First and Last Name:_____

Date: _____

Science **8** Block ____

CHEMISTRY UNIT – *Reviewing important terms*

The Kinetic Molecular Theory explains
the movement of particles in solids, liquids and gases.

Matter is
anything that has a mass and volume.
All solids liquids and gases are types of matter.

Mass is
the amount of matter in an object.
Mass is the quantity of matter that a substance or object contains.
Usually measured in: g, kg

Volume is
the amount of space taken up by a substance or object.
Usually measured in: mL, L, or cm^3. (1 cm^3 = 1 mL)

Shape is
the form in which a solid, liquid, or gas can be found

Flow is
the movement of a solid, liquid, or gas

STATE	EXAMPLE	PROPERTIES
SOLID	Pen Book Table Ice cube	**Volume** – has a fixed volume (volume does not change)
		Shape– has a fixed shape (holds its shape)
		Flow– can **NOT** flow *Discuss sugar and marble*
LIQUID	Milk Water Coke	**Volume**– has a fixed volume Eg. 250 mL of milk
		Shape– takes the shape of the container Eg. water in test tube vs. water in flask and beaker
		Flow - CAN flow
GAS	Oxygen Helium Nitrogen	**Volume**– takes the volume of the container Eg. BBQ tank, compressed gas cylinder
		Shape– takes the shape of the container Eg. gas in syringe, gas in room, gas in diver's tank
		Flow- CAN flow

PLASMA is the fourth state of matter.

It is similar to a gas (does NOT have a defined shape or fixed volume), but plasma have different electrical properties than gases.

Examples are the Sun, a fork of lightning, the glowing gas of a neon sign.

THE CHANGING STATES OF MATTER

Name:_____

Date:_____Section:_____

Can you identify which change of state is occurring in each of the following? ✎

MELTING - changing from a solid to a liquid

VAPOURIZATION - changing from a liquid to a gas

Slow vapourization is called **EVAPORATION**

Fast vapourization is called **BOILING**

CONDENSATION - changing from a gas to a liquid

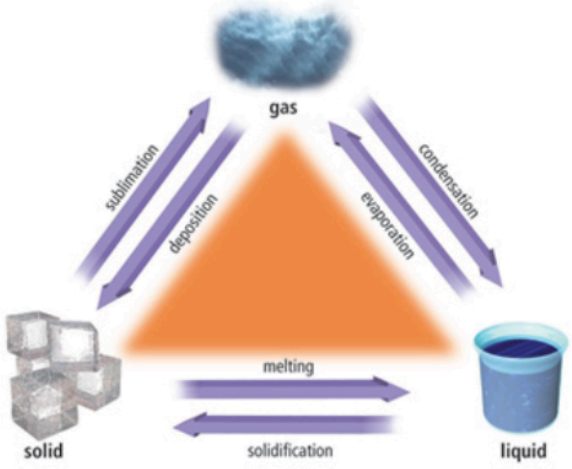
FREEZING - changing from a liquid to a solid

-also called **SOLIDIFICATION**

SUBLIMATION - changing from a solid to a gas

DEPOSITION - changing from a gas to a solid

Label the six arrows on the diagram below, showing all of the changes of states ✎



**Colour the arrow Blue if the change of state occurs as a result of losing heat

**Colour the arrow Red if the change of state is caused by Heat Increase

THE PARTICLE MODEL OF MATTER

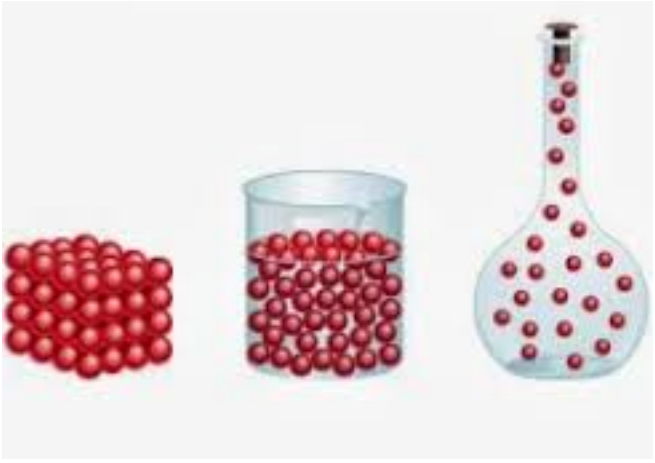
A **model** is used in Science to explain things that can not be seen.

1. All matter is made up of very small microscopic particles.
   That is,
   Solids, Liquids, and Gases all consist of very tiny particles that you can not see with the naked eye.

2. In solids, the gaps between particles are small,
   and the particles remained tightly clumped together.

3. In liquids, the gaps between particles are large,
   and the liquid particles can slide past each other.

4. In gases, the gaps between particles are much larger,
   there is more empty space between gas particles.
   Gas particles have much more room to move around.



SOLID LIQUID GAS

THE KINETIC MOLECULAR THEORY

KINETIC means moving.

MOLECULES are particles of matter.

