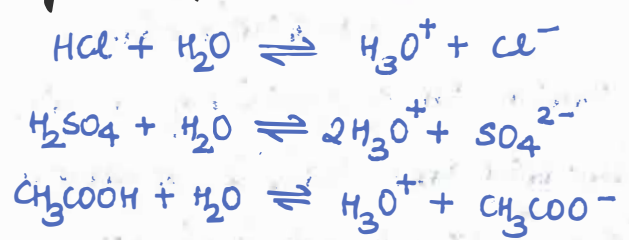




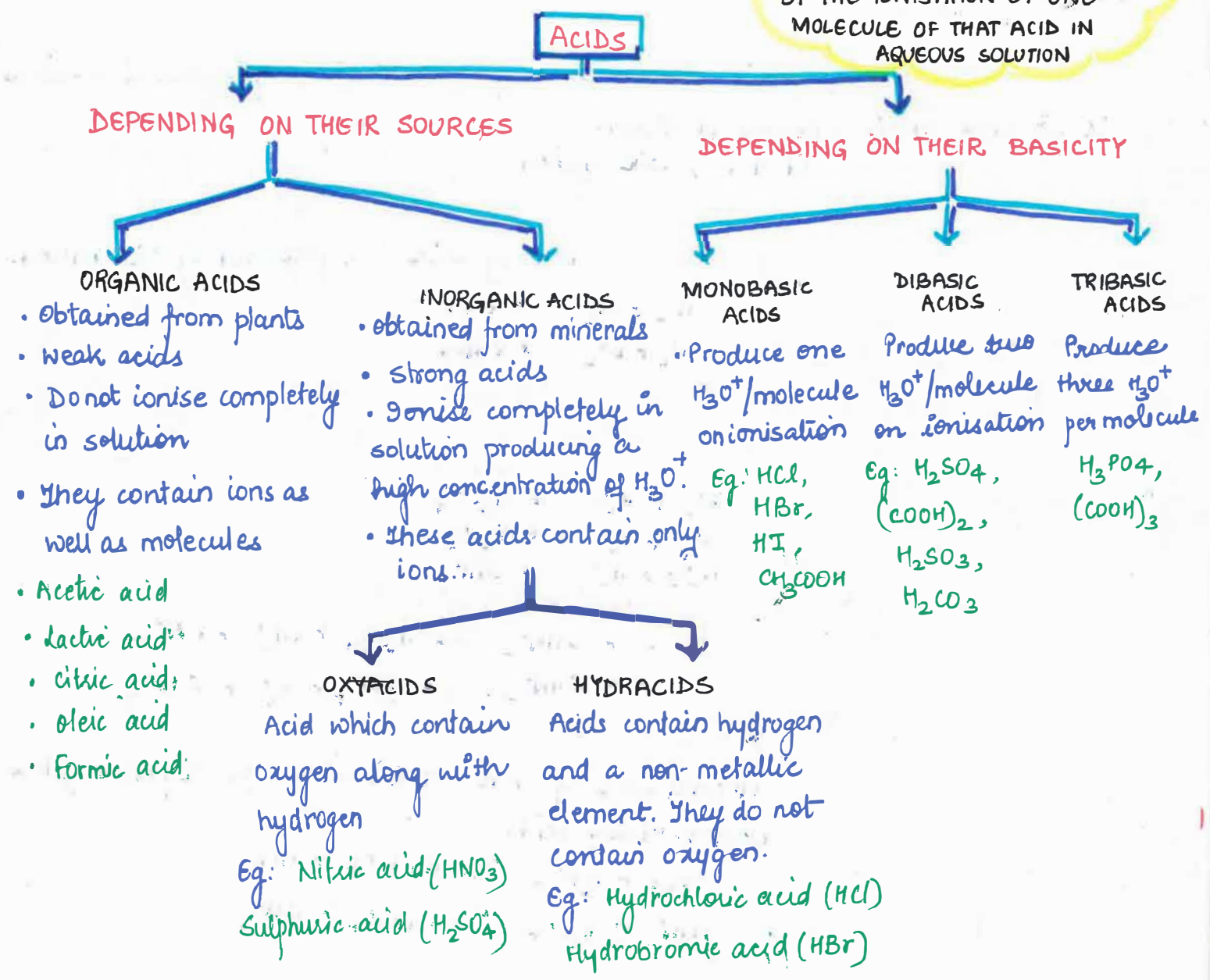
# ACIDS, BASES AND SALTS

**ACIDS:** Acids are defined as compounds which contains one or more hydrogen atoms and when dissolved in water, produce  $H_3O^+$  ions the only positively charged ions.



