

PHYSICAL AND CHEMICAL CHANGES NOTES



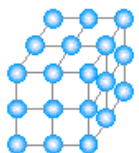
I. A. **Physical properties:** can be observed or measured **WITHOUT** chemically changing a substance.

B. **Chemical properties:** determines whether or not a substance will **REACT** chemically.

II. **PHASE:** a state in which matter can exist. There are 4 basic types

1. **SOLID**
2. **LIQUID**
3. **GAS**
4. **PLASMA**
- (5. Bose-Einstein condensates)

A. **Solids:** matter with a definite **SHAPE** and a definite **VOLUME**.



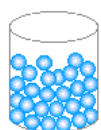
1. **CRYSTALLINE solids:** solid made of molecules arranged in a regular repeating pattern.

Ex: **DIAMOND, TABLE SALT (NaCl), SUGAR**

2. **AMORPHOUS solid:** solid made of molecules **NOT** arranged in a repeating pattern; particles slowly flow around each other.

Ex: **GLASS, RUBBER, POLYMER, COTTON CANDY**

B. **Liquids:** matter with **NO** definite shape but with a definite **VOLUME**.



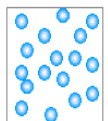
1. **Viscosity:** the **RESISTANCE** of a liquid to **FLOW**.

Ex: **TAP WATER, GASOLINE** → low viscosity

HONEY, MOTOR OIL, KETCHUP → high viscosity



C. **Gases:** matter with **NO** definite shape and **NO** definite volume.



1. The *behavior* of gases depends on:

- a. arrangement of particles
- b. movement of particles

2. **Gas Laws**

a. **Boyle's Law:** the volume of a fixed amount of gas varies **INVERSELY** with the pressure exerted on it.

BOYLE'S LAW

Pressure	Volume
INCREASES (__ collisions)	DECREASES (LESS space)
DECREASES (__ collisions)	INCREASES (MORE space)

Ex: **SHAKING A CAN OF SODA & OPENING IT**

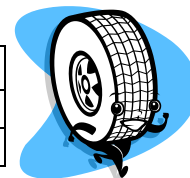


b. **Charles's Law:** the volume of a fixed amount of gas varies **DIRECTLY** with the temperature of the gas.



CHARLES'S LAW

Temperature	Volume
INCREASES	INCREASES
DECREASES	DECREASES



Ex: **IN THE WINTER, CAR TIRES DEFLATE A BIT.**

D. **Plasma:** matter that has extremely **HIGH** energy and **CANNOT** be contained by ordinary means.

Plasma is **RARE** on Earth. Ex: **SUN**, stars, & lightning; most abundant phase in universe.



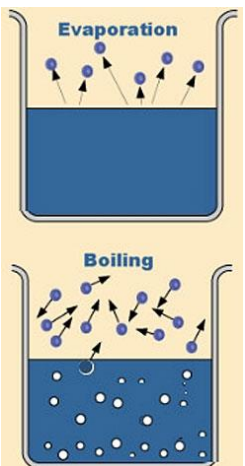


Man-made plasma = neon signs & fluorescent bulbs.



III. Matter changes phases when energy is: a. added / absorbed = **ENDOTHERMIC**

OR

b. taken away / released = **EXOTHERMIC**

Phase Change Term	Change in State	NOTES
<u>MELTING</u>	Solid → Liquid 	❖ Energy is <u>ABSORBED</u> (<u>ENDO</u> thermic) Ex: _____
<u>FREEZING</u>	Liquid → Solid 	❖ Energy is <u>RELEASED</u> (<u>EXO</u> thermic) Ex: frozen pond
<u>VAPORIZATION</u> a. Evaporation b. Boiling	Liquid → Gas 	❖ Energy is <u>ABSORBED</u> (<u>ENDO</u> thermic) a. <u>MOLECULES ESCAPE AT THE TOP OF THE SURFACE</u> Ex: <u>SWEATING</u> b. <u>MOLECULES ESCAPE INSIDE THE LIQUID & AT THE SURFACE</u> Ex: bubbling water on stove
<u>CONDENSATION</u>	Gas → Liquid 	❖ Energy is <u>RELEASED</u> (<u>EXO</u> thermic) Ex: fogged mirror during a hot shower
SUBLIMATION	Solid → Gas	❖ Energy is <u>ABSORBED</u> (<u>ENDO</u> thermic) Ex: <u>DRY ICE (FROZEN CO₂)</u> 
DEPOSITION	Gas → Solid	❖ Energy is released (<u>EXO</u> thermic) Ex: water particles in air directly freezing on a car window shield