SHORT NOTES: CLASS 9

CHAPTER 1: MATTER IN OUR SURROUNDINGS

Matter: Anything or everything that has mass and occupies space is called matter. Every matter is made up of certain particles which differ in shape, size, and nature from other types of matter.

Characteristics of the particulate nature of matter:

i. Every matter is made up of particles.
ii. The particles have empty and vacant spaces between them known as interparticle spaces.
iii. The particles constituting matter are very small in size.
iv. Particles are not stationary and are in a state of motion.
v. The particle motion increases with the rise in temperature.

States of matter- Solids, Liquids and Gases

S. No.	Property	Solid state	Liquid state	Gaseous state
1.	Interparticle spaces	Very small, particles are closely packed	Comparatively large, particles are loosely packed	Very large, particles are very loosely packed
2.	Interparticle forces	Very strong	weak	Very weak
3.	Nature	Very hard and rigid	fluid	Highly fluid
4.	Compressibility	Negligible	Very small	Highly Compressible
5.	Shape and Volume	Definite shape and volume	Indefinite shape and definite volume	Indefinite shape as well as volume
6.	Density(mass/volume)	high	Less than the density in solid state	Very low density
7.	Kinetic Energy	low	Comparatively high	Very high
8.	Diffusion	Negligible	Slow	Very fast

Interconversion of the states of matter: One state can be converted into another by changing interparticle spaces and hence interparticle force of attraction. There are two ways to achieve this:

- By changing temperature
- By changing pressure

Effect of temperature on the state of a substance: With the rise in temperature, the physical state of a substance changes from solid to liquid and liquid to gas (vapours). This is mainly due to an increase in interparticle spaces or a decrease in the strength of interparticle forces.

- The strength of interparticle or intermolecular forces varies inversely to the interparticle spaces. Thus, the greater the interparticle spaces lesser the interparticle forces and vice versa.

Melting Point, Boiling Point, Freezing Point:

- Melting Point: The temperature at which a solid starts melting i.e., starts changing into the liquid state is called m.p. Greater the melting point temperature, more will be the magnitude of interparticle forces.

- Boiling Point: The temperature at which a liquid starts boiling or the liquid state of a substance changes into a gaseous or vapour state is called b.p. Greater the interparticle forces, more will be the boiling point temperature.
- Freezing point: The temperature at which a liquid freezes.

Latent heat: The amount of heat required to convert one state of a substance into another, without any temperature change is called latent heat.

- **Latent heat of fusion:** The amount of heat needed to convert one kg of solid into liquid state without any rise in temperature is called latent heat of fusion.
- **Latent heat of vaporization:** The amount of heat energy that is needed to convert 1 kg of liquid into its vapour state without any rise in temperature is called the latent heat of vaporization.

Scales of measuring the temperature: i. Celsius scale ii. Fahrenheit scale iii. Kelvin scale.
Kelvin scale is the S.I. scale.

$$^{o}F = \frac{9}{5}{}^{O}C + 32,\ K = {}^{O}C + 273.15$$

Sublimation: Change of solid directly into the gaseous state without passing through the liquid state upon heating and back to the solid state when the temperature is lowered. E.g. Naphthalene, Camphor, NH_4Cl.

Sublimation can be used to purify impure samples of substances. An impure sample of naphthalene can be purified in this way. The impure sample of naphthalene is heated, which changes into vapours and is condensed in a condenser, while the non-volatile impurities present will not change into vapours and remain in the dish.

Effect of pressure on the state of a substance: An increase in pressure brings the particles of a matter closer, which decreases interparticle space and increases interparticle force. With the increase in pressure, the physical state of a substance changes from the gaseous state to the liquid state and liquid state to the solid state.

Scales of measuring pressure: atmosphere, Pascal (Pa)
1 atm = 76cm of Hg = 760mm of Hg
1 atm = 1.01×10^5 Pa, the pressure at sea level is 1 atm and is regarded as normal atm pressure.

Evaporation: The change of a liquid into vapour state at any temperature below the boiling point of a liquid is called evaporation. It is always accompanied by a decrease in temperature or cooling.

Factors affecting the evaporation of liquids: i. Surface area available for evaporation, ii. Increase in temperature, iii. Increase in the speed of wind, iv. Increase in humidity, v. nature of the liquid.

Difference between Evaporation and Boiling:

Boiling	Evaporation
Boiling occurs only when liquid is heated.	Evaporation of liquid takes place of its own.
Boiling takes place at specific temperature	Evaporation takes place at all temperatures.
Boiling occurs from the surface as well as from below the surface.	Evaporation is a surface phenomenon and occurs only from the surface of the liquid.
No cooling is caused during boiling.	Cooling is caused during evaporation.