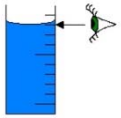
Lab and graphs

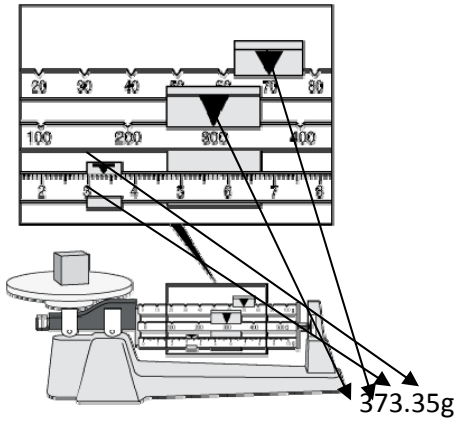
*When mixing acids and water, pour the *acid into the water*. Remember, A&W (root beer).
*To smell something, hold it away from your nose and wave your hand over it towards your nose. (waffle)
*When heating anything in a test tube, point the mouth away from people.
*Ventilation fume hood for substance producing foul odors or an experiment that produces noxious fumes- students should leave room if substance producing noxious fumes is not in the ventilation hood.

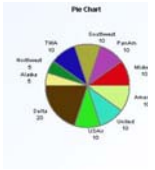


Read bottom of the meniscus

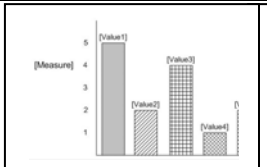
-**Hypothesis**= proposed explanations - must be testable

- **dependent variable** – what is being observed or measured in the experiment (responds to change in independent variable)
- **independent variable** - the single variable we pre-determine the amount of change in the experiment
- **control** – the trial does not receive the independent variable but receives everything else

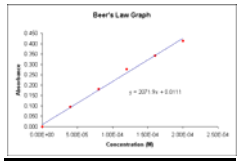




Pie graphs (circle) are used to show how a whole is broken up into its parts. Note parts add up to 100%.



Bar graphs are used to compare measurements taken from a number of objects or categories. (demonstrate trend in data)

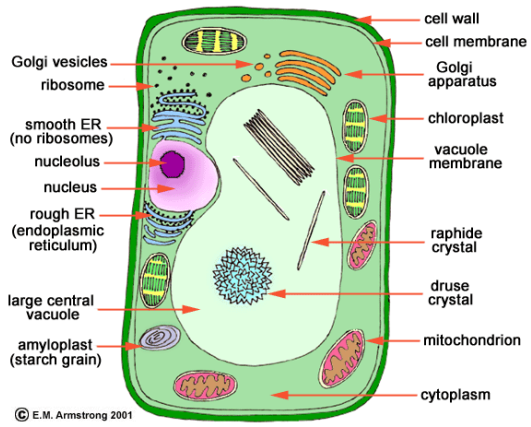


Line graphs show the relationship between two variables

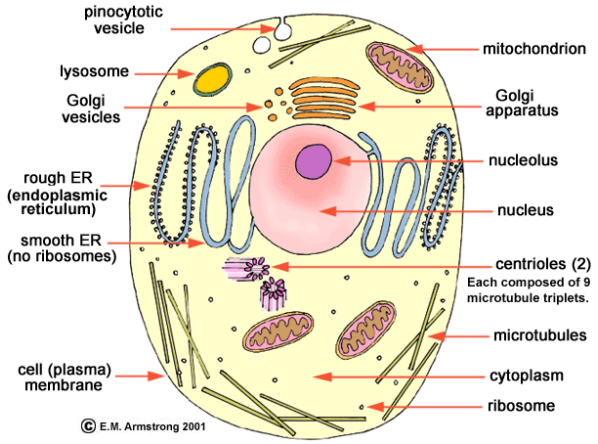
Cells

Cell Structure	Structure's Function
Cell Membrane	Encloses cell and controls what enters and leaves the cell
Cytoplasm	Surrounds organelles; transports some materials
Endoplasmic reticulum	Transports, and stores some substances, throughout the cell
Ribosome	Builds proteins; (protein synthesis)
Lysosome	Breaks down nutrients and foreign substances
Nucleus	Control center; contains DNA
Chromosomes	Genetic material The DNA
Nuclear Membrane	Encloses nucleus and controls what enters and leaves the nucleus
Golgi apparatus	Secretes and stores secretions for transport out of the cell
Chloroplast	Manufactures food in green **plants**; photosynthesis
Cell wall	Protective out barrier of **plant** cells
Vacuole	Stores food, water, wastes and building materials **large in plants**

Plant cell



Animal Cell



Prokaryotic and Eukaryotic Cells:

Prokaryotic cells do not have a nucleus or organelles bound by a membrane. Bacteria cells are an example of prokaryotic cells. Prokaryotic cells are much smaller than eukaryotic cells.

Osmosis

1. Water always moves from higher to lower concentration of water.
2. Cells can't stop water from moving, but they can stop other things (ions, molecules, etc.)