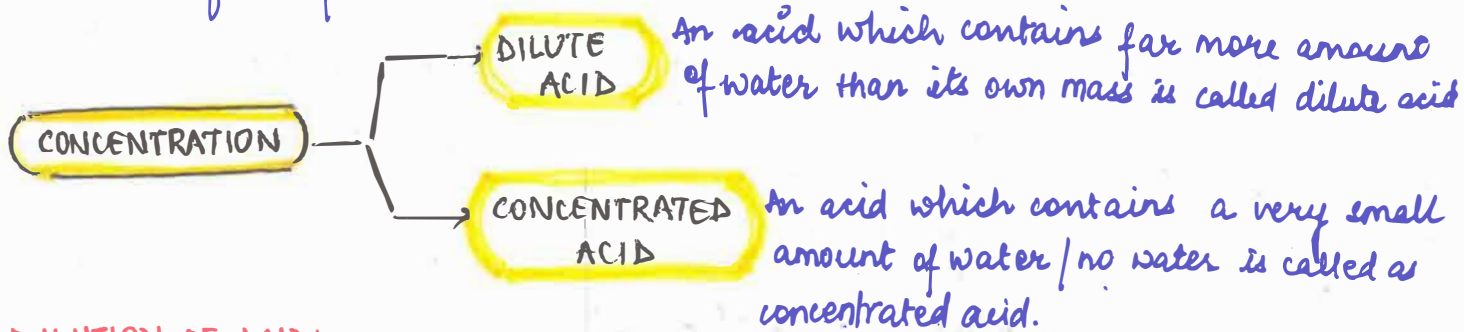
## CLASSIFICATION OF ACIDS:

**BASICITY OF AN ACID**  
THE NUMBER OF HYDRONIUM IONS ( $H_3O^+$ ) THAT CAN BE PRODUCED BY THE IONISATION OF ONE MOLECULE OF THAT ACID IN AQUEOUS SOLUTION

