C.W

Ch-2

Science

Acids, Bases and Salts [Tata Namak].

- Indicators
- Acids
- Bases
- Salt.

* **Indicator:-** A substance that shows change in colour or smell when come in a contact of acidic and basic solution.

→ It tells whether a substance is acidic or basic.

* Types of Indicators.

(i) **Natural Indicators:-** Indicators which is extracted from nature called Natural Indicators.
Ex- Red Cabbage, Litmus etc.

(ii) **Synthetic Indicators:-** Indicators that are Synthesis in Laboratory and Industry are called Synthetic Indicator.
Ex- phenolphthalein, methyl orange

(iii) **Olfactory Indicators:-** Indicators that Show change in smell or odour in acidic or

basic medium, solution are called olfactory indicator.

Ex- onion, clove oil, vanilla etc.

	Indicator	original colour	Acidic solution	Basic solution
(i)	Blue litmus	Blue	Red	No change
(ii)	Red litmus	Red	No change	Blue
(iii)	Turmeric	Yellow	No change	Reddish Brown
(iv)	Red Cabbage	Purple	Reddish	Greenish yellow
(v)	Phenolphthalein	Colourless	Colourless	pink
(vi)	methyl orange	Orange	Red	yellow
(vii)	Onion	—	No change	Smell vanishes
(viii)	Vanilla	—	No change	Smell vanishes

A	N	I	L

↓ for litmus

B	A	N
G	R	P

→ for red cabbage

* Acid :- The substance which turns blue litmus to red called Acid.

or

In aqeous soln Acid break two ions, +ions and -ions. The +ions of all acids is same H^+ ions. The +ions H^+ is responsible for their acidic property

$HCl \rightarrow H^+, Cl^-$

$H_2SO_4 \rightarrow H^+, SO_4^{2-}$

$HNO_3 \rightarrow H^+, NO_3^-$

$H_2CO_3 \rightarrow 2H^+, CO_3^-$

$CH_3COOH \rightarrow H^+, CH_3COO$

$H_3PO_4 \rightarrow 3H^+, PO_4^-$

→ Acids are corrosive in Nature

→ Acids are sour in ~~taste~~.

* Chemical properties of Acid.

(i) → Acid reacts with metal to forms Salt and release H_2 gas.

→ Metal + Acid → Salt + Hydrogen gas.

Ex- $Zn + HCl \rightarrow ZnCl_2 + H_2\uparrow$

- $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2\uparrow$
- $Mg + HCl \rightarrow MgCl_2 + H_2\uparrow$
- $Na + HCl \rightarrow NaCl + H_2$
- $Na + H_2SO_4 \rightarrow Na_2SO_4$
- $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

* Trick- Metal positive ~~ions~~ in nature hota hai | Acid ke negative part ko metal ke saath jor denge to form Salt.

Ex- $Fe + HCl \rightarrow FeCl_2 + H_2\uparrow$

(ii) When Acid reacts with metal carbonate and metal bicarbonate it gives Salt, CO_2 and H_2O.

→ Acid + Metal Carbonate or metal bicarbonate →
Salt + CO_2 + H_2O

Ex – $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + CO_2 + H_2O$
– $Na_2CO_3 + HCl \rightarrow NaCl + H_2O + CO_2$
– $NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$
– $MgCO_3 + HCl \rightarrow MgCl_2 + CO_2 + H_2O$

(iii) Acid reacts with base to form salt and water.
Acid + Base → Salt + water
→ $HCl + NaOH \rightarrow NaCl + H_2O$
→ $H_2SO_4 + KOH \rightarrow K_2SO_4 + H_2O$.

(iv) Acid react with metal oxide to form salt and water.
or
Metal oxide is Basic in Nature when it react with acid it form Salt and water.

→ Acid + Metal oxide → Salt + Hydrogen gas.
Ex – $MgO + HCl \rightarrow MgCl_2 + H_2O$.

* Uses of acid.

(i) Sulphuric acid is used in Batteries of vehicles.

(ii) Nitric acid is usid in formation Ammonium Nitrate which is used as fertilliser in Agricutture.

(iii) HCl is used as cleansing agent in toilet.

(iv) Carbonic acid is used in aerated soft drinks.

(v) Salt of Benzoic acid [Sodium Benzoate] is used in food preseruation.

* Base :- A Base is a compound which produce free hydronide ion [OH^-] when dissolves in water called base.

→ It is Bitter in taste.
→ It feels Slippery or Soapy to touch
→ It reacts with to form Salt and water.

* Type of Base.

(i) Strong base :- Bases which get completely ionised when dissolves in water Called Strong bases. It is also known as Alkalis Ex- NaOH, KOH.

→ Aqeous Solution of strong base are good Conductors of electricity they have high Concentration of OH^- ions.

(ii) Weak bases - Bases which are partially ionised when dissolve in water called weak bases.

Ex- $Ca(OH)_2$, $Mg(OH)_2$

* Chemical properties of base:

→ When Bases like Sodium hydroxide reacts with Active metals like Zinc and Aluminium they liberate Hydrogen gas.

Ex- $NaOH + Al \rightarrow NaAlO_2 + H_2$

[Sodium Aluminate]

$NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

(i) Base + Metal → Salt + Hydrogen gas.

(ii) When Bases reacts with non-metallic oxide it forms salts and water.

Ex - $CO_2 + NaOH \rightarrow Na_2CO_3 + H_2O$

$NO_2 + NaOH \rightarrow NaNO_3 + H_2O$

$SO_2 + KOH \rightarrow K_2SO_4 + H_2O$

$SO_2 + Ca(OH)_2 \rightarrow CaSO_4 + H_2O$

→ Non metallic oxides are Basic in nature

(iii) When Bases reacts with Acid to form Salt and water and the

the process is called neautralisation reaction.

