SOLUTION TEST-A

1. For ideal solution, $\Delta H_{mix} = 0 = \Delta U_{mix}$, $\Delta S_{mix} > 0$ and $\Delta G_{mix} < 0$.

   The correct answer is (iii)

2. $\pi = 7.8$ bar, $T = 37°C = 310$ K, $i = 2$ for NaCl

   $\pi = iMRT$, $M = \frac{\pi}{iRT} = \frac{7.8}{2 \times 0.083 \times 310}$

   $M = 0.15$ mol/L

   The correct answer is (i)

3. $\Delta T_f = iK_f M$ for HCl, $i = 2$

   $CuSO_4$, $i = 2$

   K_2SO_4, $i = 2$

   The ratio of depression in freezing points = 2 : 2 : 3 or 1 : 1 : 1.5

   The correct answer is (i)

4. Isotonic solution have same concentration and same osmotic pressure at a given temperature.

   The correct answer is (ii)

5. Addition of cyclohexane to ethanol results in the weakening of hydrogen bonding in ethanol. The vapour pressure then increases. The mixture of cyclohexane and ethanol shows positive deviation from Raoult's law. The assertion is wrong.

   The correct answer is (iii)

6. Van't Hoff factor for $Na_2SO_4 . 10H_2O$ is 3.

7. Ethanol-acetone shows positive deviation.

   Addition of acetone results in the cleavage of H-bonds in ethanol and unlike interactions then becomes weaker than like interaction.

8. $n_A = \frac{100}{140} = 0.714$

   $n_B = \frac{1000}{180} = 5.556$

   $\chi_A = \frac{0.714}{5.556 + 0.714} = \frac{0.714}{6.27} = 0.114$

   $\chi_B = 0.886$

   $p_{total} = P_A + P_B^o \chi_B$

   $475 = P_A + 500 \times 0.886$

   $p_A = 475 - 443 = 32$ torr

p_A = V.P of A in solution but

$$p_A = p_A^o \chi_A$$

$$\therefore \text{ VP of pure } A = \frac{P_A}{\chi_A}$$

$$P_A^o = \frac{32}{0.114} = 280.70 \text{ torr}$$

9. (i) NaCl is an electrolyte and dissociates in solution. 0.1 m NaCl solution will have more number of solute particles than 0.1 m glucose solution. Colligative properties depends only on the number of solute particles. Hence, 0.1 m NaCl solution will have higher boiling point than 0.1 glucose solution.

   (ii) Ethylene glycol in water lowers the freezing point of water and prevents the water from freezing at 0°C.

10. (i) Cellulose acetate

    (ii) 0.1 m NaCl < 0.01 m NaCl < 0.001 m NaCl.

11. Let the formula of sulphur be S_x then its molecular mass will be 32x. But molecular mass M_B is given by

$$M_B = \frac{k_f \ w_B \ 1000}{\Delta T_f \times w_A}$$

So, $32x = \frac{5.12 \times 1 \times 1000}{0.40 \times 50}$

32 x = 256, x = 8

Molecular formula of sulphur = S_B molecular mass S_B = 256.

12. 23% w/v means 23 g H_2SO_4 in 100 ml solution.

    100 ml solution contains 23 g H_2SO_4

    1L or 1000 ml solution contains 230 g H_2SO_4.

$$\therefore \ n_{H_2SO_4} = \frac{230}{98} = 2.35 \text{ moles}$$

mass of solution = V × d = 1000 × 1.20 = 1200 g

mass of water = 1200 – 230 = 970 g

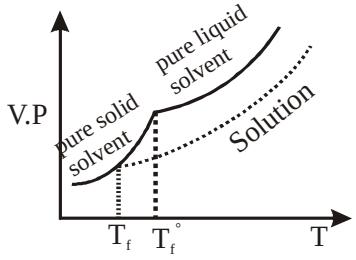
$$m = \frac{n_{H_2SO_4}}{w_{H_2O}} \times 1000$$

$$m = \frac{2.35}{970} \times 1000$$

m = 2.42 m

13. (i) Molal elevation constant is defined as the elevation in boiling point of a 1 molal solution.

(ii)



T_f^o = freezing point of pure solvent

T_f = freezing point of solution containing non-volatile solute.

14. $w_B = 2g$ $\quad M_B = 122\,g\,mol^{-1}$

w_A= 30 g $\quad \Delta T_f = 1.62\ K$

$$\Delta T_f = i\ k_f \frac{w_B 1000}{w_A M_B}$$

$$i = \frac{\Delta T_f\ w_A M_B}{k_f\ w_B 1000} = \frac{1.62 \times 30 \times 122}{4.9 \times 2 \times 1000}$$

i = 0.605

The relation between *i* and α is

$\alpha = \frac{1-i}{1-\frac{1}{n}}$ as it form a dimer, n = 2, therefore, $\alpha = \frac{1-0.605}{1-\frac{1}{2}} = 0.395 \times 2$

α = 0.79

Percentage association of benzoic acid is 79%.

15. (i) Azeotropes are binary mixture having same composition in liquid and vapour phase and boil at a constant temperature.

(ii) Henry's law states that the solubility of a gas in a liquid is directly proportional to the pressure of the gas.

(iii) Partial pressure of gas $\propto$ solubility of gas

$$\frac{p_1}{p_2} = \frac{S_1}{S_2}$$

$$\frac{1}{p_2} = \frac{6.56 \times 10^{-2}}{5.00 \times 10^{-2}} \qquad p_2 = 0.762\ bar$$