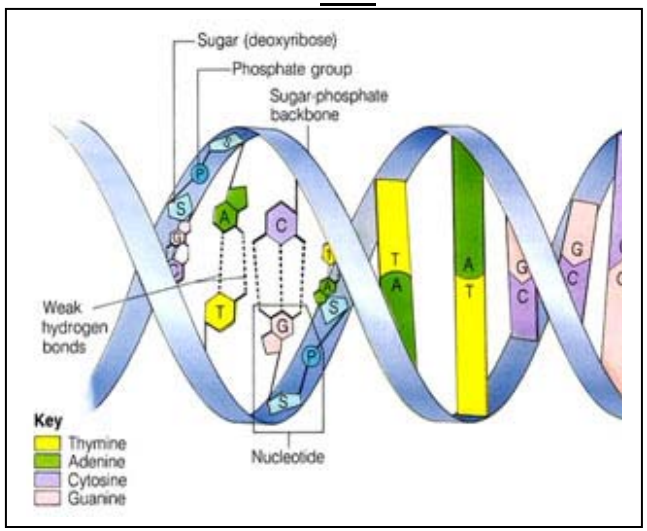
Photosynthesis – MEMORIZE

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

Respiration is just the opposite of photosynthesis.

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

DNA

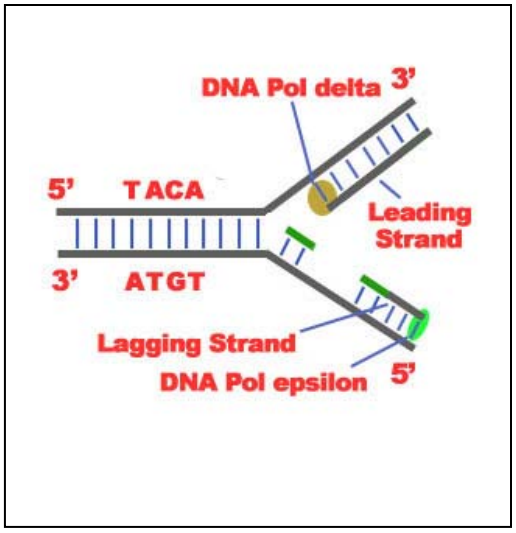


DNA;
T match with A
C match with G

Troy Aikman
Go Cowboys

Replication

The double-stranded DNA molecule has the unique ability that it can make exact copies of itself.

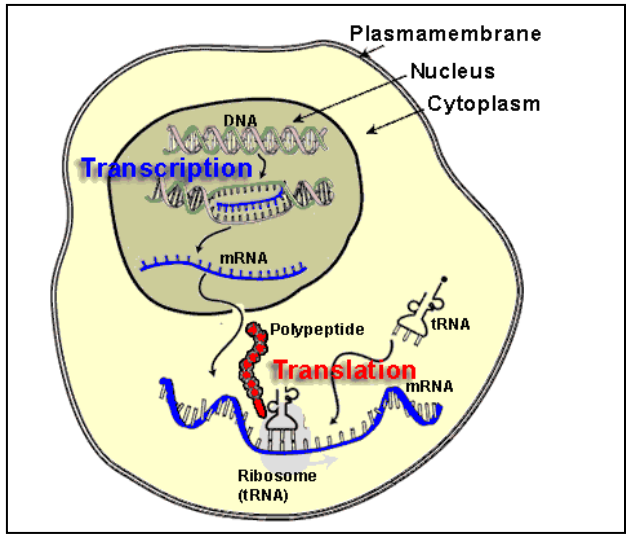


RNA

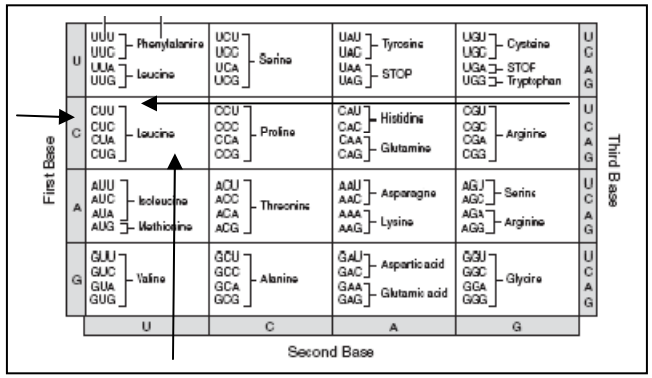
RNA contains the bases adenine (A), cytosine (C) and guanine (G); however, RNA does not contain thymine, instead, RNA's 4th nucleotide is the base Uralic (U)

U match with A **C match with G**

- **Transcription**--The synthesis of messenger RNA from a DNA template.
- **Translation**--The synthesis of a protein in the ribosome from a messenger RNA template.



Mutation = A change in the DNA of an organism. Classified as insertion (addition of a base), deletion (subtraction of a base), or substitution (replacement of one base with another).



mRNA fragment that was originally CUU what amino acid is produced?

Systems

Circulatory
Function: to transport blood to every part of the body. In the blood are all of the necessary gases, nutrients, and waste

Digestive
Function: to digest food and provide vital nutrients to the body. Eliminate wastes.

Nervous
Function: controls all bodily activities.

Endocrine
Function: secrete hormones

Reproductive
Function: to perpetuate the species through reproduction.

Integumentary (skin)
Function: regulating your body temperature, serves as a protective layer to the underlying tissues.

Skeletal
Function: provides a framework for the tissue of the body, protects the upper organs, muscles are anchored to the bones to allow for movement, produce blood cells, and store vital minerals.

Respiratory
Function: provide the body with oxygen, and also to dispel carbon dioxide from the body.

Muscular
Function: Smooth muscle allows for the contraction of organs (moves food along the intestines) and blood vessels (pushes blood through). Cardiac muscle is responsible for the pumping of the heart. Skeletal muscle allows for all movement of the body.

