$H^+ + H_2O \longrightarrow H_3O^+$

$HCl + Na^+OH \longrightarrow NaCl + H_2O$

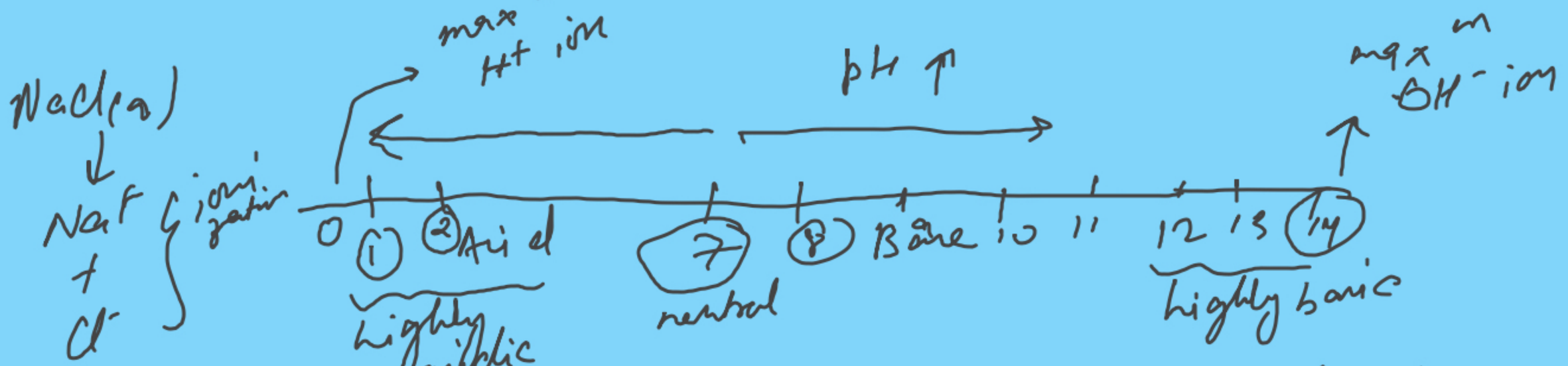
$H^+ + OH^- \rightarrow H_2O$

Acid → H^+

Base → OH^-

$$\underset{\text{Acid}}{HCl} + \underset{\text{Base}}{NaOH} \longrightarrow \underset{\text{Salt}}{NaCl} + \underset{\text{water}}{H_2O}$$

(Neutralization reaction)



$CH_3COOH(aq) \rightleftharpoons \underbrace{CH_3COO^-}_{\text{acetate ion}} + H^+$

$NaOH + H_2O \longrightarrow OH^- + Na^+$

$Ca(OH)_2$

$Mg(OH)_2$

$Mg + HCl \longrightarrow MgCl_2 + H_2\uparrow$

→ Wherever a metal reacts with strong acid, H_2 gas bubbles out effervescence ↓

metals ↓

metallic Oxides → Basic

Non-metallic oxide → acidic

$2Mg + O_2 \rightarrow 2MgO$

$2Ca + O_2 \rightarrow 2CaO$

$2Na + O_2 \rightarrow 2Na_2O$

→

Oxide → Acidic, Basic, Amphoteric, Neutral

$B_2O_3 + H_2O \rightarrow 2H_3BO_3$

$\underbrace{Na_2O}_{\text{basic oxide}} + \underbrace{H_2O}_{\text{water}} \rightarrow \underbrace{2NaOH}_{\text{base}}$

$S + O_2 \rightarrow SO_2$

$2SO_2 + O_2 \rightarrow 2SO_3$

$\underbrace{SO_3}_{\text{acidic oxide}} + \underbrace{H_2O}_{\text{water}} \rightarrow \underbrace{H_2SO_4}_{\text{acid}}$

Amphoteric Oxide → both acidic & basic character

Acidic character: $Al_2O_3 + 6HCl \longrightarrow 2Al^{3+} + 6Cl^- + 3H_2O$

Basic character: $Al_2O_3 + 2OH^- + 3H_2O \longrightarrow 2[Al(OH)_4]^{-1}$

Neutral Oxide: H_2O, CO (no acidic or basic nature)

Salt + Water → Salt Solution
(solute) (solvent) (solution mixture)

