

Q.7 The van't Hoff factor for 0.1 M $\text{Ba}(\text{NO}_3)_2$ 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 $\text{HgI}_2 \longrightarrow \text{K}_2 [\text{HgI}_4] \rightleftharpoons 2\text{K}^+ + [\text{HgI}_4]^{2-}$
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 $\text{K}_2[\text{HgI}_4]$. 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 $C = \pi/RT$

$$C = \frac{0.821 \text{ atm}}{(0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}) \times 300 \text{ K}} \\ = 0.3 \times 10^{-2} \text{ mol L}^{-1}$$

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 $\text{Fe} + 2\text{HCl} \longrightarrow \text{FeCl}_2 + \text{H}_2$

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

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

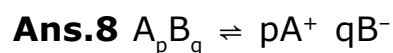
Ans.7 $\text{Ba}(\text{NO}_3)_2 \rightleftharpoons \text{Ba}^{2+} + 2\text{NO}_3^-$
Initial 0.1 M

$$\text{At. equilibrium } \frac{(0.1 - x) + \alpha + 2x}{0.1} = \frac{0.1 + 2x}{0.1} = 2.74$$

$$0.1 + 2x = 0.274$$

or $x = \frac{0.174}{2} = 0.087$

$$\% \alpha = \frac{x}{0.1} \times 100 = \frac{0.087}{0.1} \times 100 = 87\%$$

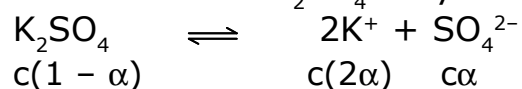


Solubility S pS qS (on 100% ionisation)

$$\begin{aligned}K_{sp} \text{ of } A_p B_q &= (A^+)^p \times (B^-)^q \\ &= (pS)^p \times (qS)^q \\ &= (S^{p+q}) (p^p \cdot q^q)\end{aligned}$$

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



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 $\alpha = \frac{1}{2} \left(\frac{0.01}{0.004} - 1 \right) = 0.75$

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