



CHEMISTRY

BOOKS - NARENDER AVASTHI CHEMISTRY (ENGLISH)

DILUTE SOLUTION

Level 01

1. The vapour pressure of a given liquid will decrease if :

- A. surface area of liquid decreased
- B. the volume of liquid in the container is decreased
- C. the volume of the vapour phase is increased
- D. the temperature is dexreased

Answer: d





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2. The normal boiling point of water is 373 K. Vapour of water at temperature T is 19 mm Hg. If enthalpy of vapourisation is 40.67 kJ/mol, then temperature T would be

(use : $\log 2 = 0.3$, $R : 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$):

- A. 250 K
- B. 291.4 K
- C. 230 K
- D. 290 K

Answer: b



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3. A sample of the liquid H_2O at 18.0 g is injected into an evacuated 7.6 L flask maintained at 27.0°C . If vapour pressure of H_2O at 27.0°C is 24.63

mm Hg, what weight percentage of the water will be vaporised when the system comes to equilibrium? Assume water vapors behaves as an ideal gas. The volume occupied by the liquid water is negligible compared to the volume of the container:

- A. 1%
- B. 10%
- C. 18%
- D. 20%

Answer: a

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4. Raoult's law is obeyed by each constituent of binary liquid solution when :

- A. the forces of attraction between like molecules are greater than those between unlike molecules

- B. the forces of attraction between like molecules are smaller than those between unlike molecules
- C. the forces of attraction between like molecules are identical with those between unlike molecules
- D. the volume occupied by unlike molecules are different

Answer: c



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5. For a binary ideal liquid solution, the total vapour of the solution is given as:

A. $P_{\text{total}} = P_A^\circ + (P_A^\circ - P_B^\circ)X_B$

B. $P_{\text{total}} = P_B^\circ + (P_A^\circ - P_B^\circ)X_A$

C. $P_{\text{total}} = P_B^\circ + (P_B^\circ - P_A^\circ)X_A$

D. $P_{\text{total}} = P_B^\circ + (P_B^\circ - P_A^\circ)X_B$

Answer: b

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6. For a ideal liquid solution with $P_A^\circ > P_B^\circ$, which relation between X_A ((mole fraction 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. $\frac{Y_A}{Y_B} < \frac{X_A}{X_B}$

Answer: c

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7. X_A and X_B are the mole fraction of A and B respectively in liquid phase y_A and y_B are the mole fraction of A and B respective in vapour phase. Find out the slope of straight line if a graph is plotted $\frac{1}{y_A}$ along Y-axis against $\frac{1}{x_A}$ along X-axis gives straight line [p_A° and p_B° are vapour pressure of pure components A and B].

A. $\frac{P_B^\circ}{P_A^\circ}$

B. $\frac{P_A^\circ}{P_B^\circ}$

C. $P_B^\circ - P_A^\circ$

D. $P_A^\circ - P_B^\circ$

Answer: a



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8. For a dilute solution, Raoult's law states that :

- A. the lowering of vapour pressure is equal to the mole fraction of solute
- B. the relative lowering of vapour pressure is equal to the mole fraction of solute
- C. the relative lowering of vapour pressure is proportional to the amount of solute in solution
- D. the vapour pressure of the solution is equal to the mole fraction of solvent

Answer: b



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9. The solubility of a specific non-volatile salt is 4 g in 100 g of water at $25^{\circ}C$. If 2.0g, 4.0g and 6.0g of the salt added of 100 g of water at 25° , in system X, Y and Z. The vapour pressure would be in the order:

A. $X < Y < Z$

B. $X > Y > Z$

C. $Z > X = Y$

D. $X > Y = Z$

Answer: d

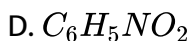
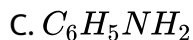
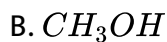
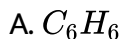


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10. The boiling point of

C_6H_6 , CH_3OH , $C_6H_5NH_2$ and $C_6H_5NO_2$ are $80^\circ C$, $65^\circ C$, $184^\circ C$ and $212^\circ C$

respectively. Which will show highest vapour pressure at room temperature :



Answer: B



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11. 6.0 g of urea (molecular mass = 60) was dissolved in 9.9 moles of water.

If the vapour pressure of pure water is P° , the vapour pressure of solution is :

A. $0.10 P^\circ$

B. $1.10 P^\circ$

C. $0.90 P^\circ$

D. $0.99 P^\circ$

Answer: d



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12. An ideal solution was found to have a vapour pressure of 80 torr when the mole fraction of a non-volatile solute was 0.2. What would be the vapour pressure of the pure solvent at the same temperature?

- A. 64 torr
- B. 80 torr
- C. 100 torr
- D. 400 torr

Answer: c



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13. If the vapor pressure of a dilute aqueous solution of glucose is 750mm of Hg at 373K, then molality of solute is

- A. 0.26
- B. 0.73

C. 0.74

D. 0.039

Answer: c

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14. Estimate the lowering of vapour pressure due to the solute (glucose) in a 1.0 M aqueous solution at 100°C :

A. 10 torr

B. 18 torr

C. 13.45 torr

D. 24 torr

Answer: c

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15. Calculate the weight of non – volatile solute having molecular weight 40, which should be dissolved in 57gm octane to reduce its vapour pressure to 80 % :

A. 47.2 g

B. 5 g

C. 106.2 g

D. None of these

Answer: b



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16. Equal mass of a solute are dissolved in equal mass of two solvents A and B and formed very dilute solution. The relative lowering of vapour pressure for the solution B has twice the relative lowering of vapour pressure for the solution A. If m_A and M_B are the molecular masses of solvents A and B respectively, then :

A. $M_A = M_B$

B. $M_B = 2 \times M_A$

C. $M_A = 4M_B$

D. $M_A = 2M_B$

Answer: b

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17. An ideal solution has two components A is more volatile than B, i.e.

$P_A^\circ > P_B^\circ$ and also $P_A^\circ > P_{\text{total}}$. If X_A and Y_A are mole fraction of

components A in liquid and vapour phases, than :

A. (a) $X_A = Y_A$

B. (b) $X_A > Y_A$

C. (c) $X_A < Y_A$

D. (d) Data insufficient

Answer: c



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18. At $25^{\circ}C$, the vapour pressure of pure liquid A (mol. Mas = 40) is 100 torr and that of pure Liquid B is 40 torr, (mol. mass = 80). The vapour pressure at $25^{\circ}C$ of a solution containing 20 g of each A and B is :

- A. (a) 80 torr
- B. (b) 59.8 torr
- C. (c) 68 torr
- D. (d) 48 torr

Answer: a



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19. The liquid A and B form ideal solutions. At 300 K, the vapour pressure of solution containing 1 mole of A and 3 mole of B is 550 mm Hg. At the same temperature, if one more mole of B is added to this solution, the vapour pressure of the solution increases by 10 mm Hg. Determine the vapour pressure of A and B in their pure states (in mm Hg).

A. 400, 600

B. 500, 500

C. 600, 400

D. none of these

Answer: a



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20. Two liquid A and B have vapour pressure in the ratio $P_A^\circ : P_B^\circ = 1.3$ at a certain temperature. Assume A and B form an ideal solution and the ratio of mole fractions of A to B in the vapour phase is 4 : 3, then the mole

fraction of B in the solution at the same temperature is :

(a) $\frac{1}{5}$

(b) $\frac{2}{3}$

(c) $\frac{4}{5}$

(d) $\frac{1}{4}$

A. $\frac{1}{5}$

B. $\frac{2}{3}$

C. $\frac{4}{5}$

D. $\frac{1}{4}$

Answer: a



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21. Two liquids A and B have P_A° and P_B° in the ratio of 1 : 3 and the ratio of number of moles of A and B in liquid phase are 1 : 3 then mole fraction of 'A' in vapour phase in equilibrium with the solution is equal to :

A. 0.1

B. 0.2

C. 0.5

D. 1

Answer: a

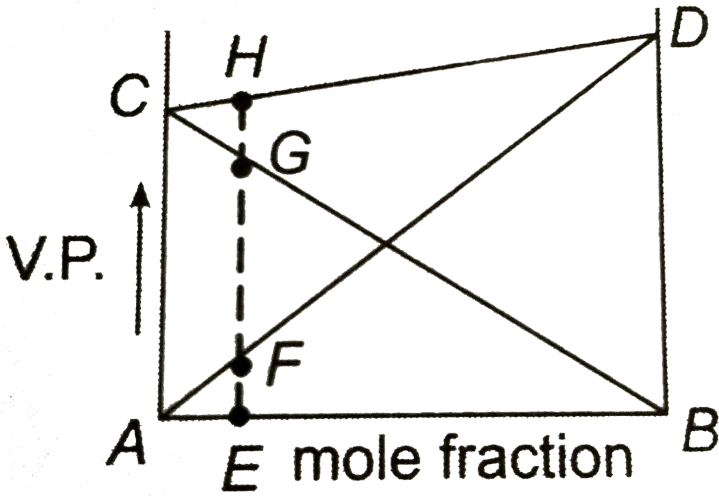


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22. Based on the given diagram, which of the following statements regarding the homogenous solution of two volatile liquids are correct?

(1) Plots AD and BC show that Raoult's law is obeyed for the solution in which B is a solvent and A is the solute and as well as for that in which A is solvent and B is solute. (2) Plot CD shows that Dalton's law of partial pressures is obeyed by the binary solution of components A and B. (3) $EF + EG = EH$; and AC and BD correspond to the vapour pressure of the pure

solvents A and B respectively.



$$X_A = 1$$

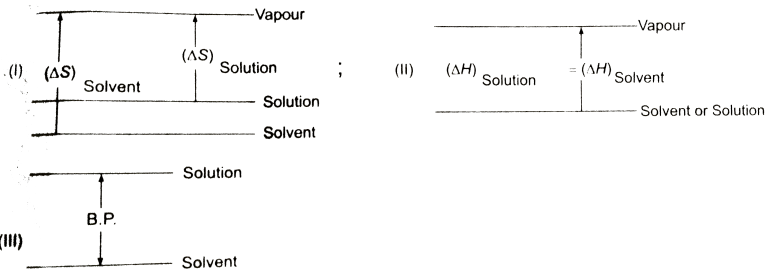
$$X_B = 1$$

- A. only 1
- B. 2 and 3
- C. 1 and 3
- D. all

Answer: d

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23. Which represents correct difference when non-volatile solute is present in an ideal solution?



