

ACIDS, BASES, AND SALTS

Acids:

An acid is a substance that furnishes hydrogen ions (H^+) when dissolved in water. For example, in its aqueous solution, hydrochloric $HCl(aq)$ dissociates as: $HCl(aq) \rightarrow H^+(aq) + Cl^-(aq)$

Some examples of acids are:

1. Hydrochloric acid (HCl) in gastric juice.
2. Carbonic acid (H_2CO_3) in soft drinks.
3. Ascorbic acid (vitamin C) in lemon and many fruits.
4. The citric acid in oranges and lemons.
5. The acetic acid in vinegar.
6. The tannic acid in tea.
7. Nitric acid (HNO_3) is used in laboratories.
8. Sulphuric acid (H_2SO_4) is used in laboratories.

Strong and Weak Acid:

Strong Acid:

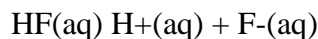
The acids that completely dissociate in water are called strong acids. Nitric acid completely dissociates in water $HNO_3(aq) \rightarrow H^+(aq) + NO_3^-(aq)$ There are only seven strong acids:

- HCl -Hydrochloric Acid
- HBr -Hydrobromic Acid
- HI -Hydroiodic Acid
- $HClO_4$ -Perchloric Acid
- $HClO_3$ -Chloric Acid
- H_2SO_4 -Sulphuric Acid
- HNO_3 -Nitric Acid

Weak Acids:

The acids that dissociate partially in water are called weak acids. All organic acids like acetic acid and some inorganic acids are weak acids.

Since their dissociation is only partial, it is depicted by double half arrows.



The double arrows indicates here that:

(i) the aqueous solution of hydrofluoric acid not only contains $H^+(aq)$ and $F^-(aq)$ ions but also the dissociated acid $HF(aq)$. (ii) there is an equilibrium between the dissociated acid $HF(aq)$ and the ions furnished by it, $H^+(aq)$ and $F^-(aq)$

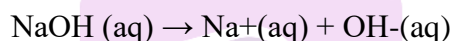
Examples:

- CH_3COOH Ethanoic (acetic) acid
- HF Hydrofluoric acid

Bases:

A base is a substance that furnishes hydroxide ions (OH^-) when dissolved in water. For example, sodium hydroxide $NaOH(aq)$,

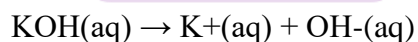
In its aqueous solutions dissociates as:



Strong Base and Weak Base:

Strong Bases:

These bases are completely dissociated in water to form the cation and hydroxide ion (OH^-).



There are only eight strong bases. These are the hydroxides of the elements of the Groups 1 and 2 of the periodic table:

1. $LiOH$ Lithium hydroxide.
2. $NaOH$ Sodium hydroxide
3. KOH Potassium hydroxide

Weak Bases:

Weak bases do not furnish OH^- ions by dissociation. They react with water (H_2O), to furnish OH^- ions.



Examples of weak bases:

1. NH_4OH



2. $\text{Cu}(\text{OH})_2$
3. $\text{Cr}(\text{OH})_3$
4. $\text{Zn}(\text{OH})_2$

Difference between Acid and Base

Nature	Acids	Bases
Taste	Sour	Bitter
Solution	Corrosive to metals	Slippery in nature
Litmus test	Blue to red	Red to blue
Neutralization	After adding base	After adding base
Phenolphthalein Test	Colourless	Pink
Methyl orange	Red	Yellow

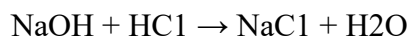
Salts:

Salts are ionic compounds made of a cation other than an H^+ ion and an anion other than an OH^- ion.

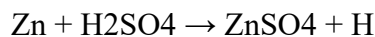
Formation of salts: Salts are formed in many reactions involving acids and bases.

1. **By Neutralization of acids and bases:** Salts are the product (besides water) of a neutralization reaction.

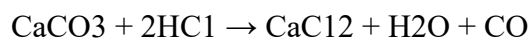
For example, Base Acid Salt Water



1. **By action of acids on metals:** In a reaction between an acid and a metal, salt is produced along with hydrogen, Metal Acid Salt Hydrogen.



1. **By action of acids on metal:** Carbonates and hydrogen carbonates Salts are produced in reactions between acids and metal carbonates and hydrogen carbonates (bicarbonates) along with water and carbon dioxide.



Type of salt and the nature of its aqueous solution:

Salt of Acid	Salt of Base	Nature of Salt Solution	pH (at 25°C)
Strong	Strong	Neutral	7



Weak	Strong	Basic	>7
Strong	Weak	Acidic	<7
Weak	Weak	More information required	-

