O-I   76 — 80

5-2   53 — 54

81 — 89

Upto 65

O- 1

S- 1

$$\Lambda_m = \Lambda_m^\infty - A\sqrt{C}$$

$\uparrow$ Const   Conc

$$\boxed{\text{As } C\uparrow \quad K\uparrow \quad \Lambda_m\downarrow}$$

for weak electrolyte

$\boxed{0.1M \text{ HA} \atop 10 \text{ lit}}$ $\boxed{0.2M \text{ HA} \atop 5 \text{ lit}}$

Λ_m^∞

for strong electrolyte
small $-$ive slope

for weak electrolyte

Λ_m

$\boxed{\alpha} > \boxed{\alpha}$

1 mol

1 mol

$\sqrt{C}$

As conc $\downarrow$ α 1es   therefor no. y ions 1es
hence Λ_m 1es

for strong electrolyte   0.1M NaCl   0.2M NaCl

$\boxed{10 lit}$ | 1mol $\circ$ | $\boxed{5lit}$
                                              1mol

To determine Λ_m^∞ for weak electrolyte a law was introduced called <u>Kohlrausch law</u>:$\rightarrow$

$$G_{NaCl} = G_{Na^+} + G_{Cl^-}$$

$$K_{NaCl} = K_{Na^+} + K_{Cl^-}$$

$$\Lambda_m(NaCl) = \Lambda_m(Na^+) + \Lambda_m(Cl^-)$$

$$\Lambda_m(CH_3COOH) \neq \Lambda_m(CH_3COO^-) + \Lambda_m(H^+)$$

$$\Lambda_m^\infty(CH_3COOH) = \Lambda_m^\infty(CH_3COO^-) + \Lambda_m^\infty(H^+)$$

"At infinite dilution each ion makes a definite contribution to the conductance of the solution irrespective of its source".

$$\Rightarrow \quad \Lambda_m(NaCl) - \Lambda_m(NaBr) \neq \Lambda_m(KCl) - \Lambda_m(KBr)$$

$$\Lambda_m(Na^+) + \Lambda_m(Cl^-) - \Lambda_m(Na^+) - \Lambda_m(Br^-) \neq \Lambda_m(K^+) + \Lambda_m(Cl^-)$$

$$\Rightarrow \quad \Lambda_m^\infty(NaCl) - \Lambda_m^\infty(NaBr) = \Lambda_m^\infty(KCl) - \Lambda_m^\infty(KBr)$$

$$\Lambda_m^\infty(Na^+) + \Lambda_m^\infty(Cl^-) - \Lambda_m^\infty(Na^+) - \Lambda_m^\infty(Br^-) = \Lambda_m^\infty(K^+) + \Lambda_m^\infty(Cl^-) - \Lambda_m^\infty(K^+) - \Lambda_m^\infty(Br^-)$$

$$Na^+$$

$$Cl^-$$
$$Br^-$$

$$\Lambda_m(Na^+) \ at \ 0.1M$$

$$\Lambda_m^\infty(Na^+)$$

Appl^n of Kohlrausch Law :-

① To determine Λ_m^∞ of weak electrolyte

$$\underline{\Lambda_m^\infty (CH_3COOH)} = \Lambda_m^\infty (CH_3COO^-) + \Lambda_m^\infty (H^+)$$

$$= \Lambda_m^\infty (CH_3COONa) + \Lambda_m^\infty (HCl) - \Lambda_m^\infty (NaCl)$$

$$= \Lambda_m^\infty (CH_3COONa) + \frac{1}{2}\Lambda_m^\infty (H_2SO_4) - \frac{1}{2}\Lambda_m^\infty (Na_2SO_4)$$

$$\Lambda_{eq}^\infty (CH_3COOH) = \Lambda_{eq}^\infty (CH_3COO^-) + \Lambda_{eq}^\infty (H^+)$$

$$\longrightarrow \Lambda_m^\infty (MgCl_2) = \Lambda_m^\infty (Mg^{2+}) + 2\Lambda_m^\infty (Cl^-)$$

$$\longrightarrow \Lambda_{eq}^\infty (MgCl_2) = \Lambda_{eq}^\infty (Mg^{2+}) + \Lambda_{eq}^\infty (Cl^-)$$

$$\Lambda_m = \frac{K \times 1000}{M} \quad \text{or} \quad \frac{K}{1000 \times M}$$

↑ molar conductivity

$$\text{Normality} = M \times n\text{-factor} \\ (N)$$

$$\Lambda_{eq} = \frac{K \times 1000}{N} \quad \text{or} \quad \frac{K}{1000 \times N}$$

