TIPS & TRICKS

Board Examination (2025-2026)

Class-XII

Subject: Chemistry

Chapter Name : *Solutions* (Chap : 1)

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1. The Van't Hoff's factor for 0.1(M) $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is:

Ⓐ 91.3% Ⓑ 87% Ⓒ 100% Ⓓ 74%

Sol: $Ba(NO_3)_2 \rightleftharpoons Ba^{++} + 2\,NO_3^-$; i.e. x = 3 use, $\alpha = \frac{1-i}{1-x}$ or $\alpha = \frac{1-2.74}{1-3} = \frac{+1.74}{+2} = 087 = 87\%$

2. Out of 0.1 molal aqueous solution of glucose and 0.1 molal aqueous solution of KCl, which one will have higher boiling point and why?

Sol: Since, $KCl \rightleftharpoons K^+ + Cl^-$, no. of solute particles increases. So, it will have higher boiling point. Glucose doesnot dissociates.

3. Predict whether Van't Hoff's factor (i) is less than one or greater than one in the following:

(i) CH_3CCOH dissolved in water

(ii) CH_3COOH dissolved in benzene

Sol: (i) i > 1, as CH_3COOH dissociates in water

(ii) i < 1, as CH_3COOH associates in benzene

4. Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we place blood cells in a solution containing

(i) 1.2% sodium chloride solution?

(ii) 0.4% sodium chloride solution?

Sol: (i) 1.2% NaCl solution > 0.9% NaCl solution or blood cells i.e. hypertonic solution. So, when blood cells are placed in this solution water flows out of cells & they **shrink** due to loss of water by osmosis.

(ii) 0.4 NaCl < 0.9 NaCl solution i.e. hypotonic solution w.r.t. blood cells or 0.9 NaCl solution. So, when blood cells are placed in this solution, water flows into the cells & they **swell**.

5. What is deicing agent? How does it function?

Sol: Common salt (NaCl) acts as a deicing agent because it lowers the freezing point of water to such an extent that it does not freeze to form ice. So, it is use to clear show roads.

6. When mercuric iodide is added an aqueous solution of KI, the freezing point is raised, why?

Sol: HgI_2 form a complex with KI i.e. no. of particles in solution decreases

$HgI_2 + KI \rightarrow K_2[HgI_4]$

This, the depression of freezing point is less and hence freezing point increases.

7. Which of the following solution has higher freezing point?

0.05 m $Al_2(SO_4)_3$, or 0.1 m $K_3[Fe(CN)_6]$ — Justify.

Sol: $\Delta T_f \alpha$ i × concentration.

For $Al_2(SO_4)_3$ i = 5, c = 0.05, $\therefore \Delta T_f \alpha\ 5 \times .05 \times .25$ moles of ion

For $K_3(Fe(CN)_6)$, i = 4, c = 0.1, $\Delta T_f \alpha$ 4 × .1 × 0.4 moles of ion

$\because$ Depression in freeze point for $Al_2(SO_4)_3$ will be less & no freeze point will have higher.

8. State the condition resulting in reverse osmosis.

Sol: When external pressure larger than osmotic pressure is applied on the solution.

9. Calculate the molality of an aqueous solution of glucose having mole fraction 0.2.

Sol: Use formula: Molality $(m^1) = \dfrac{X_A \times 1000}{X_B \times M_B}$

Where, X_A = Mole fraction of solution, X_B = Mole fraction of solvent, M_B = Molecular weight of solvent = H_2O = 18.

$$\therefore\ m^1 = \frac{0.2 \times 1000}{(1 - 0.2) \times 18} = 13.8.$$

10. Calculate the molality of 1(M) $NaNO_3$ solution having density of solution 1.2 g/cc.

Sol: Use formula: $d = M^1\left(\dfrac{1}{m^1} + \dfrac{m}{1000}\right)$.

Where d = density of solution, M^1 = Molarity.

m^1 = Molality, M = M.W. of solution = $NaNO_3$ = 85

$$\therefore\quad 1.2 = 1\left(\frac{1}{m^1} + \frac{85}{1000}\right)$$

$$\Rightarrow\quad 1.2 = \frac{1}{m^1} + 0.085$$

$$\Rightarrow\quad m^1 = 0.858 \text{ (approx)}$$

11. Ethylene glycol is used as an antifreeze in car radiator water. Calculate the minimum molal concentration of ethylene glycol solution that will protect the car radiator form freezing at –1.90°C.

Sol: $\Delta T_f = K_f \times m$

$\Delta T_f = 0 - (-1.9) = 1.9$

$\therefore\ K_f = 1.86\ K\ m^{-1}$

So, $m = \dfrac{\Delta T_f}{K_f} = \dfrac{1.9}{1.80} = 1.02\ m$

12. At the same temperature, CO_2 gas is more soluble in water than O_2 gm. Which one of then will have higher value of K_H and why?

Sol: $K_H\ \alpha\ \dfrac{1}{\text{solubility}}$; Henvy's law : $p = K_H \cdot x$

Since, O_2 has higher solubility, its K_H will be higher.

13. What is the effect of temperature of Glauber's salt ($Na_2SO_4.10H_2O$) & why?

Sol: The solubility increases upto 32.8° ct (called transition temperature), then decreases, as upto 32.8°C Glauber's salt remains hydrated & dissolution is endothermic. Thus, beyond 32.8°C solubility decreases with increase in temperature.

14. Give reasons at higher altitudes, people suffer from a disease called anoxia. In this disease, they came weak and cannot think clearly.

Sol: At higher altitudes, the partial pressure of O_2 is than that at the ground level. This leader to low concentration of O_2 in blood and tissues. So, people become weak and unable to think clearly. These are the symptoms of a condition known as **anoxia**.

15. NOTES: Composition in vapour phase:

Acc. to Dalton's law of partial pressure, partial vapour pressure of a component:

= Mole fraction of the component × Total pressure in vapour phase.

i.e. $P_1 = Y_1 P_T$, & $P_2 = Y_2 P_T$

∴ Mole fraction of component 1 in vapour phase, $\boxed{Y_1 = \frac{P_1}{P_T}}$

& mole fraction of component 1 in vapour phase, $\boxed{Y_2 = \frac{P_2}{P_T}}$

16. NOTES: (I) The characteristics of an ideal solution may be summed up as follows:

(i) It must obey Raoult's law: $\boxed{P_A = P°_A . X°_A}$; $\boxed{P_B = P_B . X_B}$; $\boxed{P_T = P_A + P_B}$

(ii) $\Delta H_{mixing} = 0$;

(iii) $\Delta V_{mixing} = 0$;

Examples: (a) Benzene + Toluene;

(b) n–hexane +n-heptane

(c) Bromoethane + Chloroethene

(d) Chlorobenzene + bromobenzene

(II) The main properties of two types of non-ideal solution are summed up below:

(A) Solutions having +ve deviation from ideal behaviour.

(i) The interaction between the components are less than in the pure components.

(ii) $P°_A > P°_A x_A$ & $P°_B > P°_B x_B$

(iii) ΔH_{mu} = _ve ⇒ endothermic solution (Dissolution is endothermic)

(iv) ΔV_{mu} = _ve ⇒ heating increasing solubility.

(B) The interaction between the components are more than in the pure components.

(i) $P_A < P°_A . X_A$ & $P_B < P°_B X_B$

(ii) ΔH_{mu} = –ve ⇒ Dissolution is exothermic

(iii) ΔV_{mu} = –ve ⇒ Heating decreases solubility