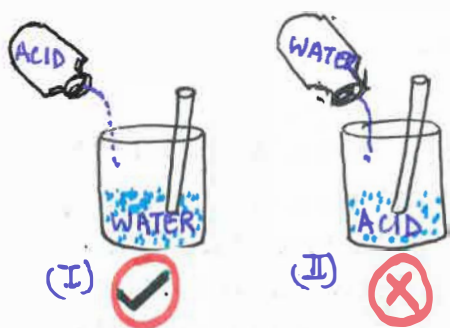




**CONCENTRATION OF AN ACID:** It is the amount of acid present in a definite amount of its aqueous solution.



**DILUTION OF ACID:**

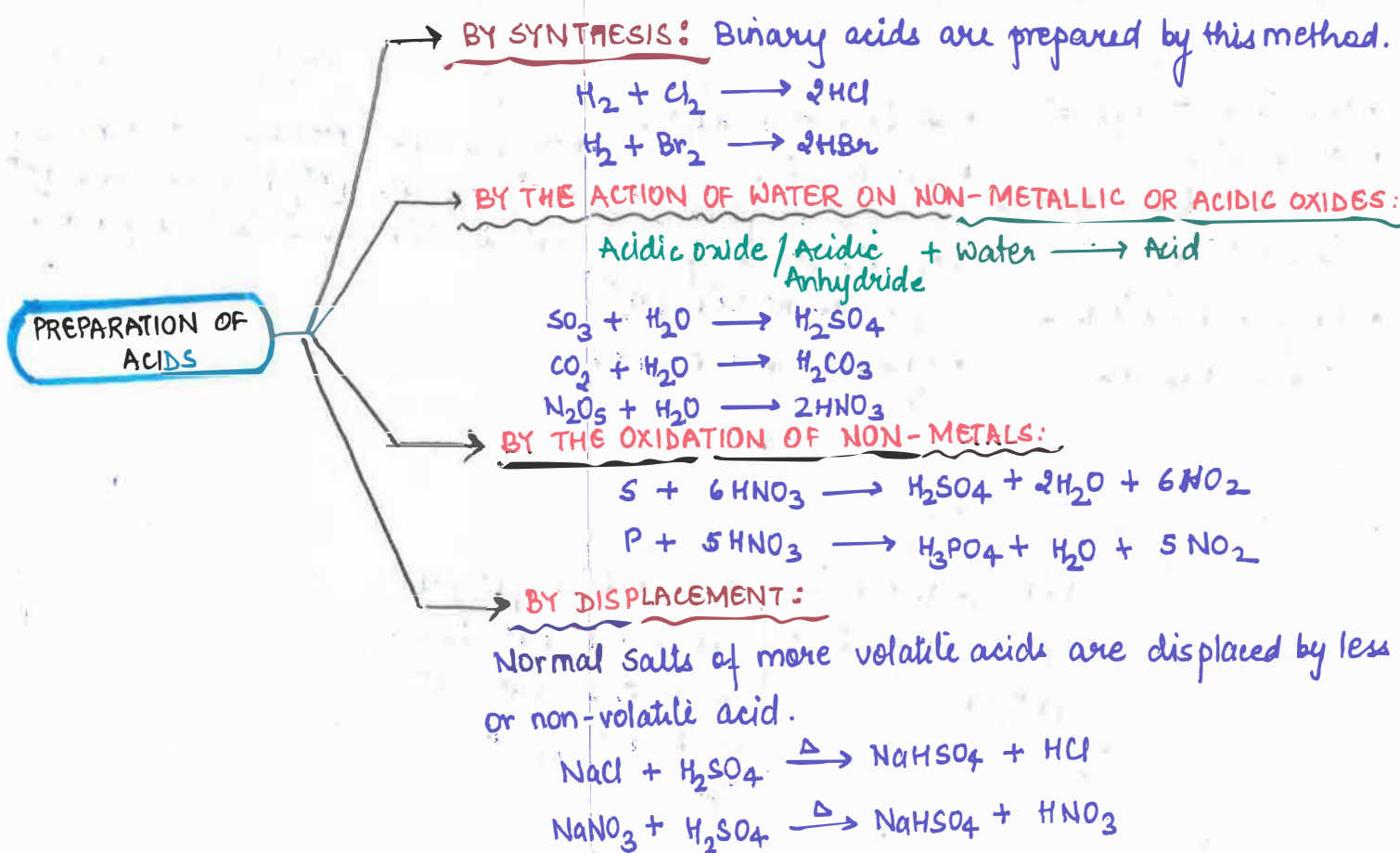


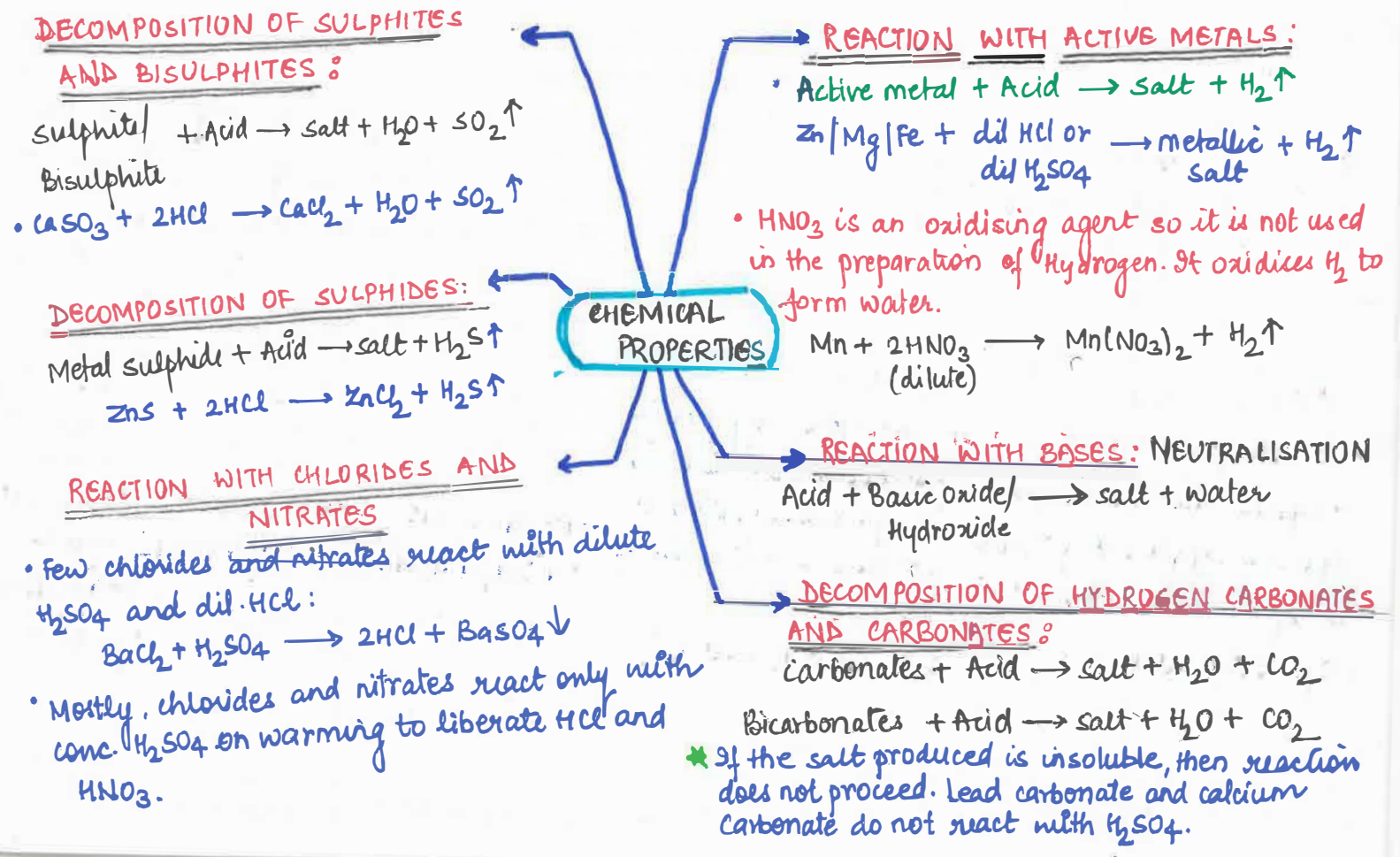
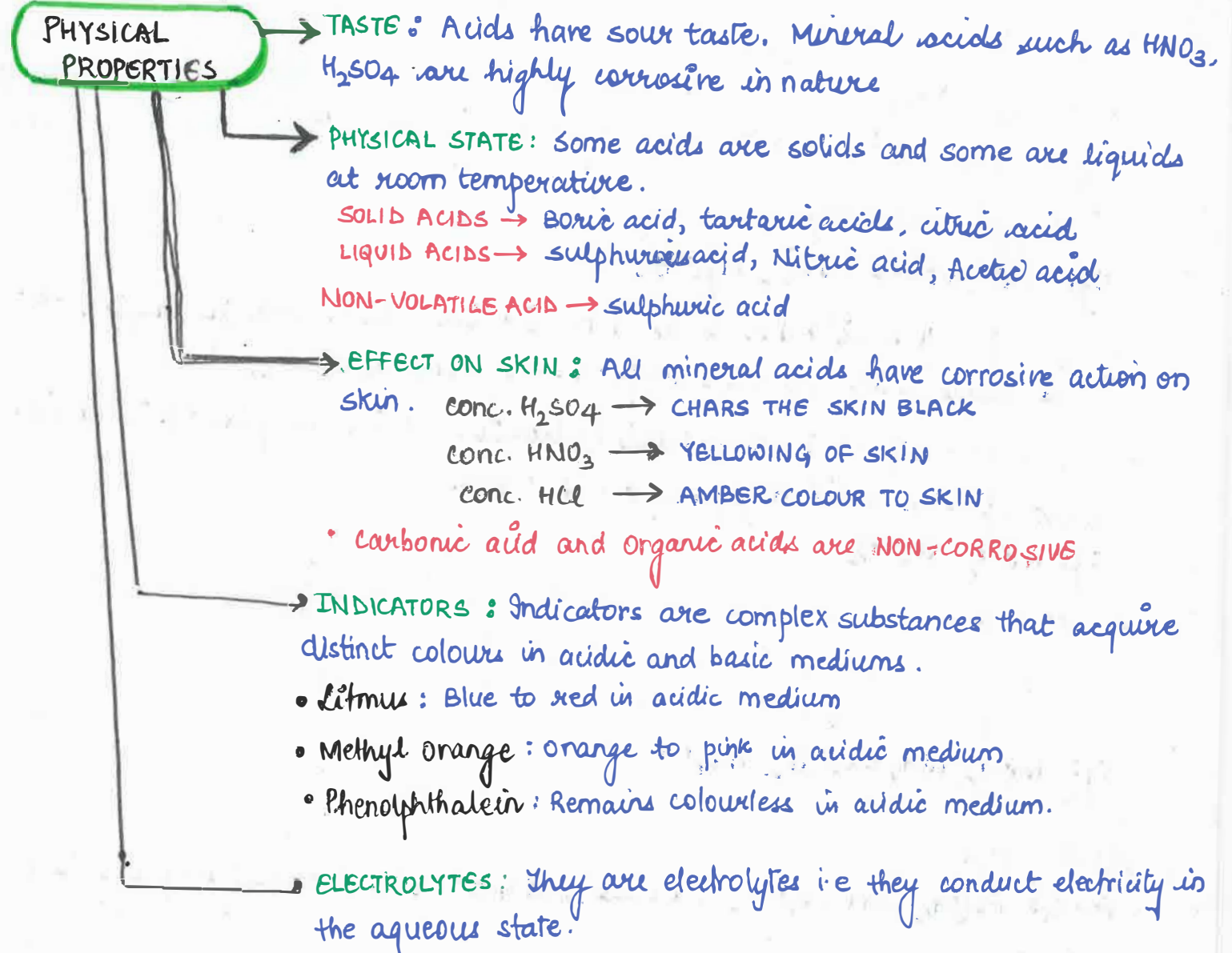
(I) CORRECT WAY of dilution of an acid.