Excretory/Urinary
Function: filter the blood and remove major waste products such as ammonia and urea.

Immune/Lymphatic
Function: protect the body from infections and antigens.

Taxonomy

King--Phillip--Came--Over--For--Good--Soup

Binomial nomenclature – "2 name system" uses the genus and the species to identify an organism. (homo sapiens)

Humans
Kingdom - animals
Phylum - chordates
Class - mammals
Order - primates
Family - hominids
Genus - homo
Species - sapiens

General ↓ Specific

TABLE 18-2 Six Kingdoms of Life

Kingdom	Cell type	Number of cells	Nutrition
Archaebacteria	prokaryotic	unicellular	autotrophy an heterotrophy
Eubacteria	prokaryotic	unicellular	autotrophy an heterotrophy
Protista	eukaryotic	unicellular and multicellular	autotrophy an heterotrophy
Fungi	eukaryotic	unicellular and multicellular	heterotrophy
Plantae	eukaryotic	multicellular	autotrophy and (rarely) heterotrophy
Animalia	eukaryotic	multicellular	heterotrophy

Plant Adaptation

An adaptation is defined as anything that helps an organism survive and successfully reproduce in an ecosystem.

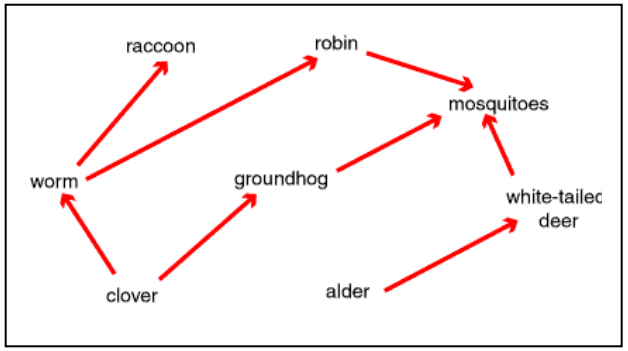
1. Open/close stomata-conserves better water.
2. Less sun-bigger leaves.
3. waxy leaves less conserve water
4. dry capsule, seeds with fine fluff, winged fruits or seeds are adapted for wind dispersal
5. fleshy fruit animals eat and excrete seeds
6. dried seeds with hooks or spines such as Coclé burrs are adapted for animal dispersal
7. tap rots allow plant to access underground water

Viruses:

1. Not alive.
2. Contain:
   - DNA or RNA to take control of the cell.
   - Protein shell to "trick" the cell into acceptance.
3. Not killed by anti-biotic.
   - Anti-biotic doesn't work on viruses.
4. **Vaccine**- A protein shell or a similar virus given to a person where they will build up a resistance to a bad virus.
5. Types Commonly seen on TAKS:
   - **HIV**- Viruses attack T-cells (white blood cells).
   - **Influenza**- "flu".
   - **Smallpox**- Like chickenpox on steroids.

Food Chains Webs And Pyramids

- **The Sun**, which provides the energy for everything on the planet.
- **Producers**: these include all green plants. Use sun energy for photosynthesis to make food for all consumers.
- **Consumers**: include *herbivores* (animals that eat plants), *carnivores* (animals that eat other animals), omnivores eat plants and animals.
- **Decomposers**: These are mainly bacteria and fungi that convert dead matter into gases such as carbon and nitrogen to be released back into the air, soil, or water
- *Autotrophs* – produce their own food (example: plants).
- *Herbivore* – plant eaters (example: deer).
- *Omnivore* – eats both plants and meat (example: bear).
- *Carnivore* – eats primary meat (example: coyote).
- *Decomposers* – breaks down dead tissue (example: bacteria).
- *Producer*- also known as autotrophs produces its own food.



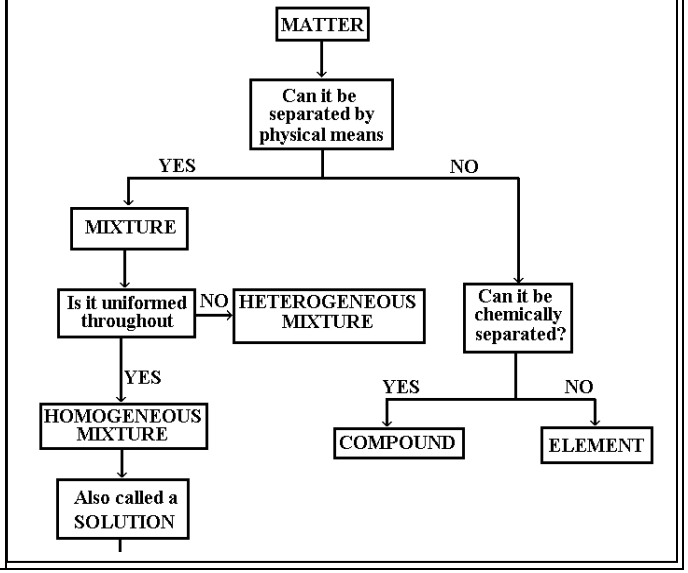
Symbiosis

1. **Predation** is a relationship in which one organism preys on another as a source of food. An example of predation is an owl hunting a field mouse.
2. **Parasitism** is a relationship in which one organism derives benefit at the expense of the other. **Commensalism** is a relationship in which one organism derives benefit with neither benefit nor harm to the other.
3. **Mutualism** is a relationship in which both organisms benefit from each other.

