

Q.1. 214.2 gm Sugar Syrup Contain 34.2 gm Sugar ($C_{12}H_{22}O_{11}$)

Cal. (i) molality of Solⁿ

(ii) mole Fraction of Sugar & water

(iii) mass fraction of Sugar.

m.w. = 342

Sol. given: mass of Solⁿ = 214.2 gm.

mass of Solute (W_B) = 34.2 gm

mass of Solvent (W_A) = 180 gm.

$$(i) \quad m = \frac{W(gm)}{m.w.} \times \frac{1000}{W_A} \Rightarrow m = \frac{34.2}{342} \times \frac{1000}{180 \times 10^3} = 0.55 \left(\frac{mol}{kgm} \right)$$

$$(ii) \quad n_{\text{Sugar}} = \frac{34.2}{342} = 0.1 = \frac{1}{10} \quad \left| \quad n_{\text{Total}} = n_{\text{Sugar}} + n_{\text{Water}} \right.$$

$$n_{\text{Water}} = \frac{180}{18} = 10$$

$$= \frac{1}{10} + 10 = \frac{101}{10}$$

$$X_{\text{Sugar}} = \frac{\frac{1}{10}}{101/10} = \frac{1}{101} \quad ; \quad X_{\text{Sugar}} + X_{\text{Water}} = 1$$

$$X_{\text{Water}} = 1 - X_{\text{Sugar}}$$

$$= 1 - \frac{1}{101} \Rightarrow$$

$$X_{\text{Water}} = \frac{100}{101}$$

(iii) mass fraction of Sugar = $\frac{34.2}{214.2}$ Ans,,

Q.2. Cal. normality, molarity, molality & mole fraction of Solute, 4g% by mass Aqueous Soln of H_2SO_4 having density 1.5 gm/ml

Sol. given: % (w/w) = 4g

$$d_{\text{Soln}} = 1.5 \text{ gm/ml}$$

\Rightarrow 4g gm Solute (H_2SO_4) in 100 gm Soln.

$$W_B = 4 \text{ gm}, \quad W_{\text{Soln}} = 100 \text{ gm}$$

$$W_A = 100 - 4 \text{ gm} \Rightarrow W_A = 51 \text{ gm}$$

$$d_{\text{Soln}} = \frac{W}{V} \Rightarrow V_{\text{Soln}} = \frac{W_{\text{Soln}}}{d_{\text{Soln}}}$$

$$V_{\text{Soln}} = \frac{100}{1.5} = \frac{100 \times 2}{3} = \frac{200}{3} \text{ ml.}$$

$$(i) \quad m = \frac{4g}{98.2} \times \frac{1000g}{200} \times 3 = \frac{15}{2} = 7.5 \quad (\text{mol/ltr})$$

$$(ii) \quad N = m \cdot v \cdot f \Rightarrow N = 7.5 \times 2 \Rightarrow \boxed{N = 15 \text{ gm-eq/ltr}}$$

$$(iii) \quad m = \frac{w_B}{m.w} \times \frac{1000}{\text{mass of solvent in gm.}}$$

$$m = \frac{4g}{98.2} \times \frac{1000 \times 500}{51} = 9.8 \quad (\text{mol/kgm.})$$

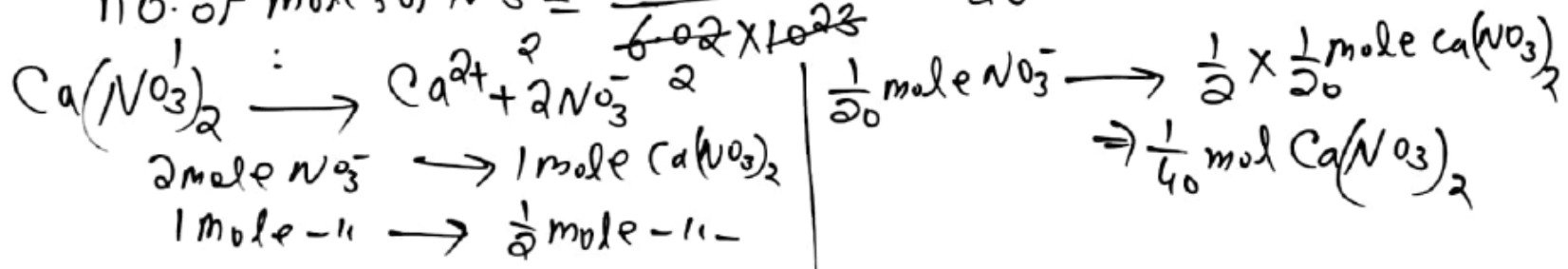
$$(iv) \quad X_B = \frac{n_B}{n_A + n_B} \Rightarrow X_B = \frac{4g/98.2}{\frac{51}{18} + \frac{4g}{98.2}} = \frac{0.5}{3.3} \text{ Ans}$$

