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

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

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

$n=\frac{60}{30}=2$ (e.f.m. for $CH_2O=30$)

so, molecular formula=$C_2H_4O_2$

2 **(a)**

$$\Delta T_f=ik_fm$$

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

$0.37 = 2 \times k_f \times 0.01$

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

For 0.02 molal urea solution

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

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

From Eqs (i) and (ii)

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

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

$\therefore \quad \Delta T_f = 0.37°C$

3 **(b)**

$Na_2SO_4 \rightleftharpoons 2Na^+ + SO_4^{2-}$

van't Hoff factor *i*=[1+(y-1) α]

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

i=(1+2 α)

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)**

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

mole-fraction

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

In 10 mole solubility is 4×10^{-4}.

8 **(d)**

$$P_T = P_A^\circ X_A + P_B^\circ x_B$$

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

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

$X_A = 0.5$, 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

$$NaCl \rightarrow Na^+ + Cl^-$$

$\therefore$ 2 ions/molecule

2. One molal $CaCl_2$ solution

$CaCl_2 \rightarrow Ca^{2+} + 2Cl^-$

∴3 ions/molecule

3. One molalKCl aqueous solution

KCl$\rightarrow K^+ + Cl^-$

∴ 2 ions/molecule

4. One molal urea aqueous solution →no dissociation

∵ $CaCl_2$ solution has highest number of ions

∴ It has lowest freezing point.

10 **(a)**

Ideal solution $\triangle H = 0$

$\triangle V = 0$

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

11 **(c)**

Given, vapour pressure of benzene,

p°=640 mm Hg

Vapour pressure of solution,

p=600 mm Hg

Weight of solute, w= 2.175 g

Weight of benzene, W= 39.08 g

Molecular weight of benzene,

M=78 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 $\{3K^+[Fe(CN)_6]^{3-}\}$

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

$\Rightarrow$ $-\Delta T_f = iK_f.m$

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

$\Rightarrow T_f = -2.3 \times 10^{-2}\,°C$

(As freezing point of water is $0°C$)

14 **(b)**

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

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

$i = 3.817$

$\because \ \alpha = \dfrac{i-1}{n-1}$

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

$x = 2.817 \approx 3$

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

15 **(b)**

For NaCl, $i = 2$

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

$T_s = T - \Delta T_f = 0 - 3.72 = -3.72°C$

16 **(c)**

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

$\Longrightarrow$ Number of moles of $H_2SO_4 = 2.0\ M \times 5.0\ L$

= 10 moles

17 **(c)**

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

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

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

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

=6.88 meq

$\therefore N_1V_1 = N_2V_2$

(HCl) (NAOH)

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

$N_1 = 0.194$

18 **(d)**

Equivalent weight of

$K_2Cr_2O_7 = \dfrac{\text{molecular weighty of } K_2Cr_2O_7}{\text{oxidation number of Cr}}$

Oxidation number of Cr in $K_2Cr_2O_7$

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

2+2x-14 = 0

2x=12

x=6

Equivalent weight $= \frac{294.19}{6} = 49.08$

$\dfrac{\text{weight of } K_2Cr_2O_7}{\text{equivalent wt. (E)}} = N \times V(L)$

$w = 0.1 \times 1 \times 49.08$ = 4.903 g

20 **(a)**

According to Raoult's law

$p = p_A^\circ X_A + p_B^\circ X_B$

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

$p_B^\circ = 350$

21 **(c)**

Two solutions are isotonic if their osmotic pressure are equal.

$\pi_1 = \pi_2$

$M_1ST_1 = M_2ST_2$

(M_1 and M_2 are molarities)

At a given temperature,

$M_1 = M_2$

$\frac{1000w_1}{m_1V_1} = \frac{1000w_2}{m_2V_2}$ $(V_1 = V_2 = 100 mL)$

Cane sugar unkown

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

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

$m_2 = \frac{342}{5}$=68.4 g mol^{-1}

22 **(d)**

According to Raoult's law,

$P_A = P_A^\circ x_A$

or $x_A = \frac{P_A}{P_A^\circ}$

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

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 g NaCl = 2 mol

Hence, concentration of solution = 2 molal

25 **(a)**

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

$KCl \rightleftharpoons K^+ + Cl^-$

$CuSO_4 \rightleftharpoons Cu^{2+} + SO_4^{2-}$

Both produced two ions in solution.

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

=0.1+.02=0.3 mol/kg

26 **(b)**

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

$HBr \longrightarrow H^+ + Br^-$

Ions at equilibrium 1-α α α

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

$= 1 + \alpha$

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

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(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

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

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

= 3.534$^{\circ}C$

$\triangle T_f =$(depression in freezing point) = freezing point of water - freezing point of solution 3.534 = 0 – freezing point of solution.

∴ Freezing point of solution = -3.534$^{\circ}C$

27 **(d)**

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

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

$= 180\ g$

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,

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

31 **(c)**

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

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

weight of solution =weight of solution + weight of solute

=1000 + 120 =1120 g

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

=0.974 K

⇒Molarity = $\frac{2.000}{0.974}$= 2.05 M

32 **(a)**

π =CRT

Hence, C =0.2 M

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

T =27+273 = 300 K

π =0.2$\times 0.082\times 300\,K$

=4.92 atm.

33 **(c)**

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

$M_1V_1=M_2V_2$

$0.1\times 19.85=M_2\times 20$

$M_2=0.09925\approx 0.099$

34 **(a)**

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

Given, normality of Na_2CO_3 solution =0.2 N

Equivalent weight = M

Molecular weight 2 M (∵ Na_2CO_3 is dipositive.)

∴ Molarity $= 0.2 \times \frac{M}{2M}$

$= 0.1$ M

35 **(b)**

Given p_s =19.8 mm

$n_A = 0.1$

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

According toRaoult's law

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

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

or 198-10 p = 19.8 ×0.1

10 p = 198-1.98

10 p =196.02

p = 19.602 mm

36 **(a)**

$N_1V_1 = N_2V_2$

$36 \times 50 = N_2 \times 100$

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

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

37 **(b)**

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

i for HBr=1 +α

where, α =degree of dissociation

i=1+0.9=1.9

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

=3.534℃

Freezing point =-3.534℃

38 **(d)**

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

Given, mass of $Al_2(SO_4)_3$ = 50 g

molecular mass of $Al_2(SO_4)_3$ = 342

$\therefore$ Moles of $Al_2(SO_4)_3 = \frac{50}{342} = 0.14$ 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)

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

[∵1m HCl = 1N HCl]

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

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

$$0.3V_1 = 0.2V_2$$

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

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 sme of the hydrogen bonds between them. Due to weaking of interactions, the solution shows positive deviation from Raoult's law.