Matter in Our Surroundings

Since ancient times, human beings have been curious to understand the nature of things around them. In earlier days, matter was broadly classified into five basic elements known as **"Pancha Tattva"** – Air, Earth, Fire, Sky, and Water. This classification was based on observations and philosophical ideas.

What is Matter?

Matter is anything that **occupies space and has mass**. Every object we see or feel around us is made of matter.
Examples: Chair, table, cow, pencil, tree, water, air, etc.

Characteristics of Matter

1. **Matter is made up of tiny particles:**
   All matter consists of extremely small particles called **atoms** or molecules.
2. **Particles are very small:**
   These particles are so tiny that they cannot be seen with the naked eye.
3. **Particles are constantly moving:**
   Particles of matter are always in motion because they possess **kinetic energy**. The speed of motion increases with temperature.
4. **There are spaces between particles:**
   Particles of matter have spaces between them, known as **inter-particle spaces**.
5. **Particles attract each other:**
   There is a force of attraction between particles which keeps them together. This force varies in different states of matter.
6. **Diffusion:**
   The spontaneous intermixing of particles of two different substances is called **diffusion**. It happens faster in gases and slower in solids.

States of Matter

There are three main states of matter:

Solid	Liquid	Gas
• Solids have a **fixed shape and fixed volume**. • Particles are **closely packed** with very little space between them. • Particles can only **vibrate at their fixed positions**. • They have **low kinetic energy**. The **force of attraction is very**	• Liquids have a **fixed volume but no fixed shape**. • They take the shape of the container in which they are kept. • Particles have **more space** compared to solids. • Particles can **move freely**. • They have **moderate**	• Gases have **no fixed shape and no fixed volume**. • They fill the entire container. • Particles are **far apart** with large spaces between them. • They move **very freely and randomly**. • They have **very high kinetic energy**.

strong. **Examples:** Stone, wood, sugar, iron, coal.	**kinetic energy**. The force of attraction is **weaker than solids**. **Examples:** Water, milk, petrol, kerosene.	The force of attraction is **very weak**. **Examples:** Air, oxygen, hydrogen, nitrogen.

Change of State of Matter

Matter can change from one state to another:

- Solid → Liquid → Gas
- Example: Ice → Water → Steam

Factors affecting change of state:

1. **Temperature**
2. **Pressure**

Effect of Temperature

- When temperature increases, particles gain energy and move faster.
- During change of state, temperature remains constant because heat is used to break the force of attraction between particles.

Melting Point

The temperature at which a solid changes into a liquid is called its **melting point**.

Boiling Point

The temperature at which a liquid changes into a gas is called its **boiling point**.

Latent Heat

Latent heat is the heat energy required to change the state of a substance without changing its temperature.

Types of Latent Heat:

1. **Latent Heat of Fusion:**
   Heat required to convert **solid into liquid** at melting point.
2. **Latent Heat of Vaporisation:**
   Heat required to convert **liquid into gas** at boiling point.

Effect of Pressure

On Solids:

- Almost no effect of pressure.
- Solids are **non-compressible**.
- On applying high pressure, they may deform or break.

On Liquids:

- Very little effect of pressure.
- Liquids are also **almost incompressible**.

On Gases:

- Pressure has a **great effect**.
- Gases are **highly compressible** due to large spaces between particles.
- Increasing pressure decreases the volume of gas.

Evaporation

Evaporation is the process by which a liquid changes into vapour **below its boiling point**.

Factors affecting evaporation:

1. Temperature (higher → faster evaporation)
2. Surface area (larger → faster evaporation)
3. Humidity (lower humidity → faster evaporation)
4. Wind speed (higher wind → faster evaporation)

Cooling Effect of Evaporation

During evaporation, particles absorb heat from surroundings to gain energy. This results in **cooling of the surroundings**.

Example:

- Sweating cools our body.
- Water kept in an earthen pot becomes cool.