ACIDS, BASES AND SALTS

What is an acid and a base?
Acid: Acids are substances that taste sour and are corrosive in nature.
Base: Bases are substances that, in aqueous solution, are slippery to the touch and bitter in taste.

Bronsted Lowry theory:

- A Bronsted acid is an H+ (aq) ion donor.
- A Bronsted base is an H+ (aq) ion acceptor.

Example:
In the reaction: $HCl\ (aq) + NH_3\ (aq) \rightarrow NH^+_4(aq) + Cl^-\ (aq)$
HCl – Bronsted acid and Cl^- : its conjugate acid
NH_3 – Bronsted base and NH^+_4 : its conjugate acid

I. Acids:
Difference between Weak Acid and Strong Acid:
Strong Acid: All mineral acids are strong acids except carbonic acid. For example: sulphuric acid, hydrochloric acid, nitric acid, phosphoric acid.
Weak Acid: All organic acids i.e. naturally occurring acids are weak acids. For example: tartaric acid, oxalic acid, formic acid, acetic acid, etc.

Properties of Acids:

- Acids are sour in taste.
- Acids turn blue litmus to red.
- Acids release H+ ions.
- Arrhenius concept: contribute hydrogen ion to a solution.
- For example: Sulphuric Acid, Hydrochloric Acid etc.

A. Chemical properties of Acids:

1. **Reaction of Acid with metals:**
   Acid + Metal → Salt + Hydrogen gas
   ($Mg + H_2SO_4 \rightarrow H_2 + MgSO_4$)
2. **Reaction of Acid with Carbonate:**
   Acid + Carbonate → Salt + Water + Carbon Dioxide
   ($Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$)
3. **Reaction of Acid with Base:**
   Acid + Base → Salt + Water
   (HCl + NaOH → NaCl + H2O)

Uses of Acids in daily life:

1. Hydrochloric Acid: Used in the production of glucose from corn starch.
2. Carbonic Acid: Used in aerated drinks.
3. Sulphuric Acid: Used in car batteries.
4. Nitric Acid: Used in the manufacture of fertilizers, explosives

B. Bases:

- Bases are bitter in taste.
- Bases turn red litmus to blue
- Bases release OH- ions.
- Arrhenius concept: donate a hydrogen ion to aqueous solution.
- Bronsted-Lowery concept: Accept a proton in a chemical reaction.

For example: Sodium Hydroxide, Calcium Carbonate, Potassium Oxide Etc.

Chemical properties of bases:

1. **Reaction of Base with salt:**
   $FeCl_3 + 3NaOH \rightarrow Fe(OH)_3 + 3NaCl$
2. **Reaction of Base with Metals**
   $2Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 + 3H_2$
3. **Reaction of Acid with Base:**
   Acid + Base → Salt + Water
   (HCl + NaOH → NaCl + H2O)

Uses of Bases in Daily Life:

1. **Sodium Hydroxide** : Used in production of soaps, detergents, synthetic fibres
2. **Calcium Hydroxide:** Used in the manufacture of bleaching powder, to make cement, lime water.
3. **Magnesium Hydroxide**: Used as an antacid (medicine that neutralizes acid in the stomach).
4. **Ammonium Hydroxide:** Used in the manufacture of fertilizers.
5. **Aluminium Hydroxide:** Used to make an antacid.

Physical properties of Acids and Bases

S.No.	Properties	Acids	Bases
1	Color	Mineral acids are colorless. Some organic acids are white color solids	Colorless except hydroxides of iron and copper
2	Taste	Sour	Bitter
3	Touch	-	Slippery
4	Solubility	Soluble in water	Some bases are soluble in water
5	Confirmation test	Turn blue litmus to red	Turn red litmus to blue
6	PH value	Lower than 7	Greater than 7
7	Example	HCl	NaOH

Similarity between Acids and Bases:

1. Both can react with water and produce ions in water.
2. Both of them changes color of litmus paper.
3. Both are good conductor of electricity.
4. Both form salt and water when react with each other

Indicators:

Special types of substances are used to test whether the substance is acid or base. This is used as the confirmation test for the presence of acids.

These substances are called indicators. Some natural occurring indicators are

- Turmeric,
- Litmus (extracted from lichens),
- China rose petals.

Neutralization:

When an acidic solution is mixed with the basic solution, their acidity or basicity gets destroyed. Such reaction is called a Neutralization reaction. Salt is produced in the process with the evolution of heat.

Acid + Base → Salt + Water

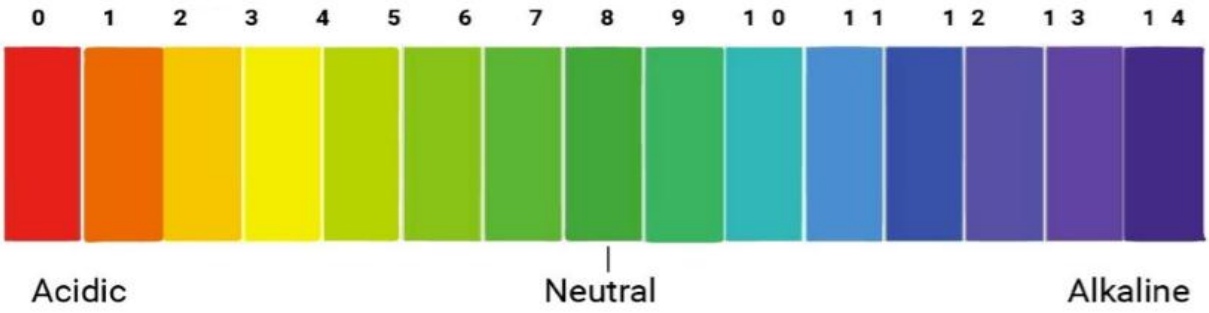
(HCl + NaOH → NaCl + H_2O)

Neutralization in Daily Life:

- During indigestion, taking milk of magnesia (magnesium hydroxide) gives us relief as it neutralizes the effect of excess acid produced inside the stomach.
- The effect of ant sting which is caused by formic acid can be neutralized by rubbing moist baking soda (basic in nature).
- To ensure that plants can grow well, the soil is treated with either acids or bases depending if it's basic or acidic in nature.
- Factory wastes, generally being acidic in nature can cause environmental damage, are treated with basic substances before discharge.

pH Scale:

- To know how strong the acid or base is, pH scale had been developed by Soren Sorenson.
- 'p'in the term pH stands for 'potentz'.
- Numbers from 1 to 14 are marked on pH scale which indicates about acidity and basicity of the solution.
- pH of an acidic solution is ranging from 0 to 6
- pH of the basic solution is ranging from 8 to 14.
- pH of a neutral solution is 7, means the solution is neither acidic nor basic.



Some important chemicals

S.No.	Chemical Name	Chemical Formula	Uses
1.	Baking Soda	$NaHCO_3$	Used in deodorant, tooth whitening, prevent sunburns.
2.	Washing Soda	$Na_2CO_3.10H_2O$	Remove permanent hardness of water
3.	Plaster of Paris	$CaSO_4.1/2H_2O$	Used for making toys, smooth the surfaces, decoration
4.	Bleaching Powder	$CaOCl_2$	Disinfect drinking water, oxidizing agent, helps in decolorizing.
5.	Caustic Soda	NaOH	Manufacture of soaps, used in paper industry