
STATES OF MATTER

MATTER:

"Anything having mass and occupies space is called matter."

KINETIC MOLECULAR THEORY OF MATTER:

- i. Matter is made up of very small particles i.e. molecules, atoms or ion.
- ii. These molecules are in some state of motion, hence they possess kinetic energy. Their motion can be translational, vibrational and rotational.
- iii. The molecules of these substances attract each other with a force which depends upon the distance between them. The force of attraction decreases with the increase of the distance between the molecules.
- iv. Molecular motion depends on temperature. It increases with increase in temperature and decreases in temperature.
- v. Molecular motion also depends on pressure. It increases with increase in pressure and decreases with decrease in pressure.

STATES OF MATTER:

There are three common states of matter:

- i. Solid state.
- ii. Liquid state.
- iii. Gaseous state.

i. SOLID STATE:

CHARACTERISTICS OF SOLIDS:

- a. Solids have a definite shape and volume.
- b. Molecules of solids are very close to each other and have no intermolecular spaces.
- c. The intermolecular force of attraction between the molecules of solid is very large.
- d. Solids are incompressible.
- e. Solid can't diffuse in other solid in same state.
- f. Molecules of a solid vibrate at their position.
- g. Solid exert pressure on their bottom.

ii. LIQUID STATE:

CHARACTERISTICS OF LIQUIDS:

- a. Liquids have definite volume but no definite shape.
- b. The molecules in liquid have very little spaces between them.
- c. The molecules of a liquid arrange themselves in the form of layer and these layers move over each other.
- d. Liquid boils when molecular motion increases very much due to which their kinetic energy overcome the binding force and separate them.
- e. Liquids exert pressure in their bottom.
- f. Liquids are incompressible.
- g. Liquids can diffuse in each other.

iii. GASEOUS STATE:

CHARACTERISTICS OF GASES:

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- a. Gases neither have definite shape nor definite volume.
 - b. The molecules of gases are far away from each other.
 - c. Cohesive forces between molecules of gases are negligible.
 - d. Their molecules possess high kinetic energy due to rapid movement.
 - e. Gases are compressible.
 - f. Molecules of gases can diffuse in each other.

INTER CONVERSION OF THREE STATES:

MELTING:

"The phenomenon of conversion of solid into liquid is called melting."

When a solid is heated, the kinetic energy of the particles increases and the solid become hot. On continuous heating the heat energy overcomes the intermolecular forces holding the solid particles in fixed positions and it starts converting into liquid. This is called melting or fusion.

MELTING POINT:

"The temperature at which a solid starts converting into liquid is called melting point."

BOLING POINT:

"The temperature at which the vapor pressure of a liquid become equal to the atmospheric pressure and it starts converting into gas is called Boiling

EVAPORATION:

"The phenomenon of conversion of liquid into gas without boiling at all temperature is called Evaporation."

S.NO.	EVAPORATION	BOILING
1.	It takes place at all temperatures.	It takes place at certain fixed temperature. (different temperature for different material)
2.	It always take place at surface.	It takes place inside the liquid near from the source of heat.

SUBLIMATION:

"The phenomenon of conversion of solid directly into gas through a liquid state are called sublime solids."

SUBLIME SOLIDS:

"The solids which directly convert into gas without passing through a liquid state are called sublime solids. E.g. dry ice, camphor, naphthalene, ammonium chloride."

GRAHAM'S LAW OF DIFFUSION:

DIFFUSION:

"The movement of one gas molecules into the intermolecular space of other gas is called Diffusion."

STATEMENT OF GRAHAM'S LAW OF DIFFUSION:

"The rate of diffusion of gas is inversely proportional to the square of its density of the square root of the molecular masses of the gas."

Mathematical Form:

If r = rate of diffusion.
 d = density of gas. Then r
 $\propto 1/\sqrt{d}$
Or $r = K (1/\sqrt{d})$

Where 'K' is constant.

BROWNIAN'S MOTION:

"The continuous rapid zigzag motion of the suspended particle through a medium is called Brownian motion."

Explanation:

This phenomenon of molecular motion was first observed by Robert Brown in 1827 when he was examining a pollen grain suspended in a drop of water under microscope. He noticed that the pollen grain continually performing haphazard zigzag movements. The irregular constant movement was later found to be due to the collision of suspended particles (pollen grain) by the surrounding molecules of the liquid medium.

The Brownian motion understood by the following experiment: **Experiment:**

Mix some powdered sulphur in water and stir it. After stirring filter the suspended sulphur. Some of the sulphur particles are very small and they can pass through pores of filter paper in to filtrate. Now put a drop of this filtrate on a slide and examine it under high microscope.

Result:

It is observed that sulphur particles perform zigzag motion through the medium and this motion is called Brownian motion.

Conclusion:

The Brownian movement of the suspended particles reflects the movement of the water molecules.

EXERCISE

1. Fill in the blanks:

- (i) There are **three** common states of matter.
- (ii) Gas possesses neither definite shape nor definite **volume**.
- (iii) All type of matter usually composed of smallest particles which are always in **motion**.
- (iv) The temperature at which liquid starts boiling is called **boiling point**.

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- (v) The **liquid** is the intermediate state between solid and gas. (vi) **Evaporation** is the escape of molecules from the surface of liquid.

(vi)

SOLUTION AND SUSPENSION

SOLUTION:

"Homogenous mixture of two or more substance is called a Solution."

Examples:

- Salt and water uniformly mixed to form a solution.
- Sugar and water uniformly mixed to form a solution.
- Zinc and copper are mixed by melting them together uniformly to form solution called brass.

SOLUTE:

"The substance which is to be dissolved in other substance to form a solution and present in lesser amount is called a solute."

Example:

Sugar and salt are used as solute in their respective.

SOLVENT:

"The substance which dissolves other substance in it and present in generally greater amount is called a solvent."

Example:

Water is used as a solvent in the aqueous solutions of all the substances.

Types of solution with respect to the quantity of solute:

Saturated solution:

"The solution which contains maximum amount of solute and can't hold more solute in it at a particular temperature and pressure is called saturated solution."

Super saturated solution:

"The solution which contains more amount of solute than its holding capacity at particular temperature and pressure is called super saturated solution."

Unsaturated solution:

"The solution which contains lesser amount of solute than its holding capacity at particular temperature and pressure is called unsaturated solution."

Preparation of an unsaturated solution:

Take few crystals of sugar and dissolve them in water. This results in an unsaturated solution, because the solution has a capacity to dissolve more crystals of sugar (solute) at a given temperature.