# **Bases and Their Classification**

### **Introduction to Bases and Their Reactions**

In a kitchen setting, Riya and Kabir explore the reaction between baking soda (a base) and lemon juice (an acid). This results in a chemical reaction that produces carbon dioxide gas. This reaction is an example of neutralization, where an acid and a base interact to neutralize each other, leading to the formation of salt, water, and gas.

### **Classification of Bases**

Bases are classified into strong bases and weak bases based on their ability to dissociate in water completely or partially.

#### **Strong Bases**

These bases dissociate completely in water, providing a high concentration of hydroxide (OH<sup>-</sup>) ions. Examples include:

- Sodium hydroxide (NaOH): Commonly known as caustic soda
- Potassium hydroxide (KOH): Also called caustic potash

#### Weak Bases

These bases do not fully dissociate in water and provide fewer hydroxide ions. Examples include:

- Magnesium hydroxide (Mg(OH)<sub>2</sub>): Found in milk of magnesia
- Ammonium hydroxide (NH<sub>4</sub>OH): Used in household cleaners

#### **Properties of Bases**

Taste: Bases have a bitter taste.

Texture: They feel soapy to touch.

Litmus Test: Bases turn red litmus paper blue.

**Reaction with Acids:** Bases react with acids to form salt and water (Neutralization Reaction).

### **Uses of Common Bases**

i. Calcium Hydroxide (Slaked Lime)

Used in agriculture as a key ingredient in pesticides. Helps in neutralizing acidic soil. Acts as a substitute for cement in low-cost construction.

# ii. Sodium Hydroxide (Caustic Soda)

Used as a laboratory reagent. Absorbs gases like CO<sub>2</sub> and SO<sub>2</sub>. Used in the refining of vegetable oils.

# iii. Potassium Hydroxide (Caustic Potash)

Functions as an absorbent for CO<sub>2</sub>.

Used in the manufacture of soft soap.

Essential in the preparation of biodiesel.

# iv. Magnesium Hydroxide (Milk of Magnesia)

Used as an antacid to relieve acidity and indigestion.

# v. Ammonium Hydroxide

Important in manufacturing household cleaners.

Used in making ammonium nitrate fertilizers.

## **Alkalis**

Water-soluble bases are called alkalies.

**Examples:** Sodium hydroxide (NaOH), Potassium hydroxide (KOH), etc.

## **Neutralization Reaction**

Neutralization is the reaction where an acid and a base react to form salt and water, releasing heat.

## **General Equation:**

Acid + Base  $\rightarrow$  Salt + Water + Heat

## Example:

Hydrochloric Acid + Sodium Hydroxide  $\rightarrow$  Sodium Chloride + Water

 $HCl + NaOH \rightarrow NaCl + H_2O$  (with heat release)