QUESTION : 1

If 0.4 g of NaOH is present in 40 mL of solution. What is the molarity and normality of solution. [Molecular mass of NaOH = 40]

(a) 0.25 N (b) 0.025 N

(c) 2.5 N (d) 0.50 N

$$M = \frac{\text{mole of Solute}}{\text{Volume of Solution (L)}}$$

$$\left[n = \frac{\omega(gm)}{m\omega t}\right]$$

$$M = \frac{\omega(gm)}{m.\omega t} \times \frac{1000}{V(mL)}$$

$$M = \frac{0.4}{40 \times 40} \times 1000 = 0.25\,M$$

$$N = \frac{\text{mass of Solute}}{\text{E.qt mass of Solute} \times V(mL)} \times 1000$$

$$= \frac{0.4}{40 \times 40} \times 1000 = 0.25\,N$$

II method

Normality = molarity × n-f or V-f

for NaOH → n-factor = 1

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

$= 0.25 \times 1$

$= 0.25$

QUESTION : 2

93 gm of H_2SO_4 present in 100 gm of Solution

98 gm

Find out the molarity of 93% (w/W) H_2SO_4 (density = 1.84 g/ml).

(a) 174.6 M

(b) 17.46 M

(c) 1.746M

(d) All of these

$$M = \frac{\text{moles of Solute}}{\text{Volume of Solution (L)}}$$

$$M = \frac{\%\text{ by wt} \times \text{density} \times 10}{\text{M.wt}} = \frac{\text{mass in gm} \times \text{Density} \times 1000}{\text{Mwt} \times \text{mass of solution}}$$

$$= \frac{93 \times 1.84 \times 1000}{98 \times 100}$$

$$= 17.46\ M$$

QUESTION : 3

$NaOH \longrightarrow Na^{\oplus} + OH^{\ominus}$

n-factor = 1

A 100 cm^3 solution is prepared by dissolving 2g of NaOH in water. Calculate the normality of the solution.

(a) 1N

(b) N/2

(c) 0.5N

(d) Both (B) and (C)

$$\text{gm eq of NaOH} = \frac{\omega(\text{gm})}{\text{Eq.wt}}$$

$$\left[\text{Eq wt} = \frac{\text{A.wt / m.wt}}{\text{n-factor}}\right]$$

$$\text{Eq.wt} = \frac{40}{1} = 40\ \text{gm}$$

$$= \frac{2}{40} = \frac{1}{20}$$

$$N = \frac{\text{gm eq of Solute} \times 1000}{\text{Volume of Solution (mL)}}$$

$$= \frac{\frac{1}{20}}{1000} \times 1000 = \frac{1}{2}\,N = 0.5\,N$$

QUESTION : 4

Find the percentage by mass and mass fraction of aspirin in the solution prepared by dissolving 3.65 g of aspirin in 25.08 g of water.

Solute → Solvent

(a) 12.7%

(b) 1.27%

(c) 0.127%

(d) 0.0127%

mass of Solution = mass of Solute + mass of Solvent

= 3.65 + 25.08 = 28.73 gm

mass fraction of Solute = $\frac{\text{mass of Solute}}{\text{Total mass}}$

= $\frac{3.65}{28.73}$ = 0.127

mass % = 0.127 × 100

= 12.7 %

QUESTION : 5

A solution was prepared by adding 125 cm^3 of isopropyl alcohol to water until the volume of the solution was 175 cm^3. Find the volume fraction and volume percent of isopropyl alcohol in the solution.

(a) 71.4%

(b) 7.14%

(c) 0.714%

(d) None of these

Solute

Solvent

$V_{solution}$

Solute

Volume of isopropyl alchol = 125 cm^3 (Solute)

Volume of Solvent = 175 − 125 = 50 cm^3

So Volume fraction = $\frac{125}{175}$ = 0.7142

% Volume fraction = 0.7142 × 100

= 71.42 %

QUESTION : 6

Solvent mass = 100 − 60 = 40 gm

60 gm CH_3OH present in 100 gm of solution

Calculate the mole percentage of CH_3OH and H_2O respectively in 60% (by mass) aqueous solution of CH_3OH.

