

# States Of Matter 1

Chemistry :

-> branch of science is

-> also a staged study of matter, anything that has mass and everything around us all matters are made of particle.

# chemistry is the study of matter, its properties, composition and structure, how and why substance compound combine and form new substances, and also how they interact with energy.

chemistry has five major branches:

- 1) organic chemistry.
- 2) Inorganic Chemistry,
- 3) physical chemistry,
- 4) analytical chemistry,
- 5) Biochemistry.

Field of study:

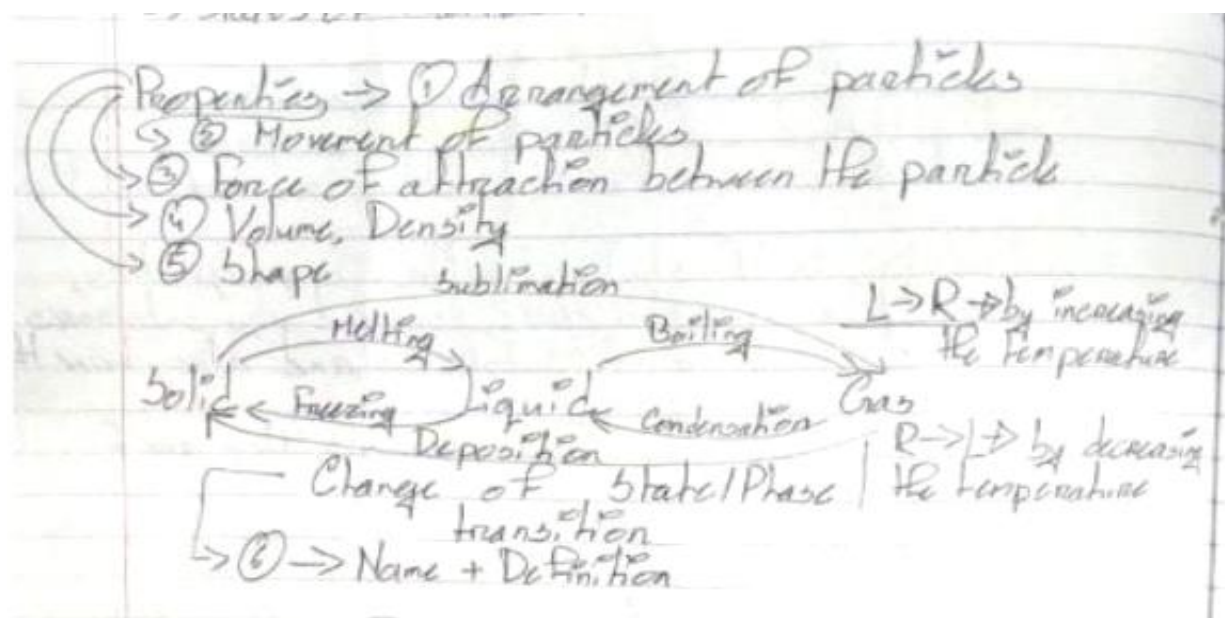
- 1) chemical engineering,
- 2) forensic chemistry,
- 3) environmental chemistry.
- 4) Food Chemistry.

We're going to classify matter into 3 categories based on properties:

- 1) solid,
- 2) liquid and
- 3) Gas

States of matter/phase properties:

- 1) arrangement of particles.
- 2) movement of particles.
- 3) force of attraction between the particle.
- 4) volume density
- 5) Shape.



## Definition format: **(name of the process)** is the change of state from initial to final state, by **(increasing or decreasing)** the

temperature, such as,

- 1) **Melting** is the change of state from **solid to liquid** by increasing the temperature is still water boiling is the change of state from liquid to gas by **increasing** the temperature. (ICE -- > WATER)
- 2) **Sublimation** is the change of state from **solid to gas** directly by **increasing** the temperature. (WATER-->STEAM)
- 3) **Freezing** is this change in state of matter from **liquid to gas** by **decreasing** the temperature .(ICE TO WATER)
- 4) **Condensation** is the change of state from **gas to liquid** by **decreasing** the temperature (when Steam is turned into water.)
- 5) **Deposition** is the change of state from **gas to liquid** directly by **decreasing** the temperature (from steam to ice).