(a) I, II, III

(b) I, III

(c) II, III

(d) I, II

A. I, II, III

B. I, III

C. II, III

D. I, II

Answer: a

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24. Select correct statement :

- a. Solution has more molecules randomness than a pure solvent. The entropy change between solution and solid is larger than the entropy change between pure solvent and solid.
- b. Heat of fusion of solution are positive
- c. Both a and b
- d. None of these

A. Solution has more molecules randomness than a pure solvent. The entropy change between solution and solid is larger than the entropy change between pure solvent and solid

B. Heat of fusion of solution are positive

C. both a and b

D. none of these

Answer: d



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25. Select correct statement :

- A. Heats of vaporisation for a pure solvent and for a solution are similar because similar intermolecular forces between solvent molecules must be overcome in both cases
- B. Entropy change between solution and vapour is smaller than the entropy change between pure solvent and vapour
- C. Boiling point of the solution is larger than that of the pure solvent
- D. All are correct statements

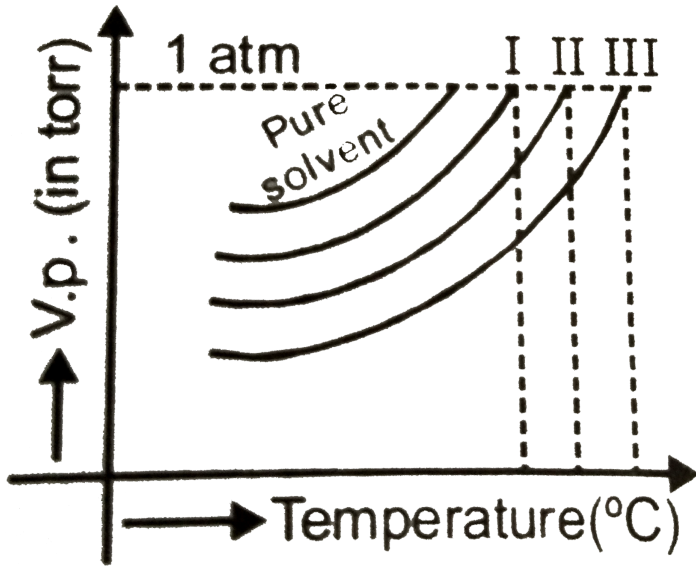
Answer: d



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26. The vapour pressure curves of the same solute in the same solvent are shown below. The curves are parallel to each other and do not intersect.

The concentrations of solutions are in order of :



A. $I < II < III$

B. $I = II = III$

C. $I > II > III$

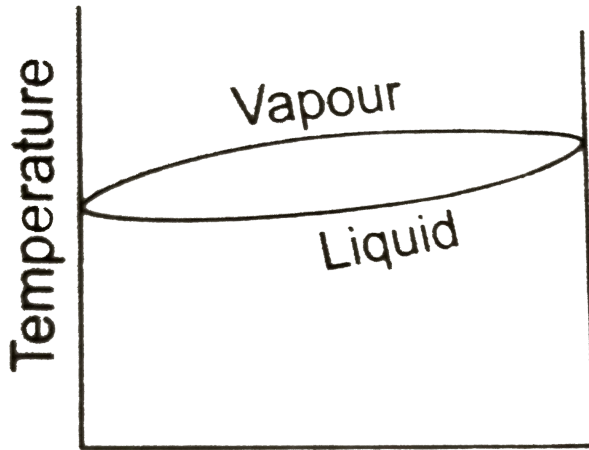
D. $I > III > II$

Answer: a



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27. Boiling point composition diagram of the liquid-vapour equilibrium for A and B is shown in the figure. If a binary liquid mixture of A and B is distilled fractionally, which of the following would be correct observation ?



$X_A = 1$ % Composition $X_B = 1$

- A. Composition of the still (residus) will approach pure liquid B only
- B. composition of the distillate will approach pure A only
- C. Composition of distillate and residus will approach pure A and B respectively
- D. Neither of the component can be obtained in pure state

Answer: c

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28. The boiling point of an azeotropic mixture of water and ethyl alcohol is less than that of the theoretical value of water and alcohol mixture.

Hence the mixture shows

- A. the mixture will show negative deviation from Raoult's law
- B. the mixture will show positive deviation from Raoult's law
- C. the mixture can be considered as true solution
- D. none of these

Answer: b

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29. Formation of a solution from two components can be considered as :

(i) pure solvent \rightarrow separated solvent molecules, ΔH_1

(ii) Pure solute \rightarrow separated molecules, ΔH_2

(iii) separated solvent and solute molecules \rightarrow solution, ΔH_3

solution so formed will be ideal if :

A. $\Delta H_{\text{soln}} = \Delta H_1 + \Delta H_2 + \Delta H_3$

B. $\Delta H_{\text{soln}} = \Delta H_1 + \Delta H_2 - \Delta H_3$

C. $\Delta H_{\text{soln}} = \Delta H_1 - \Delta H_2 - \Delta H_3$

D. $\Delta H_{\text{soln}} = \Delta H_3 - \Delta H_1 - \Delta H_2$

Answer: a



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30. Total vapour pressure of mixture of 1 mol X ($P_X^\circ = 150$ torr) and 2 mol

Y ($P_Y^\circ = 300$ torr) is 240 torr. In this case :

- A. there is a negative deviation from Raoult's law
- B. there is a positive deviation from Raoult's law
- C. there is no deviation from Raoult's law
- D. can not be decided

Answer: a

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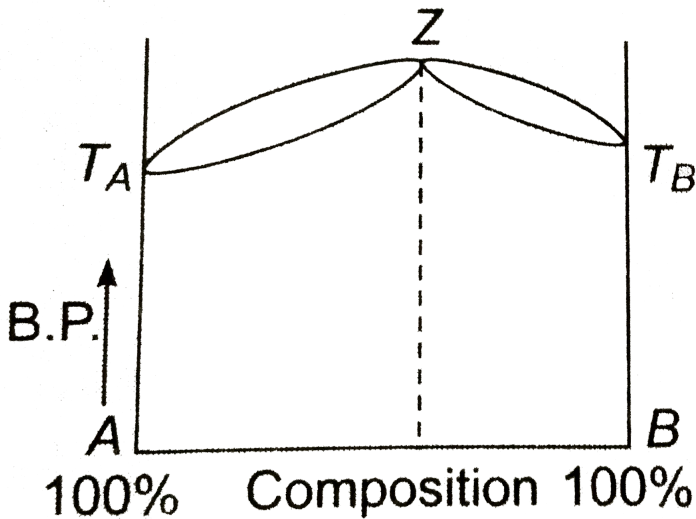
31. In a mixture of A and B, components show positive deviation when:

- A. (a) A-B interaction is stronger than A-A and B-B interaction
- B. (b) A-B interaction is weaker than A-A and B-B interaction
- C. (c) $\Delta V_{\text{mix}} < 0$, $\Delta S_{\text{mix}} > 0$
- D. (d) $\Delta V_{\text{mix}} = 0$, $\Delta S_{\text{mix}} > 0$

Answer: b

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32. A liquid mixture having composition corresponding to point Z in the figure shown is subjected to distillation at constant pressure. Which of the following statements is correct about the process?



- A. The composition of distillate differs from the mixture
- B. The boiling point goes on changing
- C. The mixture has highest vapour pressure than for any other composition

D. Composition of an azeotrope alters on changing the external pressure

Answer: d

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33. Which will form maximum boiling azeotrope ?

A. $C_6H_6 + C_6H_5CH_3$ solution

B. $HNO_3 + H_2O$ solution

C. $C_2H_5OH + H_2O$ solution

D. n-hexane and n-heptane

Answer: b

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34. Total vapour pressure of mixture of 1 mole of volatile components A ($P_A^\circ = 100 \text{ mm Hg}$) and 3 mole of volatile component B ($P_B^\circ = 80 \text{ mm Hg}$) is 90 mm Hg. 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 weaker than that between A and A or between B and B
- D. All the above statements are correct

Answer: d



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35. The azeotropic mixture of water ($B.P. = 100^\circ \text{C}$) and HCl ($B.P. = 86^\circ \text{C}$) boils at about 120°C . During fractional distillation of this mixture it is possible to obtain :

- A. pure HCl
- B. pure H_2O
- C. pure H_2O as well as pure HCl
- D. Neither H_2O nor HCl

Answer: d

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36. Azeotropic mixture of water and C_2H_5OH boils at 351 K. By distilling the mixture it is possible to obtain

- A. pure C_2H_5OH only
- B. Pure water only
- C. Neither C_2H_5OH nor water
- D. Both water and C_2H_5OH in pure state

Answer: c



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37. Azeotropic mixture of two liquid has a boiling point higher than either of them when it :

- A. shows positive deviation from Raoult's law
- B. shows negative deviation from Raoult's law
- C. shows ideal behaviour
- D. is saturated

Answer: b



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38. If two liquids A ($P_A^\circ = 100\text{torr}$) and ($P_B^\circ = 200\text{ torr}$) which are completely immiscible with each other (each one will behave independently of the other) are present in a closed vessel, the total vapour pressure of the system will be :

- A. less than 100 torr
- B. greater than 200 torr
- C. between 100 to 200 torr
- D. 300 torr

Answer: d

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39. When a liquid that is immiscible with water was steam distilled at $95.2^{\circ}C$ at a total pressure of 748 torr, the distilled contained 1.25 g of the liquid per gram of water . The vapour pressure of water is 648 torr at $95.2^{\circ}C$, what is the molar mass of liquid?

- A. 7.975 g/mol
- B. 166 g/ mol
- C. 145.8 g/mol
- D. None of these

Answer: c

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40. Water and chlorobenzene are immiscible liquids. Their mixture boils at $89^\circ C$ under reduced pressure of $7.7 \times 10^4 pa$. The vapour pressure of pure water at $89^\circ C$ is $7 \times 10^4 pa$ Mass per cent of chlorobenzene in the distillate is :

A. 50

B. 60

C. 78.3

D. 38.46

Answer: d

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41. Which of the following is not a colligative property ?

