

Relation B/w Molarity & normality =

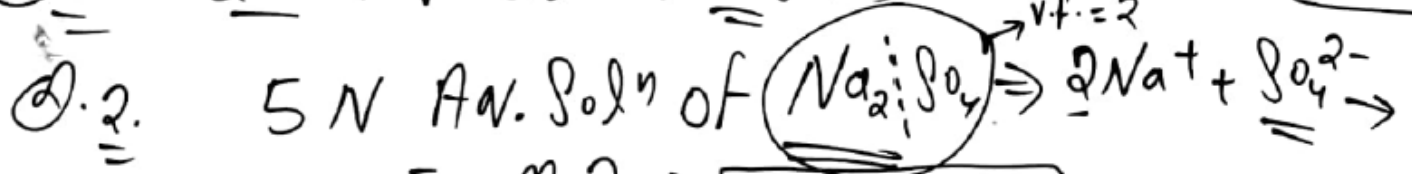
#  $N = \frac{W}{E} \times \frac{1}{V(l+r)}$  {  $E = \frac{m.w.}{V.f.}$  }

$N = \left( \frac{W}{m.w.} \times \frac{V.f.}{1}{V(l+r)} \right)$

$N = M \cdot V.f.$  \*\*\*

$\Rightarrow V.f. = 2$

Q.1. 2m. Aq. Sol<sup>n</sup> of  $H_2SO_4$   $\Rightarrow N = 2 \times 2 \Rightarrow N = 4$



$5 = M \cdot 2 \Rightarrow M = 5/2 = 2.5$  Ans.

molality (m) =

Number of moles of Solute present in 1 kgm. or 1000 gm of Solvent. is k/a molality of Soln.

#  $m = \frac{\text{no. of moles of Solute}}{\text{mass of Solvent (kgm.)}} \Rightarrow m = \frac{n}{W(\text{kgm.})}$

$m = \frac{w(\text{gm.})}{M.W.} \times \frac{1}{W(\text{kgm.})}$  \*

$m = \frac{w(\text{gm.})}{M.W.} \times \frac{1000}{W(\text{gm.})}$  \*

ex. 2m Aq. Soln of  $\text{H}_2\text{SO}_4$ .

$\Rightarrow$  2 mole of  $\text{H}_2\text{SO}_4$  present in 1 kgm. of Solvent.

$\Rightarrow n = 2 \Rightarrow \frac{w}{98} = 2 \Rightarrow w = 196 \text{ gm.}$

$\Rightarrow \text{Soln. mass} = 196 + 1000$   
 $= 1196 \text{ gm.}$

Formality (F)  $\div$  Number of formula mass of solute present in 1 ltr of sol<sup>n</sup> is k/a Formality of sol<sup>n</sup>.

$$F = \frac{\text{no. of formula mass.}}{\text{Volume of sol<sup>n</sup>. (ltr)}} = \frac{W(\text{gm.})}{F.W.} \times \frac{1}{V(\text{ltr})}$$

Here: F.W.  $\rightarrow$  Formula mass.

ex: (i) Sodium chloride (NaCl)  $\Rightarrow$  m.w. = F = 58.5

(ii)  $\text{CH}_3\text{COOH}$  in Benzene  $\rightarrow (\text{CH}_3\text{COOH})_2$   
 m.w. = 60 F.W. =  $2 \times 60 = 120$ .

(iii)  $\text{C}_6\text{H}_5\text{COOH}$  in Benzene  $\rightarrow (\text{C}_6\text{H}_5\text{COOH})_2$   
 Benzoic Acid F.W. =  $2 \times 122 = 244$   
 m.w. = 122

mole Fraction (X) ÷

	Solute	+	Solvent
	(B)		(A)
mass	$w_B$		$w_A$
molar mass.	$M_B$		$M_A$
moles	$n_B$		$n_A$
mole Fraction	$X_B$		$X_A$

