

NEET JEE - SOLUTIONS

- 1) b 2) a 3) b 4) c
 5) c 6) a 7) a 8) d
 9) b 10) a 11) c 12) b
 13) a 14) b 15) b 16) c
 17) c 18) d 19) c 20) a
 21) c 22) d 23) a 24) b
 25) a 26) b 27) d 28) c
 29) c 30) a 31) c 32) a
 33) c 34) a 35) b 36) a
 37) b 38) d 39) b 40) b

1 (b)

(π) glucose = (π) unknown compound

$$0.05 = \frac{3}{M}$$

$$M = \frac{3}{0.05} = 60$$

$$n = \frac{60}{30} = 2 \text{ (e.f.m. for } \text{CH}_2\text{O} = 30)$$

so, molecular formula = $\text{C}_2\text{H}_4\text{O}_2$

2 (a)

$$\Delta T_f = i k_f m$$

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where ΔT_f = depression in freezing point

i = van't Hoff factor

m = molality and

and k_f = freezing point depression constant

For 0.01 molal NaCl solution

$$0.37 = 2 \times k_f \times 0.01$$

$$\therefore k_f = \frac{0.37}{2 \times 0.01} \text{ -----(i)}$$

For 0.02 molal urea solution

$$\Delta T_f = 1 \times k_f \times 0.02$$

$$\therefore k_f = \frac{\Delta T_f}{0.02} \text{ -----(ii)}$$

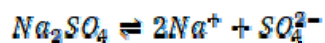
From Eqs (i) and (ii)

$$\frac{0.37}{2 \times 0.01} = \frac{\Delta T_f}{0.02}$$

$$\Delta T_f = \frac{0.37 \times 0.02}{2 \times 0.01}$$

$$\therefore \Delta T_f = 0.37^\circ\text{C}$$

3 (b)



van't Hoff factor $i = [1 + (y-1) \alpha]$

where y is the number of ions from one mole solute, (in this case =3), α the degree of dissociation.

$$i = (1 + 2\alpha)$$

4 (c)

$$N = \frac{w \times 1000}{\text{eq. wt.} \times V(\text{mL})}$$

$$= \frac{10 \times 1000}{60 \times 100} = 1.66 \text{ N}$$

6 (a)

$$\text{Molality} = \frac{18}{180} = 0.1 \text{ molal}$$

7 (a)

$$P_{N_2} = K_H \times \text{mole-fraction } (N_2)$$

mole-fraction

$$(N_2) \frac{1}{10^3} \times 0.8 \times 5 = 4 \times 10^{-3} \text{ mol}^{-1}$$

In 10 mole solubility is 4×10^{-4} .

8 (d)

$$P_T = P_A^s X_A + P_B^s X_B$$

Mixture solution boil at 1 atm = 760 mm = total pressure.

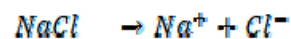
$$760 = 520 X_A + 100(1 - X_A)$$

$$X_A = 0.5, \text{ mol\% of A} = 50\%$$

9 (b)

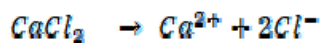
Depression in freezing point is colligative property. The solute which produces highest number of ions will have minimum freezing point .

1. One molal NaCl aqueous solution



\therefore 2 ions/molecule

2. One molal CaCl_2 solution



\therefore 3 ions/molecule

3. One molal KCl aqueous solution



\therefore 2 ions/molecule

4. One molal urea aqueous solution \rightarrow no dissociation

\therefore CaCl_2 solution has highest number of ions

\therefore It has lowest freezing point.

