CHEMISTRY

BOOKS - MTG GUIDE

SOLUTIONS

Illustration

1. A solution of glucose in water is labelled as 10% (w/W). The density of the solution is $1.20 gmL^{-1}$ Calculate

(i) molality

(ii) molarity and

(iii) mole fraction of each component in solution.

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2. The density of a solution containing 13% by mass of sulphuric acid is 1.09 g/mL. Calculate the normality of the solution.

3. Dry air contains 79% N_2 and 21% O_2. Determine the proportion of N_2 and O_2, dissolved in water at 1 atm pressure. Henry's law constant for N_2 and O_2 in H_2O are 8.54×10^4 atm and 4.56×10^4 atm respectively.

4. Two liquids X and Y on mixing form an ideal solution. The vapour pressure of the solution containing 3 mol of X and 1 mol of Y is 550 mm of Hg. But when 4 mol of X and 1 mol of Y are mixed, the vapour pressure of the solution, thus, formed is 560 mm of Hg. What will be the vapour pressure of the pure X and pure Y at this temperature?

5. At 298 K, the vapour pressure of water is 23.75 mm Hg. Calculate the vapour pressure at the same temperature over 5% aqueous solution of urea (NH_2CONH_2).

6. 0.90 g of a non-electrolyte was dissolved in 87.90 g of benzene. This raised the boiling point of benzene by $0.25°C$. If the molecular mass of the non-electrolyte is $103.0 gmol^{-1}$, calculate the molal elevation constant for benzene.

7. A very small amount of a non-volatile solute (that does not dissociate) is dissolved in $56.8cm^3$ of benzene (density= $0.889gcm^{-3}$). At room temperature, vapour pressure of this solution is 98.88 mm Hg while that

of benzene is 100 mm Hg. Find the molality of this solution. If the freezing temperature of this solution is 0.73 degree lower than that of benzene, what is the value of K_f for benzene?

8. A solution of an organic compound was prepared by dissolving 6.8 g in 100 g of water. Calculate the osmotic pressure of this solution at 298 K when boiling point of solution is $100.11°C$. Given K_b for water $= 0.52Km^{-1}$ and $R = 0.082$ litre atm $K^{-1}mol^{-1}$.

9. The boiling point of benzene is 353.23 K. When 1.80 g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point is raised to 354.11 K. Calculate the molar mass of the solute. $\left(K_b \text{ for benzene is } 2.53Kkgmol^{-1}\right)$

1. Molality of 1 M $NaNO_3$ solution (Density of solution is $1.25gMl^{-1}$and

mol. wt. of $NaNO_3 = 85gmol^{-1}$) is

A. 1.286 m

B. 4.44 m

C. 0.858 m

D. none of these.

Answer: C

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2. Nalorphene $(C_{19}H_{21}NO_3)$ similar to morphine, is used to combat

withdrawal symptoms in narcotic uses. Dose of nalorphene generally

given is 1.5 mg. The mass of $1.5 \times 10^{-3} m$ aqueous solution required for the above dose is

A. 4.2 g

B. 3.2 g

C. 2.2 g

D. 1.2 g

Answer: B

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3. Conc. HSO_4 has density of $1.9 gmL^{-1}$ and is 99% by weight. Calculate the molarity of H_2SO_4 (Mol wt of $H_2SO_4 = 98 gmol^{-1}$).

A. 2.4 M

B. 24.2 M

C. 19.1 M

D. 9.8 M

Answer: C

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4. A 500 g toothpaste sample has 0.2 g fluoride concentration. What is the concentration of fluoride in terms of ppm level?

A. 250

B. 200

C. 400

D. 1000

Answer: C

5. An aqueous solution of 6.3 g oxalic acid dehydrate is made upto 250 mL. The volume of 0.1 N NaOH required to completely neutralize 10 mL of this solution is

    A. 40 mL

    B. 20 mL

    C. 10 mL

    D. 4 mL

Answer: A

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6. A sample of drinking water severely contaminated with chloroform, $CHCI_3$ is supposed to be carcinogenic in nature. The level of contamination was 15 ppm (by mass). What is the molality of chloroform in the water sample?