mole fraction of Solute ( $X_B$ ) =  $\frac{n_B}{n_A + n_B}$

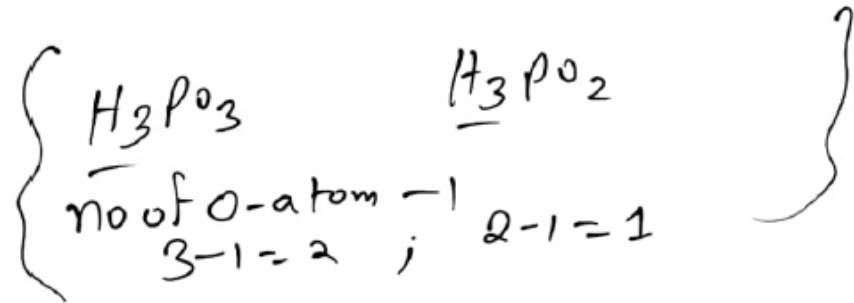
- || - Solvent ( $X_A$ ) =  $\frac{n_A}{n_A + n_B}$

$\{n_A + n_B = n_{Total}\}$

#  $X_A + X_B = 1$     #  $0 < X \leq 1$  \*\*

Mole Fraction (X) :

#  $\frac{x_A}{x_B} = \frac{n_A}{n_B}$  \*\*\*



Strength (S) : Amount of Solute (in gm) present in 1 litre of Solution is 1/a Strength of Soln.

$S = \frac{\text{mass of Solute (gm)}}{\text{Volume of Soln (ltr)}} \Rightarrow S = \frac{W(\text{gm})}{V(\text{ltr})}$

Unit :- gm/ltr.

#  $S = \frac{W_g}{E} \times \frac{E}{V(\text{ltr})} \Rightarrow S = N \cdot E$  \*\*\*

v.f. = 3

Q.1. Cal. Strength (g/ltr) of 0.2M. Aq. Soln of  $\text{H}_3\text{PO}_3$   
 So,  $N = m \cdot v.f. \Rightarrow N = 0.2 \times 3 = N = 0.6$

$$\begin{aligned} \text{m.w. of } H_3PO_4 &= 1 \times 3 + 31 + 16 \times 4 \\ &= 34 + 64 = 98 \end{aligned}$$

$$E = \frac{98}{3} ; S = N \cdot E \Rightarrow S = 0.6 \times \frac{98}{3}$$

$$S = 19.6 \text{ gm/ltr}$$

Part's per million (P.P.M.) / Part's per Billion (P.P.B.)

$$P.P.M. = \frac{\text{Weight of Solute}}{\text{Weight of Soln}} \times 10^6 = \frac{\text{Volume of Solute}}{\text{Volume of Soln}} \times 10^6$$

$$P.P.B. = \frac{\text{Wt. / Volume of Solute}}{\text{Wt. / Volume of Soln}} \times 10^9$$

## Relation b/w molality (m) & mole Fraction (X)

$$\Rightarrow \frac{X_B}{X_A} = \frac{n_B}{n_A} \Rightarrow \frac{X_B}{X_A} = \frac{W_B/m_B}{W_A/M_A} \quad \left\{ m = \frac{W_B}{m_B} \times \frac{1000}{W_A(\text{gm})} \right\}$$

$$\frac{X_B}{X_A} \rightarrow \frac{\frac{W_B(\text{gm})}{W_A(\text{gm})} \times \frac{M_A}{m_B} \times \frac{1000}{1000}}$$

$$\frac{X_B}{X_A} = \frac{m \cdot M_A}{1000} \quad *$$

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

Here  $\div X_B$  &  $X_A \Rightarrow$  mole Fraction of Solute & Solvent  
 $M_A \Rightarrow$  m.w. of Solvent.

Relation B/w % by mass ( $\frac{\%W}{W}$ ) & molarity (M) or Normality (N) %

$$M = \frac{W(gm)}{m.w.} \times \frac{1000}{V(ml)}$$

$$\left\{ \frac{\%W}{W} = \frac{W(gm)}{W(gm)} \times 100 \right\}$$

$$M = \frac{W(gm)}{m.w.} \times \frac{100}{V(ml)_{soln}} \times \frac{W(soln)(gm)}{W(soln)(gm)} \times 10$$

$$\left\{ d_{soln} = \frac{W_{soln}}{V_{soln}} \right\}$$

$$M = \frac{\% \text{ by mass} \times d_{soln} \times 10}{m.w./m_b}$$

Here  $d_{soln} \Rightarrow$  density of soln  
 $m.w./m_b \Rightarrow$  m.w. of solute.

$$N = \frac{\% \text{ by mass} \times d_{soln} \times 10}{E}$$