(a) 45.8, 54.2

(b) 54.2, 45.8

(c) 50, 50

(d) 60, 40

molar mass of H_2O = 18 gm

—"— CH_3OH = 32 gm

mole of $H_2O = \frac{40}{18} = 2.22$

mole of $CH_3OH = \frac{60}{32} = 1.87$

Total no of moles = 1.87 + 2.22 = 4.09

So mole % of $CH_3OH = \frac{1.87}{4.09} \times 100 = 45.8\%$

—"— of $H_2O = \frac{2.22}{4.09} \times 100 = 54.23\%$

QUESTION : 7

(NaCl) → Solute

→ Solvent

The molarity of a solution of sodium chloride (mol wt. = 58.5) in water containing 5.85 g of sodium chloride in 500 mL of solution is:-

(a) 0.25 (b) 2.0

(c) 1.0 (d) 0.2

$w(gm) = 5.85\ gm$

$m.wt = 58.5\ gm$

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

$$M = \frac{5.85}{58.5 \times 500} \times 1000 = 0.2\ Molar$$

QUESTION : 8

Equal weight of NaCl and KCl are dissolved separately in equal volumes of solutions then molarity of the two solutions will be

(a) Equal ✗

(b) That of NaCl will be less than that of KCl ✗

(c) That of NaCl will be more than that of KCl Solution ✓

(d) That of NaCl will be half of that of KCl solution ✗

$M = \frac{\text{mole of Solute}}{\text{Volume of solution (L)}}$

$\left[n = \frac{w(gm)}{m.wt}\right]$

$M = \frac{w(gm)}{m.wt \times V\,(L)}$

* m.wt of KCl > m.wt of NaCl

So $(M)_{NaCl} > (M)_{KCl}$

Here weight of solute and volume of Solution are equal so

$\boxed{M \propto \frac{1}{m.wt}}$

QUESTION : 9

In a solution of 7.8 g benzene (C_6H_6) and 46.0g toluene ($C_6H_5CH_3$) the mole fraction of benzene is:-

(a) $\frac{1}{6}$

(b) $\frac{1}{5}$

(c) $\frac{1}{2}$

(d) $\frac{1}{3}$

$\omega_{C_6H_6} = 7.8\ gm$

$(m.\omega)_{C_6H_6} = 78\ gm$

$n_{C_6H_6} = \frac{7.8}{78} = 0.1$

$\omega_{C_6H_5CH_3} = 46.0\ gm$

$(m.\omega t)_{C_6H_5CH_3} = 92\ gm$

$n_{C_6H_5CH_3} = \frac{46}{92} = 0.5$

$n_{Total} = 0.1 + 0.5 = 0.6$

$X_{C_6H_6} = \frac{n_{C_6H_6}}{n_{Total}} = \frac{0.1}{0.6} = \frac{1}{6}$

QUESTION : 10

An X molal solution of a compound in benzene has mole fraction of solute equal to 0.2. The value of X is:-

(a) 14

(b) 3.2

(c) 1.4

(d) 2

Relation b/w molality and mole fraction

$[x_{solute} + x_{solvent} = 1]$

$m = \frac{1000 \times x_2}{x_1 \times M_1}$

x_2 → Mole fraction of solute

x_1 → mole fraction of solvent

$m = \frac{1000 \times 0.2}{0.8 \times 78} = 3.2$ molal

QUESTION : 11

A 500 g tooth paste sample has 0.02 g fluoride concentration. What is the concentration of fluorine in terms of ppm level:-

(a) 250

(b) 40

(c) 400

(d) 1000

$$\text{PPm} = \frac{\text{weight of Solute}}{\text{weight of Solution}} \times 10^6$$

$$= \frac{0.2}{500} \times 10^6 = 40 \text{ PPm}$$

QUESTION : 12

H_2O_2 solution used for hair bleaching is sold as a solution of approximately 5.0 g H_2O_2 per 100 mL of the solution. The molecular mass of H_2O_2 is 34. The molarity of this solution is approximately:-

(a) 0.15 M

(b) 1.5 M

(c) 3.0 M

(d) 3.4 M

mass of H_2O_2 = 5 gm

molar mass = 34 gm

$$\text{mole} = \frac{\omega(\text{gm})}{\text{m.wt}} = \frac{5}{34} = 0.147$$

$$\text{Molarity} = \frac{0.147}{100} \times 1000 = 1.47 \simeq 1.5\ \text{M}$$

Thank You Lakshyians