↑ equivalent conductivity

$$\Lambda_{eq} = \frac{K \times 1000}{M \times n\text{-factor}}$$

$$\boxed{\Lambda_{eq} \times n\text{-factor} = \Lambda_m}$$

⑪ To determin 'α' of weak electrolyte

Λ_m^∞　　　　$\alpha = 1$

$$\frac{\Lambda_m}{\Lambda_m^\infty} = \boxed{\alpha}$$

$0.1M\ CH_3COOH$　　$\begin{matrix} R \\ K \\ \Lambda_M \end{matrix}$

Q. Resistance of $0.1M\ NH_4Cl$ is $100\,\Omega$

$\ell = 10\ cm$

$A = 2\ cm^2$
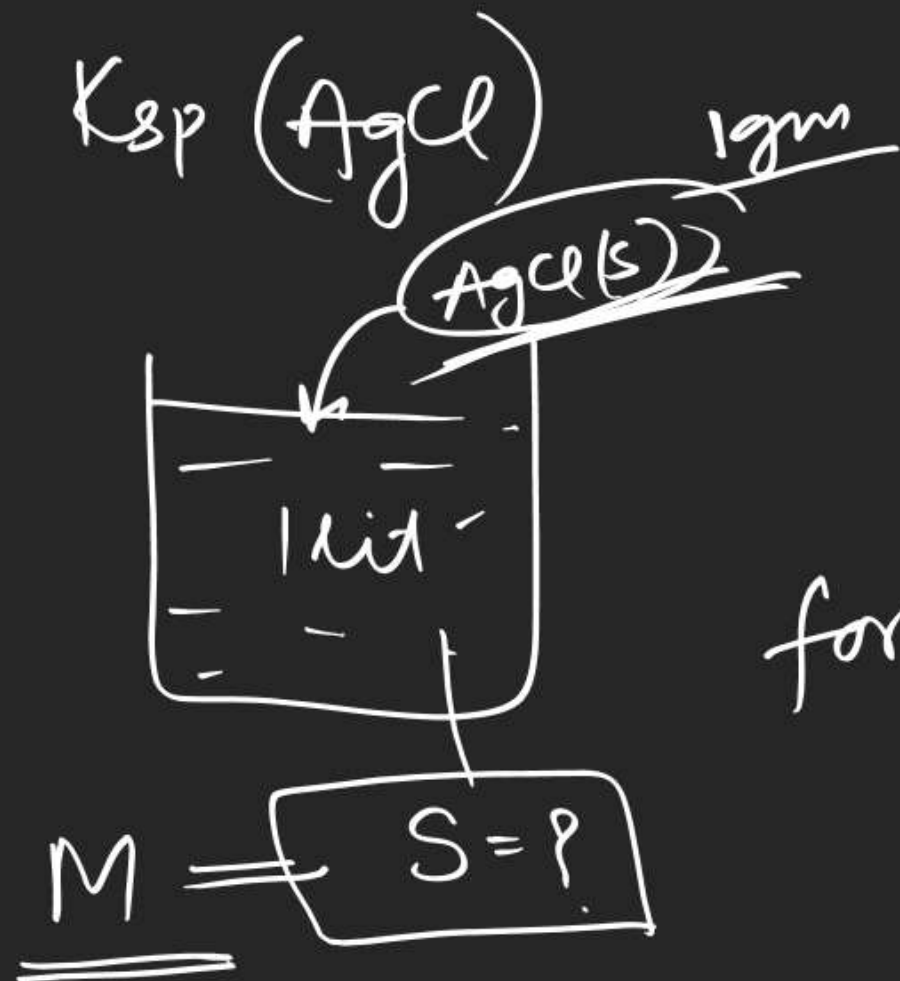
$\Lambda_m^\infty (NH_4Cl) = 1250\ S cm^2 mol^{-1}$

find α'

$$K = \frac{1}{100} \times \frac{10}{2} = \frac{1}{20}$$

$$\Lambda_m = \frac{\frac{1}{20} \times 1000^{50}}{0.1} = 500$$

$$\alpha = \frac{\Lambda_m}{\Lambda_m^\infty} = \frac{500}{1250} = \frac{2}{5} = 0.4$$