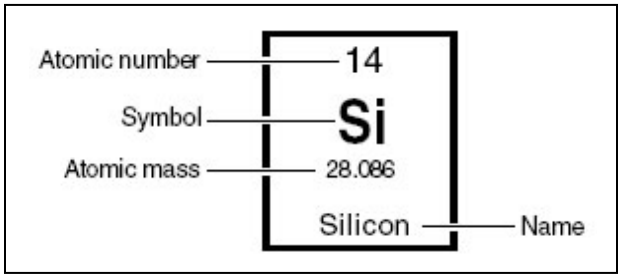
Beneficial Bacteria

- Help make essential soil mineral elements, available to the plant Nitrogen Fixation
- Decompose organic matter and improve physical properties of the soil
- Vast numbers of bacteria live in our bodies. One example is found in the intestine. This bacteria and humans have formed a symbiosis with each other. The bacteria help us with digestion and to produce vitamins. In exchange, they soak up a little extra food for themselves
- Bacteria also make, or help to make, drugs, hormones, or antibodies.
- Bacteria can even help to break down oil to make clean-up after an oil spill easier.

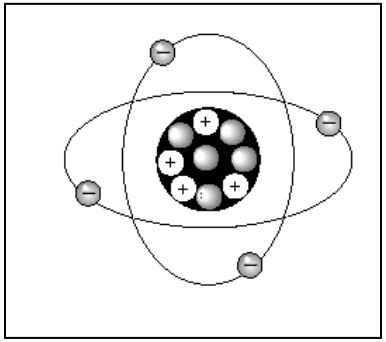
Classification of Matter



Periodic Table

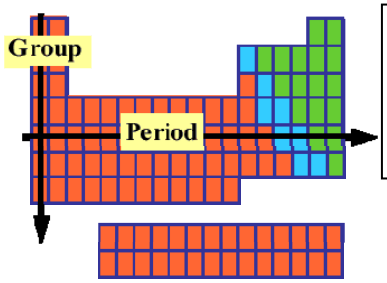


Atomic number = number protons/ all atoms of the same element have same number of protons

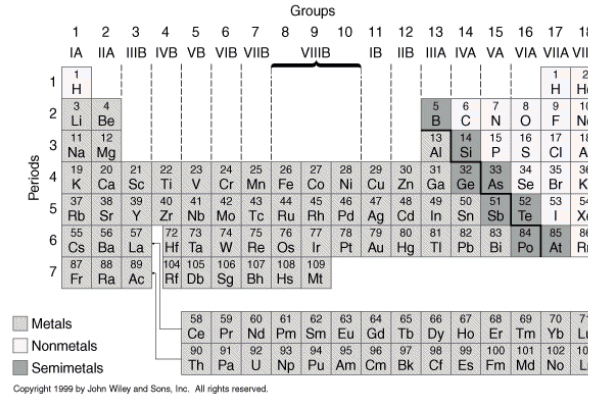


What element is depicted by the picture of the atom? 4 protons = the element with an atomic number of 4= Be

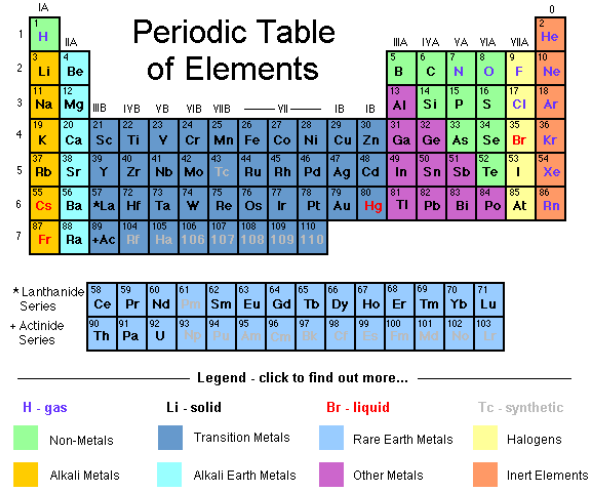
\+ Protons-Positive charge
0 Neutrons –No charge
\- Electrons-Negative charge



Elements in same group have similar properties



Metals lose electrons and become positive ions
Nonmetals gain electrons and become negative ions
Group 18 (noble gas) do not react (do nothing)
Semimetals to left of left of zig zag line act like nonmetals and to the right act like metals



Physical Change

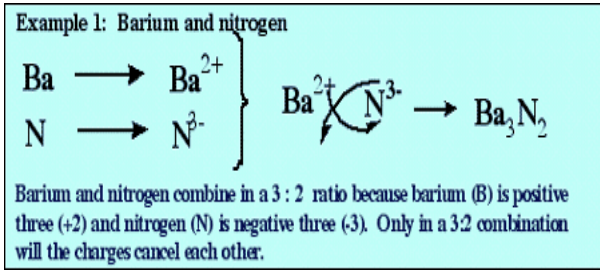
- Changes of state or appearance.
- forming a solution
- Same stuff stays the same stuff.

