CH-2 Acids Bases & Salts

❖ Imp Key-Points -1

- Acids are the chemical compounds which turn the blue litmus to red,
  e.g., HCl, H_2SO_4, HNO_3(Nitric Acid), CH_3COOH (Ethanoic/acetic Acid commonly found in Vinegar).
- Bases are the chemical compounds which turn the red litmus to blue, e.g., NaOH, KOH, Ca $(OH)_2$.
- Physical properties of acids and bases. (Note: *It is not comparison or difference*).

Acid	Base
• Acids are sour in taste. • All acids are soluble in water. • Dil. Sol. of acids conduct electricity. • Turn blue litmus to red. • Corrosive in Nature	• Bases are bitter in taste. • Water soluble bases are called Alkalis. • Dil. Sol. of bases(alkalis) conduct electricity. • Turn red litmus to blur. • Water soluble base (Alkalis) are corrosive in nature.

- Indicators are the chemical substances that indicate the presence of other substance by changing their colour or smell/odour.
- Indicator that indicates by changing in colour are termed as Chroma indicators, and indicates by changing in smell are the as Olfactory indicators.
- Indicator are of two types i.e., Natural and Artificial.
- More about few commonly known indicators;

Natural Indicator	Artificial Indicators
Litmus: litmus is a purple colour sol. that obtained from Lichen plant. Acid – Turn purple sol. to Red. Base – Turn purple sol. to Blue.	Methyl Orange: As the name suggests it is orange in colour. Turns into pinkish red with acid. Turns to yellow with bases.
Turmeric (Haldi): A Yellow colour ingredient found in kitchen. Base + Turmeric → deep pinkish-red or brown colour Acid + Turmeric → No Change	Phenolphthalein: A colourless chemical substance. Remains colourless with Acid. Change to pink with Bases. Note: Phenolphthalein cannot be used to test salts and acids simultaneously as it does not change its colour.
Onion: No change in smell with Acids. Change in smell when juice or paste is added to base.	
Vanilla: Smell vanishes with bases. No change in smell with acid.	

- Various reaction of acids and bases.

1. **Reaction of Acids & Bases with Metal**
   - Reaction with Acid
     Acid + Metal → Salt + $H_2(g)$ which is a displacement reaction where high reactive metal displaces the hydrogen.
     Examples;

a. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ b. $2Na + 2HCl \rightarrow 2NaCl + H_2$ c. $Fe + 2HCl \rightarrow FeCl_2 + H_2$

Note: All acids react with metal, but not all metal reacts with acids such as Copper (to some extent), Gold, Silver, Platinum because these are less reactive than Hydrogen.

- Reaction with Bases

Bases (Alkalis) + Metal → Salt + H_2(g)

Examples:

- Sodium aluminate and hydrogen gas are formed when sodium hydroxide reacts with aluminium metal.
  $2NaOH + 2Al + 2H_2O \rightarrow 2NaAlO_2 + 2H_2$
- Sodium hydroxide gives hydrogen gas and sodium zincate when reacts with zinc metal.
  $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

Note: *Only water-soluble bases i.e., Alkalis reacts with metal.*

2. <u>Reaction of Acid with Metal Carbonates/Metal Hydrogen Carbonates</u>

- Acid + Metal Carbonate/Metal Hydrogen Carbonates → Salt + Water + Carbon Di-oxide

Examples:

a. $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + CO_2 + H_2O$
b. $Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$
c. $NaHCO_3 + HCl \rightarrow NaCl + CO_2 + H_2O$
d. $2NaHCO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2CO_2 + 2H_2O$

Note: Sodium bicarbonate ($NaHCO_3$) is also known as sodium hydrogen carbonate, baking soda, baking powder, bread soda and bicarbonate of soda.

Note: Marble and Egg shell are made of calcium carbonate, hence when acid is poured over marble or egg shell, bubbles of carbon dioxide are formed.

Note*: Bases + Metal Carbonates/Metal Hydrogen Carbonates → NO REACTION*

3. <u>Reaction of Acid and Base</u>

- Acid + Base + → Salt + Water, this reaction is also known as Neutralisation reaction as both acid and base neutralise each other.

Examples:

$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$
$HNO_3 + NaOH \rightarrow NaNO_3 + H_2O$
$2HCl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O$

Note: *When a strong acid and weak base reacts it forms acidic salt & water, similarly when a weak acid reacts with strong base it forms a basic salt and water.*

4. <u>Reaction of Metal Oxides with Acid</u>

- Metal oxides are basic in Nature. Therefore

Acid + Metal Oxide → Salt+ Water

Al2O3 + 6HCl → 2AlCl3 + 3H2O
$2HCl + CaO \rightarrow CaCl_2 + H_2O$ Here Calcium Oxide (CaO) is metallic oxide react with HCl and forms $CaCl_2$(Salt).

5. **<u>Reaction of Non-Metallic Oxide With Base</u>**

- Non-metallic oxides are acidic On Nature. Therefore

Base + Non-Metal Oxide → Salt + Water
$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$