- A. Vapour pressure
- B. Depression in f.pt.
- C. Elevation in b.pt.
- D. Osmotic pressure

Answer: a



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42. The degree of an electrolyte is a and its van't Hoff factor is i . The number of ions obtained by complete dissociation of 1 molecule of electrolyte as :

A. $\frac{i + a - 1}{a}$

B. $i - a - 1$

C. $\frac{i - 1}{a}$

$$D. i + 1 + \frac{a}{1 - a}$$

Answer: a



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43. One mole of a solute A is dissolved in a given volume of a solvent. The association of the solute take place as follows: $nA \rightarrow A_n$ If a is the degree of association of A, then van't hoff factor i is expressed as:

A. $i = 1 - a$

B. $i = 1 + \frac{a}{n}$

C. $i = \frac{1 - a + \frac{a}{n}}{1}$

D. $i = 1$

Answer: C



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44. The van't Hoff factor i for an electrolyte which undergoes dissociation in one solvent and association in other solvent respectively:

- A. greater than one and less than one
- B. less than one and greater than one
- C. less than one and less than one
- D. greater than one and greater than one

Answer: A



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45. Which solution has the highest vapour pressure ?

- A. $0.02M NaCl$ at $50^{\circ}C$
- B. $0.03M$ sucrose at $15^{\circ}C$
- C. $0.005M CaCl_2$ at $500^{\circ}C$
- D. $0.005M CaCl_2$ at $25^{\circ}C$

Answer: c

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46. An aqueous solution is 1.00 molal in KI. Which change will cause the vapour pressure of the solution to increase ?

- A. addition of water
- B. addition of NaCl
- C. addition of Na_2SO_4
- D. Addition of 1.0 molal KI

Answer: a

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47. Four solutions of K_2SO_4 with the concentrations 0.1m, 0.01m ,0.001 m, and 0.0001 m are available . The maximum value of colligative property

corresponds to :

A. (a) 0.0001 m solution

B. (b) 0.001 m solution

C. (c) 0.01 m solution

D. (d) 0.1 m solution

Answer: d



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48. Moles of Na_2SO_4 to be dissolved in 12 mole water to lower its vapour pressure by 10 mm Hg at a temperature at which vapour pressure of pure water is 50 mm is:

A. 1.5 mole

B. 2 mole

C. 1 mole

D. 3 mole

Answer: D

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49. A very diluted saturated solution of a sparingly soluble salt X_3Y_4 has a vapour pressure of 20 mm Hg temperature T, while pure water exerts a pressure of 20.0126 mm Hg at the same temperature . Calculate molality (m) at temperature T :

A. 6.3×10^{-4}

B. 3.5×10^{-2}

C. 5×10^{-3}

D. None of these

Answer: c

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50. When 1 mole of a solute is dissolved in 1 kg of H_2O , boiling point of solution was found to be $100.5^\circ C$. K_b for H_2O is :

- A. 0.5
- B. 100
- C. 100.5
- D. 95.5

Answer: a

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51. Chloroform, $CHCl_3$, boils at $61.7^\circ C$. If the K_b for chloroform is $3.63^\circ C / \text{molal}$, what is the boiling point of a solution of 15.0 kg of CH_3 and 0.616 kg of acenaphthalene, $C_{12}H_{10}$?

- (a) 61.9
- (b) 62

(c) 52.2

(d) 62.67

A. 61.9

B. 62

C. 52.2

D. 62.67

Answer: d

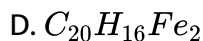
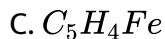
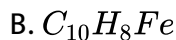
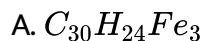
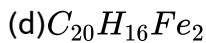
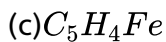


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52. A compound has the empirical formula $C_{10}H_8Fe$. A solution of 0.26 g of the compound in 11.2 g of benzene (C_6H_6) boils at $80.26^\circ C$. The boiling point of benzene is $80.10^\circ C$, the K_b is $2.53^\circ C/molal$. What is the molecules formula of the compound?

(a) $C_{30}H_{24}Fe_3$

(b) $C_{10}H_8Fe$



Answer: d



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53. A solution of 0.640 g of azulene in 100.0 g of benzene is $80.23^\circ C$. The boilingpoint of benzene is $80.10^\circ C$, and K_b is $2.53^\circ C/molal$. What is the molecular mass of azulene?

(a) 108

(b) 99

(c) 125

(d) 134

A. 108

B. 99

C. 125

D. 134

Answer: c



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54. One molal solution of a carboxylic acid in benzene shows the elevation of boiling point of 1.518 K. The degree of association for simerization of the acid in benzene is (K_b for beznene = $2.53Kkgmol^{-1}$

):

(a) 0.6

(b) 0.7

(c) 0.75

(d) 0.8

A. 0.6

B. 0.7

C. 0.75

D. 0.8

Answer: d



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55. The normal boiling point of toluene is $110.7^{\circ}C$ and its boiling point elevation constant $3.32 \text{ K kg mol}^{-1}$. The enthalpy of vaporization of toluene is nearly :

A. 17.0 kJ mol^{-1}

B. 34.0 kJ mol^{-1}

C. 51.0 kJ mol^{-1}

D. 68.0 kJ mol^{-1}

Answer: b

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56. Which one of the following aqueous solutions will exhibit highest elevation in boiling point?

A. 0.015 M urea

B. 0.01 M KNO_3

C. 0.10M Na_2SO_4

D. 0.015 m glucose

Answer: c

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57. Calculate the percentage degree of dissociation of an electrolyte XY_2 (Normal molar mass = 164) in water if the water if the observed molar

mass by measuring elevation in boiling point is 65.6

- A. 75%
- B. 25%
- C. 65%
- D. None of these

Answer: a

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58. If the elevation in boiling point of a solution of non-volatile, non-electrolytic and non-associating solute in solvent ($K_b = xK. \text{kgmol}^{-1}$) is yK , then the depression in freezing point of solution of same concentration would be

(K_f) of the solvent = $zK. \text{kgmol}^{-1}$)

- A. $2x \frac{y}{y}$
- B. $y \frac{z}{x}$

C. $x \frac{z}{y}$

D. $y \frac{z}{2x}$

Answer: b



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59. When a solution containing non- volatile solute freezes, which equilibrium would exist?

A. solid solvent \Leftrightarrow liquid solvent

B. solid solute \Leftrightarrow liquid solution

C. solid solute \Leftrightarrow liquid solvent

D. solid solvent \Leftrightarrow liquid solution

Answer: d



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60. Bromoform has a normal freezing point of 7.734°C and $K_f = 14.4^{\circ}\text{C}/m$. A solution of 2.60 g of an unknown substance in 100 g of bromoform freezes at 5.43°C . What is the molecular mass of the unknown substance?

A. 16.25

B. 162.5

C. 100

D. none of these

Answer: b

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61. C_6H_6 freezes at 5.5°C . At what temperature will a solution of 10.44 g of C_4H_{10} in 200 g of C_6H_6 freeze? $K_f(\text{C}_6\text{H}_6) = 5.12^{\circ}\text{C}/m$

A. 4.608°C

B. $0.892^{\circ}C$

C. $5.5^{\circ}C$

D. none of these

Answer: b

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62. How much ethyl alcohol must be added to $1.00L$ of water so that the solution will not freeze at $-4^{\circ}F$? K_f of water = $1.86^{\circ} \frac{C}{m}$

A. 20 g

B. 10.75 g

C. 494.5 g

D. 492 g

Answer: d

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63. The freezing point of a solution of 2.40 g of biphenyl ($C_{12}H_{10}$) in 75.0 g of benzene (C_6H_6) is $4.40^\circ C$. The normal freezing point of benzene is $5.50^\circ C$. What is the molal freezing point constant ($^\circ C/m$) for benzene ?

A. 5.3

B. 5.1

C. 4.6

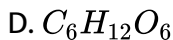
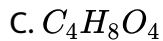
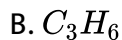
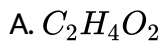
D. 4.8

Answer: a



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64. A solution containing 1.8 g of a compound (empirical formula CH_2O) in 40 g of water is observed to freeze at $-0.465^\circ C$. The molecules formula of the compound is (K_f of water = 1.86 kg Kmol^{-1}):



Answer: d

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65. Freezing point of the following equilibrium, liquid solvent \rightleftharpoons solid

solvent is :

(a) $\frac{\Delta H - \Delta G}{T \Delta S}$

(b) $\frac{\Delta H}{\Delta S}$

(c) $\frac{\Delta G}{\Delta S}$

(d) $\frac{\Delta S}{\Delta H}$

A. $\frac{\Delta H - \Delta G}{T \Delta S}$

B. $\frac{\Delta H}{\Delta S}$

C. $\frac{\Delta G}{\Delta S}$

D. $\frac{\Delta S}{\Delta H}$

Answer: b



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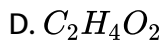
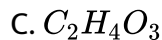
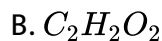
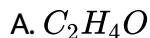
66. Freezing point of a solution is smaller than freezing point of a solvent. It is due to :

- A. ΔH of solution and solvent is almost identical since intermolecular force between solvent molecules are involved
- B. ΔS solution (between solution and solid) is larger than that of the ΔS of solvent (between solvent and solid)
- C. ΔS of then solution is smaller than that of the solvent
- D. ΔH of the solution is much higher than of solvent but ΔS of solvent than that of the solvent

Answer: b

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67. When 36.0 g of a solute having the empirical formula CH_2O is dissolved in 1.20 kg of water, the solution freezes at $-0.93^\circ C$. What is the molecular formula of the solute? ($K_f = 1.86^\circ Ckgmol^{-1}$)



Answer: d

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68. Calculate the molecular mass of a substance whose 7.0% by mass solution in water freezes at -0.93°C . The cryoscopic constant of water is $1.86^{\circ}\text{C kg mol}^{-1}$:

(a) 140 g mol^{-1}

(b) 150.5 g mol^{-1}

(c) 160 g mol^{-1}

(d) 155 g mol^{-1}

A. 140 g mol^{-1}

B. 150.5 g mol^{-1}

C. 160 g mol^{-1}

D. 155 g mol^{-1}

Answer: b



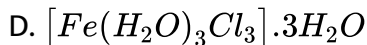
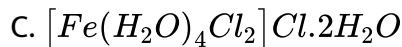
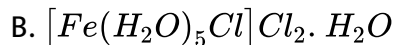
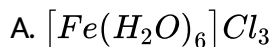
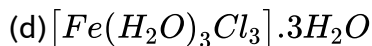
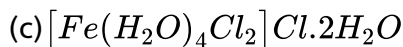
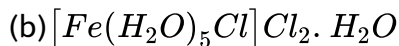
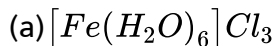
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69. Camphor is often used in molecular mass determination because



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70. For 1 molal solution of each compound minimum freezing point will be assuming compound ionisation in each case :



Answer: a



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71. Which of the following solutions (1 molal) will have the maximum freezing point, assuming equal ionization in each case?

