rain, thunder, and lightning



**HURRICANES**—a storm that forms over water with heavy winds



**TORNADOES**—a violent wind storm with a rotating column



## EARTH

- Third planet from the sun
- 150 km from the sun
- 1 of the 4 Rocky Inner Planets
- Oxygen-rich atmosphere
- 75% water
- Has life



## SUN

- Average-sized yellow star
- 100x the size of the Earth
- 4.6 billion years old
- Made of gas and helium



## MOON

- Small, rocky satellite
- 3/4 the diameter of Earth
- 1/8 the mass of Earth
- Extreme temperatures
- No atmosphere, water, or life

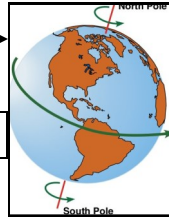


## ROTATION AND REVOLUTION

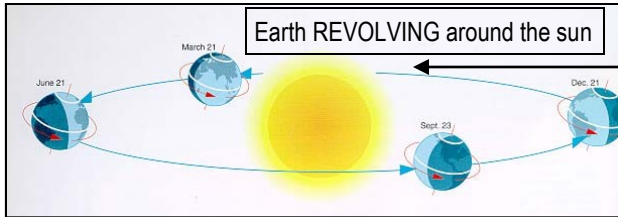
### ROTATION—a spinning motion

- It takes the Earth 24 hours (1 day and 1 night) to rotate)

Earth ROTATING on it's axis



Earth REVOLVING around the sun

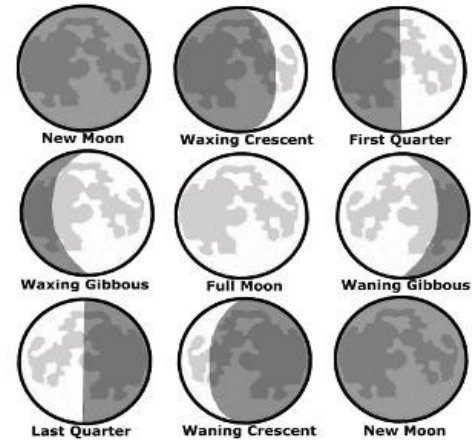
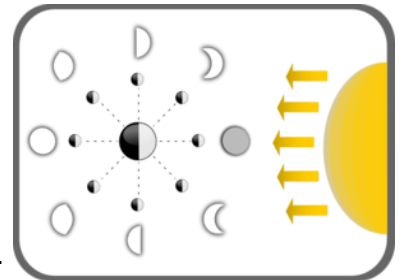


### REVOLUTION—an object moving in a circular motion around another object

- It takes the Earth 365 days (1 year) to revolve around the Sun
- It takes the Moon 28 days (1 month) to revolve around the Earth

## MOON PHASES

The phases of the moon are caused by its position relative to the Earth and the Sun.



We have SEASONS because the Earth is *tilted* and because it revolves around the sun.

We have warmer temperatures when our continent is facing and closest to the sun. When it is not, we have colder temperatures

Long ago, Scientists argued about the universe...



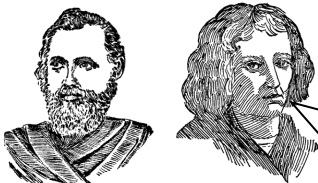
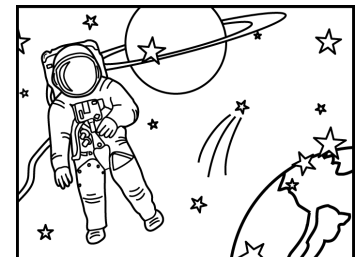
We believe the EARTH is the center of the universe!!



Aristotle & Ptolemy

Thanks to NASA and their Apollo missions, we now have a much greater understanding of space.

Astronauts bring back moon samples to help us learn.



Galileo & Copernicus

We believe that the SUN is the center of the Universe!!



Our understanding of the sun, moon, and solar system continues to grow and change with new scientific discoveries.



Virginia is rich in a wide variety of material resources including forests, arable (farmable) land, coal, sand, and aggregates (rocks), wildlife and aquatic organisms, clean water and air, and beautiful scenery.

## Land Resources

### NATURAL vs. CULTIVATED FORESTS



**CULTIVATED FORESTS**—a forest designed specifically for the planting of products

**NATURAL FORESTS**—a forest that has grown naturally, without any help from humans

\*Both Natural and Cultivated forests are a widespread resource in Virginia\*

Virginia's soil and land support a great variety of life, provide space for many economic activities, and offer a variety of recreational opportunities.

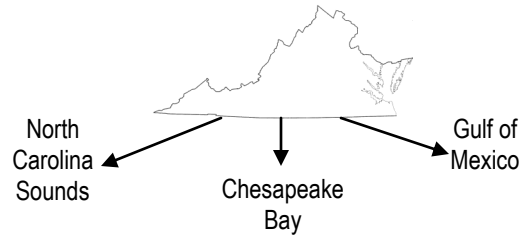


## Water Resources

### WATERSHED

**WATERSHED**—an area over which surface water flows to a single collection place

Virginia has 3 watersheds!



Other water resources include groundwater, lakes, reservoirs, rivers, bays, and oceans. Plants and animals that live in these aquatic habitats are also used as resources.



Chesapeake Bay



Potomac River



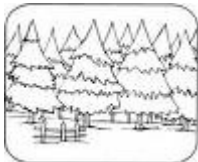
### "We all live Downstream"

Environmental programs that want to save and preserve the watersheds often use this phrase. If a neighbor litters, the trash must go somewhere eventually. Since rivers are always flowing, the trash goes into the river and then travels to another location and pollutes the water.



## Natural Resources

Trees, water, and sand



## Man-Made Resources

Paper, logs, and bleach

