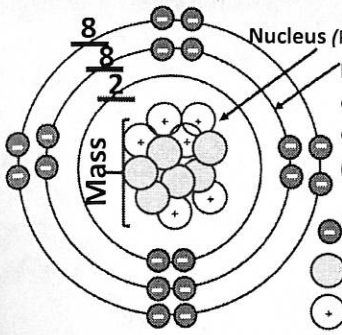
Science Benchmark #1 Review Guide



Parts of an Atom

Sub-atomic particle	Location	Charge	Mass
Protons	Nucleus	+	1
Neutrons	Nucleus	o	1
Electrons	Energy levels, electron clouds, orbits	-	0

Protons determine the **IDENTIY** of an atom.

Mass of an atom is found in the **NUCLEUS**.

Bohr Model

Atomic #
Protons
Electrons
} Same #

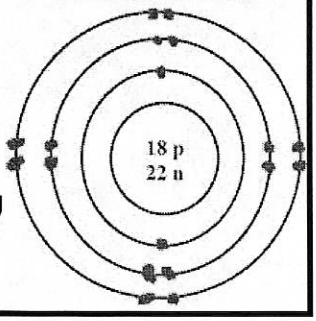
Mass
-**A**tomic #
=**N**eutrons

Example:

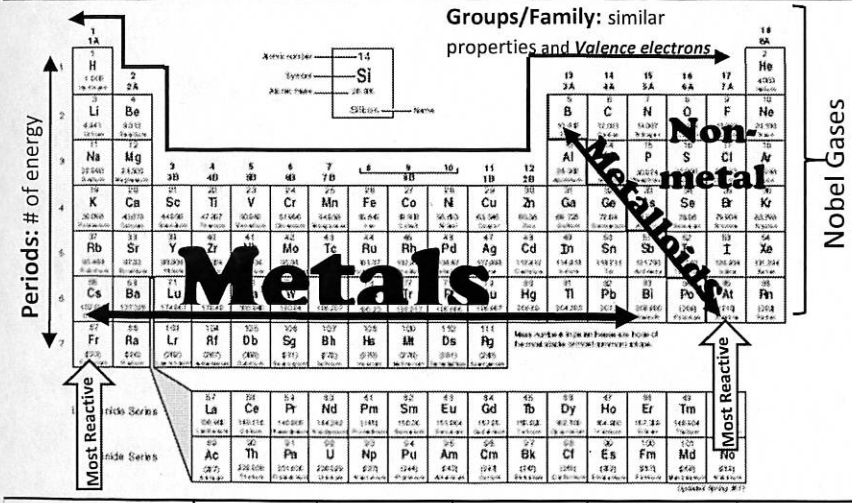
Ar

A= 18
P= 18
E= 18
M= 40 ***(39.9 rounded)***
-A= 18
=N= 22

Bohr Model: Ar



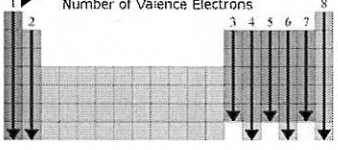
Periodic Table of Elements



Properties	Location	Luster (*shine*)	Conducts *Heat & Electricity*	Malleability *(bend/flatten)*	Reacts with
Metals	left	yes	yes	yes	non-metals
Non-Metals	right	no (dull)	no	no	metals
Metalloids	staircase	sometimes	sometimes	sometimes	both
Nobel gases	group 18	no	no	no	NONE

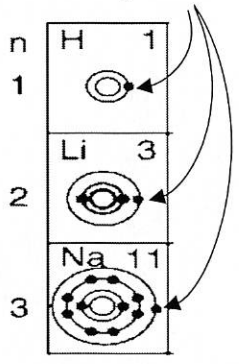
Valence electron

- Determined by ***GROUP #***
- Electrons in ***OUTERMOST*** energy level
- Determines an atoms ***REACTIVITY***



Example:

Group #



Group #1 = ALL have **1** valence electron

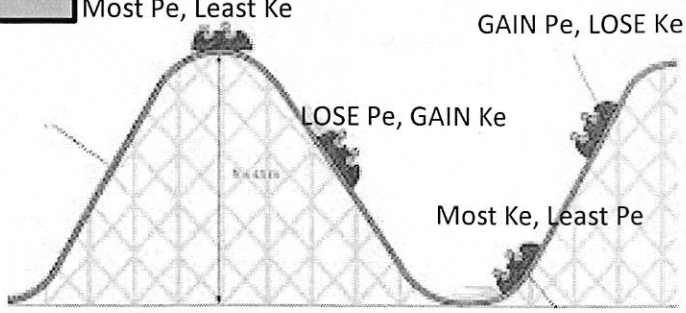
Potential and Kinetic Energy

Potential Energy: ***stored*** energy (increase ***UP***, decrease ***DOWN***)

- **Most Pe**= *highest point*
- **Least Pe**= *Lowest point*

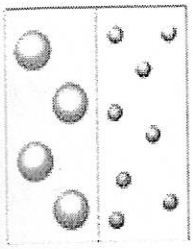
Kinetic Energy: ***moving*** energy (increase ***DOWN***, decrease ***UP***)

- **Most Ke**= *lowest* point
- **Least Ke**= *highest* point

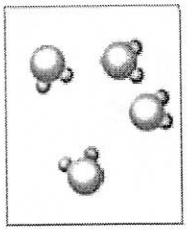


Chemical Formulas

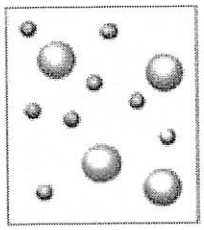
Element: **1 TYPE** of atom, ***cannot*** be separated easily.



Compound: **2 or More DIFFERENT TYPES of** atoms bonded together, NOT easily separated



Mixture: **MIX** of elements, compounds or both. ***NOT*** bonded together, ***EASILY*** be separated.



Counting Atoms: (Molecule: 2 or more atoms)

- **Subscript-H_2**: only applies to the atom *directly behind* it.
- **Subscript outside parenthesis- $(H_2O)_2$:** applies to **ALL** atoms **INSIDE** parenthesis (***multiply each atom by that B number***).
- **Coefficient-$2H_20$:** applies to all atoms after the number **UNTIL** you reach a (+) sign (***multiply every atom by that number***).

Coefficients

$$2\,H_2 + O_2 \rightarrow 2\,H_2O$$

Subscripts

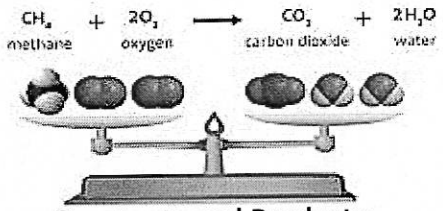
- **EX:**

$$14.\ Al_2(SO_2)_3$$

Type of Atom	# of Atoms
Al	2
S	3
O	12
Total = 3	**Total = 17**

Law Conservation of Mass

- Matter can **NOT** be created nor destroyed in a chemical reaction.
- **Atoms** must remain ***EQUAL*** for both reactants and products.
- When atoms remain the same, ***MASS*** also remains the same on both sides.



Reactants and Products:

$$2H_2 + O_2 \rightarrow 2H_2O$$

reactants *products*

Balanced / Unbalanced equation

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

C=1		C=1	***Balanced Equation***
H=4	=	H=4	
O=4		O=4	

$$CH_4 + O_2 \rightarrow CO_2 + H_2O$$

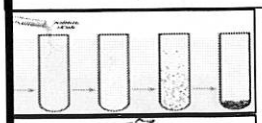
C=1		C=1	***Unbalanced Equation***
H=4	≠	H=2	
O=2		O=3	

Chemical Reactions

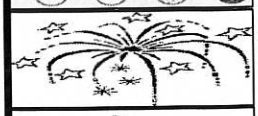
Please, Excuse, The, Coughs, Sneezes, Burps, Or Farts

Physical Properties: Changing matters physical appearance, **NOT** changing it chemically.