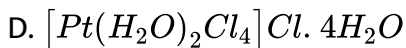
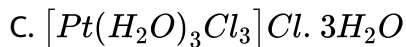
- A. $[Fe(H_2O)_6Cl]Cl_3$
- B. $[Fe(H_2O)_5Cl]Cl_2 \cdot H_2O$
- C. $[Fe(H_2O)_4Cl_2]Cl \cdot 2H_2O$
- D. $[Fe(H_2O)_3Cl_3] \cdot 3H_2O$

Answer: d

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72. $PtCl_4 \cdot 6H_2O$ can exist as hydrated complex 1 molal aq. solution has depression in freezing point of $3.72^\circ C$. Assume 100% ionisation and $K_f(H_2O) = 1.86^\circ C mol^{-1} Kg$ then complex is

- A. $[Pt(H_2O)_6]Cl_4$
- B. $[Pt(H_2O)_5Cl]Cl_2 \cdot 2H_2O$

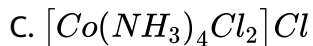
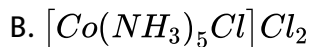
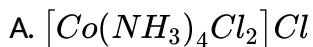


Answer: c



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73. A complex is represented as $CoCl_3 \cdot xNH_3$. Its 0.1 molal solution in aqueous solution shows $\Delta T_f = 0.558^\circ$. (K_f for H_2O is $1.86 K \text{ molality}^{-1}$) Assuming 100% ionisation of complex and coordination number of Co as six, calculate formula of complex.



D. none of these

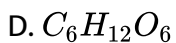
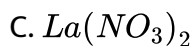
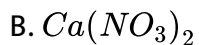
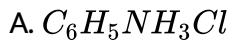
Answer: b





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74. The freezing point of equimolal solution will be highest for :



Answer: d



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75. The freezing point of 4% aqueous solution of 'A' is equal to the freezing point 10% aqueous solution of 'B'. If the molecular mass of 'A' is 60, then the molecular mass of 'B' will be:

A. 160

B. 90

C. 45

D. 180

Answer: a



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76. The depression in freezing point of $0.01m$ aqueous CH_3COOH solution is 0.02046° , $1m$ urea solution freezes at $-1.86^\circ C$. Assuming molality equal to molarity, pH of CH_3COOH solution is

a. 2

b. 3

c. 4

d. 5

A. 2

B. 3

C. 4

D. 5

Answer: b

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77. When mercuric iodide is added to the aqueous solution of potassium iodide, then:

- A. freezing point is raised
- B. Freezing point is lowered
- C. freezing point does not change
- D. boiling point does not change

Answer: a

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78. Dimer of acetic acid in liquid benzene is in equilibrium with acetic acid monomer at certain temperature and pressure. If 25% of the dimer molecules are separated out then

- (a) freezing point of the solution reduces
- (b) average molar mass of solute increases
- (c) boiling point of solution increases
- (d) molar mass of solute decreases

- A. freezing point of the solution reduces
- B. average molar mass of solute increases
- C. boiling point of solution increases
- D. molar mass of solute decreases

Answer: b



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79. The temperature of a city was found to be -9.3°C . A car used, whose radiator was filled with 5 L of water. What minimum quantity of antifreezing agent ethylene glycol were added to water of radiator in order to use the car for travelling? (K_f of water $1.861.86\text{ k mol}^{-1}$)

A. 3200 g

B. 1670 g

C. 1550 g

D. 2100 g

Answer: c

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80. The cryoscopic constant of water is $1.86\text{ K kg mol}^{-1}$. A 0.01 molal acetic acid solution produces a depression of 0.0194°C in the freezing point.

The degree of dissociation of acetic acid is :

A. zero

B. 0.043

C. 0.43

D. 1

Answer: b

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81. If 1m solution of benzoic acid in benzene has a freezing point depression of $3.84^{\circ}C$. ($K_f = 5.12^{\circ}Cmol^{-1}kg$) and boiling point elevation of $2.53^{\circ}C$ ($K_b = 2.53^{\circ}Cmol^{-1}kg$), then select the correct statement/s :
Statement I : there are dimer formation when under -going freezing

Statement II : there are no change when undergoing boiling

Statement III : reverse of I and II
Statement IV : dimer formation in freezing and boiling state

A. I, II

B. II, III

C. III, I

D. only I

Answer: a



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82. In a 0.5 molal solution KCl, KCl is 50% dissociated. The freezing point of solution will be ($K_f = 1.86 \text{ K kg mol}^{-1}$):

A. 274.674 K

B. 271.60 K

C. 273 K

D. none of these

Answer: b



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83. A 1.0 g sample of $Co(NH_2CH_2CH_2NH_2)_3Cl_3$ is dissolved in 25.0 g of water and the freezing point of the solution is $-0.87^\circ C$. How many ions are produced per mole of compound? The K_f of water is $1.86^\circ C/molal$

A. 2

B. 3

C. 4

D. 5

Answer: c



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84. An aqueous solution contain 3% and 1.8% by mass urea and glucose respectively. What is the freezing point of solution ? ($K_f = 1.86^\circ C/m$)

A. $-1.172^{\circ}C$

B. $-2.27^{\circ}C$

C. $-1.5^{\circ}C$

D. none of these

Answer: a



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85. phenol associates in benzene to a certain extent in dimerisation reaction. A solution containing 0.02 kg of phenol in 1.0 kg of benzene has its freezing point depressed 0.69 k. [$K_f(C_6H_6) = 5.12\text{kgmol}^{-1}$]. The degree of association:

A. 0.63

B. 0.73

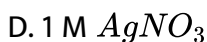
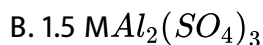
C. 0.83

D. 0.93

Answer: b

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86. Assuming complete ionisation, the solution having maximum freezing point will be:



Answer: d

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87. In a 2.0 molal aqueous solution of a weak acid HX the degree of dissociation is 0.25. The freezing point of the solution will be nearest to:

$$(K_f = 1.86 \text{ K kg mol}^{-1})$$

A. -0.26°C

B. 0.465°C

C. -0.48°C

D. 4.65°C

Answer: d



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88. An aqueous solution of 0.01 m KCl cause the same elevation in boiling point as an aqueous solution of urea. The concentration of urea solution is :

A. (a) 0.01 m

B. (b) 0.005 m

C. (c) 0.02 m

D. (d) 0.04 m

Answer: c

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89. when some NaCl was dissolved in water, the freezing point depression was numerically equal to twice the molal f.p. depression constant. The relative lowering of vapour pressure of the solution is nearly :

A. 0.036

B. 0.018

C. 0.0585

D. 0.072

Answer: a

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90. Which one of the following statement is false ?

- A. (a) The correct order of osmotic pressure for 0.01 M aqueous solution of each compound $BaCl_2 > KCl > CH_3COOH > Sucrose$
- B. (b) Isotonic solutions are those solutions which have the same osmotic pressure
- C. (c) Raoult's law state that the vapour pressure of a component over a solution is proportional to its mole fraction in liquid state
- D. (d) Two sucrose solutions of same molality prepared in different solvent will have the same freezing point depression

Answer: d



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91. 0.1 molal aqueous solution of an electrolyte AB_3 is 90% ionised. The boiling point of the solution at 1 atm is ($K_{b(H_2O)} = 0.52 \text{ kg mol}^{-1}$)

A. 273.19 K

B. 374.92 K

C. 376.4 K

D. 373.19 K

Answer: d



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92. Which of the following aqueous solutions has osmotic pressure nearest to pure solvent ?

A. Na_2SO_4

B. $BaCl_2$

C. $Al_2(SO_4)_3$

D. $C_{12}H_{22}O_{11}$

Answer: d

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93. 0.1 M NaCl and 0.05 M $BaCl_2$ solutions are separated by a semi-permeable membrane in a container. For this system, choose the correct answer

- A. (a) There is no movement of any solution across the membrane
- B. (b) Water flows from $BaCl_2$ solution towards NaCl solution
- C. (c) Water flows from NaCl solution towards $BaCl_2$ solution
- D. (d) Osmotic pressure of 0.1 M NaCl is lower than the osmotic pressure of $BaCl_2$ (assume complete dissociation)

Answer: b

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94. Two aqueous solutions, A and B, are separated by a semi-permeable membrane. The osmotic pressure of solution A immediately begins to decrease. Which of the following statement is true ?

- A. (a) The solvent molecular are moving from the solution of higher osmotic pressure to that of lower osmotic pressure
- B. (b) The initial osmotic pressure of solution B is greater than that of solution A.
- C. (c) Solvent molecules are moving from solution B into solution A.
- D. (d) Both (a) and (b) are true statements.

Answer: c



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95. 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

Answer: d



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96. The empirical formula of a non-electrolyte is CH_2O . A solution containing 3 g L^{-1} of the compound exerts the same osmotic pressure as that of 0.05 M glucose solution. The molecules formula of the compound is :

A. (a) CH_2O

B. (b) $C_2H_4O_2$

C. (c) $C_4H_8O_4$

D. (d) $C_3H_6O_3$

Answer: b



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97. A semipermeable membrane used in the measurement of osmotic pressure of a solution allows the passage of

- A. solute molecular through it
- B. solvent molecules though it
- C. both solvent and solute molecules
- D. either solvent or solute

Answer: b



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98. In the case of osmosis, solvent molecules move from :

- A. higher vapour pressure to lower vapour pressure
- B. higher concentration to lower concentration
- C. lower vapour pressure to higher vapour pressure
- D. higher osmotic pressure to lower osmotic pressure

Answer: a

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99. The osmotic pressures of equimolar solutions of urea , $BaCl_2$ and $AlCl_3$ will be in the order :

- A. (a) $AlCl_3 > BaCl_2 > urea$
- B. (b) $BaCl_2 > AlCl_3 > urea$
- C. (c) $urea > BaCl_2 > AlCl_3$
- D. (d) $BaCl_2 > urea > AlCl_3$

Answer: a



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100. Assuming each salt to be 90 % dissociated which of the following will have the highest osmotic pressure?

