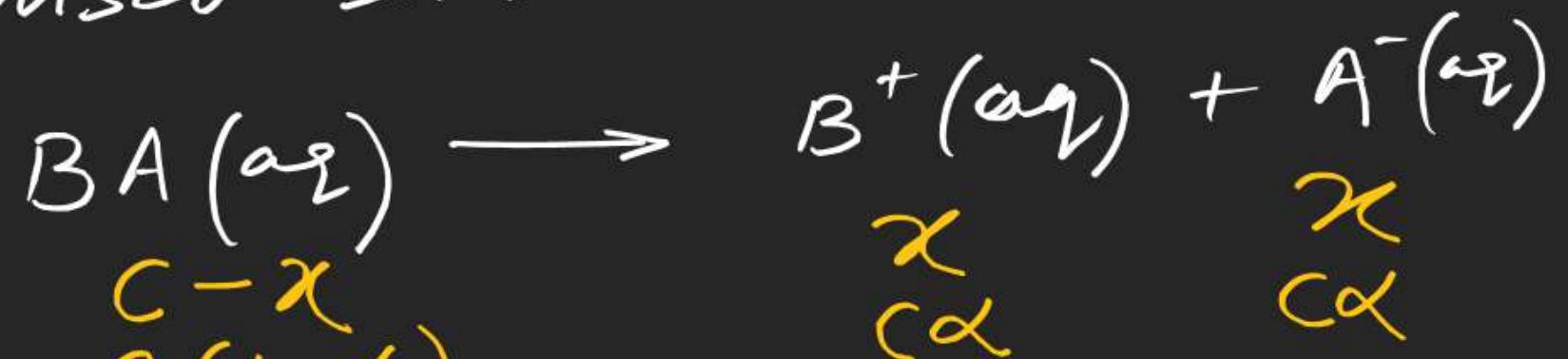


# Ionic Equilibrium: →

- ① pH calculation
- ② Solubility & Solubility product
- ③ Indicators

## Arrhenius theory of dissociation:

There exist a dynamic eqblm b/w ionised and unionised substance.



$$K_{\text{diss}} = \frac{[\text{B}^+][\text{A}^-]}{[\text{BA}]}$$

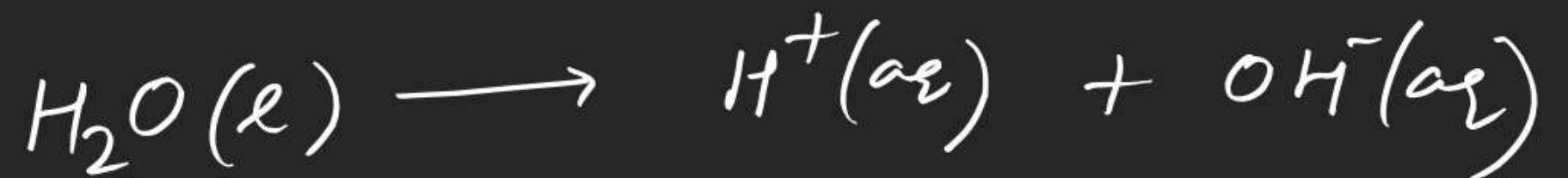
$$= \frac{\chi \cdot \chi}{c - \chi} = \frac{c\alpha \cdot c\alpha}{c(1 - \alpha)} = \frac{c\alpha^2}{1 - \alpha}$$

- Nishant Jindal
- ### factors affecting $\alpha'$
- ① Nature of solute : →
  - ② Nature of solvent : → As dielectric constant  $\uparrow$  es  $\alpha \uparrow$  es
  - ③ Temperature : → Since dissociation is endothermic  
Therefore as  $T \uparrow$  es  $K_{diss} \uparrow \alpha \uparrow$
  - ④ Concentration  $K_{diss} = \frac{C \alpha^2}{1-\alpha}$   
As  $C \downarrow \alpha \uparrow$   
This is known as  
ostwald dilution law
  - ⑤ Common ion effect.  $BA(aq) \rightleftharpoons B^+(aq) + A^-(aq)$   

$$\begin{matrix} C-y & \cdot & y & a+y \end{matrix}$$

$$K_{diss} = \frac{y(a+y)}{C-y}$$
- $$K_{diss} = \frac{\alpha^2}{C-\alpha}$$

# Dissociation of $H_2O$ :-



$$K_{diss} = \frac{[H^+][OH^-]}{[H_2O]}$$

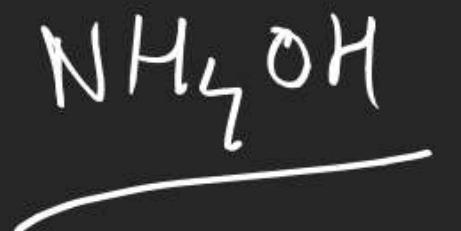
$$[H_2O] = \frac{1000}{18} = 55.555$$

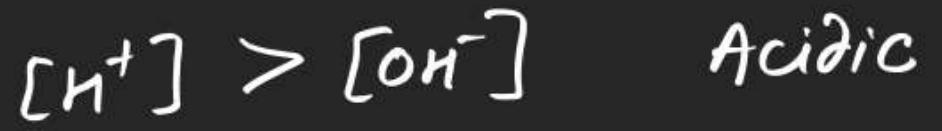
$$K_{diss}[H_2O] = K_w = [H^+][OH^-]$$

↑  
ionic product  
of  $H_2O(l)$

$$\text{At } 25^\circ C \quad K_w = 10^{-14} \left( \frac{\text{mol}}{\text{lit}} \right)^2$$