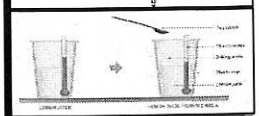
Chemical Properties: Changing matter ***chemically***.
Produces NEW SUBSTANCE with NEW PROPERTIES.***
Ex: baking cake, cooking egg



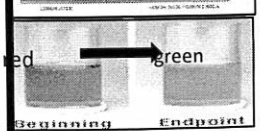
Precipitate (solid Particles or cloudy)



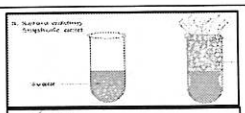
Energy Release (light, sound, explosion)



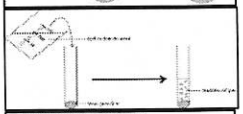
Temperature change (increase or decrease)



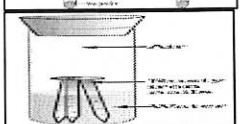
Color Change



Smell (odor release)



Bubbles, foam, fizz (gas production)

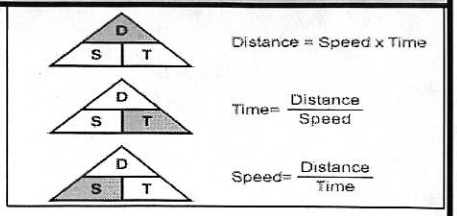


Oxidation (rust)

Flammability (burn)

Force and Motion

Speed



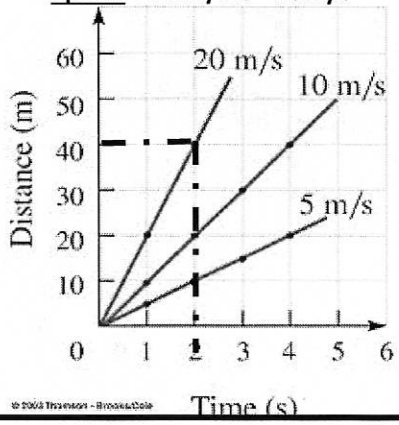
Calculating Speed:

A plane takes 6 hours to fly 2,000 km. What was the plane's speed?

S=D/T | S=? T=6hr D=2000km | S=2000km x 6hr =333.3km

Calculating Speed from graph

Speed= 40m / 2s= 20m/s



Speed, Velocity, Acceleration

Speed: ***DISTANCE*** traveled over a ***TIME*** period.

Eduardo rode his skateboard 10 meters in 1 second.

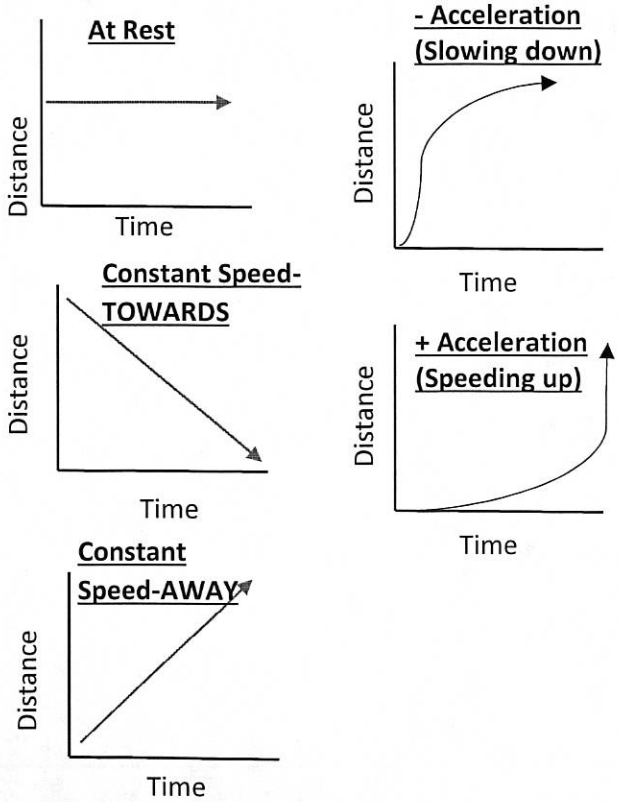
Velocity: ***SPEED*** plus ***DIRECTION.***

A tornado moves east toward Houston at 30 km/hr

Acceleration: Rate of ***SPEED*** plus ***DIRECTIONAL CHANGE*** (+acceleration, acceleration -).