- A. decimolar aluminium sulphate
- B. decimolar barium chloride solution
- C. decimolar sodium sulphate solution
- D. solution of volume of decimolar barium chloride and decimolar sodium sulphate solutions

Answer: a



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101. consider 0.1 M solutions of two solutes X and Y. The behaves as a univalent electrolyte while the solute Y dimerises in solution. Which of

the following statement are correct regarding these solutions?

- (1) The boiling point of the solution of X will be higher than that of Y
- (2) The osmotic pressure of the solution of Y will be lower than that of X
- (3) The freezing point of the solution of X will be lower than that of Y
- (4) The relative lowering of vapour pressure of both the solutions will be the same

(a) 1, 2 and 3

(b) 2, 3 and 4

(c) 1, 2 and 4

(d) 1, 3 and 4

A. 1, 2 and 3

B. 2, 3 and 4

C. 1, 2 and 4

D. 1, 3 and 4

Answer: a



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102. If M_{normal} is the normal molecular mass and α is the degree of ionization of $K_3[Fe(CN)_6]$, then the abnormal molecular mass of the complex in the solution will be :

A. $M_{\text{normal}}(1 + 2\alpha)^{-1}$

B. $M_{\text{normal}}(1 + 3\alpha)^{-1}$

C. $M_{\text{normal}}(1 + \alpha)^{-1}$

D. equal to M_{normal}

Answer: b



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103. Equal volumes of 0.1 M urea and 0.1 M glucose are mixed. The mixture will have :

A. lower osmotic pressure

B. same osmotic pressure

C. higher osmotic pressure

D. none of these

Answer: b

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104. A 5% (w/V) solution of cane sugar (molecular mass = 342) is isotonic with 1% (w/V) solution of a substance X. The molecular mass of X is :

A. (a) 34.2

B. (b) 171.2

C. (c) 68.4

D. (d) 136.8

Answer: c

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105. Insulin $(C_2H_{10}O_5)_n$ is dissolved in a suitable solvent and the osmotic pressure (π) of solutions of various concentrations $(g/cm^3)C$ is measured at $20^\circ C$. The slope of a plot of π against C is found to be 4.65×10^{-3} . The molecular weight of insulin is:

- A. 3×10^5
- B. 9×10^5
- C. 4.5×10^5
- D. 5.16×10^6

Answer: d

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106. An aqueous solution of sucrose $(C_{12}H_{22}O_{11})$ having a concentration of 34.2 gram/ litre has an osmotic pressure of 2.38 atmospheres at $17^\circ C$. For an aqueous solution of glucose $(C_6H_{12}O_6)$ to be isotonic with this solution , its concentration should be :

A. (a) 34.2 gram per litre

B. (b) 17.1 gram per litre

C. (c) 18.0 gram per litre

D. (d) 36.0 gram per litre

Answer: c



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107. Which of the following experimental methods is adopted to determine osmotic pressure?

A. Berkley- Hartely's method

B. Beckmann's method

C. Landsberger's method

D. Differential method

Answer: a



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108. Based upon the technique of reverse osmosis the approximate pressure required to desalinate sea water containing 2.5% (mass/volume) KNO_3 at $27^\circ C$ will be

- A. 10.5 atm
- B. 21 atm
- C. 12.2 atm
- D. 6.09 atm

Answer: c



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109. A 1% (mass/vol) KCl solution is ionised to the extent of 80%. The osmotic pressure at $27^\circ C$ of the solution will be :

A. 6.95 atm

B. 5.94 atm

C. 2.71 atm

D. 3.30 atm

Answer: b



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110. Osmotic pressure of blood is 7.40 atm, at 27°C . Number of moles of glucose to be used per litre for an intravenous injection that is to have same osmotic pressure of blood is :

A. (a) 0.3

B. (b) 0.2

C. (c) 0.1

D. (d) 0.4

Answer: a



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111. The relationship between osmotic pressure (π_1, π_2 and π_3) at a definite temperature when 1 g glucose, 1 g urea and 1 g sucrose are dissolved in 1 litre of water is (assume $i = 1$ for all):

A. (a) $\pi_1 > \pi_2 > \pi_3$

B. (b) $\pi_3 > \pi_1 > \pi_2$

C. (c) $\pi_2 > \pi_1 > \pi_3$

D. (d) $\pi_2 > \pi_3 > \pi_1$

Answer: c



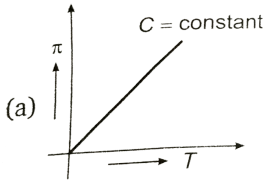
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112. van't Hoff proved that osmotic pressure (π) is a colligative property.

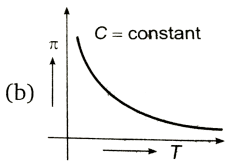
For an ideal solution, osmotic pressure(π) is helpful to determine that

molecular mass of solute using $M_B = \frac{W_B RT}{\pi \cdot V}$ Relation can expressed

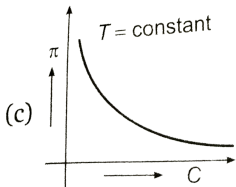
by the curve (C = concentration) :



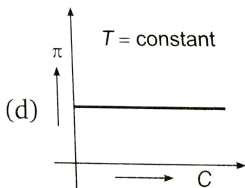
A.



B.



C.



D.

Answer: a



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113. A solution containing 4.0 g of PVCc in 2 liter of dioxane (industrial solvent) was found to have an osmotic pressure 3.0×10^{-4} atm at $27^\circ C$.

The molar mass of the polymer (g/mol) will be :

A. 1.6×10^4

B. 1.6×10^5

C. 1.6×10^3

D. 1.6×10^2

Answer: b



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114. The osmotic pressures of 0.010 M solutions of KI and sucrose ($C_{12}H_{22}O_{11}$) are 0.432 atm and 0.24 atm respectively. The van't Hoff factor for KI is :

A. 1.8

B. 0.8

C. 1.2

D. 1

Answer: a



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115. What is the correct sequence of osmotic pressure of $0.01M_{aq}$. solution of :

(a) $Al_2(SO_4)_3$ (b) Na_3PO_4 (c) $BaCl_2$ (d) *Glucose*

A. $\pi_4 > \pi_2 > \pi_3 > \pi_1$

B. $\pi_3 > \pi_4 > \pi_2 > \pi_1$

C. $\pi_3 > \pi_4 > \pi_1 > \pi_2$

D. $\pi_1 > \pi_2 > \pi_3 > \pi_4$

Answer: d

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116. 1.0 molar solution of the complex of the salt, $CrCl_3 \cdot 6H_2O$, displays an osmotic pressure of $3RT$. 0.5 L of the same solution on treatment with excess of $AgNO_3$ solution will yield (assume $\alpha = 1$) :

- A. 0.5 mole of AgCl
- B. 1.0 mole of AgCl
- C. 1.5 mole of AgCl
- D. 3.0 mole of AgCl

Answer: b

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117. A 0.010 g sample of $Cr(NH_3)_4(SO_4)Cl$ is dissolved in 25.0 mL of water and the osmotic pressure of the solution is 59.1 torr at $25^\circ C$. How many moles of ions are produced per mole of compound?

- A. 1
- B. 4
- C. 2
- D. 3

Answer: c

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118. Which of the following aqueous solutions should have the highest osmotic pressure?

- A. 0.011 M $AlCl_3$ at $50^\circ C$
- B. 0.03 M NaCl at $25^\circ C$

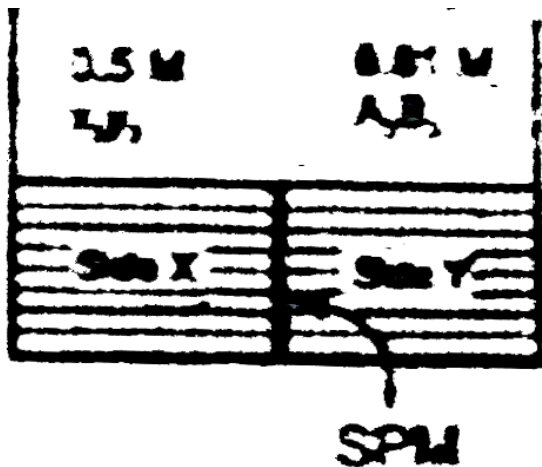
C. 0.012 M $(NH_4)_2SO_4$ at $25^\circ C$

D. 0.03 M NaCl at $50^\circ C$

Answer: d

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119. X_3Y_2 ($i = 5$) when reacted with A_2B_3 ($i = 5$) in aqueous solution gives brown colour. These are separated by a semipermeable membrane AB as shown. Due to osmosis there is :



a. brown colour formation in side X

b. brown colour formation in side Y

c.formation in both of the sides X and Y

d.no brown colour formation

A. brown colour formation in side X

B. brown colour formation in side Y

C. formation in both of the sides X and Y

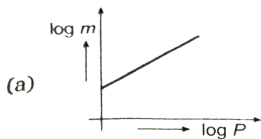
D. no brown colour formation

Answer: d

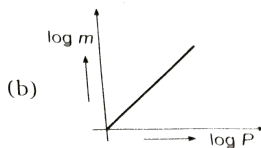


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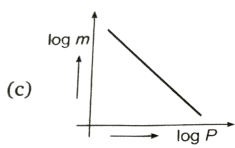
120. Which of the following curves represents the Henry's law ?



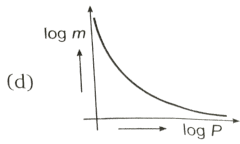
A.



B.



C.



D.

Answer: a



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121. According to Henry's law, the solubility of a gas in a given volume of liquid increases with increases in :

- A. temperature
- B. pressure
- C. Both (a) and (b)
- D. none of these

Answer: b



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122. At $300K$, $40mL$ of $O_3(g)$ dissolves in $100g$ of water at $1.0atm$. What mass of ozone dissolved in $400g$ of water at a pressure of $4.0atm$ at $300K$?

- a. 0.1 g
- b. 1.24 g
- c. 0.48 g
- d. 4.8 g

A. 0.1 g

B. 1.24 g

C. 0.48 g

D. 4.8 g

Answer: b



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123. 1 kg of water under a nitrogen pressure of 1 atmosphere dissolves 0.02 gm of nitrogen at 293 K. Calculate Henry's law constant :

A. 7.2×10^{-4} atm

B. 7.7×10^3 atm

C. 2×10^{-5} atm

D. 2×10^{-2} atm

Answer: a



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124. According to Henry's law, the partial pressure of gas (p'_g) is directly proportional to mole fraction of gas in dissolved state, i.e.,

$P_{\text{gas}}' = K_H \cdot X_{\text{gas}}$ where K_H is Henry's constant. Which are correct?