Q.3. H.w. Cal. m , m & mole Fraction of Solute 23% (w/v)
Aqueous Soln. ethyl alcohol (C_2H_5OH) having density
1.03 (gm/ml).

Sol. $m = 5$, $m = 6.25$, $X_B = 5/49$

Q.4 Cal. molarity of 300 cm³ Aq. Soln of Calcium Nitrate
which contain 3.01×10^{22} Nitrate ion. $Ca(NO_3)_2$
 (NO_3^-)

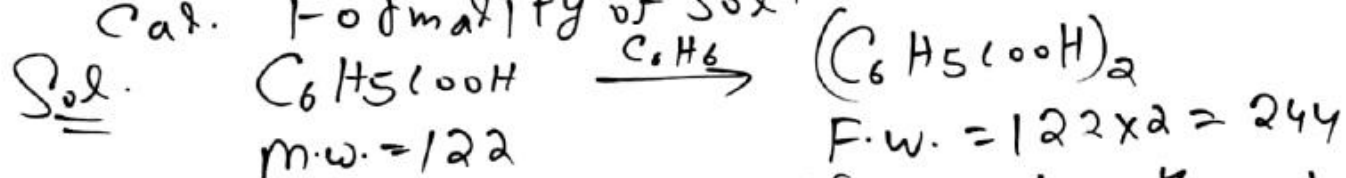
Sol. given No. of NO_3^- ions = 3.01×10^{22}
No. of moles of NO_3^- = $\frac{3.01 \times 10^{22}}{6.02 \times 10^{23}} = \frac{1}{20}$ mol ✓



$$m. = \frac{n}{V(\text{ml})} \times 1000 \Rightarrow m = \frac{1}{48} \times \frac{1000}{388} = \frac{1}{12} (\text{mol/ltr})$$

Q. ues. 6.1 gm of Benzoic acid ($\text{C}_6\text{H}_5\text{COOH}$) was dissolved in Benzene (C_6H_6) & Solⁿ was made to 250 ml.

Cal. Formality of Solⁿ



$$F = \frac{W_{\text{gm}}}{Fw} \times \frac{1000}{V(\text{ml})} \Rightarrow F = \frac{6.1}{244} \times \frac{1000}{250} = \frac{1}{10} = 0.1$$

V.V. imp.

Q. ues. A certain Public water supply contain 0.2 p.p.b of Chloroform (CHCl_3). How many molecules of chloroform would be obtain from 0.478 ml drop of water ($d = 1 \text{ gm/ml}$)

Ex. Given: p.p.b = 0.2

Volume of water supply = water + CHCl₃
(Soln) = 0.478 ml

$$d_{\text{Soln}} = 1 \text{ gm/ml} \Rightarrow d = \frac{W}{V} \Rightarrow \boxed{\frac{W}{\text{Soln}} = d \cdot V}$$

$$W_{\text{Soln}} = 1 \times 0.478 \Rightarrow \boxed{W_{\text{Soln}} = 0.478 \text{ g.}}$$

$$\text{p.p.b.} = \frac{\text{wt. of Solute}}{\text{wt. of Soln}} \times 10^9 \Rightarrow 0.2 = \frac{\text{wt. of Solute}}{0.478} \times 10^9$$

$$\text{wt of Solute (CHCl}_3) = \frac{0.2 \times 0.478 \times 10^9}{10} = 0.956 \times 10^{-10} \text{ gm.}$$

$$\text{m.w. of CHCl}_3 = 12 + 1 + 35.5 \times 3 = 119.5$$

$$n_{\text{CHCl}_3} = \frac{0.956 \times 10^{-10}}{119.5} \Rightarrow \text{No. of molecules} = \frac{0.956 \times 10^{-10}}{119.5} \times 6.02 \times 10^{23} = \frac{5.736}{119.5} \times 10^{13} \text{ No.}$$