SOLUTIONS

Q.1 When mercuric iodide is added to the aqueous solution of potassium iodide, the

(A) freezing point is raised (B) freezing point does not change
(C) freezing point is lowered (D) boiling point does not change.

Q.2 The freezing point of equimolal aqueous solution will be highest for

(A) $C_6H_5NH_3Cl$ (aniline hydrochloride)
(B) $Ca(NO_3)_2$
(C) $La(NO_3)_2$
(D) $C_6H_{12}O_6$ (glucose).

Q.3 Osmotic pressure of a solution is 0.0821 atm at temperature of 300 K. The concentration in mole/litre will be

(A) 0.33 (B) 0.066 (C) 0.3×10^{-2} (D) 3

Q.4 Increasing the temperature of an aqueous solution will cause

(A) decrease in molality (B) decrease in molarity
(C) decrease in mole fraction (D) decrease in % (w/w)

Q.5 The vapour pressure of a solution of 5 g of non electrolyte in 100 g of water at a particular temperature is 2985 Nm^{-2}. The vapour pressure of pure water at that temperature is 3000 Nm^{-2}. The molecular weight of the solute is

(A) 180 (B) 90 (C) 270 (D) 200

Q.6 How many moles of Fe^{2+} ions are formed when excess iron is treated with 500 mL of 0.4N HCl under inert atmosphere ? Assume no change in volume.

(A) 0.4 (B) 0.1 (C) 0.2 (D) 0.8

Q.7 The van't Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is

(A) 91.3% (B) 87% (C) 100% (D) 74%

Q.8 For a sparingly soluble salt A_pB_q, the relationship of its solubility product (L_S) with its solubility (S) is :

(A) $L_S = S^{p+q} \cdot p^p \cdot q^q$ (B) $L_S = S^{p+q} \cdot p^q \cdot q^p$
(C) $L_S = S^{pq} \cdot p^p \cdot q^q$ (D) $L_S = S^{pq} \cdot (p \cdot q)^{p+q}$

Q.9 A molal solution is one that contains one mole of a solute in

(A) 1000 g of the solvent (B) one litre of solvent
(C) one litre of solution (D) 22.4 litre of the solution.

Q.10 A 0.004 M solution of K_2SO_4 is isotonic with a 0.010 M solution of glucos at the same temperature. The apparent per cent degree of dissociation of K_2SO_4 is

(A) 25% (B) 50% (C) 75% (D) 100%

ANSWER KEY

Q.No.	1	2	3	4	5	6	7	8	9	10
Ans.	A	D	C	B	A	B	B	A	A	C

SOLUTIONS (SOLUTIONS)

Ans.1 When $HgI_2 \longrightarrow K_2[HgI_4] \rightleftharpoons 2K^+ + [HgI_4]^{2-}$
Thus there is a net decrease in number of ions present in solution. Two formula units of KI i.e., four ions decrease to three ions in $K_2[HgI_4]$. As number of ions decrease ΔT_f decreases or f.p., is raised.

Ans.2 Highest freezing point (i.e., least depression in freezing point) is when i is least. The van't Hoff factor, i is minimum in case of glucose (i = 1).

Ans.3 $\pi = CRT$ or $C = \pi/RT$

$$C = \frac{0.821 \text{ atm}}{(0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}) \times 300 \text{ K}}$$

$= 0.3 \times 10^{-2}$ mol L^{-1}

Ans.4 An increase in temperature increases the volume of the solution and thus decreases its molarity.

Ans.5 $\frac{(3000 - 2985)}{3000 \text{Nm}^{-2}} = \frac{5/M_B}{100/18}$ (For a dilute solution)

$$\frac{15 \times 100}{18 \times 3000} = \frac{5}{M_B}$$

or $M_B = 180$

Ans.6 $Fe + 2HCl \longrightarrow FeCl_2 + H_2$

Moles of Fe^{2+} formed = $\frac{1}{2}$ × Moles of HCl used

$$= \frac{1}{2} \times \frac{0.4 \times 500}{1000} = 0.1$$

Ans.7

	$Ba(NO_3)_2 \rightleftharpoons Ba^{2+} + 2NO_3^-$
Initial	0.1 M
At.equilibrium	$\frac{(0.1 - x) + \alpha + 2x}{0.1} = \frac{0.1 + 2x}{0.1} = 2.74$
	$0.1 + 2x = 0.274$
or	$x = \frac{0.174}{2} = 0.087$
	$\%\alpha = \frac{x}{0.1} \times 100 = \frac{0.087}{0.1} \times 100 = 87\%$

Ans.8 $A_pB_q \rightleftharpoons pA^+ \; qB^-$

Solubility S pS qS (on 100% ionisation)

K_{sP} of $A_pB_q = (A^+)^p \times (B^-)^q$

$= (pS)^p \times (qS)^q$

$= (S^{p+q})\,(p^p \cdot q^q)$

Ans.9 One molal solution contains one mole solute in 1000 g of solvent.

Ans.10 The dissociation of K_2SO_4 may be written as

$K_2SO_4 \rightleftharpoons 2K^+ + SO_4^{2-}$

$c(1-\alpha) \qquad c(2\alpha) \quad c\alpha$

The concentration of species in the solution is $c(1-\alpha) + (2\alpha) + c\alpha = c(1+2\alpha)$ (where c = 0.004 M) Hence, $c(1+2\alpha) = 0.01$ M.

or $\alpha = \frac{1}{2}\left(\frac{0.01}{0.04} - 1\right) = 0.75$

The percent of dissociation is 0.75 × 100, i.e. 75%.