Acids, Bases and Salts

- **Acid**: Turns blue litmus colour to red
- **Base**: Turns red litmus colour to blue
- Bases which are soluble in water are called alkalis. Example KOH, $Mg(OH)_2$
- Turmeric is a natural indicator
- **Reaction of acid with metals**
- In most cases, metals replace hydrogen from acids.

$$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$$

- **Metal oxide + Acid**
- Metal oxide + Acid → Salt + Water
- **Reaction of base with metals**
- $2NaOH + Zn \rightarrow Na_2ZnO_2$(sodium zincate) + H_2

- **Acids with metal carbonate and hydrogen carbonate**
- Carbonate + Acid → Salt + Water + CO_2
- $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$
- Further on passing the carbon dioxide gas evolved through lime water.
- $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

- **Acid – Base reaction**

Acid + Base → Salt + Water

$$NaOH + HCl \rightarrow NaCl + H_2O$$

- **In water solution**

Acid → H^+ ion ; $H^+ + H_2O \rightarrow H_3O^+$
Base → OH^- ion

$$HCl + H_2O \rightarrow H_3O^+ + Cl^-$$

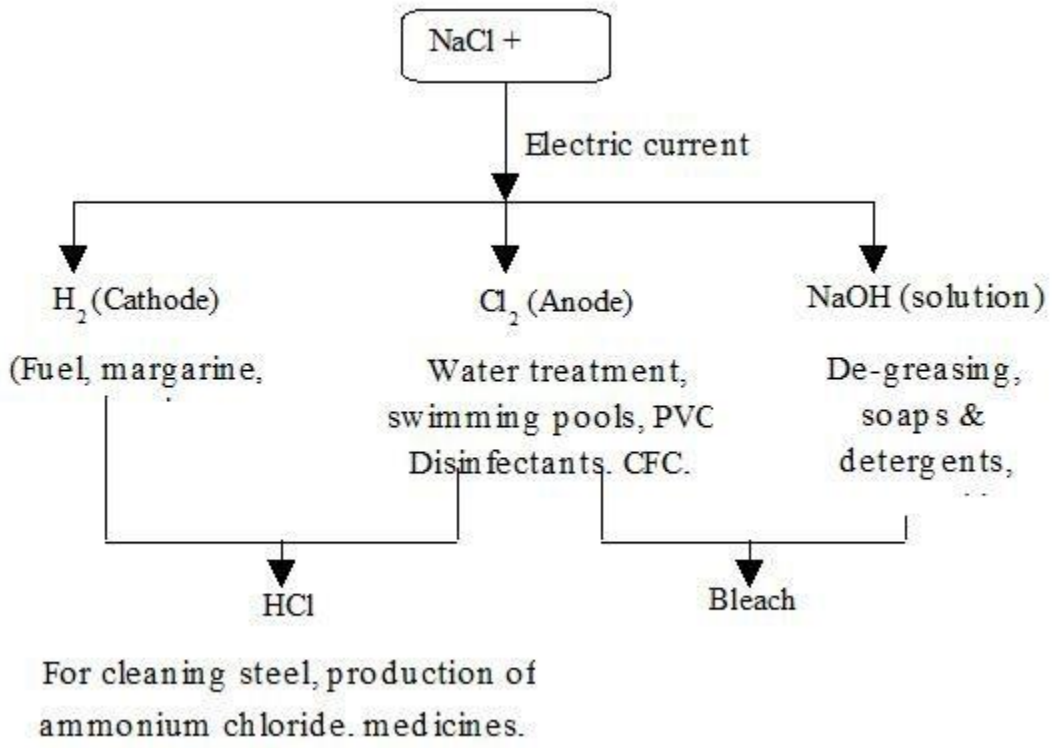
$$NaOH \xrightarrow{H_2O} Na^+ + OH^-$$

- Higher H^+ concentration → Strong acid
- Lower H^+ concentration →Weak acid
- Higher the OH^- concentration → Stronger the base
- **pH Measure**
- pH → Measure of acidity →Measure H^+ concentration on the scale (0 – 14)

- pH 7 → Neutral solution
- pH < 7 → Acidic solution
- pH > 7 → Basic solution
- **Salts' pH = 7**

- Human body pH = 7.0 – 7.8
- Change in pH in body causes → Tooth decay, stomach pain, burning pain (Honey bee sting)
- Plants and animals are sensitive to pH change
- Self defence by animals and plants through chemical wefare

- **Common salt →** NaCl



- **Bleaching powder →** $CaOCl_2$
- **Preparation**–

  $Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

- **Use** –

  Bleaching of → cotton in textile industry
  → wood pulp
  → Clothes in laundry

  Oxidising agent

Disinfecting material
Baking soda – ($NaHCO_3$) Sodium hydrogen carbonate

- **Preparation –**

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3 \text{ (Mild non-corrosive base)}$$

- **Use** –

Making baking powder (Baking soda + Mild acid, like tartaric acid)
Ingredient for antacids
Soda–acid fire extinguisher
Washing soda – $Na_2CO_3.\ 10H_2O$

- **Preparation**–

$$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$$

- **Use** –In glass, soap, paper industries

Making sodium compounds such as borax
As domestic cleaning agent
- **Removing permanent hardness of water**

- **Water of crystallisation :** It refers to a fixed number of water molecules present in one formula unit of salt.
- **Example -** In gypsum, the water of crystallisation is 2.

$$CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O \rightarrow \underset{\text{(Gypsum)}}{CaSO_4.2H_2O} \text{ (solid)}$$

- **Hydrated substances:** Substances containing water of crystallisation for example, hydrated copper sulphate ($CuSO_4.5H_2O$).
- **Anhydrous substances:** Substances either not containing water of crystallisation or from which water of crystallisation is removed, for example, sodium chloride (NaCl) and anhydrous copper sulphate ($CuSO_4$).
- **Drying agents:** Substances that absorb moisture without undergoing a chemical reaction, for example, anhydrous calcium chloride ($CaCl_2$).
- **Dehydrating agents:** Substances the remove chemically bonded water from a compound, for example, concentrated sulphuric acid (H_2SO_4).