10 (a)

Ideal solution $\Delta H = 0$

$$\Delta V = 0$$

$$F_{A-A} = F_{B-B} = F_{A-B}$$

11 (c)

Given, vapour pressure of benzene,

$$p^\circ = 640 \text{ mm Hg}$$

Vapour pressure of solution,

$$p = 600 \text{ mm Hg}$$

Weight of solute, $w = 2.175 \text{ g}$

Weight of benzene, $W = 39.08 \text{ g}$

Molecular weight of benzene,

$$M = 78 \text{ g}$$

Molecular weight of solute, $m = ?$

According to Raoult's law,

$$\frac{P^\circ - P}{P^\circ} = \frac{w \times M}{m \times W}$$

$$\frac{640 - 600}{640} = \frac{2.175 \times 78}{m \times 39.08}$$

$$\frac{40}{640} = \frac{2.175 \times 78}{m \times 39.08}$$

$$m = \frac{16 \times 2.175 \times 78}{39.08}$$

$$m = 69.60$$

12 (b)

$$N = \frac{w \times 1000}{\text{eq. wt.} \times V(\text{mL})} = \frac{4 \times 1000}{40 \times 100} = 1.0 \text{ N}$$

13 (a)

Van't Hoff's factor (i) = 4 $\{3K^+[Fe(CN)_6]^{3-}\}$

$$\text{Molality} = \frac{0.1}{329} \times \frac{1000}{100} = \frac{1}{329}$$

$$\Rightarrow -\Delta T_f = i K_f \cdot m$$

$$= 4 \times 1.86 \times \frac{1}{329} = 2.3 \times 10^{-2}$$

$$\Rightarrow T_f = -2.3 \times 10^{-2}^\circ\text{C}$$

(As freezing point of water is 0°C)

14 (b)

$$\Delta x = i \times k_f \times m$$

$$7.10 \times 10^{-3} = i \times 1.86 \times 0.001$$

$$i = 3.817$$

$$i \propto \frac{i - 1}{n - 1}$$

$$\therefore 1 = \frac{3.817 - 1}{(x + 1) - 1}$$

$$x = 2.817 \approx 3$$

\therefore molecular formula of the compound is $K_3[Fe(CN)_6]$

15 (b)

For NaCl, $i = 2$

$$\Delta T_f = 2k_f \times m = 2 \times 1.86 \times 1 = 3.72$$

$$T_s = T - \Delta T_f = 0 - 3.72 = -3.72^\circ\text{C}$$

16 (c)

Number of moles = Molarity \times Volume (in L)

$$\Rightarrow \text{Number of moles of } H_2SO_4 = 2.0\text{ M} \times 5.0\text{ L}$$

$$= 10 \text{ moles}$$

17 (c)

We know that 1 g equivalent weight of NaOH = 40 g

$$\therefore 40 \text{ g of NaOH} = 1 \text{ g eq. Of NaOH}$$

$$\therefore 0.275 \text{ g of NaOH} = \frac{1}{40} \times 0.275 \text{ eq.}$$

$$= \frac{1}{40} \times 0.275 \times 1000$$

$$= 6.88 \text{ meq}$$

$$\therefore N_1V_1 = N_2V_2$$

(HCl) (NaOH)

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$$N_1 \times 35.4 = 6.88 \quad (\because \text{meq} = NV)$$

$$N_1 = 0.194$$

18 (d)

Equivalent weight of

$$\text{K}_2\text{Cr}_2\text{O}_7 = \frac{\text{molecular weight of K}_2\text{Cr}_2\text{O}_7}{\text{oxidation number of Cr}}$$

Oxidation number of Cr in $\text{K}_2\text{Cr}_2\text{O}_7$

$$2[+1] + 2(x) + 7(-2) = 0$$

$$2 + 2x - 14 = 0$$

$$2x = 12$$

$$x = 6$$

$$\text{Equivalent weight} = \frac{294.18}{6} = 49.03$$

$$\frac{\text{weight of K}_2\text{Cr}_2\text{O}_7}{\text{equivalent wt. (E)}} = N \times V(L)$$

$$w = 0.1 \times 1 \times 49.03 = 4.903 \text{ g}$$

20 (a)

According to Raoult's law

$$p = p_A^0 X_A + p_B^0 X_B$$

$$= 290 = 200 \times 0.4 + p_B^0 \times 0.6$$

$$p_B^0 = 350$$

21 (c)

Two solutions are isotonic if their osmotic pressure are equal.

$$\pi_1 = \pi_2$$

$$M_1 S T_1 = M_2 S T_2$$

(M_1 and M_2 are molarities)