Example,

solid, ---> ICE,




liquid ---> water and

gas ---> water vapor or steam

All matters, either exist as solid, liquid or gas. We can convert solid into liquid by heating and eating and filter.

Eating charges liquid to guess.Change of a substance from one state to another is called a change of state or phase transition.

- 1) Temperature at which all of the solid becomes a liquid is called melting point.
- 2) Temperature at which, of a liquid becomes a gaseous called boiling point.
- 3) The process of conversion from **solid to liquid** is known as melting, it is also sometimes referred as fusion
- 4) The conversion of liquid to solid is known as freezing.
- 5) **Boiling or vaporization** is the change of a liquid into a gas
- 6) The conversion of gas to a liquid is known as **condensation**. It is also referred to liquid deification for example h2 Or gas h2 or liquid.
- 7) There are certain elements or compounds that charge there state directly from solid to gas, this specific occurrence is called **sublimation**. the vice versa is known as the **deposition**.

	Solid	Liquid	Gas
Diagram			
Arrangement of Particles	Particles are arranged regularly and in a repeating pattern called lattice.	Particles are arranged irregularly and randomly.	Particles are arranged irregularly and randomly.
Separation of Particles	Particles are very tightly or closely packed. They are also touching one another.	Particles are tightly and closely packed. Some are touching one another.	Particles are very loosely packed. They are separated and far away from each other.
Movement of Particle	Particles vibrate about a fixed position, they do not move.	Particles move/flow from one place to another freely, randomly and slowly.*	Particles move/flow from one place to another, freely, randomly and quickly. So the particles collide with each other.
Force of Attraction between Particles	Very strong	Stronger but slightly weaker than solid.	Non-existent

#### Solid:

- 1) fixed volume
- 2) Definite Shape
- 3) non compressible
- 4) particles are closely packed particles,
- 5) vibrate about in fixed position.
- 6) strong force of attraction between particles.

#### Liquid:

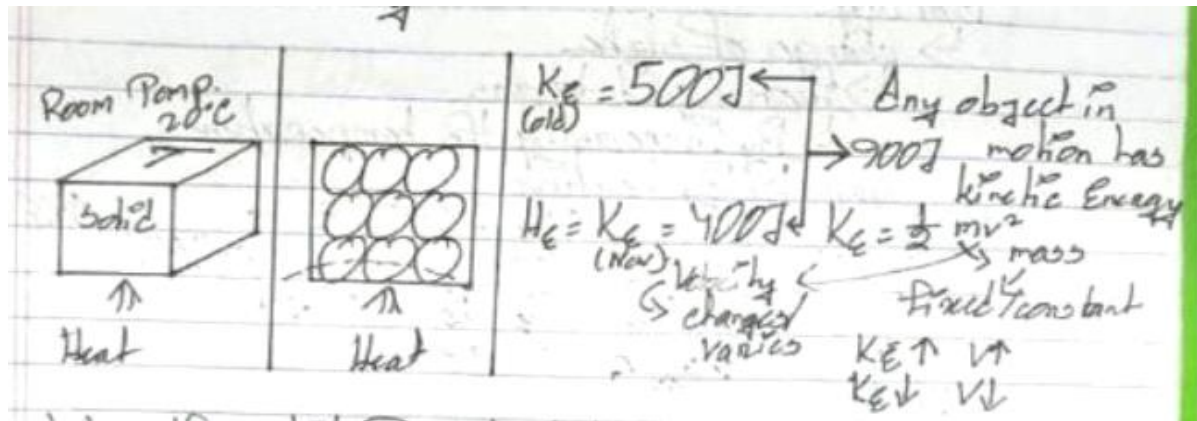
- 1) fixed volume,
- 2) take the shape of the container,
- 3) not compressible
- 4) particles are closely packed, (less than the solid) particles,
- 5) slide past each other.
- 6) moderate force of attraction

#### Gas:

- 1) no fixed volume,
- 2) take the shape of the container,

- 3) highly compressible
- 4) particles are far apart.
- 5) Particles moves randomly,
- 6) Less force of attraction.
- 7) So the particles, slide over each other.