As T ↑     $K_w$  ↑





Acidic

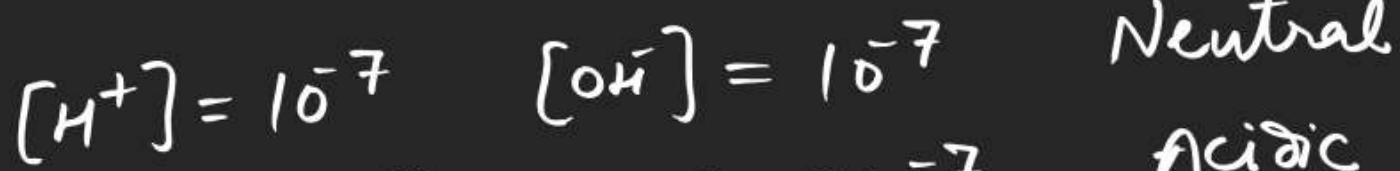


Basic



Neutral

At  $25^\circ C$   $10^{-14} = [H^+][OH^-]$



Neutral



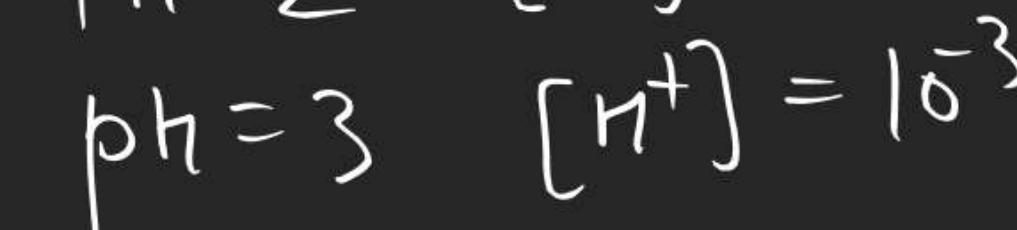
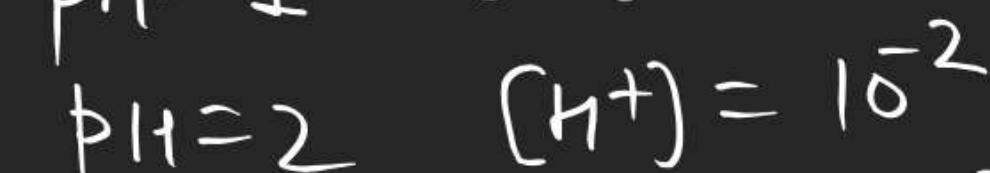
Acidic



Basic

$$pH = -\log [H^+]$$

$$pOH = -\log [OH^-]$$

at  $25^\circ C$ 

$$K_w = [H^+] [OH^-]$$

$$-\log K_w = -\log [H^+] - \log [OH^-]$$

$$pK_w = pH + pOH$$

at  $25^\circ C$

$$pH + pOH = 14$$

$$pH = -\log [H^+]$$

$$\text{if } [H^+] > 1 \quad pH < 0$$



Q. At  $80^\circ\text{C}$ ,  $K_w = 4 \times 10^{-12} (\text{mol/lit})^2$ .

@ Find pH of pure water

b) Define a solution as acidic, basic or neutral

Acidic  $\rightarrow$  (i) 5

Basic  $\rightarrow$  (ii) 6

Basic  $\rightarrow$  (iii) 7

c) find  $\alpha$  of  $\text{H}_2\text{O}$  at  $80^\circ\text{C}$

$$C\alpha = [\text{H}^+] = 2 \times 10^{-6}$$

$$\frac{1000}{18} \alpha = 2 \times 10^{-6}$$

$$\alpha = \frac{18}{1000} \times 2 \times 10^{-6}$$

$$@ [\text{H}^+][\text{OH}^-] = 4 \times 10^{-12}$$

$$[\text{H}^+]^2 = 4 \times 10^{-12}$$

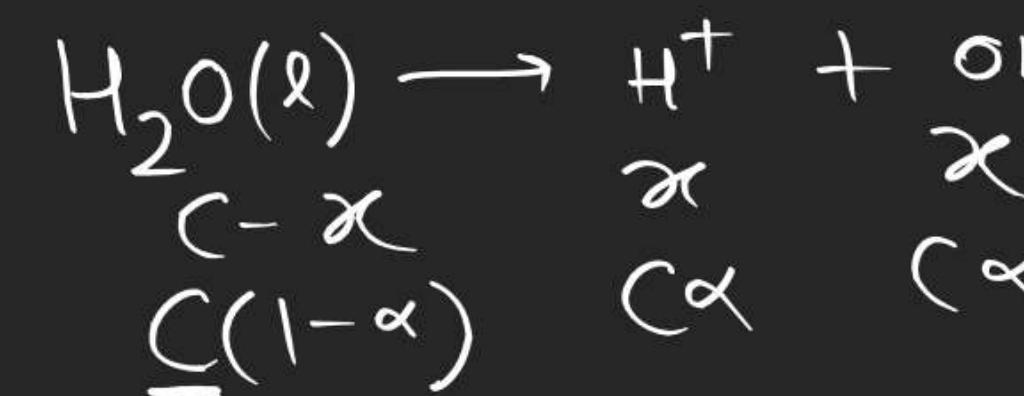
$$[\text{H}^+] = 2 \times 10^{-6}$$

$$\text{pH} = 6 - \log 2 = 5.7$$

$$\log 2 = 0.3$$

$$\log 3 = 0.4771$$

$$\log 5 = 0.7$$



$$K_w = [\text{H}^+][\text{OH}^-]$$

$$4 \times 10^{-12} = (\alpha)^2$$

$$2 \times 10^{-6} = C\alpha$$

# pH-Calculation