(II) INCORRECT WAY: Water is not added to acid as it is an exothermic process and in this process enormous amount of heat is produced which may break the container.

**STRENGTH OF AN ACID:** It is the measure of concentration of hydronium ions it produces in its aqueous solution.

dil HCl > ~~conc~~ CH<sub>3</sub>COOH (conc) ... dil HCl produces more H<sup>+</sup> ions.







## BASES

• A base is either a metallic oxide or a metallic hydroxide or ammonium hydroxide which reacts with hydrogen ions of an acid to form salt and water only.

Eg:  $\text{CuO}$  (metallic oxide),  $\text{Mg}(\text{OH})_2$

• **BASIC OXIDE:** A basic oxide is a metallic oxide which contains the ion  $\text{O}^{2-}$  and reacts with an acid to form salt and water only.

• **BASIC HYDROXIDE:** It is a metallic hydroxide which contains  $\text{OH}^-$  and will react with an acid to form salt and water.

Eg:  $\text{NaOH}$ ,  $\text{Al}(\text{OH})_3$

• **ALKALIS:** An alkali is a basic hydroxide which when dissolved in water produces  $\text{OH}^-$  ions as the only -vely charged ions.

• Alkali is a base soluble in water.

Eg:  $\text{NaOH}$ ,  $\text{KOH}$ ,  $\text{Ca}(\text{OH})_2$ ,  $\text{NH}_4\text{OH}$

⇒ All alkalis are bases but all bases are not alkalis:

For Eg:  $\text{Fe}(\text{OH})_3$  and  $\text{Cu}(\text{OH})_2$  are bases, but not alkalis because they are insoluble in water.

### CLASSIFICATION OF BASES

On the basis of their strength

#### STRONG ALKALI

• It undergoes almost complete dissociation in aqueous solution to produce a high concentration of  $\text{OH}^-$ .

Eg:  $\text{NaOH}$ ,  $\text{KOH}$

#### WEAK ALKALI

• It undergoes only partial dissociation or ionisation in aqueous solution to produce a low conc. of  $\text{OH}^-$  ions.

Eg:  $\text{NH}_4\text{OH}$ ,  $\text{Ca}(\text{OH})_2$

On the basis of their acidity

**Acidity:** It is the number of  $\text{OH}^-$  ions which can be produced per molecule of the base in aqueous solution.

#### Monoacidic base

• Produces one  $\text{OH}^-$  ion/molecule

Eg:  $\text{NaOH}$ ,  $\text{KOH}$

#### Diacidic base

• Produces two  $\text{OH}^-$  ion/molecule

Eg:  $\text{Ca}(\text{OH})_2$

#### Triacidic base

• Produces three  $\text{OH}^-$  ion/molecule

Eg:  $\text{Al}(\text{OH})_3$



## PROPERTIES OF BASES / ALKALIS:

### PHYSICAL PROPERTIES

- They have sharp and bitter taste
- They are soapy to touch
- They change the colour of the indicators
  - Litmus → blue to red in basic medium
  - Phenolphthalein → ~~Orange to yellow~~ Colourless to pink
  - Methyl orange → Orange to yellow.
- They are strong electrolytes and they show a mild corrosive action on skin.