A. K_H is characteristic constant for a given gas-solvent system

- B. Higher is the value of K_H , lower is solubility of gas for a given partial pressure of gas
- C. K_H has temperature dependence
- D. K_H decreases with increase of temperature

Answer: d

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125. At 760 torr pressure and $20^\circ C$ temperature, 1 L of water dissolves 0.04 gm of pure oxygen or 0.02 gm of pure nitrogen. Assuming that dry air is compound of 20% oxygen and 80% nitrogen (by volume), the masses (in g/L) of oxygen and nitrogen dissolved by 1 L of water at $20^\circ C$ exposed to air at a total pressure of 760 torr are respectively :

- A. 0.008, 0.016
- B. 0.016, 0.008
- C. 0.16, 0.08

D. 0.04, 0.02

Answer: a

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Level 02

1. Two beaker A and B present in a closed vessel. Beaker A contains 152.4 g aqueous solution of urea, containing 12 g of urea. Beaker B contain 196.2 g glucose solution, containing 18 g of glucose. Both solution allowed to attain the equilibrium. Determine mass % of glucose in its solution at equilibrium allowed to attain the equilibrium :

A. 6.71

B. 14.49

C. 16.94

D. 20

Answer: b



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2. 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 intercept respectively are given as:

(a) $\frac{P_A^\circ}{P_B^\circ}, \frac{P_B^\circ - P_A^\circ}{P_B^\circ}$

(b) $\frac{P_B^\circ}{P_A^\circ}, \frac{P_A^\circ - P_B^\circ}{P_A^\circ}$

(c) $\frac{P_B^\circ}{P_A^\circ}, \frac{P_B^\circ}{P_B^\circ - P_A^\circ}$

(d) $P_A^\circ - P_B^\circ, \frac{P_A^\circ}{P_B^\circ}$

A. $\frac{P_A^\circ}{P_B^\circ}, \frac{P_B^\circ - P_A^\circ}{P_B^\circ}$

B. $\frac{P_B^\circ}{P_A^\circ}, \frac{P_A^\circ - P_B^\circ}{P_A^\circ}$

C. $\frac{P_B^\circ}{P_A^\circ}, \frac{P_B^\circ}{P_B^\circ - P_A^\circ}$

D. $P_A^\circ - P_B^\circ, \frac{P_A^\circ}{P_B^\circ}$

Answer: b



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3. At 48°C , the vapour pressure of pure CS_2 is 850 torr. A solution of 2.0 g of sulphur in 100g of CS_2 has a vapour pressure 844.9 torr. Determine the atomicity of sulphur molecule :

A. 1

B. 2

C. 4

D. 8

Answer: d



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4. An ideal solution contains two volatile liquids $A(P^\circ = 100\text{ torr})$ and $B(P^\circ = 200\text{ torr})$. If mixture contain 1 mole of A and 4 mole of B then total vapour pressure of the distillate is :

- A. 150
- B. 180
- C. 188.88
- D. 198.88

Answer: c

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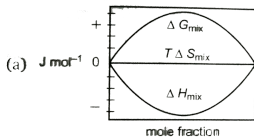
5. The vapour pressure of two pure liquids A and B, that from an ideal solution are 100 and 900 torr respectively at temperature T. This liquid solution of A and B is composed of 1 mole of A and 1 mole of B. What will be the pressure, when 1 mole of mixture has been vaporized?

- A. 800 torr
- B. 500 torr
- C. 300 torr
- D. None of these

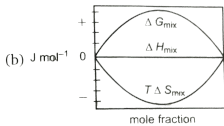
Answer: c

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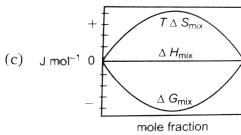
6. Which of the following represents correctly the changes in thermodynamic properties during the formation of 1 mole of an ideal binary solution :



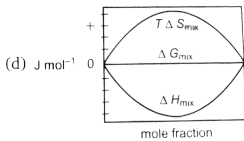
A.



B.



C.



D.

Answer: c



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7. A saturated solution of XCl_3 has a vapour pressure 17.20 mm Hg at $20^\circ C$, while pure water vapour pressure is 17.25 mm Hg. Solubility product (K_{sp}) of XCl_3 at $20^\circ C$ is :

(a) 1.8×10^{-2}

(b) 10^{-5}

(c) 2.56×10^{-6}

(d) 7×10^{-5}

A. 1.8×10^{-2}

B. 10^{-5}

C. 2.56×10^{-6}

D. 7×10^{-5}

Answer: d



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8. A certain non-volatile electrolyte contain 40% carbon, 6.7% hydrogen and 53.3% oxygen. An aqueous solution containing 5% by mass of the solute boils at 100.15°C . Determine molecular formula of the compound ($K_b = 0.51^{\circ}\text{C}/m$):

$$K_b = 0.51^{\circ}\text{C}/m$$

A. HCHO

B. CH_3OH

C. $\text{C}_2\text{H}_5\text{OH}$

D. $\text{C}_6\text{H}_{12}\text{O}_6$

Answer: d

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9. A 0.10 M solution of a mono protic acid ($d = 1.01\text{g}/\text{cm}^3$) is 5% dissociated what is the freezing point of the solution the molar mass of the acid is 300 and $K_f(\text{H}_2\text{O}) = 1.86\text{C}/m$

A. $-0.189^{\circ}C$

B. $-0.194^{\circ}C$

C. $-0.199^{\circ}C$

D. none of these

Answer: c



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10. An aqueous solution boils at $101^{\circ}C$. What is the freezing point of the same solution?

(Gives : $K_f = 1.86^{\circ}C/m$ and $K_b = 0.51^{\circ}C/m$)

A. (a) $3.647^{\circ}C$

B. (b) $-3.647^{\circ}C$

C. (c) $-0.199^{\circ}C$

D. (d) none of these

Answer: b



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11. An industrial waste water I found to contain 8.2% Na_3PO_4 and 12% $MgSO_4$ by mass in solution. If % ionisation of Na_3PO_4 and $MgSO_4$ are 50 and 60 respectively then its normal boiling point is [$K_b(H_2O) = 0.50 K kg mol^{-1}$]:

A. $102.3^\circ C$

B. $103.35^\circ C$

C. 101.785°

D. none of these

Answer: c



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12. Ratio of $\frac{\Delta T_b}{K_b}$ of 10 g AB_2 and 14 g A_2B per 100 g of solvent in their respective, solution (AB_2 and A_2B both are non-electrolytes) is 1 mole/ kg in both cases. Hence, atomic wt. of A and B are respectively :

- A. 100, 40
- B. 60, 20
- C. 20, 60
- D. None of these

Answer: b

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13. The freezing point of solution containing 0.2g of acetic acid in 20.0g of benzene is lowered by $0.45^\circ C$. Calculate the degree of association of acetic acid in benzene.

$$(K_f = 5.12K^\circ mol^{-1}kg^{-1})$$

A. 0.527

B. 0.8

C. 0.945

D. None of these

Answer: c



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14. If the boiling point of an aqueous solution containing a non-volatile solute is $100.1^{\circ}C$. What is its freezing point? Given latent heat of fusion and vapourization of water 80calg^{-1} and 540calg^{-1} , respectively.

A. $0.361^{\circ}C$

B. $-0.361^{\circ}C$

C. $-3.61^{\circ}C$

D. None of these

Answer: b

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15. 100 g of $C_6H_{12}O_6$ (aq.) solution has vapour pressure is equal to 40 torr at certain temperature. Vapour pressure of $H_2O(l)$ is 40.18 torr at same temperature. If this solution is cooled to $-0.93^\circ C$, what mass of ice will be separated out? ($K_f = 1.86 \text{ kg mol}^{-1}$):

A. 95.5 g

B. 4.5 g

C. 45.5 g

D. 47.8 g

Answer: d

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16. 1.0 g of a monobasic acid HA in 100 g water lowers the freezing point by 0.155 K. IF 0.75 g, of same acid requires 25 mL of N/5 NaOH solution for complete neutralisation then %, degree of ionization of acid is (K_f of $H_2O = 1.86 K kg mol^{-1}$):

A. 0.2

B. 0.25

C. 0.4

D. 0.5

Answer: b

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17. 0.1 M KI and 0.2 M $AgNO_3$ are mixed in 3 : 1 volume ratio. The depression of freezing point of the resulting solution will be [$K_b(H_2O) = 1.86 K kg mol^{-1}$]:

(a) 3.72 K

(b) 1.86 K

(c) 0.93 K

(d) 0.279 K

A. 3.72 K

B. 1.86 K

C. 0.93 K

D. 0.279 K

Answer: d



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18. If 0.1 M H_2SO_4 (aq.) solution shows freezing point $-0.3906^\circ C$ then what is the K_{a2} for H_2SO_4 ? (Assume $m = M$ and $K_f(H_2O) = 1.86 Kkg mol^{-1}$)

(a) 0.122

(b) 0.0122

(d) 1.11×10^{-3}

(d) None of these

A. 0.122

B. 0.0122

C. 1.11×10^{-3}

D. None of these

Answer: b



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19. A living cell contains a solution which is isotonic with 0.2 M glucose solution. What osmotic pressure develops when the cell is placed in 0.05 M $BaCl_2$ solution at 300 K ?

(a) 1.23 atm

(b) 3.69 atm

(c) 6.15 atm

(d) None of these

- A. 1.23 atm
- B. 3.69 atm
- C. 6.15 atm
- D. None of these

Answer: a



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20. What is the osmotic pressure of 0.2 M HX (aq.) solution at 300 K ?

- (a) 4.926 atm
- (b) 0.5024 atm
- (c) 5.024 atm
- (d) None of these

- A. 4.926 atm
- B. 0.5024 atm
- C. 5.024 atm

D. None of these

Answer: c

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21. A solution contain 8 g of a carbohydrate in 100 g of water has a density 1.025 g/mL and an osmotic pressure of 5 atm at $27^{\circ}C$. What is the molar mass of the carbohydrate?

