

**DPP**  
DAILY PRACTICE PROBLEMS



**ATOMOS CLASSES**  
PROVEN BEST CHEMISTRY LEARNING SOLUTION  
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**04**

**CHAPTER : THE LIQUID SOLUTION**

**Max. Marks : 180**

**GENERAL INSTRUCTIONS:-**

**Duration : 1 Hour**

- This Question Paper contains **45 objective type** questions.
- Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.
- For each question, you will be awarded **4 Marks** if you give the correct answer and zero **Mark** if No answer is given. In all other cases, **Minus One (-1) Mark** will be awarded.

**Write Starting Time:** \_\_\_\_\_

**Write End Time:** \_\_\_\_\_

- Select correct statement -
 

(A) b.p. of 1 molal NaCl solution is twice that of 1 molal sucrose solution

(B) b.p. elevation of 1 molal glucose solution is half of the 1 molal KCl solution

(C) b.p. is a colligative property

(D) All of the above
- Total vapour pressure of mixture of 1 mol volatile component A ( $p_A^0 = 100$  mmHg) and 3 mol of volatile component B ( $p_B^0 = 60$  mmHg) is 75 mm. For such case -
 

(A) there is positive deviation from Raoult's law

(B) boiling point has been lowered

(C) force of attraction between A and B is smaller than that between A and A or between B and B

(D) All the above statements are correct
- At a given temperature, total vapour pressure in Torr of a mixture of volatile components A and B is given by  
 $P = 120 - 75 X_B$   
 hence, vapour pressure of pure A and B respectively (in Torr) are -
 

(A) 120, 75                      (B) 120, 195

(C) 120, 45                      (D) 75, 45
- Van't Hoff factors of aqueous solutions of X, Y, Z are 1.8, 0.8 and 2.5. Hence their -
 

(A) b.p. :  $Y < X < Z$

(B) osmotic pressure :  $X = Y = Z$

(C) v.p. :  $Y < X < Z$

(D) None of these
- Decimolar solution of potassium ferricyanide,  $K_3[Fe(CN)_6]$  has osmotic pressure of 3.94 atm at 27°C. Hence percent ionisation of the solute is -
 

(A) 10%                              (B) 20%

(C) 30%                              (D) 40%
- An aqueous solution of urea containing 18 g urea in 1500 cm<sup>3</sup> of solution has a density of 1.052 g/cm<sup>3</sup>. If the molecular weight of urea is 60, then the molality of solution is-
 

(A) 0.2                                (B) 0.192

(C) 0.064                            (D) 1.2
- 2.56 g of sulphur in 100 g of CS<sub>2</sub> has depression in f.p. of 0.010°,  $K_f = 0.1 \text{Kmol}^{-1}$ . Hence, atomicity of sulphur is -
 

(A) 2                                    (B) 4

(C) 6                                    (D) 8
- Consider following solutions -  
 I : 1 M a glucose  
 II. : 1 M a sodium chloride  
 III. : 1 M benzoic acid in benzene  
 IV. : 1 M ammonium phosphate  
 Select incorrect statement -  
 (A) all are isotonic solutions  
 (B) III is hypotonic of I, II, IV  
 (C) I, II, IV are hypertonic of III  
 (D) IV is hypertonic of I, II, III