$+ \longrightarrow -$

Na Cl

Endothermic

Δ T ↑ → S ↑

Exothermic

Δ T ↑ S ↓

→ With ↑ temperature, sol of gas in liquid ↓

NPK fertilizer → Nitrogen, phosphorus, Potassium

$(NH_4)_2SO_4$, NH_4NO_3, KH_2PO_4

food flavours → NaCl, KCl, KNO_3

toothpaste → NaF

photographic film → AgCl, AgBr

$BaCl_2 + MgSO_4 \rightarrow BaSO_4 + MgCl_2$

$H_2SO_4 + Ca \rightarrow \underset{\text{insoluble}}{CaSO_4} + H_2$

$Ag + HCl \rightarrow \underset{\text{ppt. white}}{AgCl_2\downarrow} + H_2$

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

$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

Cation & Anion Analysis

(1) $NH_4^+ + OH^- \longrightarrow NH_3 + H_2O$

(2) $Cu^{2+} + 2OH^- \longrightarrow Cu(OH)_2$

(3) $Fe^{2+} + 2OH^- \longrightarrow Fe(OH)_2$ (pale green)

(4) $Fe^{3+} + 3OH^- \longrightarrow Fe(OH)_3$ (reddish-brown)

(5) $Al^{3+} + 3OH^- \longrightarrow Al(OH)_3$] → Amphoteric oxides

(6) $Zn^{2+} + 2OH^- \longrightarrow Zn(OH)_2$

(7) $Ca^{2+} + 2OH^- \longrightarrow Ca(OH)_2\uparrow$ (white ppt.)

(8) $Ag^+ + Cl^- \longrightarrow AgCl$

$Ag^+ + Br^- \longrightarrow AgBr$

$Ag^+ + I^- \longrightarrow AgI$

(9) $Ba^{2+} + SO_4^{2-} \longrightarrow BaSO_{4(s)}$

(10) $8Al + 3NO_3^- + 5OH^- + 2H_2O$

$\hookrightarrow 3NH_3 + 8AlO_2^-$

(11) $2H^+_{(aq)} + CO_3^{2-}{}_{(aq)} \longrightarrow CO_{2(g)} + H_2O_{(l)}$

Salts Category	Soluble	Insoluble
(1) NaBr, NaCl, NaI	11	$AgCl_2$, $PbCl_2$
(2) Na_2SO_4, $MgSO_4$	11	$BaSO_4$, $PbSO_4$, $CaSO_4$
(3) Na_2CO_3, K_2CO_3, $(NH_4)_2CO_3$	11	most Insoluble

Acid + Base ⟶ Salt + Water

$HCl + NaOH \longrightarrow NaCl + H_2O$

$NaCl(aq) \downarrow Na^+ + Cl^-$

salts → KCl, $MgSO_4$, $CaSO_4$, Na_3PO_4

Reversible Reacn :

$$NH_4Cl \rightleftharpoons NH_3 + HCl$$

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

$$2SO_2 + O_2 \rightleftharpoons 2SO_3$$

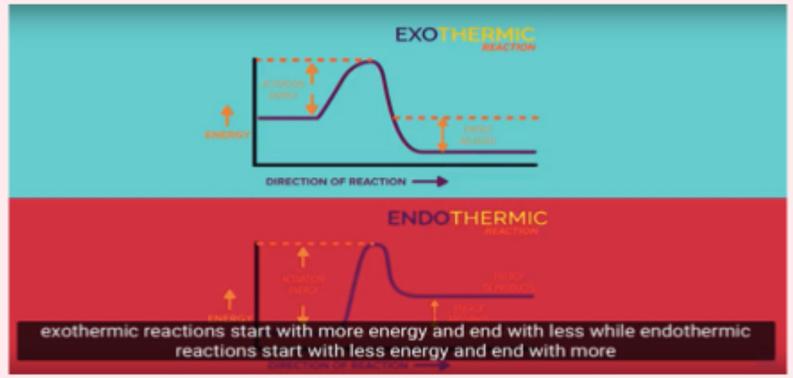
Sublimation Reacn

Solid phase $\xrightarrow{\Delta}$ Gaseous phase

Camphor $\xrightarrow{\Delta}$ Vapour

Exothermic Reacn

→ All combustion reacn



→ Freezing & Condensation

→ gives out heat

→ $C + O_2 \rightarrow CO_2$

$Mg + O_2 \rightarrow MgO$

$2Na + O_2 \rightarrow 2Na_2O$

Endothermic Reacn

→ melting & boiling

→ takes in heat

Equilibrium

→ Rate of forward reaction = Rate of backward reaction
→ Net overall change = 0
→ Reaction has to be reversible and should be in a closed system

Le-Chatelier's principle : Oppose the change & equilibrium shifts accordingly

Factors affecting :
1. Concentration
2. temperature
3. Pressure
4. Surface Area
5. Catalyst
6. Nature of reactant