Chemical Change

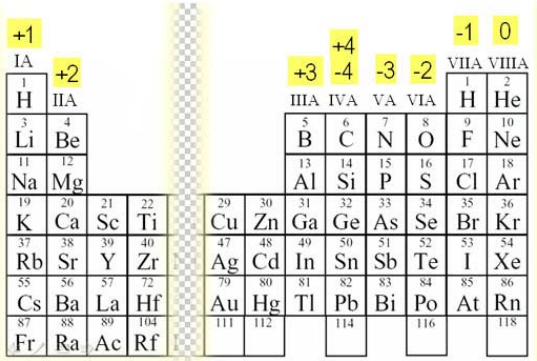
- Release of energy, forms bubbles without heating, two solutions make a solid, color change
- rotting, digestion, with an acid, rusting, burning,
- New substance formed

Writing formulas

Criss cross and reduce oxidation numbers, write metal first

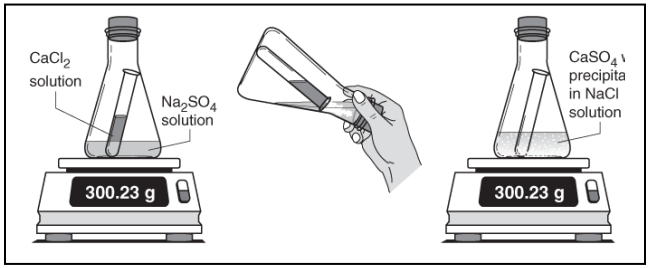


Oxidation numbers metal + nonmetal -



Law of Conservation of Matter

Equations must be balanced because: Law of Conservation of Matter: Same number atoms of each type before and after a reaction, so there must be the same number of atoms on both sides of the equation. **The mass of all the reactants (the substances going into a reaction) must equal the mass of the products (the substances produced by the reaction).**



Balancing an Equation

$$NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$$

1. Draw boxes around all the chemical formulas. Do not change anything inside the box! Here's what the equation looks like:

$$\boxed{NaOH} + \boxed{H_2SO_4} \rightarrow \boxed{Na_2SO_4} + \boxed{H_2O}$$

2. Make an element inventory. Let side of the equation is the before and right side is the after.

$$\boxed{NaOH} + \boxed{H_2SO_4} \rightarrow \boxed{Na_2SO_4} + \boxed{H_2O}$$

Element	Before	After
Na	1	2
O	5	5
H	3	2
S	1	1

3. Write numbers in front of each of the boxes until the inventory for each element is the same both before and after the reaction. Now, what happens when we put a number in front of a formula? Basically, anything in that box is multiplied by that number.

$$2\,\boxed{NaOH} + \boxed{H_2SO_4} \rightarrow \boxed{Na_2SO_4} + \boxed{H_2O}$$

Element	Before	After
Na	2	2
O	6	5
H	4	2
S	1	1

Well, looking at the new inventory, we can see that we now have two sodium atoms on both the left and the right sides, but the others still don't match up. You can see from the inventory that on the right side of the equation, there are two hydrogen atoms and on the left there are four. Put a "**2**" in front of the water on the right side of the equation to make the hydrogens balance out. A new inventory that looks something like this:

$$2\,\boxed{NaOH} + \boxed{H_2SO_4} \rightarrow \boxed{Na_2SO_4} + 2\,\boxed{H_2O}$$

Element	Before	After
Na	2	2
O	6	6
H	4	4
S	1	1

Since both sides of the inventory match, the equation is now balanced! All other equations will balance in exactly the same way, though it might take a few more steps in some cases.

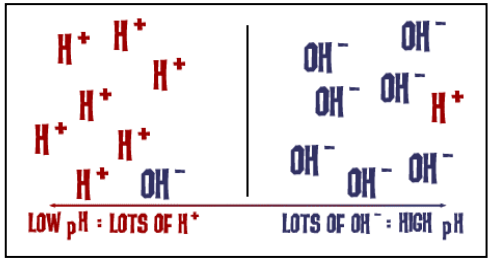
Acids & Bases

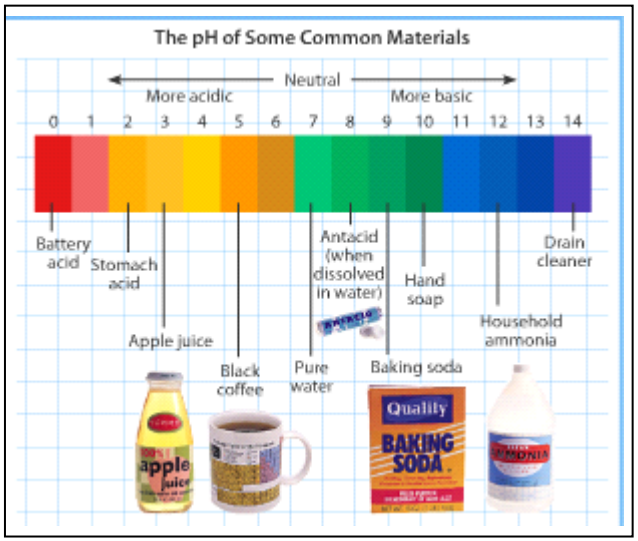
ACIDS

Litmus blue to red, Taste sour, Corrosive to metals, Produce H^+ in water, Less acidic w/ base

BASES

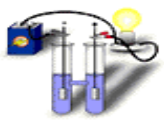
Litmus red to blue, Fell slippery, Produce OH^- in water
Less basic w/ acid





Electrolytes

Strong electrolytes	Non-electrolytes
completely breaks apart into ions	does not break apart
solutions strongly conduct electricity	solutions don't conduct electricity