$HCl + NaOH \longrightarrow NaCl + H_2O$

$H_2SO_4 + KOH \longrightarrow K_2SO_4 + H_2O$.

(iv) Bases liberates Ammonia gas from Ammonium Salt.

Ex- $NH_4Cl + NaOH \longrightarrow NaCl + H_2O + NH_3$

When Ammonium chloride is heated with Sodium Hydronide it liberates Ammonia gas along with the formation of NaCl and H_2O.

(v) Solution of Alkalies precipitates insoluble hydronide of metals from the solution of their Salt

Ex- $CuCl_2 + NaOH \longrightarrow Cu(OH)_2 + NaCl$
[Bluish Colour]

or

When Alkies reacts with metallic Salt to form metal hydronide as a precipitate.

⇒ Jab Alkali kisi metallic Salt ke Saath react krta h to metal hydronide as a precipitate form hota h.

⇒ whenever Sodium hydronide reacts with Copper chloride a bluish white precipitate

of $Cu(OH)_2$ is formed along with NaCl.

$FeCl_3 + Ca(OH)_2 \rightarrow Fe(OH)_3 + CaCl_2$

→ When Iron chloride react with Calcium hydroxide a reddish brown insoluble precipitate iron hydroxide is formed along with $Ca(OH)_2$.

* Similarities between Acids and Bases.

(i) Both Acid and Base react with metal liberate hydrogen gas.

(ii) Both Acids and Bases are good conductor of Electricity in their Aqeous Solution.

(iii) Both Acids have the tendency to release ions when dissolves in water.

(iv) Both Acids and bases are Corrosive in Nature.

(v) Both acids and bases change the Colour of litmus paper

(vi) Both acid and bases when mixed with water produces a lot amount of heat.

* Do all acids and bases released ions when dissolve in water.

Ans Acid dissociates in their ageous Soln to released ions. This ions responsible for the conduction of electric in their ageous solution acids do not disociate in the absence of water that's why dry HCl gas has no effect on litmus paper.

* Uses of base.

→ NaOH is used for making soaps.
→ $Mg(OH)_2$ is used as an antacid.
→ $Ca(OH)_2$ is used for white washing and for the preparation of bleaching powder. or used in Agriculture.
→ Ammonium hydroxide is used as cleansing agent and for the formation of Ammonium salt.

* pH [potenz of Hydrogen].

→ The strength of an acidic and basic solution is determined by the Concentration of H^+ and OH^- in it the Concentration of these ions is described by a parameter is called pH.

→ A device is used to measure pH of a solution is called pH scale or pH meter.

→ It's range lies b/w 0 to 14.

→ for an acidic soln pH value is less than 7.

→ for a basic soln pH value is more than 7.

→ for neutral soln pH value is equal to 7.

$H^+ = OH^- \rightarrow 7$

$H^+ > OH \rightarrow$ Acidic < 7

$H^+ < OH \rightarrow$ Basic > 7.

* Importance of pH in everyday life.

→ pH plays vital role in the digestion of food and other Bio chemical substance in the human and Animal body. gastric juice have the pH value 1-2 due to Secretion of HCl.

→ The pH change results in tooth decay. Enamel of teeth is made up of $Ca_3(PO_4)_2$ it gets corroded when the pH of mouth is below 5.5 in Acidic condition and a yellow layer is formed over the teeth. To neutralise the effect of acid we use toothpaste containing base for detergent ...

→ Plants also requires a specific pH range for the proper growth the soil may be acidic, basic or neutral depending upon the Concentration of H^+ and OH^- ions.

* Salt

→ An ionic Compound formed by the reaction of an acid or a base.

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

→ Cation of Salt is always obtained form base and Anion is always obtained from Acid.

Ex - $NH_4OH + HCl \rightarrow NH_4Cl + H_2O$

$Ca(OH)_2 + HCl \rightarrow CaCl_2 + H_2O$

→ If an acid, with end "ic" react with a base, the Salt form will End with Ate.

Ex → $H_2SO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$

$HNO_3 + KOH \rightarrow KNO_3 + H_2O$

* Classification of Salt.

(i) Neutral Salt:- It is formed when Strong acid and Strong base reacts with each other

$NaOH + HCl \rightarrow NaCl + H_2O$

$H_2SO_4 + KOH \rightarrow K_2SO_4 + H_2O$

(ii) Acidic Salt.

→ It is formed when strong acid and weak base reacts with each other.

(iii) Basic salt

→ It is formed when weak acid and strong base react each other.

EX- $KOH + H_2CO_3 \rightarrow K_2CO_3 + H_2O$

* Solubility of Salt:

→ Salt of sodium and potassium are Soluble in water

EX- NaCl, KNO_3

→ Salt of silver and mercury and lead are Insoluble in water.

EX- AgCl, $PbCl_2$

* Chemical compound for various Salt:

(i) NaOH [Caustic Soda]:-

(a) preparation:-

(i) It is prepared by the electrolytic

decomposition of Aqueous solution of NaCl Called Brine.

→ When electricity is passed through the brine it decomposes into sodium Hydroxide Chlorine gas and Hydrogen gas.

→ chlorine gas gets accumulated at Anod and H_2 gas gets accumulated at Cathode

→ $NaCl + H_2O \xrightleftharpoons[\text{Brine.}]{\text{Electricity}} NaOH(s) + Cl_2\uparrow + H_2\uparrow$

* Properties:

→ It is white crystalline powder.

* Used.

→ It is used for making soaps and detergents
→ It is used as cleansing agent.
→ It is used for manufacturing paper.
→ It is use of for making artificial textile fibre.
→ It is used in de-greasing metals, oil refining, and making dyes and bleaches.