ABLES KOTA

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

(ii) $n_{Sugar} = \frac{34.2}{342} = 0.1 = 1/10$

$n_{water} = \frac{180}{18} = 10$

$n_{Total} = n_{Sugar} + n_{water}$

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

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

$$X_{water} = 1 - X_{Sugar}$$

$$= 1 - \frac{1}{101} \Rightarrow \boxed{X_{water} = \frac{100}{101}}$$

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

Q.2. Cal. normality, molarity, molality & mole Fraction of Solute, 49% by mass Aqous Soln of H_2SO_4 having density 1.5 gm/ml

Sol. given $\div$ % $\left(\frac{w}{W}\right) = 49$

$d_{Soln} = 1.5$ gm/ml

$\Rightarrow$ 49 gm Solute (H_2SO_4) in 100 gm Soln.

$w_B = 49$ gm, $w_{Soln} = 100$ gm.

$w_A = 100 - 49 \Rightarrow \boxed{w_A = 51 \text{ gm}}$

$$d_{Soln} = \frac{w}{V} \Rightarrow V_{Soln} = \frac{w_{Soln}}{d_{Soln}}$$

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

(i) $m = \frac{4g}{98_2} \times \frac{1000\,5}{200} \times 3 = \frac{15}{2} = 7.5$ (mol/ltr)

(ii) $N = m.v.f. \Rightarrow N = 7.5 \times 2 \Rightarrow$ **$N = 15$ gm-eq/ltr**

(iii) $m = \frac{W_B}{m.w} \times \frac{1000}{\text{mass of Solvent in gm.}}$

$m = \frac{4g}{98_2} \times \frac{1000\,500}{51} = 9.8$ (mol/kgm.)

(iv) $X_B = \frac{n_B}{n_A + n_B} \Rightarrow X_B = \frac{4g/98_2}{\frac{51}{18} + \frac{4g}{98_2}} = \frac{0.5}{3.3}$ Ans

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

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

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Q.4 Cal. molarity of 300 cm^3 Aq. Soln of Calcium Nitrate which Contain 3.01×10^{22} nitrate ion. (NO_3^-) $Ca(NO_3)_2$

Sol. given no. of NO_3^- ions $= 3.01 \times 10^{22}$

no. of moles of $NO_3^- = \frac{3.01 \times 10^{22}}{6.02 \times 10^{23}} = \frac{1}{20}$ mol ✓✓

$Ca(NO_3)_2 \longrightarrow Ca^{2+} + 2NO_3^-$

2 mole $NO_3^- \longrightarrow$ 1 mole $Ca(NO_3)_2$

1 mole-" $\longrightarrow \frac{1}{2}$ mole-"-

$\frac{1}{20}$ mole $NO_3^- \longrightarrow \frac{1}{2} \times \frac{1}{20}$ mole $Ca(NO_3)_2$

$\Rightarrow \frac{1}{40}$ mol $Ca(NO_3)_2$

$$m. = \frac{n}{V_{(ml)}} \times 1000 \Rightarrow m = \frac{1}{4g} \times \frac{1000}{3g} = \frac{1}{12} \text{ (mol/ltr)}$$

Q. Ques. 6.1 gm of Benzoic acid [C_6H_5COOH] was dissolved in Benzene (C_6H_6) & Soln was made to 250ml. Cal. Formality of Soln

Sol. $C_6H_5COOH \xrightarrow{C_6H_6} (C_6H_5COOH)_2$

m.w. = 122 F.w. = 122 × 2 = 244

$$F = \frac{W \text{ gm}}{Fw} \times \frac{1000}{V_{(ml)}} \Rightarrow F = \frac{6.1}{122 \times 2} \times \frac{1000}{250} \times 10 = \frac{1}{10} = 0.1$$

V.V. imp.

Q. Ques. 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 gm/ml)

Sol. given ÷ $p.p.b = 0.2$

Volume of water Supply = water + $CH.Cl_3$

V_{soln} (Soln) $= 0.478$ ml

$d_{soln} = 1$ gm/ml $\Rightarrow d = \frac{w}{V} \Rightarrow \boxed{w_{soln} = d.V.}$

$w_{soln} = 1 \times 0.478 \Rightarrow \boxed{w_{soln} = 0.478 \text{ gm.}}$

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

$$\text{wt of Solute } (CHCl_3) = \frac{0.2}{10} \times 0.478 \times 10^{-9} = 0.956 \times 10^{-10} \text{ gm.}$$

m.w. of $CHCl_3 = 12 + 1 + 35.5 \times 3 = 119.5$

$$n_{CHCl_3} = \frac{0.956 \times 10^{-10}}{119.5} \Rightarrow \text{No. of molecules} = \frac{0.956 \times 10^{-10}}{119.5} \times 6.02 \times 10^{23}$$

$$= \frac{5.736}{119.5} \times 10^{13} \text{ Ans.}$$