A. $2.25 \times 10^{-5}m$

B. $1.25 \times 10^{-4}m$

C. $1.85 \times 10^{-6}m$

D. $1.72 \times 10^{-5}m$

Answer: B

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7. 50 mL of 10 N H_2SO_4, 25 mL of 12 N HCl and 40 mL of 5 N HNO_3 are mixed and the volume of the mixture is made 1000 mL by adding water. The normality of resulting solution will be

A. 1 N

B. 2N

C. 9N

D. 4N

Answer: A

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8. When 1.04 g BaCl, is dissolved in water to have 105 g of solution, concentration of the solution is

    A. 10.4 ppm

    B. 0.05 ppin

    C. 0.5 ppm

    D. 0.104 ppm

Answer: A

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9. How much water is needed to dilute 10 mL of 10 N hydrochloric acid to make it exactly decinormal (0.1 N)?

A. 990 mL

B. 1000 mL

C. 1010 mL

D. 100 mL

Answer: A

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10. A 1.24 M solution of KI has a density of 1.15 g/cm'. What is the molality of the solution?

A. 2.61 m

B. 1.31 m

C. 4.12 m

D. 3.12 m

Answer: B

11. With increase of temperature, which of these changes?

A. Molality

B. Weight fraction of solute

C. Fraction of solute present in water

D. Mole fraction

Answer: C

12. The density (in g mL^{-1}) of a 3.60 M sulphuric acid solution that is 29% H_2SO_4 (molar mass $= 98gmol^{-1}$) by mass, will be

A. 1.45

B. 1.64

C. 1.88

D. 1.22

Answer: D

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13. Calculate the mole fraction of ethylene glycol $(C_2H_6O_2)$ in an aqueous solution containing 20% of $C_2H_4O_2$ by mass.

A. 0.68

B. 0.068

C. 0.932

D. 0.0932

Answer: B

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14. A solution weighing 'a'g has molality 'b'. The molecular mass of solute, if the mass of solute is 'c' g, will be

A. $\dfrac{c}{b} \times \dfrac{100}{(a-c)}$

B. $\dfrac{b}{a} \times \dfrac{1000}{(a-b)}$

C. $\dfrac{b}{c} \times \dfrac{1000}{(a-c)}$

D. $\dfrac{c}{a} \times \dfrac{1000}{(b-a)}$

Answer: A

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15. If 18 g of glucose $(C_6H_{12}O_6)$ is present in 1000 g of an aqueous solution of glucose, it is said to be

A. 1 molal

B. 1.1 molal

C. 0.5 molal

D. 0.1 molal

Answer: D

16. The amount of oxalic acid (mol. wt. 63) required to prepare 500 mL of its 0.10 N solution is

A. 0.315 g

B. 3.150 g

C. 6.300 g

D. 63.00 g

Answer: B

17. The density of 10.0% by mass KCl solution in water is $1.06 gcm^{-3}$. Its molarity is

    A. 1.489 M

    B. 1.420 M

    C. $1.420 molkg^{-1}$

    D. $1.489 molkg^{-1}$

Answer: B

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18. The molality of 648 g of pure water is

    A. 36 m

    B. 55.5 m

    C. 3.6 m

    D. 5.55 in

Answer: B

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19. Unit of molality is

A. gram/litre

B. mol/litre

C. litre/kg

D. mol/kg.

Answer: A

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20. How many gram of dibasic acid (molecular weight 200) should be present in 100 mL of the aqueous solution to give 0.1 normality?