FACTORS INCREASE THE RATE OF A SOLUTE DISSOLVING IN WATER:

1. grinding, crushing
2. stirring, swirling
3. increase temperature

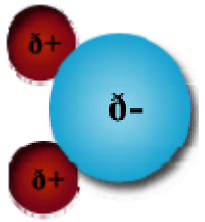
FACTORS INCREASE SOLUBILITY OF A GAS:

1. ↓ temperature ↑ gas solubility
2. ↑ pressure ↑ gas solubility

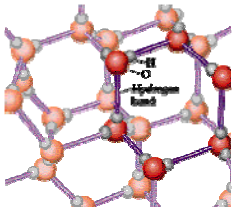
FACTOR INCREASE SOLUBILITY OF A SOLID:

1. ↑ temperature often ↑ solubility

Water



Is polar because of its molecular shape (geometry) →causing may substance to dissolve in water



Ice is less dense than liquid water because of the empty space in ice.

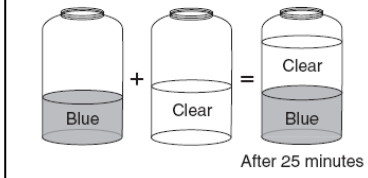
ICE floats and is a good insulator

Density, Viscosity, Buoyancy, Archimedes Principle

Density

Less dense float
more dense sinks

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$



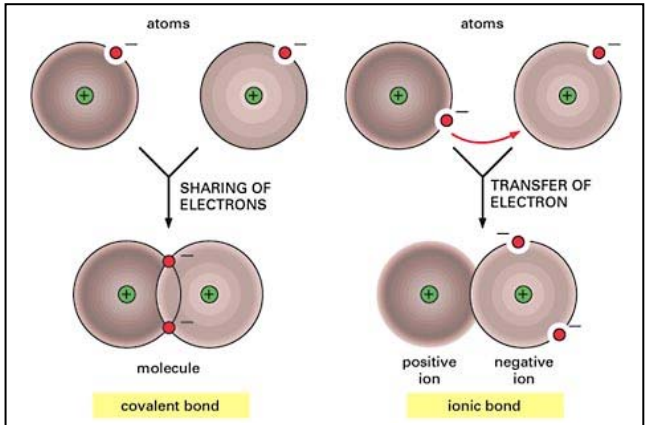
Which is denser?

Viscosity-Resistance to "Flow" –more viscous the slower it pours

Buoyancy- is a measure of the upward pressure a fluid exerts on an object.

Archimedes principle -the force exerted on an object in a liquid is equal to the weight of the fluid displaced by the object

Bonding



Ionic Bonds occurs between metal and a nonmetal atoms or a metal atom and a negative polyatomic ion
Covalent bonds occur between two non-metal atoms

Units To MEMORIZE

Mass- grams (g), kilograms (kg)
Distance- meters (m), centimeters (cm)
Time-seconds, minutes
Force- Newtons (N)
Work or Energy- Joules (J)
Power- Watts (W)
Momentum- kgm/s
Speed or velocity- m/s
Acceleration- m/s^2

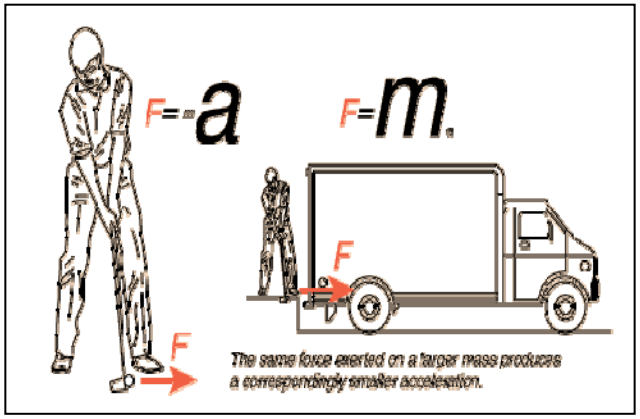
Heat

Conduction:
Transfer from one substance to another by direct contact of molecules.
Example: When you touch a hot stove.
Convection:
Heat carried from one place to another in a liquid or gas as molecules move in currents caused by density differences.
Example: Warm air rising.
Radiation:
Heat carried through empty space in the form of infrared rays.
Example: When you face the sun and feel warmth on your face

