

**Single Correct Answer Type:**

- The plots of  $\frac{1}{X_A}$  vs  $\frac{1}{Y_A}$  (where  $X_A$  and  $Y_A$  are the mole fraction of liquid 'A' in liquid and vapour phase respectively) is linear with slope and intercepts respectively.  
 (A)  $\frac{P_A^0}{P_B^0}$  and  $\frac{(P_A^0 - P_B^0)}{P_B^0}$  (B)  $\frac{P_A^0}{P_B^0}$  and  $\frac{(P_B^0 - P_A^0)}{P_B^0}$  (C)  $\frac{P_B^0}{P_A^0}$  and  $\frac{(P_A^0 - P_B^0)}{P_B^0}$  (D)  $\frac{P_B^0}{P_A^0}$  and  $\frac{(P_B^0 - P_A^0)}{P_B^0}$
- 20g of a binary electrolyte (mol. Wt = 100) are dissolved in 500g of water. The freezing point of the solution is  $-0.744^\circ\text{C}$ ,  $K_f = 1.86 \text{ K.m}^{-1}$ . The degree of ionisation of the electrolyte is  
 (A) 0.5 (B) 0.75 (C) 1 (D) 0
- At  $40^\circ\text{C}$ , the v.p (in torr) of  $\text{CH}_3\text{OH}$ (A) and  $\text{C}_2\text{H}_5\text{OH}$ (B) solution is represented by  $P = 120 X_A + 138$ , where  $X_A$  is mole fraction of  $\text{CH}_3\text{OH}$ . The value of  $\lim_{X_A \rightarrow 0} \frac{P}{X_B}$  and  $\lim_{X_B \rightarrow 0} \frac{P}{X_A}$  are respectively.  
 (A) 138, 258 (B) 258, 138 (C) 120, 138 (D) 138, 125
- 'Y' gram of non-volatile organic substance of molecular mass 'M' is dissolved in 250g benzene. Molal elevation constant of benzene is  $K_b$ . Elevation in its boiling point is given by  
 (A)  $\frac{M}{K_b Y}$  (B)  $\frac{4K_b Y}{M}$  (C)  $\frac{K_b Y}{4M}$  (D)  $\frac{K_b Y}{M}$
- Mixture of volatile components A and B has total vapour pressure ( in torr)  
 $p = 254 - 119 x_A$   
 where  $x_A$  is mole fraction of A in mixture. Hence  $p_A^0$  and  $p_B^0$  ( in torr) are  
 (A) 254, 119 (B) 119,254 (C) 135, 254 (D) 154,119
- Consider the following cases  
 I : 2M  $\text{CH}_3\text{COOH}$  solution in benzene at  $27^\circ\text{C}$  where there is dimer formation to the extent of 100%  
 II : 0.5 M KCl (aq) solution at  $27^\circ\text{C}$  which ionizes 100%  
 (A) both are isotonic (B) I is hypertonic (C) II is hypertonic (D) none of correct
- At a certain temperature pure liquid A and liquid B have vapour pressure 10 torr and 37 torr respectively. For a certain ideal solution of A and B, the vapour in equilibrium with the liquid has the components A and B in the partial pressure ratio  $P_A : P_B = 1 : 7$ . What is the mole fraction of A in the solution ?  
 (A) 0.346 (B) 0.654 (C) 0.5 (D) none of these
- 1.0 molal aqueous solution of an electrolyte  $X_3Y_2$  is 25% ionized. The boiling point of the solution is ( $K_b$  for  $\text{H}_2\text{O} = 0.52 \text{ K kg/mol}$ )  
 (A) 375.5 K (B) 374.04 K (C) 377.12 K (D) 373.25 K
- A solution of protein was prepared by dissolving 0.75 g in  $125 \text{ cm}^3$  of an aqueous solution. At  $4^\circ\text{C}$  an osmotic pressure rise of 2.6 mm of the solution was observed. Then molecular weight of protein is (Assume density of solution is  $1.00 \text{ g/cm}^3$ ):  
 (A)  $94 \times 10^5$  (B)  $5.4 \times 10^5$  (C)  $5.4 \times 10^{10}$  (D)  $9.4 \times 10^{10}$

