

CHAPTER NO 06

STATES OF MATTER

Q1. What is matter? Write its states?

MATTER:

“Matter is anything that has mass and occupies space.”

STATES OF MATTER:

There are three common states of matter.

- i. Solid ii. Liquid iii. Gas

Q2. What is kinetic molecular theory? Write down the main postulates of kinetic molecular theory.

KINETIC MOLECULAR THEORY:

“Matter is composed of very tiny particles, which are called as molecules. These molecules are always in motion and they possess kinetic energy.”

MAIN POSTULATES OF KINETIC MOLECULAR THEORY:

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

Q3. Write down the characteristics of Solid state, Liquid state and Gaseous state.

SOLID STATE:

- i. In solid state molecules or particles are tightly packed with one another.
- ii. They have only back and forth motion (vibrational) motion.
- iii. Particles in solid cannot slip or slide over one another.
- iv. They possess definite shape and volume.

LIQUID STATE:

- i. In liquid state molecules or particles are not tightly packed with one another.
- ii. Their position are not fixed and they can move in all direction.
- iii. They do not have any definite shape.
- iv. They have a fixed volume.

GASEOUS STATE:

- i. In gaseous state molecules can move in all direction easily.
- ii. The cohesive force in a gas are negligible.
- iii. The kinetic energy possessed by these molecules are very high.
- iv. They have neither definite shape nor definite volume.

Q4. Define the following terms:

- | | | | |
|-----------------|-------------------|--------------------|----------------------|
| i. Sublimation | ii. Melting Point | iii. Boiling Point | iv. Evaporation |
| v. Vaporization | vi. Fusion | vii. Diffusion | viii. Freezing Point |

1. SUBLIMATION:

“The process in which solid directly change into gas is called Sublimation.”

2. MELTING POINT:

“The temperature at which the solid substance starts to melts and whole of the solid converted into liquid is called Melting Point.”

Example: Melting point of water is 0°C.

BOILING POINT:

“The temperature at which the vapour pressure of a liquid becomes equal to the atmospheric pressure and it starts converting into gas is called Boiling Point.”

Example: Boiling point of water is 100°C.

EVAPORATION:

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

VAPORIZATION:

“The rise in temperature is used in the change of state from liquid to gas and this change is called Vaporization”.

FUSION:

“The rise in temperature is used in change of state from solid to liquid and this change is called Fusion”.

DIFFUSION:

“The spreading of molecules through a medium like air or liquid is called Diffusion”.

FREEZING POINT:

“The temperature at which a liquid turns into a solid when cooled is called freezing point.”

Example: Freezing point of HCl is -30°C.

Q5. State Graham’s law of diffusion with example.

INTRODUCTION:

Thomas Graham in 1846 studied the rate of diffusion of different gases and formulated a graham’s law.

STATEMENT:

“The rate of diffusion of a gas at constant temperature and pressure is inversely proportional to the square root of its density or molar mass.”

Mathematically:

$$r \propto \frac{1}{\sqrt{d}} \quad \text{or} \quad r \propto \frac{1}{\sqrt{M}}$$

Where,

r= rate of diffusion

d= density

M= molar mass

Example:

Hydrogen gas diffuses four times faster than oxygen gas at a similar condition because hydrogen gas is lighter than oxygen gas.

Q6. Define Brownian’s motion with example.

BROWNIAN’S MOTION:

INTRODUCTION:

In 1827, an English scientist Robert Brown gave an idea about the molecular movement (motion) of particles through medium.

STATEMENT:

“The continuous rapid zig-zag movement (motion) of suspended particles through medium is called Brownian’s Motion.”

The Brownian motion can be explained by the following example.

Example:

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 into filtrate. Now put a drop of this filtrate on a slide and examine it under high power microscope.

OBSERVATION:

It is observed that sulphur particles which are yellow in colour perform rapid zig-zag movement through water molecules.

Q7. Write down the differences between:

i. Solid State and Liquid State ii. Liquid State and Gaseous State iii. Solid State and Gaseous State

| | SOLID STATE | LIQUID STATE |
|----|--|---|
| 01 | In solid state particles are packed. | In liquid state particles are not packed. |
| 02 | They have definite shape and volume. | They don't have definite shape and volume. |
| 03 | They possess very low kinetic energy. | They possess high kinetic energy. |
| 04 | Their particles can do vibrational motion. | Their particles can move in all directions. |

| | LIQUID STATE | GASEOUS STATE |
|----|--|--|
| 01 | Their particles are not packed. | Their particles are very far from each other. |
| 02 | They have fixed volume. | They don't have fixed volume. |
| 03 | They have low kinetic energy than gaseous state. | They have very high kinetic energy. |
| 04 | The cohesive force in liquid state is higher than gaseous state. | The cohesive force in gaseous state is negligible. |

| | SOLID STATE | GASEOUS STATE |
|----|--------------------------------------|--|
| 01 | They can only do vibrational motion. | They can move in all directions easily. |
| 02 | They have definite shape and volume. | They don't have definite shape and volume. |
| 03 | They have very low kinetic energy. | They have very high kinetic energy. |
| 04 | The cohesive force is very high. | The cohesive force is negligible. |