**Melting** is a change of state, from solid to liquid by decreasing the temperature by increasing the temperature as in heating.



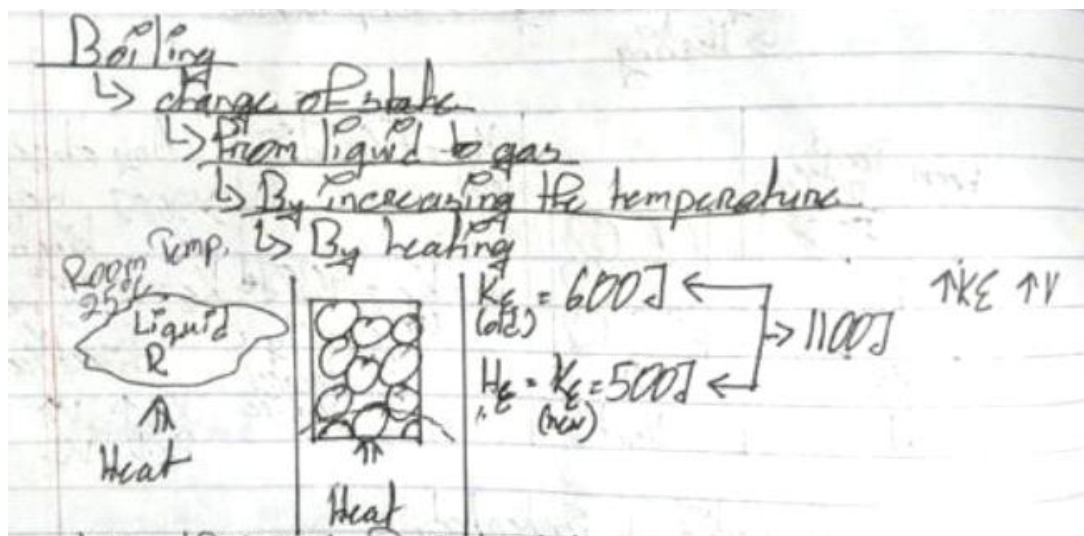
When the solid **T**, is heated.

- 1) The particles gains/absorbs heat energy as kinetic energy,
- 2) so the kinetic energy of the particles increases.
- 3) As the kinetic energy of the particles increases the velocity of the particles also increases and thus they vibrate faster.

The heat energy eventually brought through

- 4) The heat energy eventually spreads throughout the solid and the temperatures in the solid increases.
- 5) At certain temperature, The force of attraction between particles is partially broken or partially over come and the solid melts into a liquid. The certain temperature at which solid melts into all liquid is known as melting point.

