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Acids, Bases and Buffers

i)Acid: are the substance

¬Which converts blue litmus paper to red

¬Having the P^H <7

¬Sour taste

¬React with bases to form salts and water

Eg :- Hydrochloric acid (HCl)

ii) Base: are the substance

- Which converts red litmus paper to blue
- Having the P^H >7
- Bitter taste
- React with Acids to form salts and water

Eg: Sodium Hydroxide (NaOH)

Acids

"An Acid is a substance that can release hydrogen ion (H+) when dissolved in water"

(OR)

"A substance which when dissolved in water gives hydrogen ions (H^+) is known as acid"

Eg: Hydrochloric acid.

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

Base

"A Base is a substance that can release a Hydroxyl ion (OH^-) when dissolved in water"

(OR)

"A substance which when dissolved in water gives Hydroxyl ion (OH^-)is known as acid"

Eg : Sodium Hydroxide

$NaOH \rightarrow Na^+ +$

- Boric Acid,
- Hydrochloric acid,
- Strong ammonium hydroxide,
- Calcium hydroxide,
- Sodium hydroxide.

Boric Acid

H_3BO_3 / 61.83

Syn: Orthoboric Acid, Aecidium boricum

MOP:-

Borax with Sulphuric acid in presence of water

$$Na_2B_4O_7 + H_2SO_4 + 5H_2O \longrightarrow 4H_3BO_3 + Na_2SO_4$$

Properties :-

a) Physical Properties:

- White crystalline powder
- Odorless
- Soluble in water
- Soluble in Ethanol
- Soluble in glycerin

b) Chemical Properties:

a) Reaction with turmeric paper:

Boric acid turn into brown color

b) Reaction with glycerin:

Boric acid + glycerin

Glyceroboric acid

c) Action on heating :-

Boric acid (H_3BO_3)

↓ 100^0C

Metaboric acid (HBO_2)

↓ 160^0C

Tetra boric acid ($H_2B_4O_7$)

↓ Up to red hot

Boron trioxide (B_2O_3)

Uses:

- Local anti-infective
- To maintain acidic pH medium in Medicament
- Preparation of buffer solution
- In ophthalmic preparation
- Dusting powder
- Preparation of ointement

Storage

“ It should be stored in well closed container at a cool Place.”

Hydrochloric Acid

HCl / 36.46

Syn: spirit of salt, muriatic acid,

acidium hydrochloricum

MOP:-

Conc.Sulphuric acid react with sodium chloride

$$NaCl + H_2SO_4 \longrightarrow HCl + NaHSO_4$$

Properties :-

a) Physical Properties:

- Clear colorless liquid
- Pungent odour
- Miscible with water
- Miscible with alcohol
- fuming liquid

b) Chemical Properties:-

i)Reaction with metals :

hydrochloric acid react with sodium gives sodium chloride & evolution of hydrogen gas.

$$2Na + 2HCl \longrightarrow 2NaCl + H_2$$

ii)Reaction with alkali :

hydrochloric acid react with sodium hydroxide gives sodium chloride & water

$$HCl + NaOH \longrightarrow NaCl + H_2O$$

Uses:

1) As a pharmaceutical aid
   (acidifying agent)

2) Solvent in industry

3) For manufacturing of basic pharmaceuticals

4) Reagent in Laboratory

Storage

“ It should be stored in well closed container of glass at a temperature not exceeding 30^0C”

Strong ammonium hydroxide

NH_3/ 17.03

Syn: Ammonia solution, ammonium hydroxide, strong ammonium water, liquor ammoniae forties

MOP:-

By mixing ammonium chloride with slaked lime

$$NH_4Cl + Ca(OH)_2 \longrightarrow NH_4OH + CaCl_2$$

Properties :-

a)Physical Properties:

- Clear colorless liquid
- Pungent odour
- Characteristic taste
- Miscible with water
- Aqueous solution is strongly alkaline in nature

b) Chemical Properties:-

i) Reaction with acid :

React with acid it form salts and water

$$NH_4OH + HCl \longrightarrow NH_4Cl + H_2O$$

ii) Reaction with cations :

React with acid it form complex

Uses:

- Alkalizing agent
- Reflux stimulant (fainted person)
- Vaso constrictor
- Strong base
- Antacid
- Reagent in Laboratory

Storage

“ It should be stored in well closed amber colored container with a rubber stopper at a cool Place.”

Incompatibility

- With iodine (Explosive compound)
- heavy metals, silver salts and tannins

Calcium hydroxide

$Ca(OH)_2$ / 74.10

Synonym: slaked lime, lime water

MOP:-

by treating calcium chloride with sodium hydroxide

$$CaCl_2 + 2NaOH \longrightarrow Ca(OH)_2 + 2NaCl$$

Properties :-

a)Physical Properties:

- White amorphous powder
- Slight bitter taste
- Slightly soluble in water
- Insoluble in alcohol
- Soluble in glycerin

b) Chemical Properties:-

i)Reaction with hydrochloric acid :

On Reaction with hydrochloric acid gives calcium chloride and water

$$Ca(OH)_2 + 2HCl \longrightarrow CaCl_2 + 2H_2O$$

ii) **Effect of heating :**

On strongly heating it looses water and converted into calcium oxide

$$Ca(OH)_2 \longrightarrow Cao + H_2O$$

Uses:

- Antacid
- Astringent
- Fluid electrolyte
- Emulsifying agent
- Absorb carbon dioxide
- Making of glass
- White washing of cloth

Storage

“ It should be stored in air tight container at a cool Place.”

Sodium hydroxide
NaOH / 40

Syn: Caustic soda, soda lye

MOP:

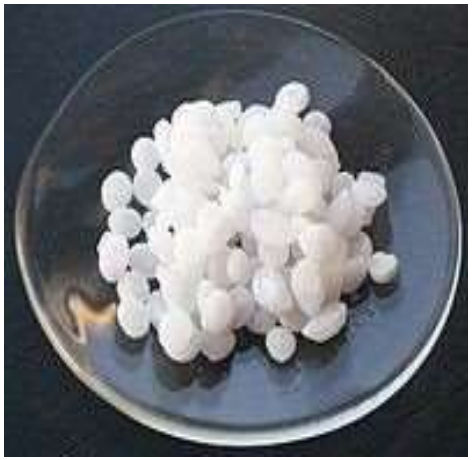
By treating sodium carbonate with lime water

$Na_2CO_3 + Ca(OH)_2 \rightarrow 2NaOH + CaCO_3$

Properties :-

a)Physical Properties:

- White amorphous pellets
- Slight bitter taste
- Soluble in water
- Soluble in alcohol
- Soluble in glycerin
- Deliquescent in nature



b) Chemical Properties:-

i)Reaction with HCl :

Sodium hydroxide react with Hydrochloric acid gives sodium chloride & water

$$HCl + NaOH \longrightarrow NaCl + H_2O$$

ii) Reaction with carbon dioxide:

It absorb carbon dioxide from air to form sodium carbonate

$$2NaOH + CO_2 \longrightarrow Na_2CO_3 + H_2O$$

Uses:

> Alkalizing agent

> Disinfectant for animal houses

> For preparation of soap

> Absorb CO_2 gas

> Common laboratory reagent

Storage

“ It should be stored in air tight container at a cool Place.”

Common Properties

H_3BO_3, HCl, NH_3 , $Ca(OH)_2$ & NaOH

- Colorless or white color

HCl & NH_3 : **Liquid**

H_3BO_3, $Ca(OH)_2$, NaOH : **Solid**

- characteristic odor
- Soluble in water
- Soluble in alcohol

(expect calcium hydroxide)