Q.1 *** Cal mole Fraction of Solute in 0.1 molal in Aq. Soln.

Sol. given $m = 0.1$

water m.w. = 18

$$m = \frac{X_B}{X_A} \times \frac{1000}{m_A} \Rightarrow 0.1 = \frac{X_B}{1-X_B} \times \frac{1000}{18} \Rightarrow \frac{1.8}{1000} = \frac{X_B}{1-X_B}$$

$$\frac{X_B}{1-X_B} = 0.0018 \Rightarrow X_B = 0.0018 - 0.0018 \cdot X_B$$

$$X_B = \frac{0.0018}{1.0018} = 0.0017 \text{ Ans.}$$

Q.2 Cal molality of Aq. Soln ethyl alcohol (C_2H_5OH) in which mole Fraction of ethyl alcohol 0.64 & density of Soln is 0.84 gm/ml. also Cal. Molality of Soln.

Sol. given: $X_B = 0.64$; $X_A = 1 - 0.64$

$X_A = 0.36$

$d_{Soln} = 0.84$ gm/ml

$$m = \frac{X_B}{X_A} \times \frac{1000}{m_A}$$

$$m = \frac{0.64}{0.36} \times \frac{1000}{18} \Rightarrow \boxed{m = 98.76 \left(\frac{mol}{kgm}\right)}$$

$\Rightarrow$ 98.76 mole of Solute Preset in 1 kgm or 1000 gm of Solvent

$\Rightarrow n = \frac{w}{m.w.} \Rightarrow w = n \cdot m.w. = 98.76 \times 46$

mass of Soln = $1000 + 98.76 \times 46$

= 5543 gm.

$d = \frac{w}{V_{soln}} \Rightarrow \boxed{V_{soln} = \frac{w}{d}} \Rightarrow \boxed{V_{soln} = \frac{5543}{0.84}}$

$m = \frac{n}{V_{ml}} \times 1000 \Rightarrow m = \frac{98.76}{5543} \times 0.84 \times 1000 \Rightarrow \boxed{m = 14\left(\frac{mol}{ltr}\right)}$

(2) Ques. 0.2 mol of HCl & 0.3 mol of $BaCl_2$ are mixed to form 500ml Soln. Cal. molarity of Chloride ion in Final Soln.

Sol. 0.2 mol $\Rightarrow HCl \longrightarrow H^+ + Cl^-$; $BaCl_2 \longrightarrow Ba^{2+} + 2Cl^-$ (2 × 0.3 = 0.6 mole)

moles of Cl^- in HCl = 0.2 mol ; 0.3 mol

Total no. of moles of Cl^- ion = 0.2 + 0.6 = 0.8 mol ; V = 500ml

$m = \frac{0.8}{500} \times 1000 \Rightarrow \boxed{m = 1.6\ mol/ltr} = [Cl^-]$

(3) Ques. 50ml of 20.8% (w/v) $BaCl_2$ & 100ml of 9.8% (w/v) H_2SO_4 Soln are mixed together. Cal. molarity of Chloride ion in final Soln.

Sol. given: 20.8% (w/v) $BaCl_2$ Soln $\Rightarrow$ 20.8 gm of $BaCl_2$ present in 100ml of Soln.

$\therefore$ 50ml of $BaCl_2$ Soln $\Rightarrow$ 10.4 gm $BaCl_2$ present.

$$n_{BaCl_2} = \frac{10.4}{\frac{208}{2} \times 10} = \frac{1}{20} \text{ mol of } BaCl_2.$$

$$BaCl_2 \longrightarrow Ba^{2+} + 2Cl^-$$

$\frac{1}{20}$ mol $\quad\quad$ $\frac{1}{20} \times 2 = 0.1$ mol of Cl^-

$$[Cl^-] = \frac{n_{Cl^-}}{V_{ml}} \times 1000$$

$$= \frac{0.1}{150} \times 1000$$

$$= \frac{10}{15} = \frac{2}{3} = 0.66\ m$$

Given 100ml of 9.8 % (w/v) H_2SO_4 Soln.

$\Rightarrow$ 9.8 gm H_2SO_4 present in 100ml Soln.

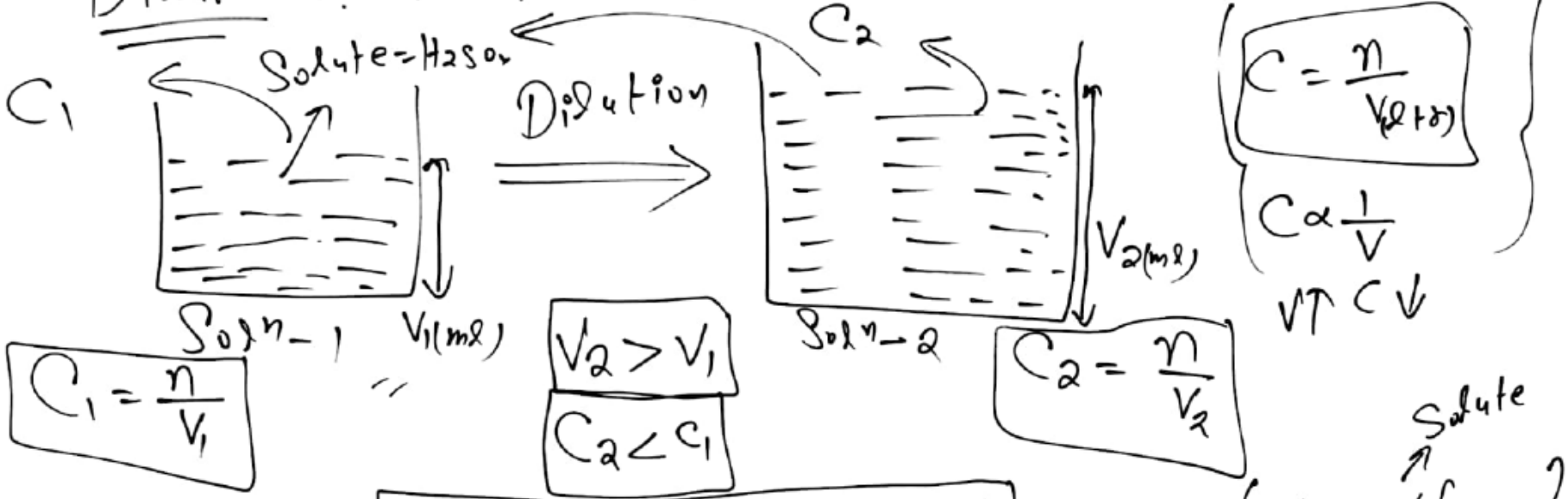
$\Rightarrow$ $n_{H_2SO_4} = \frac{9.8}{98} = 0.1$ mole

T. volume = 100 + 50 = 150ml

Ques. 50ml of 20.8% (w/v) $BaCl_2$ & 100ml of 9.8% (w/v) H_2SO_4 Soln are mixed together. Cal. molarity of chloride ion in final Soln.

{Mw. of $BaCl_2$ = 208}

Dilution :- Further addition of Solvent.



$C = \frac{n}{V_{(l+s)}}$

$C \propto \frac{1}{V}$

$V \uparrow \; C \downarrow$

$C_1 = \frac{n}{V_1}$

$V_2 > V_1$

$C_2 < C_1$

$C_2 = \frac{n}{V_2}$

Dilution ⇑ Concentration ⇓

$N = M \cdot V \cdot f$ (Solute)

imp.

gm-eq. Before dilution = gm-eq. After Dilution

$N_1 V_1 = N_2 V_2$ ⇒ $M_1 V_1 = M_2 V_2$ **.

⇒ $M_1 \cancel{V.f.} V_1 = M_2 \cancel{V.f.} V_2$

Q.1. 1 ltr Soln Containing 490 gm of Sulphuric acid (H_2SO_4) is diluted to 10 ltr water. What is the normality of resulting Solution.

Sol.

I st.

Before dilution. $V_1 = 1$ ltr

$$m_1 = \frac{490}{98} \times \frac{1}{1} = 5$$

$$E = \frac{98}{2} = 49$$

after dilution, $V_2 = 10$ ltr

$m_2 = ?$

$m_1V_1 = m_2V_2$

$5 \times 1 = m_2 \times 10 \Rightarrow m_2 = \frac{5}{10} = \frac{1}{2}$

II nd

Before dilution, $V_1 = 1$ ltr

$$N_1 = \frac{490}{49} \times \frac{1}{1} \Rightarrow N_1 = 10$$

After dilution $V_2 = 10$ ltr

$N_2 = m_2 \cdot V.f$

$$N_2 = \frac{1}{2} \times 2 = 1 \text{ gm-eq/ltr}$$

$N_1V_1 = N_2V_2$

$N_2 = 1$