

Acids, Bases and Salts

Introduction

In chemistry, substances are classified as **acids, bases, and salts** based on their behavior in aqueous solutions. These substances are widely used in daily life, industries, medicines, and agriculture.

ACIDS

Acids are substances that **produce H^+ ions (hydrogen ions)** in aqueous solution.

General Properties:

Sour in taste	Turn blue litmus red
Conduct electricity	Corrosive in nature

Examples:

HCl (Hydrochloric acid)	H_2SO_4 (Sulphuric acid)
HNO_3 (Nitric acid)	CH_3COOH (Acetic acid)

Bases and Alkalis

Bases produce **OH^- ions** in aqueous solution.

Bases that are **soluble in water** are called alkalis.

General Properties:

Bitter in taste	Soapy/slippery feel
Turn red litmus blue	Conduct electricity

Examples:

NaOH (Sodium hydroxide)	KOH (Potassium hydroxide)
$Ca(OH)_2$ (Calcium hydroxide)	

Indicators

Indicators are substances that **change color** in acidic or basic solutions.

Types:

1. **Natural Indicators**

Litmus	Turmeric
--------	----------

2. **Synthetic Indicators**

Phenolphthalein → Colorless (acid), Pink (base)

Methyl orange → Red (acid), Yellow (base)

3. **Olfactory Indicators**

Substances whose **smell changes** in acidic or basic medium.

Onion	Vanilla
-------	---------

Clove oil

Chemical Nature of Acids and Bases

Acids produce **H^+ ions only in aqueous solution**

Bases produce **OH^- ions in aqueous solution**

Dry HCl gas does not show acidic behavior without water.

Q. Why Do Acids and Bases Conduct Electricity?

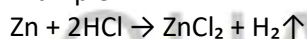
Ans- Because they produce **free ions** in water, which carry electric current.

Chemical Reactions of Acids

1. With Metals:

Acid + Metal \rightarrow Salt + Hydrogen gas

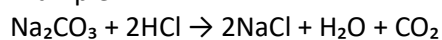
Example:



2. With Metal Carbonates:

Acid + Carbonate \rightarrow Salt + CO_2 + Water

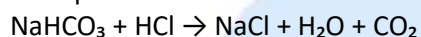
Example:



3. With Metal Bicarbonates:

Acid + Bicarbonate \rightarrow Salt + CO_2 + Water

Example:



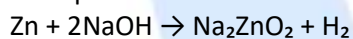
Chemical Reactions of Bases

1. With Metals:

Generally metal do not react with base because metal are basic in nature

Base + Metal \rightarrow Salt + Hydrogen

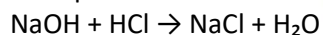
Example:



Neutralisation:

Acid + Base \rightarrow Salt + Water

Example:



This reaction is exothermic

Oxides

Metal Oxides	Non-metal Oxides
<ul style="list-style-type: none">• Basic in nature• React with acids• Example: $\text{CuO} + \text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2\text{O}$	<ul style="list-style-type: none">• Acidic in nature• React with bases• Example: $\text{CO}_2 + \text{Ca(OH)}_2 \rightarrow \text{CaCO}_3$

Dilution

Adding water to acid or base to decrease its concentration.

- Always add **acid to water**, not water to acid (for safety).
- It is an **exothermic process**.

Strength of Acids and Bases (pH Scale)

pH Scale:

- Range: 0 to 14

p ^H Value	Nature
< 7	Acidic
= 7	Neutral
> 7	Basic

Examples:

- pH 1–3 → Strong acids
- pH 4–6 → Weak acids
- pH 7 → Neutral (water)
- pH 8–10 → Weak bases
- pH 11–14 → Strong bases

Strong vs Weak Acids/Bases

Strong Acid:

- Completely ionize in water
- Examples: HCl, H₂SO₄

Weak Acid:

- Partially ionize
- Example: CH₃COOH

Strong Base:

Example: NaOH, KOH

Weak Base:

Example: NH₄OH

Importance of pH in Everyday Life

1. Digestive System:

- Stomach contains HCl
- Too much acid → indigestion
- Treated with antacids

2. Tooth Decay:

- Starts below pH 5.5
- Toothpaste is basic to neutralize acid

3. Soil Treatment:

- Acidic soil → treated with quicklime/slaked lime
- Basic soil → treated with organic matter

4. pH of Water Bodies:

- Sudden pH change harms aquatic life

5. Acid Rain:

- pH < 5.6
- Damages plants, buildings, and water life

Salts

Salts are formed from **neutralisation reactions**.

Types:

Neutral salts → NaCl

Acidic salts → NH₄Cl

Basic salts → Na₂CO₃

Chemicals from Common Salt (NaCl)

1. Sodium Hydroxide (NaOH)

Prepared by **Chlor-alkali process**

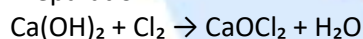
Chlor-Alkali Process

Electrolysis of NaCl solution produces:

- NaOH
- Cl₂ gas
- H₂ gas

2. Bleaching Powder (CaOCl₂)

Preparation:



Uses:

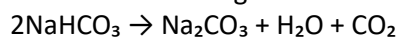
- Disinfecting water
- Bleaching cotton and linen

3. Baking Soda (NaHCO₃)

Uses:

- Baking (makes cakes fluffy)
- Antacid

Reaction on heating:



4. Washing Soda (Na₂CO₃·10H₂O)

Uses:

- Cleaning agent
- Softening hard water
- Glass and soap manufacturing

QUANTA CLASSES
BY - VISHANT SIR

5. Plaster of Paris (POP)

Formula: $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

Preparation: Heating gypsum

Uses:

- Making toys
- Plaster casts
- Decoration

Water of Crystallisation

Fixed number of water molecules in a salt crystal.

Example: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

QUANTA CLASSES
BY - VISHANT SIR