A. lg

B. 2 g

C. 10 g

D. 20 g

Answer: A

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21. 25 mL of a solution of barium hydroxide on titration with a 0.1 molar solution of hydrochloric acid gave a titre value of 35 mL. The molarity of barium hydroxide solution was

A. 0.07

B. 0.14

C. 0.28

D. 0.35

Answer: A

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22. In which mode of expression, the concentration of solution remains

independent of temperature?

A. Normality

B. Formality

C. Mole fraction

D. Molarity

Answer: C

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23. Density of a 2.05 M solution of acetic acid in water is 1.02 g/mL. The

molality of the solution is

A. $1.14 molkg^{-1}$

B. $3.28 molkg^{-1}$

C. $2.28 molkg^{-1}$

D. $0.44 molkg^{-1}$

Answer: C

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24. A mixture of NO_2 and N_2O_4 has a vapour density of 38.3 at 300 K. What is the number of moles of NO_2 in 100 g of the mixture?

A. 0.43

B. 4.4

C. 3.4

D. 3.86

Answer: A

25. 0.5 M of H_2SO_4 is diluted from 1 litre to 10 litre, normality of resulting solution is

A. IN

B. 0.1 N

C. 10 N

D. 11N

Answer: B

26. A certain aqueous solution of $FeCl_3$ [formula mass = 162] has a density of 1.1 g/mL and contains 20.0% FeCiz. Molar concentration of this solution is

A. 0.028

B. 0.163

C. 1.357

D. 1.47

Answer: C

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27. Given that the molecular mass of KOH is 56, the weight required to prepare 500 mL of N/20 solution is

A. 5.60 g

B. 0.56 g

C. 0.28 g

D. 1.40 g

Answer: D

28. The mole fraction of nitrogen, in a mixture containing 70 grams nitrogen, 120 grams of oxygen and 44 grams of carbon dioxide is

A. 0.36

B. 0.34

C. 0.29

D. 5

Answer: B

29. In observing the effect of pressure on the solubility of a gas in liquid, which of the following is the most appropriate explanation?

A. Increase in pressure increases the number of gaseous particles per

unit volume over the solution.

B. Increase in pressure increases the rate at which the gaseous

particles are striking the surface of solution.

C. Increase in pressure increases the solubility of a gas in solution.

D. All of these.

Answer: D

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30. A supersaturated solution is a metastable state of solution in which

solute concentration

A. is equal to the solubility of that substance in water

B. exceeds its solubility

C. less than its solubility

D. continuously changes.

Answer: B

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31. The solubility of gas in liquid increases with

A. increase in temperature

B. reduction of gas pressure

C. decrease in temperature

D. amount of liquid taken.

Answer: C

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32. The Henry's law constant for the solubility of N_2 gas in water at 298 K is 1.0×10^5 atm. The mole fraction of N_2 in air is 0.8. The number of moles of N, from air dissolved in 10 moles of water at 298 K and 5 atm pressure is

    A. 4.0×10^{-4}

    B. 4.0×10^{-5}

    C. 5.0×10^{-4}

    D. 4.0×10^{-6}

Answer: A

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33. Vapour pressure of pure A = 100 torr, moles = 2, vapour pressure of pure B = 80 torr, moles = 3 Total vapour pressure of mixture is

    A. 440 torr

B. 460 torr

C. 180 torr

D. 88 torr

Answer: D

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34. The solubility of common salt is 36.0 g in 100 g of water at $20°C$. If systems, I, II and III contain 40.0, 36,0 and 20.0 g of the salt added to 100.0 g of water in each case, the vapour pressures would be in the order

A. IltII ItIII

B. IgtII gt III

C. I = II gt III

D. I = II lt III

Answer: D

35. A mixture of ethyl alcohol and propyl alcohol has a vapour pressure of 290 mm at 300 K. The vapour pressure of propyl alcohol is 200 mm. If the mole fraction of ethyl alcohol is 0.6, its vapour pressure (in mm) at the same temperature will be