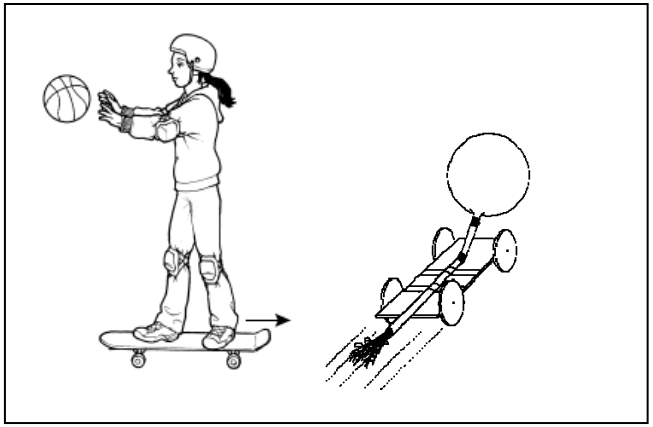
Newton's Laws

1st- **Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it.**

2nd- **F = ma.** Force=Mass times Acceleration



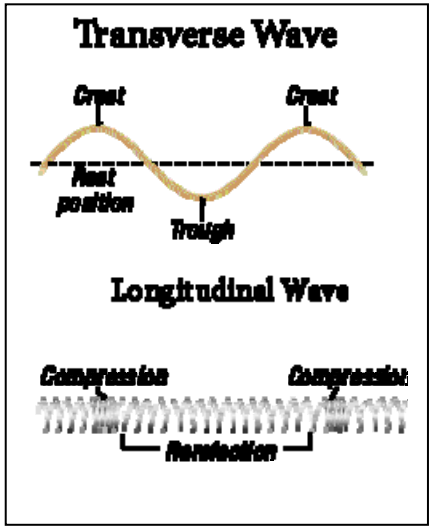
3rd-**For every force there is an equal and opposite reactive force.** Forces <u>always</u> come in pairs - equal and opposite action-reaction force pairs.



Energy

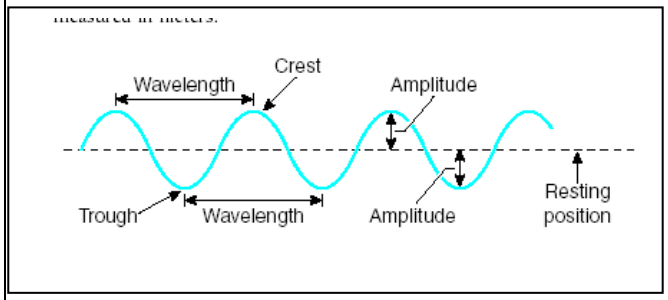
Kinetic Energy-Motion
Potential Energy-Position (Not moving) ball on top o hill
Electrical Energy- Electronics, Generators
Chemical Energy- Batteries, Sugar cells
Solar Energy- Sunlight-Photosynthesis-solar cells
Mechanical Energy-Machines moving
Nuclear Energy- Atoms splitting, decay
Thermal Energy- heat

Types Waves

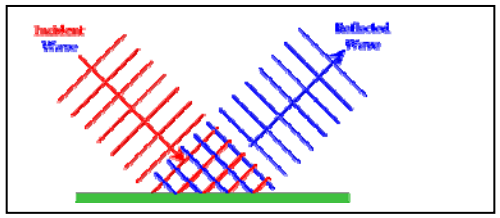


Examples of transverse waves-visible light, Infra Red light, Ultra Violet light, gamma rays, x-rays, AM-FM radio, microwave, etc.
Examples of longitudinal waves-A **loudspeaker** cone moves back-and-forth to create a sound, which is a compression wave. **AC electricity Electrons** move back-and-forth in a wire, sending a wave of electric power through the wire.

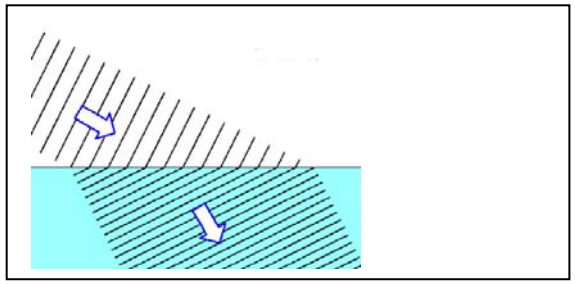
Properties of Waves



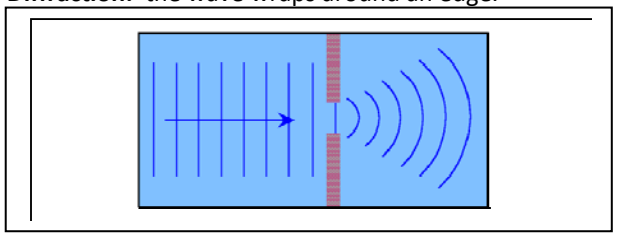
Amplitude is the height of a wave from the resting position. As the energy of a wave increases, amplitude increases.
The **frequency** represents the number of waves that pass by a point every second. As the energy of a wave increases; frequency increases.
Wavelength is the distance between two corresponding points on a wave. As the energy of a wave increases, wavelength decreases.
Reflections: means to bounce off a surface -mirror



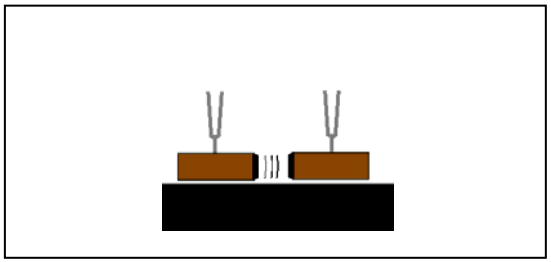
Refractions: means to bend through an object



Diffraction: the wave wraps around an edge.



Frequency
The frequency is the number of cycles (wave's crests) per unit time. Frequency is also called the pitch of a sound. It corresponds to the note in musical sounds. The pitch of a sound is determined by its wavelength or its frequency.
Resonance
When one object vibrating at the same natural frequency of a second object forces that second object into vibrational motion. Resonance is a common cause of sound production in musical instruments.