(ii)   To determine Ksp

Ksp $(AgCl)$

$AgCl(s)$ $1 gm$

Init

$M = \boxed{S = ?}$

$G = \dfrac{1}{R}$

$\boxed{K} = G\, \dfrac{l}{A}$

$\underline{\Lambda_m = \dfrac{\boxed{K} \times 1000}{\boxed{M} = S}}$

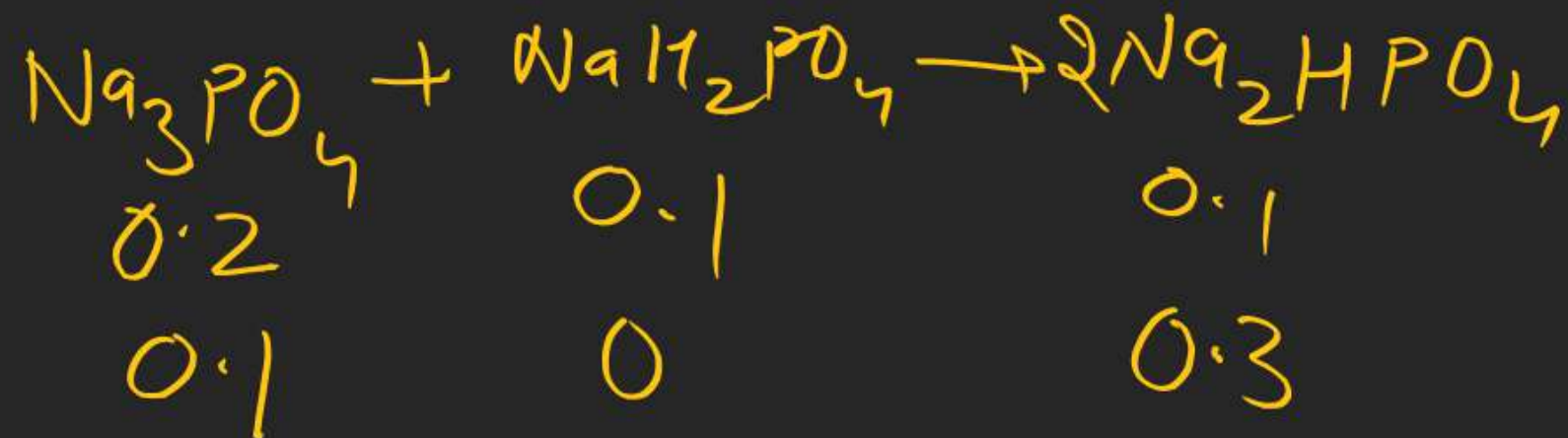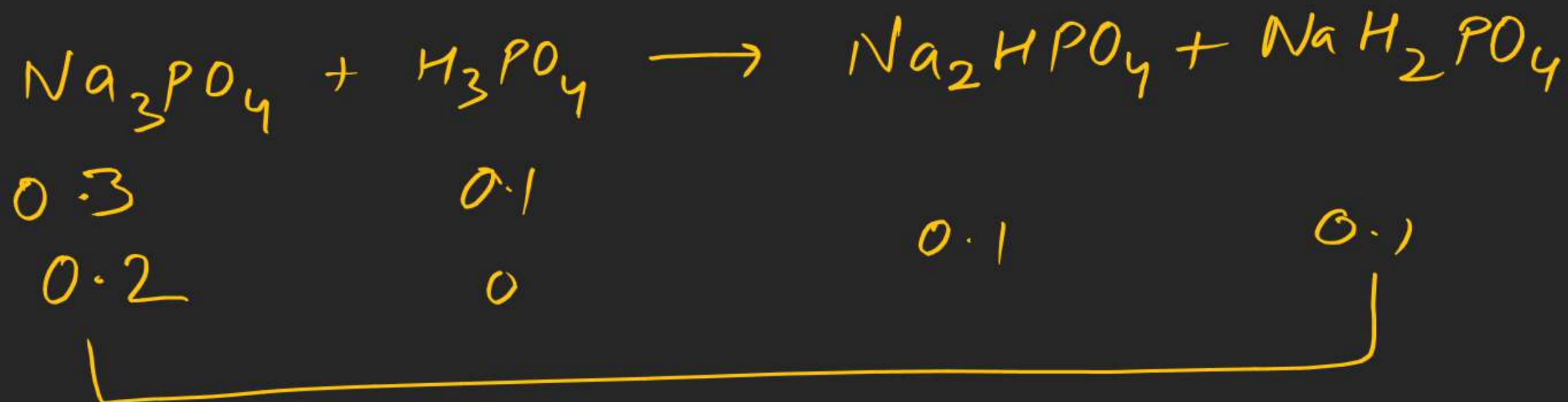for all sparingly salt $\alpha = 1$

$$\dfrac{\Lambda_m}{\Lambda_m^{\infty}} = 1$$

$$\Lambda_m^{\infty} = \dfrac{K \times 1000}{M = S}$$

1. Out of given crystal system, the number of crystal systems in which atleast one of the edge length is shorter or longer that the other edge lengths and one of the interaxial angle is necessarily $90°$ are:

    Cubic, Tetragonal, Orthorhombic, Monoclinic, Hexagonal, Rhombohedral, Triclinic

5. pH of a solution obtained by mixing 3 litre 0.1 M Na_3PO_4 with 1 litre 0.1 M H_3PO_4 will be: [$\log 3 = 0.48, \log 2 = 0.3$]

$$Na_3PO_4 + H_3PO_4 \longrightarrow Na_2HPO_4 + NaH_2PO_4$$

$$0.3 \qquad\qquad 0.1$$
$$0.2 \qquad\qquad 0 \qquad\qquad 0.1 \qquad\qquad\qquad 0.1$$

$$Na_3PO_4 + NaH_2PO_4 \longrightarrow 2Na_2HPO_4$$
$$0.2 \qquad\qquad 0.1 \qquad\qquad\qquad 0.1$$
$$0.1 \qquad\qquad 0 \qquad\qquad\qquad 0.3$$

6. $(100)^{-n}$ atm is the pressure of hydrogen required to be maintained over pure water at $25^{\circ}C$ to get zero hydrogen electrode potential. Find value of n.

7. Increasing amount of dilute HCl was added to an aqueous solution containing $10^{-4}M$ each of Pb^{+2} and Hg_2^{+2}. Given that Ksp value of $PbCl_2$ and Hg_2Cl_2 are 10^{-8} and 10^{-16} respectively at $25°C$ then value of pH of the solution at which precipitation of the least soluble metal halide will start is: