PARMAR SSC

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Chemistry

Acid, Base and Salts

Lecture :- 5

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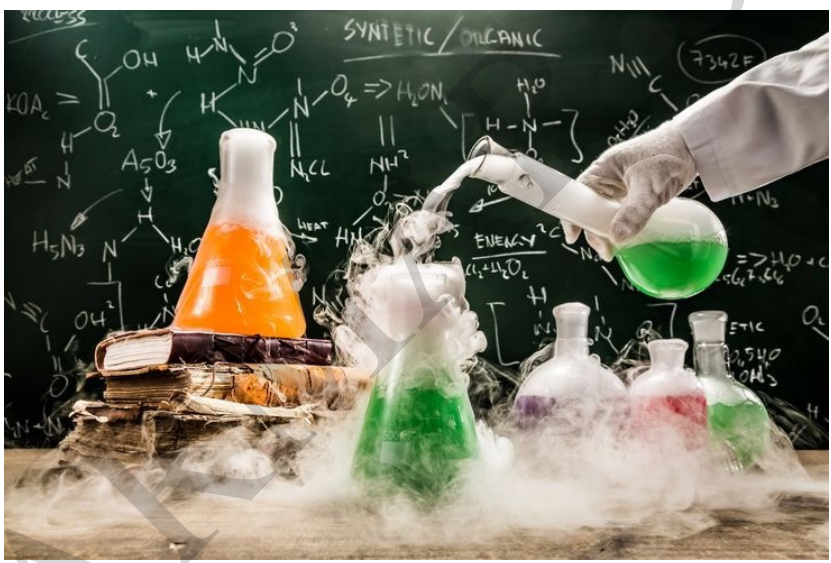
ACID, BASES AND SALT



What are Acids and Bases?

Acids: Sour substance, Corrosive in nature

Types:

1. Organic acids: from nature → Has source
2. Mineral acids: eg: HCl, H_2SO_4, HNO_3
   Corrosive

Bases: Bitter substances

Organic acid	Source of organic acid
Citric acid	Citrus fruits such as oranges, lemons, etc.
Formic acid	Sting of ants, bees
Acetic acid	Vinegar, ~~Tomato~~
Malic acid	Apple, ~~Grape~~ ,Banana
Tartaric acid	Tamarind, grapes, unripe mangoes, etc.
Oxalic acid	Spinach, Cabbage, Tomato
Lactic acid	Curd, milk
Ascorbic acid (Vitamin C)	Citrus fruits, amla

Used as Preservatives

6-8% acetic acid and remaining water

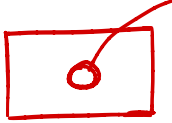
Lacto term used for milk products

Indicators: indicates if anything is an Acid/Base

Litmus Paper: Lichen
- Algae + Fungus
- natural indicator
- Purple dye
  - Neutral
- Belongs to Thallophyta
- Blue to Red in Acid
- Red to Blue in Base

Phenolphthalein
- Acid: Colourless
- Base: Pink

Methyl Orange
- Acid: Red
- Base: Yellow



- Yellow stain curry
- Red Brown stain when washed however changes to yellow again when dried
- Due to Soap (Base)

OLFACTORY INDICATORS

smell

	Acid	Base
 Onion	Remains smell	Loses it's smell
 Vanilla Extract	Remains smell	Loses it's smell
 Clove Oil	Remains smell	Loses it's smell

→ How do acids and bases react with metals?

M A S H
- Metal
- Acid
- Salt
- Hydrogen

few bases when react with metal → Produce H_2 gas

How do metal carbonates and metal hydrogen carbonates react with acids?

- Metal carbonate + Acid → Salt + H_2O + CO_2
- Na_2CO_3 + HCl → NaCl + H_2O + CO_2
- $Ca(OH)_2$ + CO_2 → $CaCO_3$ + H_2O
  - $Ca(OH)_2$ → Lime water
  - CO_2 → Turns lime water milky
  - $CaCO_3$ → White ppt
    - Limestone
    - Chalk
    - Marble

Quick lime

$CaO + H_2O \rightarrow Ca(OH)_2$

How do acids and bases react with each other?

A + B → S + H_2O → Neutralisation reaction → Exothermic (Heat evolved)

- Antacids: to neutralise the acidity in our stomach
  - Milk of magnesia → $Mg(OH)_2$

Reaction of metallic oxide with acids

- Base + Acid → Salt + Water

Reaction of non-metallic oxide with base

- Acidic + Base → Salt + Water

→ What happens to an acid or base in a water solution?