### CHEMICAL PROPERTIES

→ (1) **strong alkali + CO<sub>2</sub> → carbonate + water**

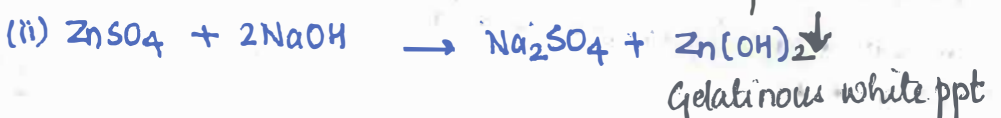


→ (2) Base / Alkali + Acid → salt + water



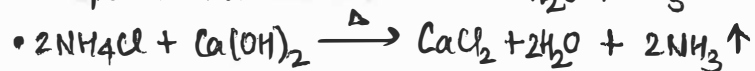
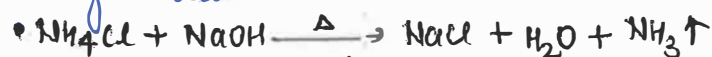
→ (3) They precipitate as insoluble metallic hydroxides when added to the solutions of the salts of heavy metals

Metallic salt + Base / alkali → salt + Insoluble hydroxides



• The hydroxides of Zinc, Aluminium and ~~iron~~ Lead being amphoteric in nature, dissolve in excess of NaOH or KOH but other hydroxides do not.

→ (4) When alkalies are warmed with an ammonium salt, ammonia gas is given out.