A. 387

B. 374

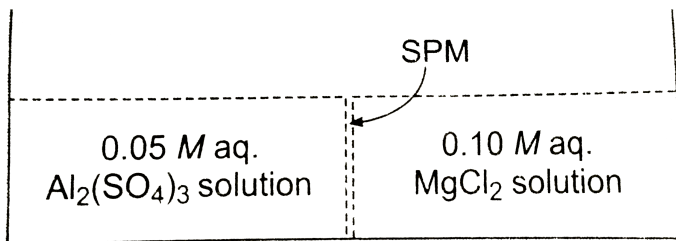
C. 3740

D. None of these

Answer: b

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22. Study the following figure and choose the correct options. Assuming complete dissociation of electrolyte:



- A. (a) There will be no net movement of any substance across the membrane
- B. (b) $MgCl_2$ will flow towards the $Al_2(SO_4)_3$ solution
- C. (c) $Al_2(SO_4)_3$ will flow towards the $MgCl_2$ solution
- D. (d) The π (osmotic pressure) of 0.1 M $MgCl_2$ is higher than the π of 0.05 M $Al_2(SO_4)_3$

Answer: d

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23. The total vapour pressure of a 4 mole % solution of NH_3 in water at 293 K is 50.0 torr. The vapour pressure of pure water is 17.0 torr at this temperature . Applying Henry's and Raoult's law, calculate the total vapour pressure for a 5 mole % solution:

A. 58.25 torr

B. 33 torr

C. 42.1 torr

D. 52.25 torr

Answer: a

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24. The vapour pressure of two pure liquids A and B which form an ideal solution are 500 and 800 torr respectively at 300 K . A liquid solution of A and B for which the mole fraction of A is 0.60 is contained in a cylinder closed by a piston on which the pressure can be varied. The solution is

slowly vaporized at 300 kmby dereasing the applied pressure.

Find the total pressure of solution.

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25. The composition of vapour when first bubble formed is:

A. $y_A = 0.6, y_b = 0.4$

B. $y_A = 0.48, y_b = 0.52$

C. $y_A = 0.52, y_b = 0.48$

D. $y_A = 0.5, y_b = 0.5$

Answer: b

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26. What is the composition of last droplet of liquid remaining in equilibrium with vapour?

A. $x_A = 0.6, x_B = 0.4$

B. $x_A = 0.5, x_B = 0.5$

C. $x_A = 0.7, x_B = 0.3$

D. $x_A = 0.3, x_B = 0.7$

Answer: c

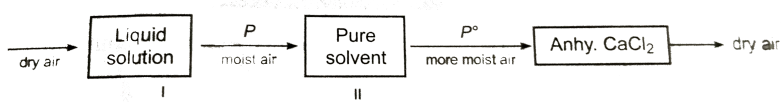


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Level 03

1. Lowering in vapour pressure is determined by Ostwald and Walker dynamic method. It is based on the principle, that when air is allowed to pass through a solvent or solution, it takes up solvent vapour with it to get itself saturated at that temperature

I and II are weighed separately before and after passing dry air. Loss in mass of each set, gives the lowering of vapour pressure. The temperature of air, the solution and the solvent is kept constant.



Loss in mass of solvent (w_{II}) will be proportional to :

A. $P^\circ - P$

B. $P - P^\circ$

C. $\frac{P}{P^\circ}$

D. $P \times P^\circ$

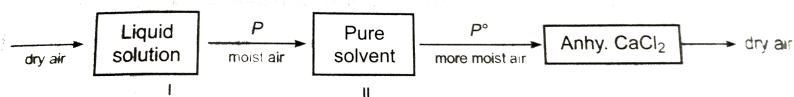
Answer: a

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2. Lowering in vapour pressure is determined by Ostwald and Walker dynamic method. It is based on the principle, that when air is allowed to pass through a solvent or solution, it takes up solvent vapour with it to get itself saturated at that temperature

I and II are weighed separately before and after passing dry air. Loss in

mass of each set, gives the lowering of vapour pressure. The temperature of air, the solution and the solvent is kept constant.



Gain in mass of anhydrous $CaCl_2$ is proportional to :

- A. P
- B. P°
- C. $P - P^\circ$
- D. $P^\circ - P$

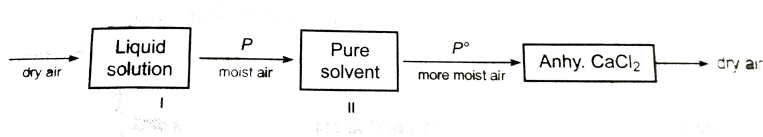
Answer: b

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3. Lowering in vapour pressure is determined by Ostwald and Walker dynamic method. It is based on the principle, that when air is allowed to pass through a solvent or solution, it takes up solvent vapour with it to

get itself saturated at that temperature

I and II are weighted separately before and after passing dry air. Loss in mass of each set, gives the lowering of vapour pressure. The temperature of air, the solution and the solvent is kept constant.



$\frac{P^\circ - P}{P^\circ}$ is equal to :

- A. $\frac{w_I}{w_{II} + w_I}$
- B. $\frac{w_{II}}{w_I + w_{II}}$
- C. $\frac{w_I}{w_{II} - w_I}$
- D. $\frac{w_{II}}{w_I}$

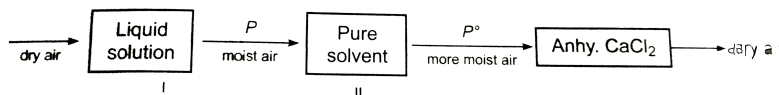
Answer: b

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4. Lowering in vapour pressure is determined by Ostwald and Walker dynamic method. It is based on the principle, that when air is allowed to

pass through a solvent or solution, it takes up solvent vapour with it to get itself saturated at that temperature

I and II are weighted separately before and after passing dry air. Loss in mass of each set, gives the lowering of vapour pressure. The temperature of air, the solution and the solvent is kept constant.



Dry air was passed through 9.24 g of solute in 108 g of water and then through pure water. The loss in mass of solution was 3.2 g and that of pure water 0.08 g. The molecular mass (g/mol) of solute is nearly :

- (a) 50
- (b) 62
- (c) 70
- (d) 80

A. 50

B. 62

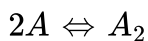
C. 70

D. 80

Answer: b

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5. A dilute solution contains 'x' moles of solute A in 1 kg of solvent with molal elevation constant K_b . The solute dimerises in the solution according to the following equation. The degree of association is (a) :



The van't Hoff factor will be:

A. $i = 1 - 2a$

B. $i = 1 - \frac{a}{2}$

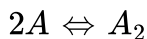
C. $i = 1 + \frac{a}{2}$

D. $i = 1 + a$

Answer: b

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6. A dilute solution contains 'x' moles of solute A in 1 kg of solvent with molal elevation constant K_b . The solute dimerises in the solution according to the following equation. The degree of association is (a) :



The degree of association is equal to :

A. $a = \frac{(K_b x - \Delta T_b)}{\Delta T_b 2}$

B. $a = \frac{2(K_b x - \Delta T_b)}{K_b x}$

C. $a = 2 + \frac{2 \Delta T_b}{K_b x}$

D. $a = \frac{\Delta T_b}{2K_b x}$

Answer: b

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7. Which of the following statement(s) is/are correct, if intermolecular forces in liquids A, B and C are in the order of $A < B < C$?

- A. B evaporates more readily than A
- B. B evaporates more readily than C
- C. A evaporate more readily than C
- D. all evaporates at same rate at same temperature.

Answer: b,c

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8. When non-volatile solute is added to a pure solvent, the:

- A. vapour pressure of the solution becomes lower than the vapour pressure of the pure solvent
- B. rate of evaporation of solvent is reduced
- C. solute does not affect the rate of condensation
- D. none of these

Answer: a,b,c



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9. The total vapour pressure of a binary solution is given by

$$P = (100X_A + 260X_B)\text{mm Hg}$$

where, X_A and X_B are the mole fractions of components A and B. This indicates that the:

- A. vapour pressure of solution is less than the pure B component
- B. vapour pressure of solution is less than the pure A component
- C. vapour pressure of pure A is 100 mm Hg and that of pure B is 260 mm Hg
- D. the vapour pressure of pure A and B are 260 mm Hg and 100 mm hg respectively

Answer: a,b,c



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10. Which of the following is correct for an ideal solution?

A. $\Delta H_{\text{mix}} = 0$ and $\Delta V_{\text{mix}} = 0$

B. $\Delta V_{\text{mix}} = 0$ and $\Delta S_{\text{mix}} > 0$

C. $\Delta H_{\text{mix}} > 0$ and $\Delta S_{\text{mix}} > 0$

D. $\Delta G_{\text{mix}} < 0$ and $\Delta S_{\text{mix}} > 0$

Answer: a,b,d

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11. Which of the following is correct for a non-ideal solution of liquids A and B showing negative deviation?

A. $\Delta H_{\text{mix}} = -ve$

B. $\Delta V_{\text{mix}} = -ve$

C. $\Delta S_{\text{mix}} = -ve$

D. $\Delta G_{\text{mix}} = -ve$

Answer: a,b,d

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12. A binary solution of liquids A and B will show positive deviation from Raoult's law if it fulfils the following condition:

A. (a) $P_A > X_A P_A^\circ$ and $P_B > X_B P_B^\circ$

B. (b) The intermolecular forces of $A - B < A - A, B - B$

C. (c) ΔH_{mixing} is positive

D. (d) ΔV_{mixing} is negative

Answer: a,b,c

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13. Which of the following statement is/are correct about acetone and trichloromethane mixture?

- A. (a) Mixtures of acetone and trichloromethane show positive deviation from Raoult's law
- B. (b) The forces of attraction acting between molecules of acetone and trichloromethane in a mixture are stronger than those acting between the molecules in pure acetone
- C. (c) Pure acetone can be obtained by the careful fractional distillation of any mixture of acetone and trichloromethane
- D. (d) When acetone and trichloromethane are mixed, the enthalpy change is negative

Answer: b,d

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14. The azeotropic solution of two miscible liquids:

- A. (a) can be separated by simple distillation

B. (b) may show positive or negative deviation from Raoult's law

C. (c) are supersaturated solution

D. (d) behave like a single component and boil at a constant temperature

Answer: b,d



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15. For exact determination of molecular mass through colligative properties measurement :

A. solute must be volatile

B. solution must be vary dilute

C. solution must be formed by similar nature of substances

D. solute must not be dissociated

Answer: b,d



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16. In the depression of freezing point experiment, it is found that the:

- A. vapour pressure of pure solvent is more than that of solution
- B. vapour pressure of pure solvent is less than that of solution
- C. only solute molecules solidify at the freezing point
- D. only solvent molecules solidify at the freezing point

Answer: a,c



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17. The cryoscopic constant value depends upon:

- A. the molar mass of the solute in the solution
- B. the molar mass of the solvent in the solution
- C. the enthalpy of fusion of the solvent

D. the freezing point of the solvent

Answer: b,c,d

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18. Consider 0.1 M solutions of two solutes X and Y. The solute X behaves as univalent electrolyte, while the solute Y dimerises in solution. Select correct statement(s) regarding these solutions:

- A. The boiling point of solution of 'X' will be higher than that of 'Y'
- B. The osmotic pressure of solution of 'Y' will be lower than that of 'X'
- C. The freezing point of solution of 'X' will be lower than that of 'Y'
- D. The relative lowering of vapour pressure of both the solution will be the same

Answer: a.b,c

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19. Consider following solutions: (I) 1 M glucose(aq) (II) 1 M sodium chloride(aq)

(III) 1 M acetic acid in benzene (IV) 1 M ammonium phosphate (aq)

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 I, II, III

Answer: b.c.d



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20. Which of the following statement is (are) incorrect?