A. 360

B. 350

C. 300

D. 700

Answer: B

36. At $80°C$, the vapour pressure of pure liquid A is 520 mm of Hg and that of pure liquid B is 1000 mm of Hg. If a mixture solution of A and B

boils at $80°C$ and 1 atm pressure, the amount of A in the mixture is (1 atm = 760 mm of Hg)

A. 50 mol percent

B. 52 mol percent

C. 34 mol percent

D. 48 mol percent

Answer: A

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37. The vapour pressure of water at $20°C$ is 17.5 mm Hg. If 18 g of glucose $(C_6H_{12}O_6)$ is added to 178.2 g of water at $20°C$, the vapour pressure of the resulting solution will be

A. 17.325 mm Hg

B. 17.675 mm Hg

C. 15.750 mm Hg

D. 16.500 mm Hg

Answer: A

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38. Two liquids X and Y form an ideal solution. At 300 K, vapour pressure of the solution containing 1 mol of X and 3 mol of Y is 550 mm Hg. At the same temperature, if 1 mol of Yis further added to this solution, vapour pressure of the solution increases by 10 mm Hg. Vapour pressure (in mm Hg) of X and Y in their pure states will be, respectively

A. 200 and 300

B. 300 and 400

C. 400 and 600

D. 500 and 600

Answer: C

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39. A binary liquid solution is prepared by mixing n-heptane and ethanol. Which one of the following statements is correct regarding the behaviour of the solution?

    A. The solution formed is an ideal solution.

    B. The solution is non-ideal, showing +ve deviation from Raoult's law.

    C. The solution is non-ideal, showing -ve deviation from Raoult's law.

    D. n-heptane shows +ve deviation while ethanol shows -ve deviation from Raoult's law.

Answer: B

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40. For an ideal binary liquid solution with $P_A^\circ > P_B^\circ$ which relation between X_A (mole fraction of A in liquid phase) and Y(mole fraction of A

in vapour phase) is correct, X_B and Y_B are mole fraction of B in liquid and vapour phase respectively

A. $X_A = Y_A$

B. $X_A > Y_A$

C. $\dfrac{X_A}{X_B} < \dfrac{Y_A}{Y_B}$

D. $X_A 1, Y_A, X_B$ and Y_B cannot be correlated

Answer: C

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41. An ideal mixture of two liquids A and B is put in a cylinder containing piston. Piston is pulled out isothermally so that the volume of liquid decreases but that of vapours increases. Negligibly small amount of liquid was left and mole fraction of A in vapour is 0.4. If $P_A^\circ = 0.4$ atm and $P_B^\circ = 1.2$ atm at the experimental temperature, which of the following is the total pressure at which the liquid is almost evaporated?

A. 0.22 atm

B. 0.431 atm

C. 0.667 atm

D. 1 atm

Answer: C

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42. A mixture of chlorobenzene and water (which are virtually immiscible) boils at $90.3°C$ at an external pressure of 740.2 mm. The vapour pressure of pure water at $40.3°C$ is 530.1 mm. What is the percentage weight of chlorobenzene in the distillate?

A. 20.21

B. 37.19

C. 28.74

D. 71.26

Answer: D

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43. Two liquids A and B have vapour pressure in the ratio $P_A^\circ : P_B^\circ = 1:2$ at a certain temperature. Suppose that we have an ideal solution of A and B in the mole fraction ratio A : B = 1:2, the mole fraction of A in the vapour in equilibrium with the solution at the given temperature is