At a given temperature,

$$M_1 = M_2$$

$$\frac{1000 W_1}{m_1 V_1} = \frac{1000 W_2}{m_2 V_2} \quad (V_1 = V_2 = 100 \text{ mL})$$

Cane sugar unknown

$$\therefore \frac{W_1}{m_1} = \frac{W_2}{m_2}$$

$$\frac{5}{329} = \frac{1}{m_2}$$

$$m_2 = \frac{329}{5} = 65.8 \text{ g mol}^{-1}$$

22 (d)

According to Raoult's law,

$$P_A = P_A^\circ \chi_A$$

$$\text{or} \quad \chi_A = \frac{P_A}{P_A^\circ}$$

$$= \frac{32 \text{ mm Hg}}{40 \text{ mm Hg}} = 0.8$$

23 (a)

One molar (1 M) aqueous solution is more concentrated than one molal aqueous solution of the same solute. In solution, H_2SO_4 provides three ions. While NaCl provides two ions. Hence, vapour pressure of solution of NaCl is higher (as it gives less ions). Therefore, 1 molal NaCl will have the maximum vapour pressure.

24 (b)

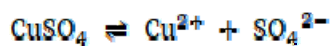
The number of moles or gram molecules of solute dissolved in 1000 g of solvent = molality

$$117 \text{ g NaCl} = 2 \text{ mol}$$

Hence, concentration of solution = 2 molal

25 (a)

In solution the KCl and CuSO_4 produces same number of ions in solution.



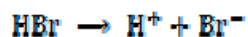
Both produced two ions in solution.

So, ionic strength of a solution is combined ionic strength of both of the salt.

$$= 0.1 + 0.02 = 0.3 \text{ mol/kg}$$

26 (b)

$$\Delta T_f = i \times k_f \times m$$



Ions at equilibrium $1-\alpha \quad \alpha \quad \alpha$

$$\therefore \text{Total ions} = 1 - \alpha + \alpha + \alpha$$

$$= 1 + \alpha$$

$$\therefore i = 1 + \alpha$$

Given, $k_f = 1.86 \text{ K mol}^{-1}$

Mass of HBr = 8.1 g

Mass of H_2O = 100 g

(α) = degree of ionization = 90%

$$m(\text{molality}) = \frac{\text{mass of solute mol.wt. of solute}}{\text{mass of solvent in kg}}$$

$$= \frac{8.1/81}{100/1000}$$

$$i = 1 + \alpha$$

$$= 1 + 90/100$$

$$= 1.9$$

$$\Delta T_f = i \times k_f \times m$$

$$= 1.9 \times 1.86 \times \frac{8.1/81}{100/1000}$$

$$= 3.534^\circ\text{C}$$

ΔT_f = (depression in freezing point) = freezing point of water - freezing point of solution $3.534 = 0 -$ freezing point of solution.

\therefore Freezing point of solution = -3.534°C

27 (d)

$$M = \frac{1000 \times k_f \times w}{\Delta T_f \times W}$$

$$= \frac{1000 \times 1.86 \times 4.5}{0.465 \times 100}$$

$$= 180 \text{ g}$$

28 (c)

$$\frac{p^0 - p_s}{p^0} = \frac{w}{m} \times \frac{M}{W}$$

$$\frac{0.30 \text{ mm}}{17.54 \text{ mm}} = \frac{20}{m} \times \frac{18}{100} \Rightarrow m = \frac{20 \times 18 \times 17.54}{0.30 \times 100} = 210.48$$

29 (c)

For ideal solution,

$$\Delta H_{\text{solution}} = \Delta H_1 + \Delta H_2 + \Delta H_3$$

31 (c)

$$\text{Molarity} = \frac{\text{Moles of solute}}{\text{Volume of solution (L)}}$$

$$\text{moles of urea} = \frac{120}{60} = 2$$

weight of solution = weight of solution + weight of solute

$$= 1000 + 120 = 1120 \text{ g}$$

$$\Rightarrow \text{Volume} = \frac{1120 \text{ g}}{\frac{1.15 \text{ g}}{\text{mL}}} \times \frac{1}{1000 \text{ mL/L}}$$