10. After electrolysis of a solution of NaCl with inert electrodes for a certain period of time, 600 ml of the solution was left which was found to be 1N NaOH. During the same time 31.75 gram of Cu was deposited in the copper voltmeter in series with the electrolytic cell. Calculate the percentage theoretical yield of NaOH obtained.
- (A) 50 (B) 70 (C) 60 (D) 40
11. The relationship between osmotic pressure at 273K when 10g glucose ( $P_1$ ), 10g urea ( $P_2$ ) and 10 g sucrose ( $P_3$ ) are dissolved in 250 mL of water is:
- (A)  $P_1 > P_2 > P_3$  (B)  $P_3 > P_1 > P_2$   
 (C)  $P_2 > P_1 > P_3$  (D)  $P_2 > P_3 > P_1$
12. Which one of the following pairs of solution can we expect to be isotonic at the same temperature
- (A) 0.1 M urea and 0.1 M NaCl (B) 0.1 M urea and 0.2 M  $MgCl_2$   
 (C) 0.1 M NaCl and 0.1 M  $Na_2SO_4$  (D) 0.1 M  $Ca(NO_3)_2$  and 0.1 M  $Na_2SO_4$
13. A weak electrolyte, AB, is 5% dissociated in aqueous solution. What is the freezing point of a 0.100 molal aqueous solution of AB ?  $K_f$  for water is 1.86 deg/molar.
- (A)  $-3.8^\circ C$  (B)  $-0.1953^\circ C$  (C)  $-1.7^\circ C$  (D)  $-0.78^\circ C$
14. The Van't Hoff factor for 0.1 M  $La(NO_3)_3$  solution is found to be 2.74 the percentage dissociation of the salt is
- (A) 85% (B) 58% (C) 65.8% (D) 56.8%
15. The vapour pressure of pure benzene at  $50^\circ C$  is 268 torr. How many mol of non-volatile solute per mole of benzene is required to prepare a solution of benzene having a vapour pressure of 167 torr at  $50^\circ C$ .
- (A) 0.377 (B) 0.605 (C) 0.623 (D) 0.395
16. 6gm of urea is dissolved in 90gm of water. The relative lowering of vapour pressure is
- (A) 0.02 (B) 0.04 (C) 0.06 (D) 0.03
17. Match the following.

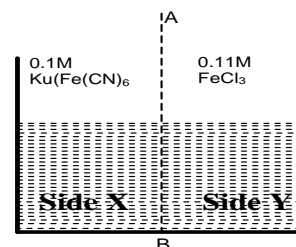
	COMPOUND		EQUIVALENT WEIGHT
1)	$K_2Cr_2O_7$ in acidic medium	a)	158
2)	Hypo with Iodine	b)	126
3)	Oxalic acid with acidified $KMnO_4$	c)	31.6
4)	$KMnO_4$ in acidic medium	d)	49
		e)	63

The correct code is

- (A) 1-d, 2-a,3-e,4-c (B) 1-d,2-a,3-c,4-e  
 (C) 1-d, 2-a,3-b,4-c (D) 1-d,2-c,3-b,4-e
18. Total vapour pressure of mixture of 1 mole A ( $P_A^\circ = 150$  torr) and 2 mole B ( $P_B^\circ = 240$  torr) is 200 mm. In this case
- (A) There is positive deviation from Raoult's law  
 (B) There is negative deviation from Raoult's law  
 (C) There is no deviation from Raoult's law  
 (D) molecular masses of A and B are also required.
19. 12.2g of benzoic acid ( $M = 122$ ) in 100g of benzene has depression in freezing point  $2.6^\circ$ ,  $k_f = 5.2^\circ$  kg/mole. If there is 100% polymerization, number of molecules of benzoic acid in associated state is
- (A) 1 (B) 2 (C) 3 (D) 4

20.  $\text{FeCl}_3$  on reaction with  $\text{K}_4[\text{Fe}(\text{CN})_6]$  in aq solution gives blue colour. These are separated by a semipermeable membrane AB as shown. Due to Osmosis there is :

- (A) blue colour formation in side X  
 (B) blue colour formation in side Y  
 (C) blue colour formation in both sides X and Y  
 (D) no blue colour formation.



**Numerical Based:**

21. 25g ethylene glycol ( $\text{C}_2\text{H}_6\text{O}_2$ ) is present in 100g of water. The solution is cooled to  $-10^\circ\text{C}$ ,  $K_f$  for  $\text{H}_2\text{O}$  is  $1.86 \text{ K. Kg. mol}^{-1}$ . If the amount of ice separated on cooling is 'x' gm, then the value of  $\frac{100}{x}$  is
22. The ratio of v.p of two liquids A and B in pure state are 1 : 2. If the two liquids are mixed and the ratio of their mole fraction in vapour phase are 2 : 1, the liquids A and B were mixed in the ratio of their moles are
23. A 0.025 M solution of monobasic acid has a freezing point of  $-0.06^\circ\text{C}$ .  $K_f$  for water is  $1.86 \text{ K.M}^{-1}$ . Assuming molality is equal to molarity, and the dissociation constant of acid is  $2.96 \times 10^{-y}$ . The value of 'y' is ....
24. A mixture of two immiscible liquids nitrobenzene and water boiling at  $99^\circ\text{C}$  has a partial v.p of water 733 mm and that of nitrobenzene 27mm. The ratio of the weights of nitrobenzene to the water in distillate is
25. At  $10^\circ\text{C}$ , the O.P of urea solution is 500 mm. The solution is diluted and the temperature is raised to  $25^\circ\text{C}$ , when the O.P is found to be 105.3 mm, then the extent of dilution is

**KEY**

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|-------|-------|-------|-------|-------|
| 1. B  | 2. D  | 3. A  | 4. B  | 5. C  |
| 6. A  | 7. A  | 8. B  | 9. B  | 10. C |
| 11. C | 12. D | 13. B | 14. B | 15. A |
| 16. A | 17. A | 18. B | 19. B | 20. D |
| 21. 4 | 22. 4 | 23. 3 | 24. 4 | 25. 5 |