An airplane slows down at a rate of 3 m/s²

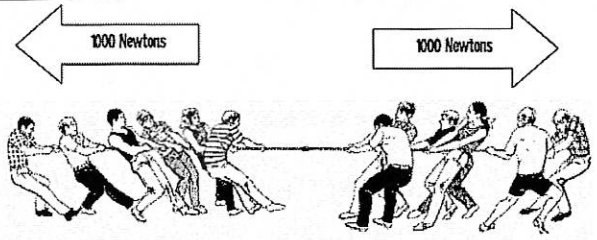
Distance Time Graphs



Forces

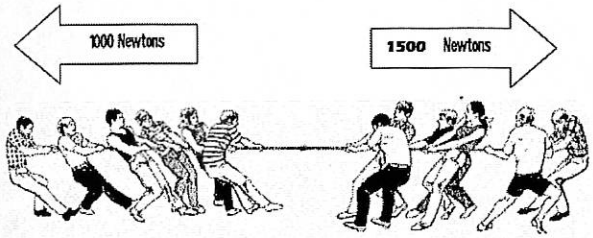
Forces: ***PUSH*** or ***PULL*** and they act in ***PAIRS***
Net Force: **TOTAL** force acting on the object
Forces are still applied on objects not moving (sitting)

- **Balanced force:** When the net forces are *equal= **NOT MOVING***



Net Force= 1000N – 1000N = 0 (***NOT MOVING***)

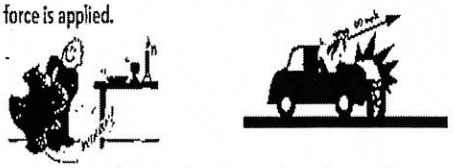
Unbalanced forces: When the net forces are *NOT Equal= **MOVING***



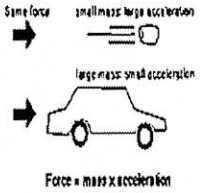
Net Force= 1500N – 1000N = 500N to the ***RIGHT (MOVING)***

Newton's Laws of Motion

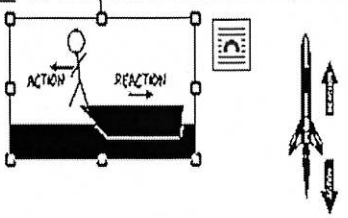
1st Law of Motion (Inertia Law): An object at rest will remain at rest until an unbalanced force is applied. An object in motion will remain in motion at the ***same speed*** and ***direction*** until an unbalanced force is applied.



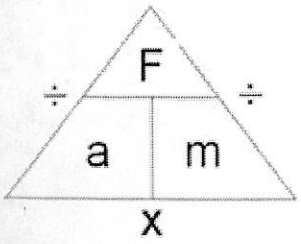
2nd Law of Motion: The acceleration of an object is dependent on the amount of force applied and the mass of the object.



3rd Law of Motion: for every action there is an ***EQUAL*** but ***OPPOSITE*** reaction.



Force Calculations



Equations:

- F= m x a
- a= f ÷ m
- m= f ÷ a

Units:

- F= N (newton)
- a= m/s^2
- m= Kg

A student uses a magnet to move a 0.025 kg metal ball. The magnet exerts a force of 5 N which causes the ball to begin moving. What is the acceleration of the ball when it begins to move?

A 200 m/s^2

B 0.125 m/s^2

C 5 m/s^2

D 5.025 m/s^2

Question:
(Equation)

a= f ÷ m

Variables:

f= 5N
a=?
m= 0.025kg

Plug variables into equation:

a= 5N ÷ 0.025 kgFr
= 200m/s^2