A. 0.1 M KCl solution will have the same osmotic pressure as 0.1 M glucose solution

B. 0.1 M KCl solution will have the same boiling point as 0.1 M urea solution

C. 0.1 m glucose and 0.1 m urea are ismotic

D. 0.1 m $MgCl_2$ solution will have less relative lowering of vapour pressure than 0.1 m NaCl

Answer: a,b,d

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21. Consider following solution:

0.1 m $C_6H_5NH_3^+ Cl^-$, 0.1 m KCl, 0.1 m Glucose, 0.1 m $Na_2C_2O_4 \cdot 10H_2O$

A. the solution with higher boiling point is 0.1 $Na_2C_2O_4 \cdot 10H_2O$

B. the solution with higher freezing point is 0.1 m glucose

C. 0.1 m $C_6H_5NH_3Cl$ and 0.1 m NaCl will have the same osmotic pressure

D. 0.1 m glucose solution will have the lowest osmotic pressure

Answer: a,b,c,d

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22. Column -I and Column -II contain four entries each. Entries of column-I are to be matched with some entries of column-II. One or more than one entries of column-I may have the matching with the same entries of

Column-I	Column-II
(A) <i>n</i> -hexane + <i>n</i> -heptane	(P) Can be separated by fractional distillation
(B) Acetone + chloroform	(Q) Maximum boiling azeotrope
(C) Chlorobenzene and bromobenzene	(R) Cannot be separated by fractional distillation completely
(D) Ethanol + water	(S) Minimum boiling azeotrope

column-II.

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23. Column -I and Column -II contain four entries each. Entries of column-I are to be matched with some entries of column-II. One or more than one

entries of column-I may have the matching with the same entries of

Column-I	Column-II
(A) π_1 : 0.1 M glucose; π_2 : 0.1 M urea	(P) π_1 and π_2 are isotonic
(B) π_1 : 0.1 M NaCl; π_2 : 0.1 M Na_2SO_4	(Q) No net migration of solvent across the membrane
(C) π_1 : 0.1 M NaCl; π_2 : 0.1 M KCl	(R) π_1 is hypertonic to π_2
(D) π_1 : 0.1 M CuSO_4 ; π_2 : 0.1 M sucrose	(S) π_1 is hypotonic to π_2

column-II.

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Others

1. Column -I and Column -II contain four entries each. Entries of column-I are to be matched with some entries of column-II. One or more than one entries of column-I may have the matching with the same entries of

Column-I	Column-II
(A) 0.1 M $\text{Al}_2(\text{SO}_4)_3$	(P) Solution with highest boiling point
(B) 0.1 M AlPO_4	(Q) van't Hoff factor is greater than 1
(C) 0.1 M urea	(R) Solution with lowest osmotic pressure
(D) 0.1 M MgCl_2	(S) Solution with lowest freezing point

column-II.

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2. Column -I and Column -II contain four entries each. Entries of column-I are to be matched with some entries of column-II. One or more than one entries of column-I may have the matching with the same entries of

Column-I	Column-II
(Solute)	(Van't Hoff factor, i)
(A) AlCl_3 if $\alpha = 0.8$	(P) $i = 3.4$
(B) BaCl_2 if $\alpha = 0.9$	(Q) $i = 2.8$
(C) Na_3PO_4 if $\alpha = 0.9$	(R) $i = 3.8$
(D) $\text{K}_4[\text{Fe}(\text{CN})_6]$ if $\alpha = 0.7$	(S) $i = 3.7$

column-II.



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3. Each question contains STATEMENT-I(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : An increase in surface area increases the rate of evaporation.

STATEMENT - 2 : Stronger the intermolecular attraction force, faster is the rate of evaporation at a given temperature.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C



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4. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : An ideal solution obeys Raoult's law.

STATEMENT - 2 : In an ideal solution, solute-solvent as well as solvent-solvent, interactions are similar to solute - solvent interactions.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A



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5. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : if a liquid solute more volatile than the solvent is added to the solvent, the vapour pressure of the solution is greater than vapour pressure of pure solvent.

STATEMENT - 2 : Vapour pressure of solution is equal to vapour pressure of solvent.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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6. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : ΔV_{mix} and ΔS_{mix} for an ideal solution is zero.

STATEMENT - 2 : A...B interaction in an ideal solution are same as between A...A and B...B.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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7. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : Elevation in boiling point will be high if the molal

elevation constant of the liquid is high.

STATEMENT - 2 : Elevation in boiling point is a colligative property.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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8. Each question contains STATEMENT-I(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : The boiling point of 0.1 M urea solution is less than that

of 0.1 M KCl solution.

STATEMENT - 2 : Elevation of boiling point is directly proportional to the number of moles of non-volatile solute particles present in the solution.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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9. Statement-1 : The observed molar mass of acetic acid in benzene is more than the normal molar mass of acetic acid.

Statement-2 : Molecules of acetic acid dimerise in benzene due to hydrogen bonding.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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10. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : addition of ethylene glycol to water lowers the freezing

point of water, therefore, used as antifreeze substance.

STATEMENT - 2 : Ethylene glycol is soluble in water.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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11. Each question contains STATEMENT-I(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instrution given below:

STATEMENT - 1 : Osmotic pressure is a colligative property.

STATEMENT - 2 : Osmotic pressure is developed in a column due to osmosis.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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12. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : Osmosis involves movement of solvent molecules from

lower concentration to higher concentration.

STATEMENT - 2 : Solutions having the same osmotic pressure are called isotonic solutions.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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13. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : Isotonic solutions must have the same molar concentration.

STATEMENT - 2 : Solution which have the same osmotic pressure are known as isotonic solution.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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14. Each question contains STATEMENT-I(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer accoring

to the instruction given below:

STATEMENT - 1 : Isotonic solutions do not show phenomenon of osmosis.

STATEMENT - 2 : Isotonic solutions have same molal concentration at same temperature.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A



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15. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according

to the instruction given below:

STATEMENT - 1 : When dried fruits and vegetables are placed in water, they slowly get swollen.

STATEMENT - 2 : It happens due to the phenomenon of osmosis.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A



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16. Statement- Reverse osmosis is used to purify saline water.

Explanation- Solvent molecules pass from concentrate solution to dilute

solution through semipermeable membrane if high pressure is applied on solution side.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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17. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : All solute becomes more soluble in water at higher

temperature.

STATEMENT - 2 : Solubility of solute depends upon temperature.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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18. Each question contains STATEMENT-I(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instrution given below:

STATEMENT - 1 : Henry's law is always applicable for gases. STATEMENT - 2 :

Raoult's law is a special case of Henry's law.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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19. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).Read the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : Increasing pressure on pure water decrease its freezing

point.

STATEMENT - 2 : Density of water is maximum at 273 K.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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20. Each question contains STATEMENT-I(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : The molecular mass of acetic acid determined by

depression in freezing point method in benzene and water was found to be different.

STATEMENT - 2 : Water is polar and benzene is non-polar.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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21. Each question contains STATEMENT-1(Assertion) and STATEMENT-2(Reason).Read the statement carefully and mark the correct answer according to the instruction given below:

STATEMENT - 1 : If red blood cells were removed from the body and placed in pure water, pressure inside the cell increases.

STATEMENT - 2 : The concentration of the salt content in the cells increases.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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22. STATEMENT - 1 : Azeotrope is a binary mixture formed by ideal solutions.

STATEMENT - 2 : Azeotrope boils with unchanged composition.

- A. If both the statements are TRUE and STATEMENT-2 is the correct explanation STATEMENT-1
- B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation STATEMENT-1
- C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE
- D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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23. The vapour pressure of two pure liquids A and B are 5 and 10 torr respectively. Calculate the total pressure of the solution (in torr) obtained by mixing 2 mole of A and 3 mole of B.

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24. The vapour pressure of two pure liquids A and B are 50 and 40 torr respectively. If 8 moles of A is mixed with x moles of B, then vapour pressure of solution obtained is 48 torr. What is the value of x.

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25. The vapour pressure of a liquid solution containing A and B is 99 torr. Calculate mole % of B in vapour phase.

(Given : $P_{A^\circ} = 100$ torr , $P_{B^\circ} = 80$ torr)

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26. If 30 g a solute of molecular mass 154 is dissolved in 250 g of benzene.

What will be the elevation in boiling point of the resulting solution ?

(Given : $K_B(C_6H_6) = 2.6 K kg mol^{-1}$)

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27. Calculate elevation in boiling point for 2 molal aqueous solution of glucose.

(Given $K_b(H_2O) = 0.5 \text{ kg mol}^{-1}$)

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28. Calculate depression of freezing point for 0.56 molal aq. Solution of KCl.

(Given : $K_f(H_2O) = 1.8 \text{ kg mol}^{-1}$).

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29. What is the maximum value of van't Hoff factor for $AlCl_3$?

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30. A solution containing 500 g of a protein per liter is isotonic with a solution containing 3.42 g sucrose per liter. The molecular mass of

protein in 5×10^x , hence x is.

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31. An aqueous solution of urea has a freezing point of $-0.515^\circ C$.

Predict the osmotic pressure (in atm) of the same solution at $37^\circ C$.

Given: K_f (Water) = 1.86K kg per mol

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32. 0.2 M aq. Solution of KCl is isotonic with 0.2 M K_2SO_4 at same temperature. What is the van't Hoff factor of K_2SO_4 ?

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