

## States of Matter

### 1. Solid:

- Definite shape and volume.
- Particles are closely packed in a regular, fixed arrangement.
- Vibrational motion is limited.

### 2. Liquid:

- Definite volume but no definite shape.
- Particles are close together but can move past one another.
- Takes the shape of its container.

### 3. Gas:

- No definite shape or volume.
- Particles are far apart and move freely.
- Takes both the shape and volume of its container.

### 4. Plasma:

- High-energy state where atoms lose their electrons.
- Found in stars, lightning, and certain types of flames.
- Uncommon on Earth, but predominant in the universe.

### 5. Bose-Einstein Condensate (BEC):

- Extremely low temperatures near absolute zero.
- Atoms occupy the same space and quantum state.
- Only observed under special laboratory conditions.

### 6. Fermionic Condensate:

- Similar to Bose-Einstein Condensate but involves fermions.
- Achieved at very low temperatures.
- Behaves like a superfluid.

## Phase Transitions

- **Melting:** Solid to liquid.
- **Freezing:** Liquid to solid.
- **Vaporization:** Liquid to gas (includes evaporation and boiling).
- **Condensation:** Gas to liquid.
- **Sublimation:** Solid directly to gas.
- **Deposition:** Gas directly to solid.

## Factors Influencing States of Matter

- **Temperature:** Increasing temperature generally leads to a transition from solid to liquid to gas.
- **Pressure:** Increasing pressure often leads to a transition from gas to liquid to solid.
- **Particle Attraction:** Stronger attractive forces between particles favor the solid state.
- **Critical Point:** Temperature and pressure conditions beyond which a distinct liquid and gas phase no longer exist.
- **Triple Point:** Unique temperature and pressure where all three phases (solid, liquid, and gas) coexist in equilibrium.
- **Super cooling and Superheating:** The process of cooling or heating a substance below or above its normal freezing or boiling point without a phase transition.