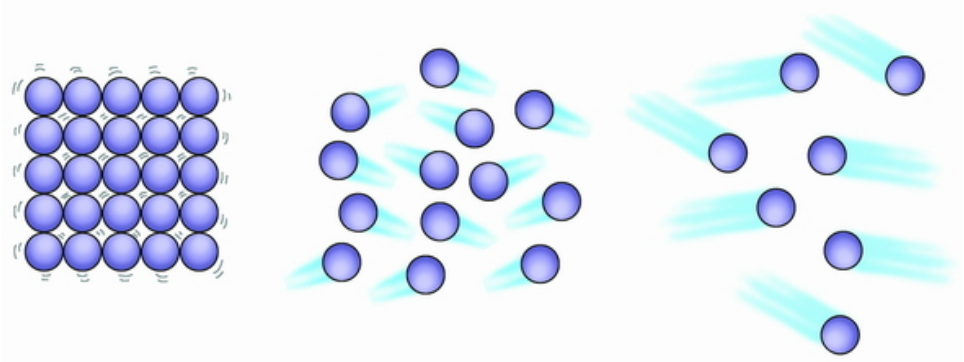
A **THEORY** is used to explain observations.

The Kinetic Molecular Theory explains our observations of moving particles of matter.

- **THE KMT IS A REVISED VERSION OF THE PARTICLE MODEL OF MATTER.**
- **IT EXPLAINS THE MOVEMENT (AND NOT JUST THE ARRANGEMENT) OF THE PARTICLES IN A SOLID, LIQUID, OR GAS.**
- **IT EXPLAINS WHAT HAPPENS WHEN HEAT IS ADDED TO MATTER.**

There are eight statements in the **Kinetic Molecular Theory**:

1. All ___**MATTER**___ (solid, liquid and gas) is made up of tiny particles.
2. These particles are in constant _**MOTION**_.
   This means they have kinetic energy ("_**MOVING**_" energy).
3. There are __**SPACES**__ between the particles of matter.
4. The particles and spaces are so __**SMALL**__ that they can not be seen.
5. In a __**SOLID**_, the particles are very close together, and the spaces between the particles are small. Particles of a solid can not move very fast, but can only vibrate.
6. In a _**LIQUID**__, the particles are slightly farther apart, because the spaces between the particles are larger. Liquid particles move slightly _**FASTER**_ than solid particles.
7. In a __**GAS**_, the particles are very far apart. The spaces between the gas particles are very large. Gas particles can move very _**FAST**_.
8. If __**HEAT**__ is added to matter, the particles gain kinetic energy, and so they can move faster.



SOLID **LIQUID** **GAS**

Temperature, Thermal Energy and Heat

Thermal Energy is **heat.**

Heat and Temperature are **NOT** the same thing.

Heat or Thermal Energy is the total energy of all the particles in an object.

-Heat depends on the size of the object.
eg. a pot of hot soup has more thermal energy than a cup of hot soup

Temperature is a measure of the speed of the particles

-Temperature does **NOT** depend on the size of the object.
eg. a cup of soup and a pot of soup have the same temperature.

Low temperature- slow moving particles

High temperature – fast moving particles

Thermometers measure temperature.

Fahrenheit scale: measures water freezing at $32^{o}F$

Celsius scale: measures water freezing at $0^{o}C$

Heat Transfer

Heat transfer involves the movement of heat from a hot object to a cold one.

MEASURING TEMPERATURE:

-What did Anders Celsius do that makes his name famous?

He developed the thermometer (or hotness meter).
He did this by putting a tube full of mercury into a flask containing ice. The mercury "shrunk" inside the tube, (the level of mercury moved downwards). He marked off the spot where the mercury moved to, and labeled it 0 degrees Celsius.
Then he put the tube of mercury into boiling water and watched the mercury level rise in the tube. He marked off the spot where the mercury rose to, and labeled it 100 degrees Celsius.
Basically, a thermometer is a scale of 0 to 100 on how much mercury *expands* or *contracts* in a given width of tube!

Connection to the KMT:
-speed of molecules as heat energy is being added to them -eg. hot water molecules transfer their heat energy through the glass onto the mercury molecules, and then they start to speed up.
-expansion of molecules as they heat up - eg. mercury that is not moving faster wants to spread out, so when they are inside this tube, in order to expand, they have to move upwards.

ROOM TEMPERATURE: 20 or 25 degrees Celsius
BODY TEMPERATURE: 37 degrees Celsius

LOWEST POSSIBLE TEMPERATURE:

The lowest possible temperature is called **absolute zero**. It is -273^{o}C.
It is the lowest Kinetic Energy that molecules can have (note molecules always have to have a little bit of Kinetic energy - because all molecules are in constant motion).
So, absolute zero is the slowest that molecules can move.
Sometime scientists find negative temperatures awkward. So they use the Kelvin scale for temperature. The Kelvin scale was developed by British Scientist and engineer Lord Kelvin.
O K = -273^{o}C
273 K = 0^{o}C
373 K = 100^{o}C

HIGHEST POSSIBLE TEMPERATURE:

UNKNOWN!