$$= 0.974 \text{ L}$$

$$\Rightarrow \text{Molarity} = \frac{2.000}{0.974} = 2.05 \text{ M}$$

32 (a)

$$\pi = CRT$$

Hence, $C = 0.2 \text{ M}$

$$R = 0.082 \text{ L atm mol}^{-1} \text{ K}^{-1}$$

$$T = 27 + 273 = 300 \text{ K}$$

$$\pi = 0.2 \times 0.082 \times 300 \text{ K}$$

$$= 4.92 \text{ atm.}$$

33 (c)

$$\text{Molarity of base} = \frac{\text{Normality}}{\text{Acidity}} = \frac{0.1}{1} = 0.1$$

$$M_1 V_1 = M_2 V_2$$

$$0.1 \times 19.85 = M_2 \times 20$$

$$M_2 = 0.09925 \approx 0.099$$

34 (a)

$$\text{Molarity} = \text{normality} \times \frac{\text{equivalent weight}}{\text{molecular weight}}$$

Given, normality of Na_2CO_3 solution = 0.2 N

Equivalent weight = M

Molecular weight $2M$ ($\because \text{Na}_2\text{CO}_3$ is dipositive.)

$$\therefore \text{Molarity} = 0.2 \times \frac{M}{2M}$$

$$= 0.1 \text{ M}$$

35 (b)

Given $p_s = 19.8 \text{ mm}$

$$n_A = 0.1$$

$$n_B = \frac{178.2}{18} = 9.9$$

According to Raoult's law

$$\frac{p_s - p}{p_s} = \frac{n_A}{n_A + n_B}$$

$$\frac{19.8 - p}{19.8} = \frac{0.1}{9.9 + 0.1}$$

$$\text{or } 198 - 10p = 19.8 \times 0.1$$

$$10p = 198 - 1.98$$

$$10p = 196.02$$

$$p = 19.602 \text{ mm}$$

36 (a)

$$N_1 V_1 = N_2 V_2$$

$$36 \times 50 = N_2 \times 100$$

$$\therefore N_2 = \frac{36 \times 50}{100} = 18$$

$$\therefore \text{Molarity of acid} = \frac{\text{Normality}}{\text{Basicity}} = \frac{18}{2} = 9 \text{ M}$$

37 (b)

$$\Delta T_f = i \times k_f \times m$$

$$i \text{ for HBr} = 1 + \alpha$$

where, α = degree of dissociation

$$i = 1 + 0.9 = 1.9$$

$$\therefore \Delta T_f = 1.9 \times 1.86 \times \frac{8.1 \times 1000}{100 \times 81}$$

$$= 3.534^\circ\text{C}$$

Freezing point = -3.534°C

38 (d)

$$\text{Moles} = \frac{\text{mass}}{\text{molecular weight}}$$

Given, mass of $\text{Al}_2(\text{SO}_4)_3 = 50 \text{ g}$

molecular mass of $\text{Al}_2(\text{SO}_4)_3 = 342$

$$\therefore \text{Moles of } \text{Al}_2(\text{SO}_4)_3 = \frac{50}{342} = 0.14 \text{ mol}$$

39 (b)

Let the volume of 0.4 M HCl is V_1 and that of 0.9 M HCl is V_2 .

We know that,

$$NV = N_1V_1 + N_2V_2$$

(Mixture) (for 0.4 M HCl) (for 0.9 M HCl)

$$0.7(V_1 + V_2) = 0.4 \times V_1 + 0.9 \times V_2$$

$$[\because 1\text{m HCl} = 1\text{N HCl}]$$

$$0.7V_1 + 0.7V_2 = 0.4V_1 + 0.9V_2$$

$$0.7V_1 + 0.4V_1 = 0.9V_2 + 0.7V_2$$

$$0.3V_1 = 0.2V_2$$

$$\frac{V_1}{V_2} = \frac{0.2}{0.3} = \frac{2}{3}$$

40

(b)

n-heptane and ethanol forms non-ideal solution. In pure ethanol, Molecules are hydrogen bonded. On adding *n*-heptane, its molecules get in between the host molecules and break some of the hydrogen bonds between them. Due to weakening of interactions, the solution shows positive deviation from Raoult's law.