9. The relationship between osmotic pressure at 273 K when 10 g glucose ( $P_1$ ), 10 g 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)  $P_2 > P_3 > P_1$
10. The osmotic pressure of a solution of benzoic acid dissolved in benzene is less than expected because -  
 (A) Benzoic acid is an organic solute  
 (B) Benzene is a non-polar solvent  
 (C) Benzoic acid dissociates in benzene  
 (D) Benzoic acid gets associated in benzene
11. Assuming each salt to be completely dissociated which of the following will have highest osmotic pressure-  
 (A) Decimolar  $Al_2(SO_4)_3$   
 (B) Decimolar  $BaCl_2$   
 (C) Decimolar  $Na_2SO_4$   
 (D) A solution obtained by mixing equal volumes of (B) and (C) and filtering
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 0.1M  $Na_2SO_4$   
 (D) 0.1 M  $Ca(NO_3)_2$  and 0.1 M  $Na_2SO_4$
13. For a solution containing non-volatile solute, the relative lowering of vapour pressure is 0.2. If the solution contains 5 moles in all, which of the following are true ?  
 I. Mole fraction of solute in the solution is 0.2  
 II. No. of moles of solute in the solution is 0.2  
 III. No. of moles of solvent in the solution is 4  
 IV. Mole fraction of solvent is 0.2 -  
 (A) I, IV (B) II, III  
 (C) I, III (D) II, IV
14. A complex containing  $K^+$ , Pt(IV) and  $Cl^-$  is 100% ionised giving  $i = 3$ . Thus, complex is  
 (A)  $K_2 [PtCl_4]$  (B)  $K_2 [PtCl_6]$   
 (C)  $K_3 [PtCl_5]$  (D)  $K [PtCl_3]$
15. If  $pK_a = -\log K_a = 4$ , and  $K_a = Ca^2$  then van't Hoff factor for weak monobasic acid when  $C = 0.01$  M is -  
 (A) 0.01 (B) 1.02  
 (C) 1.10 (D) 1.20
16. pH of 1M HA (weak acid) is 2. Hence van't Hoff factor is -  
 (A) 1.2 (B) 1.02  
 (C) 1.1 (D) 1.01
17. In which case van't Hoff factor is maximum  
 (A) KCl, 50% ionised  
 (B)  $K_2SO_4$ , 40% ionised  
 (C)  $FeCl_3$ , 30% ionised  
 (D)  $SnCl_4$ , 20% ionised
18. If 18 gram of glucose ( $C_6H_{12}O_6$ ) is present in 1000 gram of an aqueous solution of glucose it is said to be-  
 (A) 39.2 gram (B) 1.1 molal  
 (C) 0.5 molal (D) 0.1 molal
19. What is the molarity of  $H_2SO_4$  solution that has a density of 1.84 gm/cc at  $35^\circ C$  and contains 98% by weight-  
 (A) 4.18 M (B) 8.14 M  
 (C) 18.4 M (D) 18 M
20. In order to prepare 100  $cm^3$  of 0.250 M barium chloride solution the amount of  $BaCl_2 \cdot 2H_2O$  required will be-  
 (A) 0.250 moles  
 (B) 0.0025 moles  
 (C) 2.5 moles  
 (D) 6.1 gram of  $BaCl_2 \cdot 2H_2O$
21. 25 mL of 3 M HCl were added to 75 mL of 0.05 M HCl. The molarity of HCl in the resulting solution is approximately-  
 (A) 0.055 M (B) 0.35 M  
 (C) 0.787 M (D) 3.05 M
22. 0.2 mole of HCl and 0.1 mole of  $CaCl_2$  were dissolved in water to have 500 ml of solution, the molarity of  $Cl^-$  ions is-  
 (A) 0.04 M (B) 0.8 M  
 (C) 0.4 M (D) 0.08 M
23. When 5.0 gram of  $BaCl_2$  is dissolved in water



- to have  $10^6$  gram of solution. The concentration of solution is-
- (A) 2.5 ppm (B) 5 ppm  
(C) 5M (D) 5 gm L<sup>-1</sup>
24. For an ideal binary liquid solution with  $P_A^0 > P_B^0$ , which relation between  $X_A$  (molefraction of A in liquid phase) and  $Y_A$  (mole fraction of A in vapour phase) is correct?  
(A)  $Y_A < Y_B$  (B)  $X_A > X_B$   
(C)  $\frac{Y_A}{Y_B} > \frac{X_A}{X_B}$  (D)  $\frac{Y_A}{Y_B} < \frac{X_A}{X_B}$
25. Mole fraction of A vapours above the solution in mixture of A and B ( $X_A = 0.4$ ) will be [Given :  $P_A^0 = 100$  mm Hg and  $P_B^0 = 200$  mm Hg]  
(A) 0.4 (B) 0.8  
(C) 0.25 (D) None of these
26. The exact mathematical expression of Raoult's law is  
(A)  $\frac{P^0 - P_s}{P^0} = \frac{n}{N}$  (B)  $\frac{P^0 - P_s}{P^0} = \frac{N}{n}$   
(C)  $\frac{P^0 - P_s}{P_s} = \frac{n}{N}$  (D)  $\frac{P^0 - P_s}{P^0} = n \times N$
27. A mixture contains 1 mole of volatile liquid A ( $P_A^0 = 100$  mm Hg) and 3 moles of volatile liquid B ( $P_B^0 = 80$  mmHg). If solution behaves ideally, the total vapour pressure of the distillate is  
(A) 85 mm Hg (B) 85.88 mmHg  
(C) 90 mm Hg (D) 92 mm Hg
28. Which of the following aqueous solution will show maximum vapour pressure at 300 K?  
(A) 1 M NaCl (B) 1 M CaCl<sub>2</sub>  
(C) 1 M AlCl<sub>3</sub> (D) 1 M C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>
29. The Van't Hoff factor for a dilute aqueous solution of glucose is  
(A) zero (B) 1.0  
(C) 1.5 (D) 2.0
30. The correct relationship between the boiling points of very dilute solution of AlCl<sub>3</sub> ( $T_1$ ,K) and CaCl<sub>2</sub> ( $T_2$ ,K) having the same molar concentration is  
(A)  $T_1 = T_2$  (B)  $T_1 > T_2$   
(C)  $T_2 > T_1$  (D)  $T_2 \leq T_1$
31. A 0.001 molal solution of a complex [MA<sub>8</sub>] in water has the freezing point of  $-0.0054^\circ\text{C}$ . Assuming 100% ionization of the complex salt and  $K_f$  for H<sub>2</sub>O = 1.86 Km<sup>-1</sup>, write the correct representation for the complex  
(A) [MA<sub>8</sub>] (B) [MA<sub>7</sub>]A  
(C) [MA<sub>6</sub>]A<sub>2</sub> (D) [MA<sub>5</sub>]A<sub>3</sub>
32. The vapour pressure of a solution of a non-volatile electrolyte B in a solvent A is 95% of the vapour pressure of the solvent at the same temperature. If the molecular weight of the solvent is 0.3 times the molecular weight of solute, the weight ratio of the solvent and solute are  
(A) 0.15 (B) 5.7  
(C) 0.2 (D) 4.0
33. At a given temperature, total vapour pressure in Torr of a mixture of volatile components A and B is given by  $P_{\text{Total}} = 120 - 75 X_B$  hence, vapour pressure of pure A and B respectively (in Torr) are  
(A) 120, 75 (B) 120, 195  
(C) 120, 45 (D) 75, 45
34. Assuming each salt to be 90% dissociated, which of the following will have highest boiling point?  
(A) Decimolar Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> (B) Decimolar BaCl<sub>2</sub>  
(C) Decimolar Na<sub>2</sub>SO<sub>4</sub>  
(D) A solution obtained by mixing equal volumes of (B) and (C)
5. The vapour pressure of a solvent decreased by 10 mm of Hg when a non-volatile solute was added to the solvent. The mole fraction of solute in solution is 0.2, what would be mole fraction of the solvent if decrease in vapour pressure is 20 mm of Hg.  
(A) 0.2 (B) 0.4  
(C) 0.6 (D) 0.8
36. Elevation of boiling point of 1 molar aqueous glucose solution (density = 1.2 g/ml) is  
(A)  $K_b$  (B) 1.20  $K_b$   
(C) 1.02  $K_b$  (D) 0.98  $K_b$
37. What will be the molecular weight of CaCl<sub>2</sub> determined in its aq. solution experimentally from depression of freezing point?  
(A) 111 (B) < 111