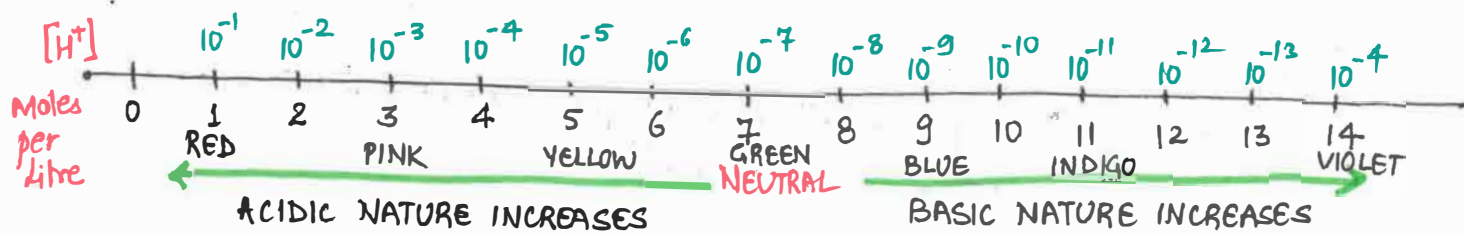




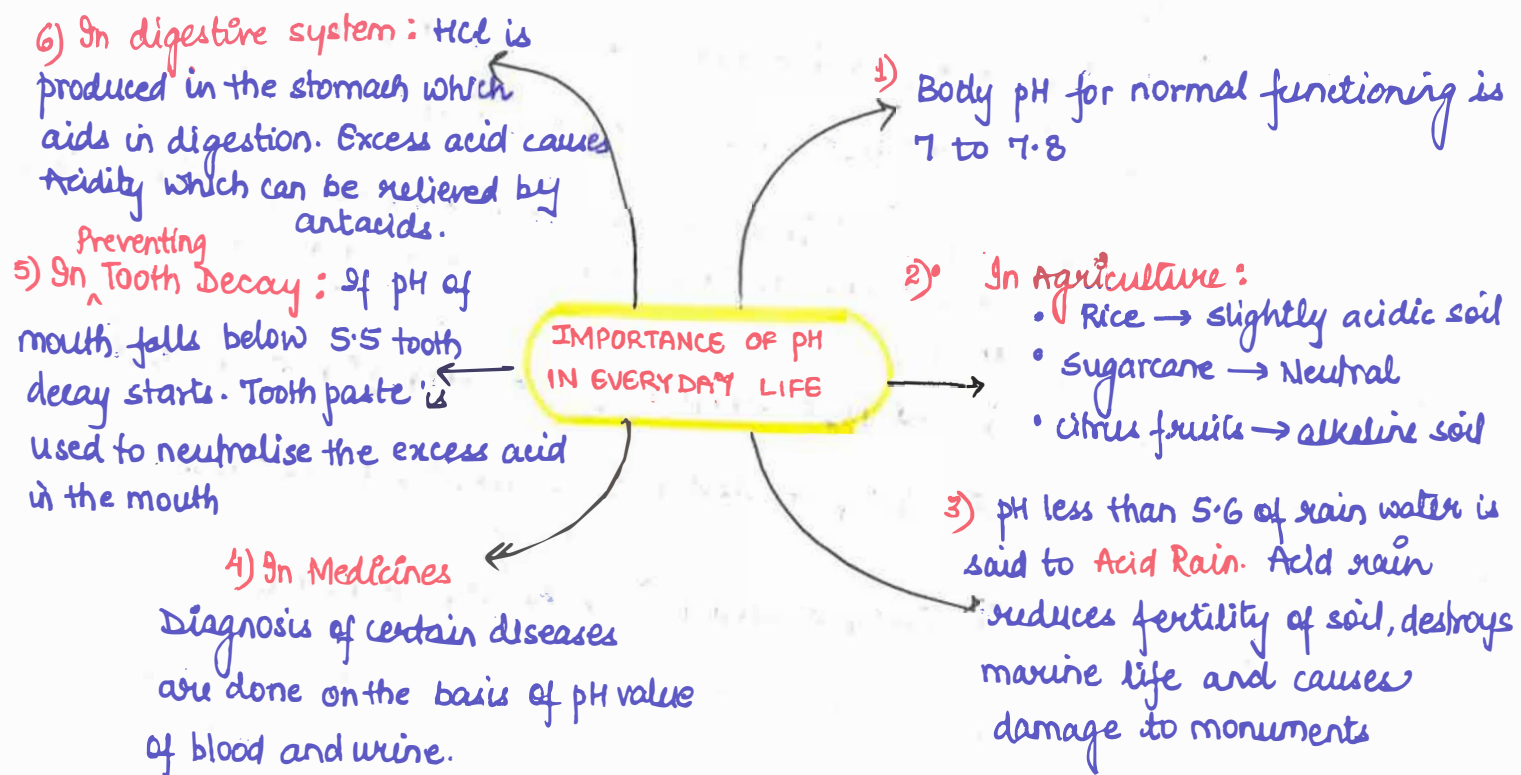
## PH SCALE → DEVISED BY: SORENSEN (1909)

pH of the solution is the negative logarithm to the base 10 of  $H^+$  conc. expressed in moles/litre