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

  $+$

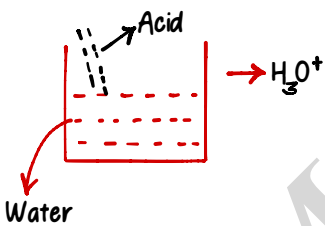
  $H_2O \longrightarrow H_3O^+$ Hydronium ion

- $NaOH \longrightarrow Na^+ + OH^- \longrightarrow$ Hydroxide ion

- More $H_3O^+ \rightarrow$ Concentrated
- Less $H_3O^+ \rightarrow$ Less acidic

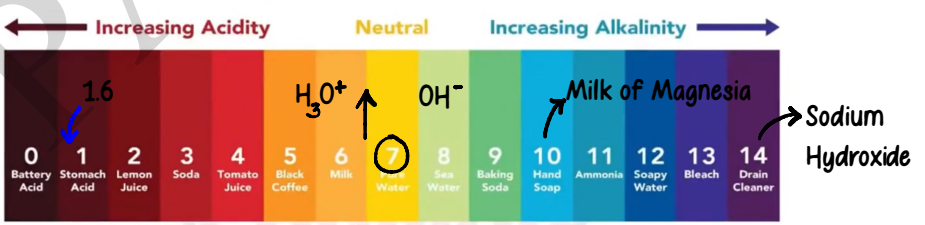
Acid is added to water vice versa is not possible

→ Why?
as Highly exothermic



- Those bases which dissolve in water are called as Alkali → Corrosive
- All alkali are base but not vice versa

Strength of an ACID/BASE



pH Scale: Power of Hydrogen → gives strength of Acid or Base

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pH in German means: Potenz

Importance of pH in our daily life

- Our body works in a pH of: 7–7.8
- pH in our digestive system: 1.6
- pH change as a cause of Tooth Decay: 5.5 ↓
- Use of pH by plants for self defence
- Acid Rain: 5.6 ↓
- Saliva pH: slightly acidic (6.4)
- Blood pH: slightly alkaline (7.4)
- Nettle leaves (Herbaceous plant) → Formic acid → Methanoic acid
  - Uses it as self-defence
  - Present in Ant sting
- Dock Plant neutralises Nettle leaves sting (basic in nature)
- Planets: thick clouds of H_2SO_4 → Venus
  - Oil of Vitriol

Salts

pH of salts

Less than 7 → Acidic salt

More than 7 → Basic salt

Acid + Base → Salt

Strong A + Strong B → Neutral salt

Strong A + Weak B → Acidic salt

Weak A + Strong B → Basic salt

Common salt– raw material for chemicals

Rock salt → NaCl

Table Salt →

Sodium Hydroxide

$$NaCl\ (aq) + H_2O \xrightarrow{\text{electrolysis}} NaOH + Cl_2 + H_2 \longrightarrow \text{Chlor-alkali process}$$

Brine — cathode — anode — cathode

Bleaching Powder

- $Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2$
  - $Ca(OH)_2$: Lime water
  - $CaOCl_2$: Calcium Hypochlorite
    - used for making Bleaching powder
    - Oxidising agent
      - to make drinking water germ free

Uses:

- Chlorine: water purification
- Cotton and linen: Textile industry and bleaching
- Paper factories: wood pulp bleaching

Baking Soda

- $NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$
  - Baking Soda (common name)
  - Sodium Hydrogen Carbonate

Uses

1. Baking powder: Baking soda + edible acid (tartaric acid)
2. Soda Acid fire extinguisher
3. Antacids

$$NaHCO_3 + H^+ \xrightarrow{\text{Heat/Water}} CO_2\uparrow$$

Washing Soda

- $2\,NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$
- $Na_2CO_3 + 10\,H_2O \rightarrow Na_2CO_3 \cdot 10\,H_2O$
  - Water of crystallisation

Uses of Washing Soda

1. To remove permanent hardness of water
2. Glass, soap and paper factories
3. To manufacture Sodium compounds → Borax → $Na_2B_4O_7 . 10 H_2O$ → Used in Toothpaste/mouthwash
4. As a Cleansing agent for domestic purpose

Plaster of Paris

Gypsum: $CaSO_4 . 2H_2O$ → $CaSO_4 . 1/2 H_2O$ → Plaster of Paris

373 − 273 → 100°C

Some more salts

- Blue vitriol: $CuSO_4 . 5H_2O$ → when heated: colourless
- Green " : $FeSO_4 . 7H_2O$
- White " : $ZnSO_4 . 7H_2O$
- Epsom salt: $MgSO_4 . 7H_2O$
- Potash Alum: $KAl(SO_4)_2 . 12H_2O$
- Mohr's salt: $(NH_4)_2 Fe(SO_4)_2 . 6H_2O$
- Sodium Benzoate: used as preservative in jam, tomato sauce
- Ethanoic acid: CH_3COOH → Acetic acid
- Glauber salt: $Na_2SO_4 . 10H_2O$
- Acid found in Spinach: Oxalic acid
- Another Folic acid: Pteroylglutamic acid
- Citric acid: Oranges

- Muriatic acid another name for Hydrochloric acid

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  used in chlorides, fertilizers and dyes, in electroplating and in the photographic, textile and rubber industries

- Bases used in window cleaner: Ammonium hydroxide
- moist baking soda should be applied when ant bites
- Litmus paper changes to blue color when put in soap water
- pH of water: 7
- Double salt

  Dolomite: formed from $CaCO_3$ + $MgCO_3$

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  Formula: $CaMg(CO_3)_2$