### Boiling:



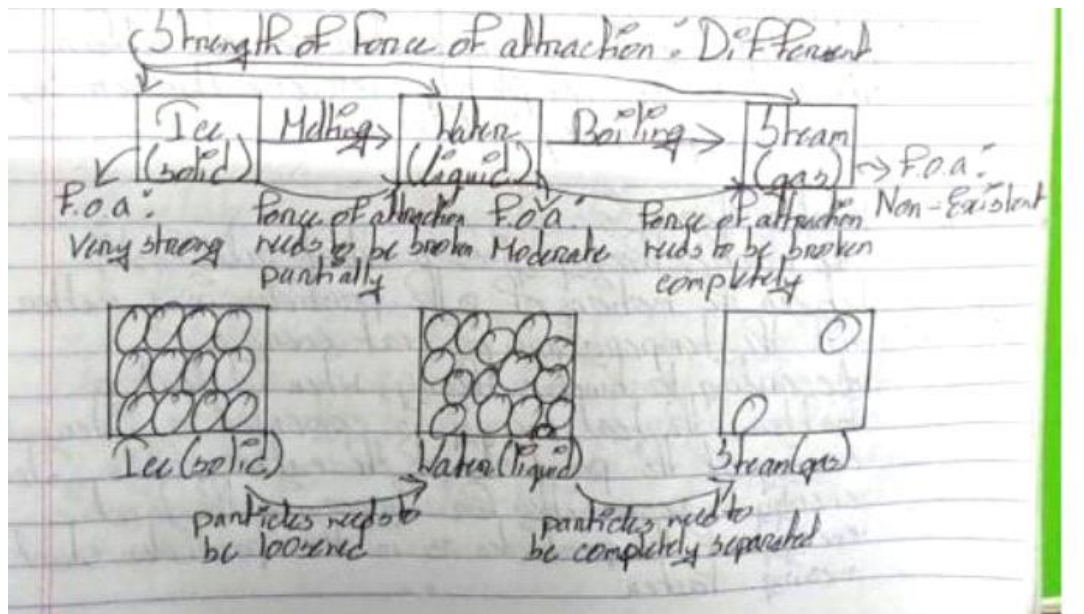
When the liquid **R** is heated

- 1) the particles gains the heat energy as kinetic energy,

- 2) so the initial kinetic energy of the particles increases.
- 3) As the kinetic energy of the particles increases, the velocity of the particles also increases and as they move faster.
- 4) The heat energy eventually spreads throughout the liquid and the temperature of the liquid increases.
- 5) At a certain temperature the molecule or force of attraction between the particles is completely overcome and liquid converts into gas.
- 6) The certain temperature at which the liquid boils into the, into our gas is known as Boiling Point.

### States of matter: boiling point.

It is the temperature at which all of liquid becomes a gas .



### #QUESTION 1:

Explain why it requires less energy to be converted a certain amount of ice to water then to convert the same amount of water into steam/Water vapour.

Answer: ice to water :

particles in solid ice needs to loosened and intramolecular force between them need to be partially overcome are broken so less energy is required.

water to steam:

particles in water need to be completely separated, and then create intermolecular force of attraction between the need to be completely overcome or broken, some more energies required kinetic energy.

### kinetic theory:

kinetic theory gives a relationship between the motions of the particles in the matter with the temperature on heat energy. According to kinetic theory when we heat a matter of the heat energy is converted into internal energy of the particles of the matter. These intense energy is responsible for increasing the kinetic energy of the particles, as in the particles stand moving faster.

**In case of a solid** when the particles have gained enough and kinetic energy the intermolecular force of attraction between the particles is broken or overcome and solid is converted into liquid.

**In case of liquid**, if the particles gain enough kinetic energy the intermolecular force of attraction between the particles is broken or overcome and they can escape through the surface, converting into gas.

### ##Determining the physical state of a substance, at a given particular temperature



In order to determine if the physical state of a substance at a given temperature, we have to compare the given temperature with melting point and boiling point of the substance.

A substance is in **solid state**, if the given particular temperature is **less than the melting point and the boiling point** of the substance,

A substance is in **liquid state**, if the given particular temperature is **greater than/ equal to the melting point and less than the boiling point** of the substance.

A substance is in **gaseous state**, i.e, the effect given particular temperature is **greater than or equal to the sole boiling point** of the substance.

$  \begin{aligned}  T &< \text{m.p and b.p} \rightarrow \text{Solid} \\  T &\geq \text{m.p and } < \text{b.p} \rightarrow \text{Liquid} \\  T &\geq \text{m.p and } \geq \text{b.p} \rightarrow \text{Gas}  \end{aligned}  $			
Given/Current Temp	Melting Point	Boiling Point	State
Temp = 20°C			
Substance A	100°C	870°C	Solid
Substance B	10°C	30°C	Liquid
Substance C	10°C	19°C	Gas
Temp = 35°C			
Substance D	35°C	100°C	Liquid
Substance E	0°C	35°C	<del>Liquid</del> Gas
Substance F	200°C	1000°C	Solid

# Home-work:

Substance	Melting Point	Boiling Point	State	Current Temp
1) M	-10	100	Liquid	
2) A	35	120	Liquid	
3) N	100	1500	Solid	35°C
4) G	20	35	S & Gas	
5) O	20	34	Liquid	
6) E	20 (sublimation)		Gas	