

Chapter 9.3: Principle of Expansion and Contraction of Matter

1. Expansion and Contraction of Matter

- **Effect of Temperature on Matter:** Changes in temperature can cause matter to expand or contract.
- **Expansion:** When heated, particles move faster and further apart, causing the material to increase in volume.
- **Contraction:** When cooled, particles move slower and closer together, causing the material to decrease in volume.

Example Sentence: Heating a metal rod causes it to expand, while cooling it causes it to contract.

2. Behavior of Different States of Matter

- **Solids:**
 - Particles vibrate in fixed positions.
 - Expansion: Particles move further apart when heated.
 - Contraction: Particles move closer together when cooled.

Example Sentence: A metal rod expands when heated because the particles within it move further apart.

- **Liquids:**
 - Particles move freely and randomly.
 - Expansion: Particles move further apart when heated.
 - Contraction: Particles move closer together when cooled.

Example Sentence: Water expands when heated as the particles move more rapidly and spread out.

- **Gases:**

- Particles move very rapidly and are far apart.
- Expansion: Particles move even further apart when heated.
- Contraction: Particles move closer together when cooled.

Example Sentence: Air inside a balloon expands when heated, causing the balloon to inflate.

3. Uses of Expansion and Contraction in Daily Life

- **Mercury Thermometers:** Mercury expands and contracts with temperature changes, allowing temperature measurement.
- **Railway Tracks:** Gaps are left between tracks to allow for expansion in hot weather, preventing buckling and overlaps.
- **Steel Bridges:** Built with rollers and gaps to allow for expansion and contraction, maintaining structural integrity.

Example Sentence: Gaps in railway tracks prevent the tracks from buckling during hot weather by allowing them to expand.

4. Bimetallic Strips

- **Composition:** Made of two different metals that expand and contract at different rates.
- **Applications:** Used in devices like fire alarms for temperature regulation.
 - Fire Alarm System: The bimetallic strip bends when heated, completing a circuit to trigger the alarm.

Example Sentence: Bimetallic strips in fire alarms bend when exposed to heat, closing the circuit and sounding the alarm.

5. Solving Simple Problems Using Expansion and Contraction

- **Situation 1: Opening a Tight Bottle Lid:**
 - Submerging the bottle lid in hot water causes the lid to expand, making it easier to open.

Example Sentence: To open a tight bottle lid, submerge it in hot water to cause the lid to expand.

- **Situation 2: Fixing a Dented Table Tennis Ball:**

- Placing the ball in hot water causes the air inside to expand, pushing out the dent.

Example Sentence: A dented table tennis ball can be fixed by placing it in hot water, causing the air inside to expand and remove the dent.