Polarized light and Filters
- light travels in waves that can go in different directions (up & down, side to side)
- if a filter with slits in only one direction is used , those waves traveling the other direction will be blocked out
- polarized light is the light that makes it through those slits
- glare, the light that makes you squint, is mainly horizontal (sideways) waves and so sunglasses are designed to block out those light waves reducing glare
- filters block out certain wavelengths and allow only certain waves through

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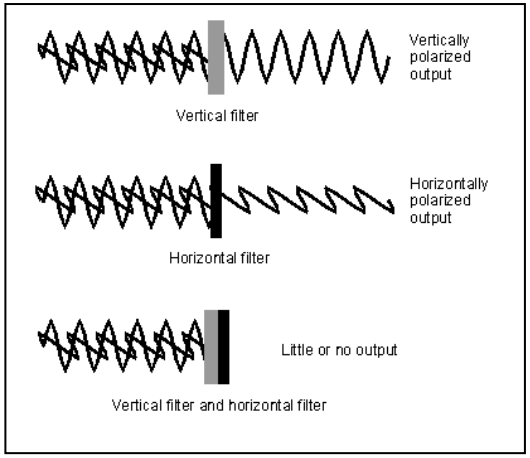
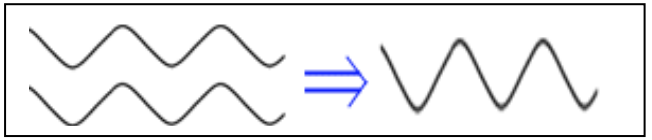
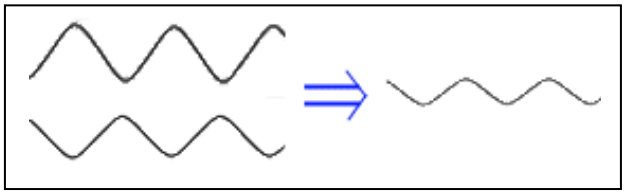


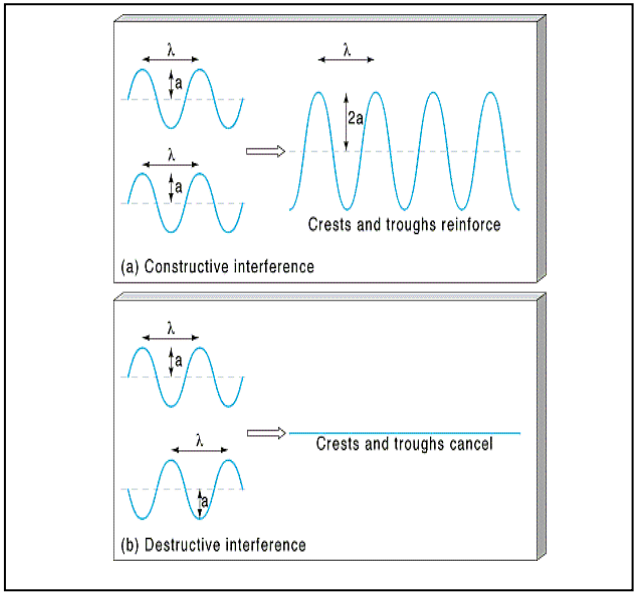
Interference

Constructive interference: If the crests of the original waves line up with one another, the resulting wave will have larger amplitude (height) than either of the original waves.



Destructive Interference: Destructive interference can occur when the crests of one wave line up with the troughs of another wave. In this case, the amplitude of the combined wave is equal to the larger wave's amplitude minus the smaller wave's amplitude. If the waves have the same amplitude, then the waves cancel each other out.





Formula Chart

- On the science chart, the meanings of the letters in the formulas are given to you.
- You must know the measurement units to know what numbers fit to which letter.

The box at the bottom provides some help . . . Let's look

Constants/Conversions		
g = acceleration due to gravity = 9.8 m/s^2		
c = speed of light = 3×10^8 m/s		
speed of sound = 343 m/s at sea level and 20°C		
1 cm^3 = 1 mL		
1 wave cycle/second = 1 hertz (Hz)		
1 calorie (cal) = 4.18 joules		
1000 calories (cal) = 1 Calorie (Cal) = 1 kilocalorie (kcal)		
newton (N) = kgm/s^2		
joule (J) = Nm		
watt (W) = J/s = Nm/s		
volt (V)	ampere (A)	ohm (Ω)

When solving problems

- Match units to formulas on the formula page.
- Time should be in seconds for all formulas.
- When calculating Force, Momentum, Work and Power mass must be in Kilograms.
- Work and energy must be in Joules or Newton-meters (Nm).

What is the net force exerted on a 90.0 kg race-car driver while the race car is accelerating from 0 to 44.7 m/s in 4.50 s?

The following information is used from the formula chart

$$\text{Force} = \text{mass} \times \text{acceleration}$$

$$F = ma$$

$$\text{Acceleration} = \frac{\text{final velocity} - \text{initial velocity}}{\text{change in time}}$$

$$a = \frac{v_f - v_i}{\Delta t}$$

We see kg, but not m/s^2, so we have to calculate acceleration first. .

Acceleration = $\frac{Vf - Vi}{\text{time}}$

A = $\frac{44.7 - 0}{4.5}$ = 9.9 m/s^2

F= ma = 90.0kg x 9.9 m/s^2 = 893.9 N

Science questions sometimes give more information than is needed.

A person pushes a large box across a level floor by applying a horizontal force of 200 N. If the person pushes the box a distance of 5 meters in ~~10 seconds~~, how much work does the person do on the box?

$$\text{Work} = \text{force} \times \text{distance}$$

$$W = Fd$$

Time is not needed to find work

Work = force x distance

No mention of time!
W= Fd
200N x 5 m = 1000 joules