

JEE CHEMISTRY

Topic: Liquid Solution

1. If in a solvent, n simple molecules of solute combine to form an associated molecule, x is the degree of association, the Van't Hoff factor 'i' is equal to

(A) $\frac{1}{1-nx}$

(B) $\frac{1-x+nx}{1}$

(C) $\frac{1-x+x/n}{1}$

(D) $\frac{\frac{x}{n}-1+x}{1}$

2. At a constant temperature with increase in concentration of solute, the osmotic pressure of the solution

(A) increases

(B) decreases

(C) remains constant

(D) none of these

3. Consider following cases:

I: 2 M CH_3COOH solution in benzene at 27°C where there is dimer formation to the extent of 100%.

II: 0.5 M KCl aq. solution at 27°C , which ionizes 100%, which is/are true statement (s)?

(A) both are isotonic

(B) I is hypertonic

(C) II is hypertonic

(D) none is correct

4. Which of the following statements is correct, if the intermolecular forces in liquids A, B and C are in the order $A < B < C$?

(A) B evaporates more readily than A

(B) B evaporates less readily than C

(C) A and B evaporate at the same rate

(D) A evaporates more readily than C

5. The osmotic pressure of a 5% solution of cane sugar at 150°C is

(A) 4 atm

(B) 3.4 atm

(C) 3.55 atm

(D) approx 5 atm

6. 100 ml of liquid A was mixed with 25 ml of liquid B to give a non – ideal solution of A – B mixture. The volume of this mixture would be
- (A) 75 ml (B) 125 ml
(C) close to 125 ml but not exactly 125 ml (D) just more than 125 ml
7. The Van't Hoff factors i for an electrolyte which undergoes dissociation and association in solvents are respectively
- (A) greater than one and less than one (B) less than one and greater than one
(C) less than one in both cases (D) more than one in both cases
8. For the given electrolyte A_xB_y . The degree of dissociation ' α ' can be given by
- (A) $\alpha = \frac{i-1}{(x+y-1)}$ (B) $i = (1-\alpha) + x\alpha + y\alpha$
(C) $\alpha = \frac{1-i}{(1-x-y)}$ (D) either of these
9. Glucose is added to 1 litre water to such an extent that $\Delta T_f / k_f$ becomes equal to 1/1000. The weight of glucose added is
- (A) 180 gm (B) 18 gm
(C) 1.8 gm (D) 0.18 gm
10. When mercuric iodide is added to the aqueous solution of potassium iodide, the
- (A) freezing point is raised (B) freezing point is lowered
(C) freezing point does not change (D) can not predict
11. According to Raoult's law the relative decrease in the solvent vapour pressure over the solution is equal to
- (A) the mole fraction of the solvent (B) the mole fraction of solute
(C) the number of moles of solute (D) all of these
12. The freezing point of equimolal aqueous solution will be highest for
- (A) $C_6H_5NH_3^+Cl^-$ (B) $Ca(NO_3)_2$
(C) $La(NO_3)_3$ (D) $C_6H_{12}O_6$

13. Molal depression constant is given by the expression

- (A) $\frac{\Delta T_f}{m}$ (B) $\Delta T_f \times M$
(C) $\Delta T_f \times N$ (D) $\frac{\Delta T}{M}$

14. 0.01 M solution each of urea, common salt and Na_2SO_4 are taken, the ratio of depression of freezing point

- (A) 1 : 1 : 1 (B) 1 : 2 : 1
(C) 1 : 2 : 3 (D) 2 : 2 : 3

15. A X molal solution of a compound in benzene has mole fraction of solute equal to 0.2. Thus value of X is

- (A) 14 (B) 3.2
(C) 1.4 (D) 2

16. The azeotropic mixture of water (b.p. = 100°C) and HCl (b.p = 85°C) is distilled, it is possible to obtain:

- (A) pure HCl (B) pure water
(C) pure HCl as well as water (D) neither HCl nor H_2O in pure form

17. Mole fraction of $\text{C}_3\text{H}_5(\text{OH})_3$ in a solution of 36 gm of water and 46 gm of glycerine is

- (A) 0.46 (B) 0.36
(C) 0.20 (D) 0.40

18. The vapour pressure of a dilute aqueous solution of glucose is 750 mm of mercury at 373K. The mole fraction of solute is

- (A) $\frac{1}{10}$ (B) $\frac{1}{7.6}$
(C) $\frac{1}{35}$ (D) $\frac{1}{76}$

19. The ratio of the value of colligative property for KCl solution to that of sugar solution at the same concentration is nearly

- (A) 1 (B) 2
(C) 0.5 (D) 2.5

20. The Van't Hoff factor of a 0.005 M aqueous solution of KCl is 1.95. The degree of ionization of KCl is
- (A) 0.95 (B) 0.97
(C) 0.94 (D) 0.96
21. Equimolal solution of A and B show depression in freezing point in the ratio of 2 : 1. A remains in normal state in solution, B will be in.....state in solution.
- (A) normal (B) associated
(C) hydrolysed (D) dissociated
22. 2.56 gm of sulphur in 100 gm CS₂ has depression in f.p of 0.010°C; $K_f = 0.1^\circ (\text{molal})^{-1}$. Hence atomicity of sulphur in CS₂ is
- (A) 2 (B) 4
(C) 6 (D) 8
23. Which of the following azeotropic solutions has the boiling point less than boiling point of the constituents A and B?
- (A) CHCl₃ and CH₃COCH₃ (B) CS₂ and CH₃COCH₃
(C) CH₃CH₂OH and CHCl₃ (D) CH₃CHO and CS₂
24. If a solute undergoes dimerisation and trimerisation the minimum values of the Van't Hoff factors are
- (A) 0.5 and 1.5 (B) 1.5 and 1.33
(C) 0.5 and 0.33 (D) 0.25 and 0.67
25. Osmotic pressure of blood is 7.65 atm at 310 K. An aqueous solution of glucose then will be isotonic with blood is
- (A) 5.41% (B) 3.54%
(C) 4.53% (D) 5.34%
26. 1 mole benzene ($P_{\text{benzene}}^0 = 42 \text{ mm}$) and 2 moles toluene ($P_{\text{toluene}}^0 = 36 \text{ mm}$) will have
- (A) total vapour pressure 38 mm
(B) mole fraction of vapours of benzene above liquid mixture is 7/19
(C) ideal behaviour
(D) all of the above

27. The value of observed and calculated molecular weight of silver nitrate are 92.64 and 170 respectively. The degree of dissociation of silver nitrate is
- (A) 60% (B) 83.5%
(C) 46.7% (D) 60.23%
28. Lowering of vapour pressure due to a solute in 1 molal aqueous solution at 100°C is
- (A) 13.43 torr (B) 14.12 torr
(C) 312 torr (D) 352 torr
29. The vapour pressure of pure benzene at 50°C is 268 torr. How many mol of non volatile solute per mol of benzene is required to prepare a solution of benzene having a vapour pressure of 167 torr at 50°C
- (A) 0.377 (B) 0.605
(C) 0.623 (D) 0.395

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	C	A	B	D	D	C	A	A	D	A
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	B	D	A	C	B	D	C	D	B	A
Que.	21	22	23	24	25	26	27	28	29	
Ans.	B	D	A	C	A	B	B	A	A	