(C) > 111 (D) data insufficient

38. 1.0 molal aqueous solution of an electrolyte  $A_2B_3$  is 60% ionised. The boiling point of the solution at 1 atm is ( $K_{b(H_2O)} = 0.52 \text{ K kg mol}^{-1}$ )

- (A) 274.76 K (B) 377 K  
(C) 376.4 K (D) 374.76 K

39. Which of the following plots represents an ideal binary mixture?

(A) Plot of  $P_{\text{total}} v/s 1/X_B$  is linear ( $X_B$  = mole fraction of 'B' in liquid phase)

(B) Plot of  $P_{\text{total}} v/s Y_A$  is linear ( $Y_B$  = mole fraction of 'A' in vapour phase)

(C) Plot of  $\frac{1}{P_{\text{total}}} v/s Y_A$  is linear

(D) Plot of  $\frac{1}{P_{\text{total}}} v/s Y_B$  is non linear

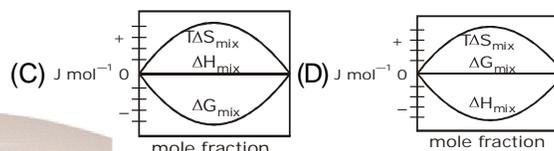
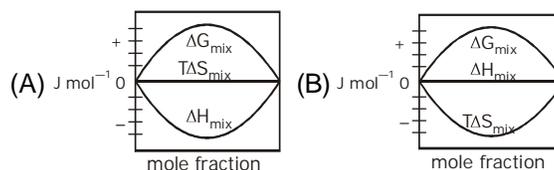
40. Pressure over ideal binary liquid mixture containing 10 moles each of liquid A and B is gradually decreased isothermally. If  $P_A^0 = 200 \text{ mm Hg}$  and  $P_B^0 = 100 \text{ mm Hg}$ , find the pressure at which half of the liquid is converted into vapour.

- (A) 150 mm Hg (B) 166.5 mm Hg  
(C) 133 mm Hg (D) 141.4 mm Hg

41. Two liquids A & B form an ideal solution. What is the vapour pressure of solution containing 2 moles of A and 3 moles of B at 300 K? [Given At 300 K, Vapour pr. of pure liquid A ( $P_A^0$ ) = 100 torr, Vapour pressure of pure liquid B ( $P_B^0$ ) = 300 torr]

- (A) 200 torr (B) 140 torr  
(C) 180 torr (D) None of these

42. Which of the following represents correctly the changes in the changes in thermodynamic properties during the formation of 1 mol of an ideal binary solution



43. The vapour pressure of a saturated solution of sparingly soluble salt ( $XCl_3$ ) was 17.20 mm Hg at 27°C. If the vapour pressure of pure  $H_2O$  is 17.25 mm Hg at 300 K, what is the solubility of sparingly soluble salt  $XCl_3$  in mole/Litre.

- (A)  $4.04 \times 10^{-2}$  (B)  $8.08 \times 10^{-2}$   
(C)  $2.02 \times 10^{-2}$  (D)  $4.04 \times 10^{-3}$

44. At 300 K, the vapour pressure of an ideal solution containing 3 mole of A and 2 mole of B is 600 torr. At the same temperature, if 1.5 mole of A & 0.5 mole of C (non-volatile) are added to this solution the vapour pressure of solution increases by 30 torr. What is the value of  $P_B^0$ ?

- (A) 940 (B) 405  
(C) 90 (D) None of these

45. 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%

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