

Acids, Bases and Salts

Acids

Acids furnish H^+ ions or H_3O^+ ions when dissolved in water. Acids have one or more replaceable H atoms.

Arrhenius Concept of Acids

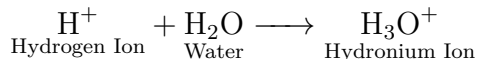
Acid is capable of producing hydrogen ion H^+ by dissociating in aqueous solution. This reaction can be represented by



For example: Hydrochloric Acid (HCl)



The proton or hydrogen ion binds itself to a water molecule to form a **hydronium ion** (H_3O^+)



The **hydronium ion** is also known as **oxonium ion** or **hydroxonium ion**.

Note:

- H^+ ions are protons.
- Metals usually are **basic** in nature whereas Non metals usually are **acidic** in nature.

Properties of Acids

- Acids generally have sour taste.
- Acids change Blue litmus Red.
- They are colorless with **phenolphthalein** and pink with **methyl orange**.
- Acids show acidic nature in their aqueous form.

Classification of Acids

- **Based on Source:**

- **Organic Acids** are present in plants and animals (living beings).

Eg:

- * HCOOH (Formic Acid/Methanoic Acid, found in **stings of bees/ants**)
- * CH_3COOH (Acetic Acid/Ethanoic Acid, found in **Vinegar**)

- **Inorganic Acids** are found from rocks and minerals.

Eg: HCl (Hydrochloric Acid), HNO_3 (Nitric Acid), H_2SO_4 (Sulphuric Acid)

- **Based on their Basicity**

Basicity = The number of H atoms replaceable by a base in a particular acid.

- **Monabasic Acid** gives one H^+ ion per molecule of the acid in solution.

Eg: HCl , HNO_3

- **Dibasic Acid** gives two H^+ ions per molecule of the acid in the solution.

Eg: H_2SO_4 , H_2CO_3

- **Tribasic Acid** gives three H^+ ions per molecule of the acid in the solution.

Eg: H_3PO_4

- **Based on Ionisation**

- **Strong Acids** ionise completely in water.

Eg: HCl

- **Weak Acids** ionise partially in water.

Eg: CH_3COOH

- **Based on Concentration**

- **Concentrated Acid** has a relatively high percentage of acid in its aqueous solution.
- **Dilute Acid** has a relatively low percentage of acid in its aqueous solution.

Chemical Properties of Acids

- **Reaction of acids with Metals**

Acids give hydrogen gas along with respective salt when they react with a metal.

Metal + Acid \longrightarrow Salt + Hydrogen

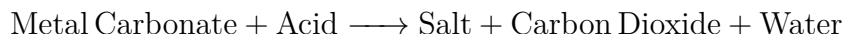
Examples:

- $\text{Zn} + 2\text{HCl} \longrightarrow \text{ZnCl}_2 + \text{H}_2 \uparrow$
- $2\text{Na} + 2\text{HCl} \longrightarrow 2\text{NaCl} + \text{H}_2 \uparrow$
- $\text{Fe} + 2\text{HCl} \longrightarrow \text{FeCl}_2 + \text{H}_2 \uparrow$

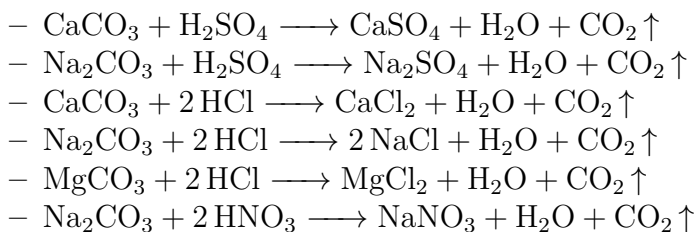


- **Reaction of acids with Metal Carbonates**

Acids react with metal carbonates to give respective salt, carbon dioxide and water.

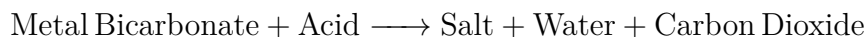


Examples:

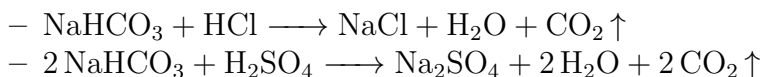


- **Reaction of acids with Metal Hydrogen Carbonates (Bicarbonates)**

Acids give CO_2 gas, respective salt and water when they react with metal hydrogen carbonates.



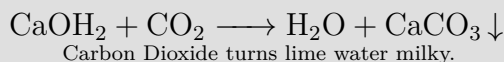
Examples:



Notes:

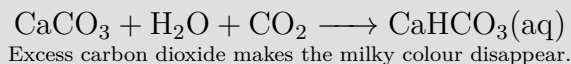
- Sodium Bicarbonate (NaHCO_3) is also known as Sodium Hydrogen Carbonate, **Baking Soda** and **Baking Powder**
- The gas evolved in the reaction of acid and metal hydrogen carbonate or bicarbonate, **turns lime water milky**. This indicates that the gas is Carbon Dioxide (CO_2).

This is due to the formation of white ppt of **Calcium Carbonate**, CaCO_3



- But when excess CO_2 is passed through lime water, it makes the milky colour disappear.

This happens because of formation of **calcium hydrogen carbonate**. As it is soluble in water, the milky colour disappears.



- **Calcium Carbonate**, CaCO_3 is a salt found in **eggshells**, **chalk powder** and **marble**.

- **Reaction of acids with Metallic oxides**

Metal oxides are basic in nature. Thus, when an acid reacts with a metal oxide, both neutralize each other. In this reaction, respective salt and water is formed.

Acid + Metal Oxide \longrightarrow Salt + Water

Examples:

- $2\text{HCl} + \text{CaO} \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O}$
- $\text{H}_2\text{SO}_4 + \text{ZnO} \longrightarrow \text{ZnSO}_4 + \text{H}_2\text{O}$
- $6\text{HCl} + \text{Al}_2\text{O}_3 \longrightarrow 2\text{AlCl}_3 + 3\text{H}_2\text{O}$

Strong and Weak Acids

Strong Acids	Weak Acids
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These acids completely dissociate in water. |

These acids dissociate partially in water. |

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