Class 9th

**CHEMISTRY**

**CHAPTER - 01**

**MATTER IN OUR SURROUNDINGS**

**"Anything that occupies space, has mass and offer resistance is called matter."**

**Physical Nature of Matter**

- Matter is made up of particles. All matter constitute of very small particles. These small particles are called atoms.
- These particles of matter are too small so they cannot be seen by naked eyes or simple microscope.

**Characteristics of the matter:**

1. **Particles of matter have spaces between them**
   - This characteristic is one of the concepts behind the solubility of a substance in other substances. For example, on dissolving sugar in water, there is no rise in the water level because the particles of sugar get into the interparticle spaces between the water particles.
2. **The particles are continuously moving.**
   - Particles of matter show continuous random movements due to the kinetic energy they possess.
   - A rise in temperature increases the kinetic energy of the particles, making them move more vigorously.

3. **Particles of matter attract each other**

   In every substance, there is an interparticle force of attraction acting between the particles. To break a substance, we need to overcome this force. The strength of the force differs from one substance to another.

**DIFFUSION**

When the particles of matter intermix on their own with each other, the phenomenon is called diffusion. For example, spreading of ink in water.

- During diffusion, the particles occupy the interparticle spaces.
- The rate of diffusion increases with an increase in temperature due to increase in the kinetic energy of the particles.

**The matter is categorized into three categories: Solid, Liquid, and Gas.**

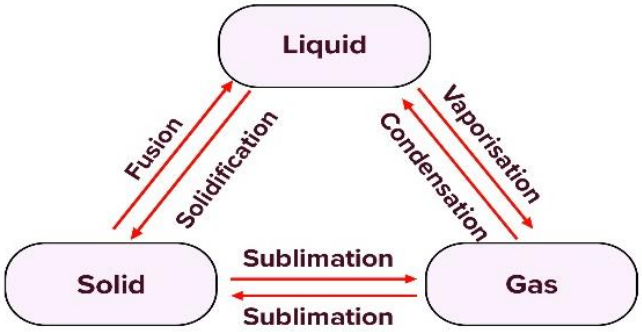
**PHYSICAL STATES OF MATTER**

There are also two physical state of matter plasma and Bose-Einstein. The main difference between plasma and Bose-Einstein condensate is that the plasma state contains a gas of ions and free electrons, whereas Bose-Einstein condensate contains a gas of bosons at low densities, which is cooled to a low temperature close to absolute zero.

| SOLIDS | LIQUIDS | GASES |
|---|---|---|
| Fixed Shape | No Fixed Shape | No Fixed Shape |
| Fixed Volume | Fixed Volume | No Fixed Volume |
| High density | Moderate Density | Low Density |

| | | |
|---|---|---|
| Not capable of filling their container | Capable of filling their container | Capable of filling their container |
| Cannot be compressed | Cannot be compressed | Can be compressed easily |
| Cannot Flow | Can flow | Can flow easily |
| Particles are closely packed | Particles are not as closely packed as solids | Particles are loosely packed |
| The force of attraction between particles is strong | The force of attraction between particles is not as strong as solids | They have a very weak force of attraction between particles |
| Kinetic energy is very low | Kinetic energy is more than solids | Maximum Kinetic Energy |

**Interconversion of states of matter**


**Melting Point**

The melting point of a solid is defined as the temperature at which solid melts to become liquid at the atmospheric pressure.

- At the melting point, these two phases, i.e., solid and liquid, are in equilibrium, i.e., at this point, both solid state and liquid state exist simultaneously.

**Boiling Point**

The boiling point of a liquid is defined as the temperature at which the vapour pressure of the liquid is equal to the atmospheric pressure.

**Conversion of Temperature**

- The temperature conversion formula from Celsius to Kelvin is:
  $K = C + 273.15$
- The temperature conversion formula from Kelvin to Celsius is:
  $C = K - 273.15$
- The temperature conversion formula from Fahrenheit to Celsius is:
  $C = (F - 32) \times 5/9$
- The Temperature Conversion Formula from Celsius to Fahrenheit is:
  $F = C(9/5) + 32$

**Latent Heat of Fusion**

It is the amount of heat energy that is required to change 1 kg of a solid into liquid at atmospheric pressure at its melting point.

**Latent Heat of Vaporisation**

It is the amount of heat energy that is required to change 1 kg of a liquid into gas at atmospheric pressure at its boiling point.

**SOME IMPORTANT PHENOMENON**

**1. Diffusion**

When the particles of matter intermix on their own with each other, the phenomenon is called diffusion. For example, spreading of ink in water.

**2. Evaporation**

The phenomenon by which molecules in liquid state undergo a spontaneous transition to the gaseous phase at any temperature below its boiling point is called evaporation.

- For example, the gradual drying of damp clothes is caused by the evaporation of water to water vapour.

**Factors Affecting Evaporation**

- Temperature: The rate of evaporation increases with an increase in temperature.
- Surface area: The rate of evaporation increases with an increase in surface area.
- Humidity: The rate of evaporation decreases with an increase in humidity.
- Wind speed: The rate of evaporation increases with an increase in wind speed.

**Cooling Due to Evaporation**

During evaporation, the particles of a liquid absorb energy from the surroundings to overcome the inter-particle forces of attraction and undergo phase change. The absorption of heat from the surrounding makes the surroundings cool.

For example, sweating cools down our body.

**Applications:**

- To keep water cool, it is kept in earthenware containers. Similar to the pores in cotton fabric, the pores in the earthen pot's surface area allow for more evaporation.
- To keep our bodies cool, we sweat a lot. Evaporation is what transpiration ultimately is. Our body's water evaporates, using energy in the process and lowering our body temperature as a result.
- We dress in cotton during the summer. Since cotton is a powerful water absorbent, it allows more perspiration to come into touch with the air, promoting more evaporation. We have a cooling effect when wearing cotton clothing because of this.