$$pH = \log_{10} \frac{1}{[H^+]} = -\log_{10} [H^+]$$



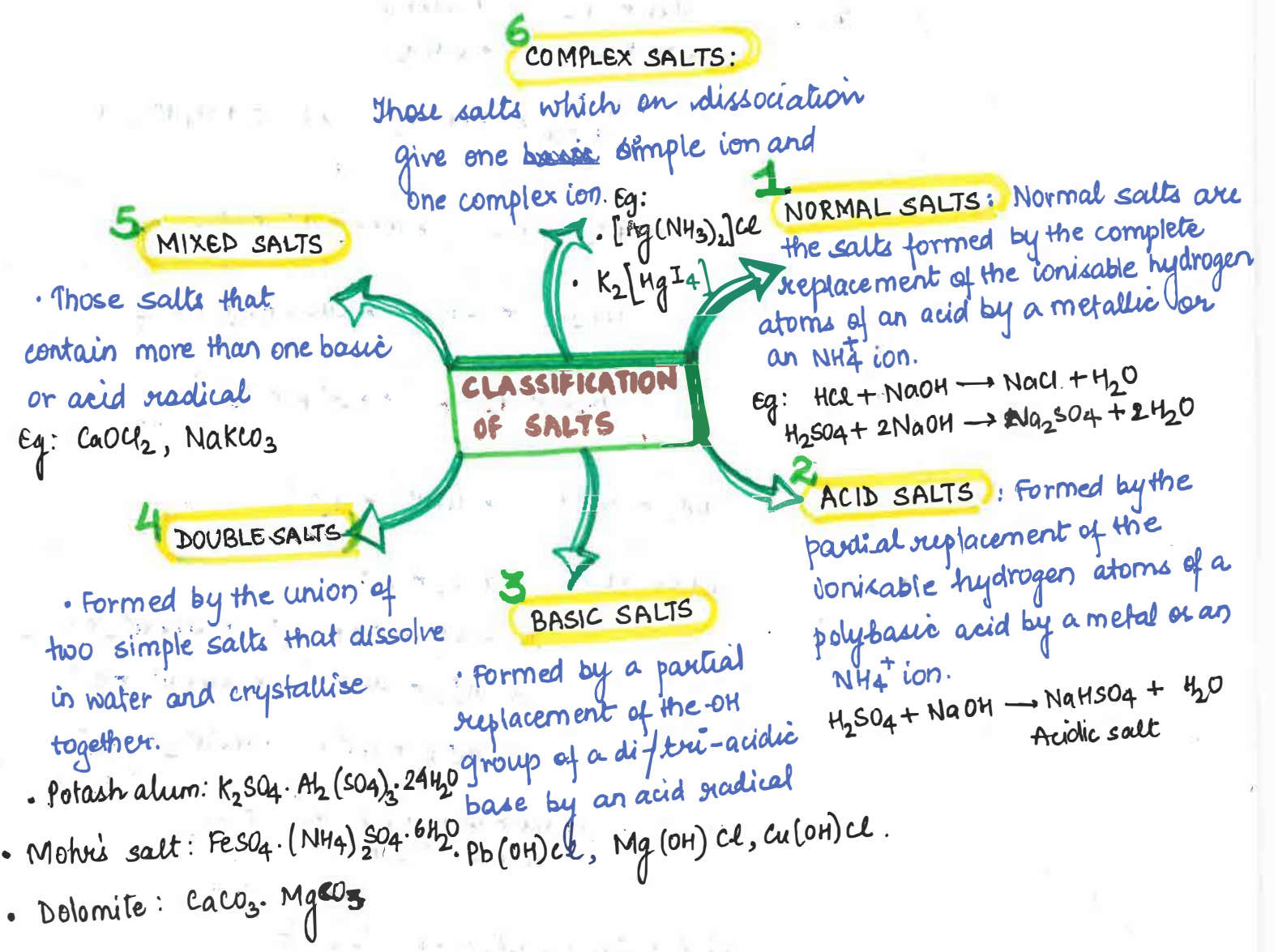
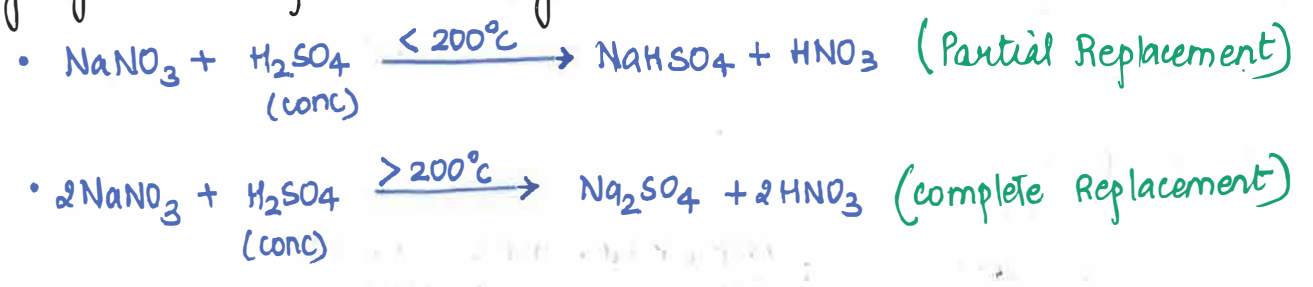
- **UNIVERSAL INDICATOR**: It is a mixture of indicator dyes that gives a spectrum of colours depending on how acidic or alkaline a solution is. Universal indicators give different colours at different concentrations of  $H^+$  ions in a solution.





# SALTS AND THEIR PREPARATION

SALT: Salt is the neutralisation product of an acid and a base. Salt is a compound formed by the partial or total replacement of the ionisable hydrogen atoms of an acid by a metallic ion or an ammonium ion.



## SOLUBILITY OF SALTS:

- All the compounds of ammonium, sodium and potassium are SOLUBLE in water.
- All nitrates and nitrites are soluble.
- All chlorides, bromides and iodides are soluble in water

$[\text{Hg}_2\text{Cl}_2, \text{AgCl}, \text{PbCl}_2]$  }  $\text{PbCl}_2$  are soluble in hot water, not in cold water }



4. All sulphates are soluble ( $\text{CaSO}_4$ ,  $\text{PbSO}_4$ ,  $\text{BaSO}_4$ )

5. All carbonates, sulphides, sulphites and phosphates are insoluble  
(Except of ammonium, sodium and potassium)

# All metallic oxides and hydroxides are insoluble except of sodium, potassium and ammonium.  $\text{Ca(OH)}_2 \rightarrow$  slightly soluble  
•  $\text{NaHCO}_3$  and  $\text{KHCO}_3 \rightarrow$  sparingly soluble.