A. 0.25

B. 0.2

C. 0.5

D. 0.33

Answer: B

44. Which among the following is the correct mathematical representation of Dalton's law of partial pressures?

A. $P_r = x_1 P_1^{\circ} + x_2 P_2^{\circ}$

B. $P_T = P_1^{\circ} + \left(P_2^{\circ} - P_1^{\circ}\right) x_2$

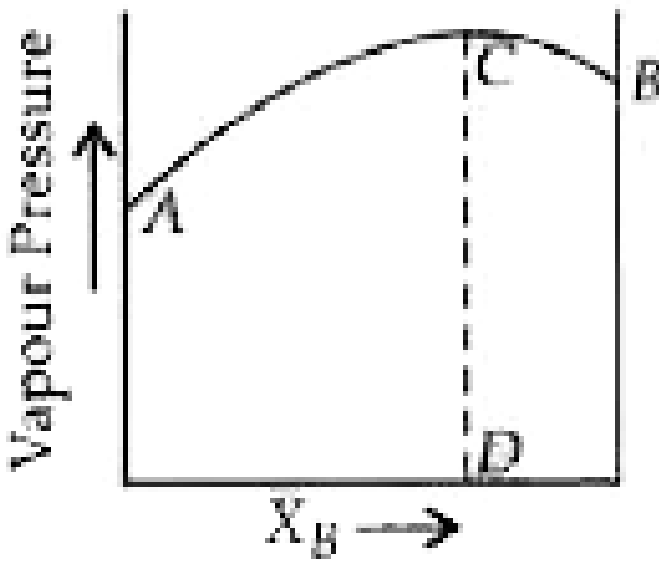C. $P_T = (1 - x_2) P_1^{\circ} + x_2 P_2^{\circ}$

D. All of these

Answer: D

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45. The diagram given below is a vapour pressure-composition diagram for a binary solution of A and B.In the solution, A-B interactions are

A. similar to A-A and B-B interactions

B. greater than 1-A and B-B interactions

C. smaller than 1-A and B--B interactions

D. unpredictable.

Answer: C

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46. At a particular temperature, the vapour pressures of two liquids A and B are respectively 120 and 180 mm of mercury. If 2 moles of A and 3 moles of B are mixed to form an ideal solution, the vapour pressure of the solution at the same temperature will be in mm of mercury)

A. 156

B. 145

C. 150

D. 108

Answer: A

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47. A solution containing components A and B follows Raoult's law when

A. A - B attraction force is greater than A - A and B-B

B. A - B attraction force is less than 4 - A and B-B

C. A - B attraction force remains same as A - A and B-B

D. volume of solution is different from sum of volumes of solute and
    solvent.

Answer: C

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48. In which case Raoult's law is not applicable?

A. 1M NaCl

B. 1 Murea

C. 1 M glucose

D. 1 M sucrose

Answer: A

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49. On mixing, heptane and octane form an ideal solution. At 373 K, the vapour pressure of the two liquid components (heptane and octane) are 105 kPa and 45 kPa respectively. Vapour pressure of the solution obtained by mixing 25 g of heptane and 35 g of octane will be (molar mass of heptane $= 100gmol^{-1}$ and of octane $= 114gmol^{-1}$)

A. 144.5 kPa

B. 72.0 kPa

C. 36.1 kPa

D. 96.2 kPa

Answer: B

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50. Which of the following does not show positive deviation from Raoult's law?

A. Benzene-chloroform

B. Benzene-acetone

C. Benzene-ethanol

D. Benzene-carbon tetrachloride

Answer: A

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51. The vapour pressure of pure benzene and toluene are 160 and 60 torr respectively. The mole fraction of toluene in vapour phase in contact with equimolar solution of benzene and toluene is

A. 0.5

B. 0.16

C. 0.27

D. 0.73

Answer: C

52. An ideal solution was obtained by mixing methanol and ethanol. If the partial vapour pressure of methanol and ethanol are 2.619 kPa and 4.556 kPa respectively, the composition of vapour (in terms of mole fraction) will be

A. 0.635 MeOH, 0.365 EtOH

B. 0.173 MeOH, 0.827 EtOH

C. 0.574 MeOH, 0.326 EtOH

D. 0.365 McOH, 0.635 EtOH

Answer: D

53. Benzene and toluene form nearly ideal solutions. At $20°C$, the vapour pressure of benzene is 75 torr and that of toluene is 22 torr. The partial vapour pressure of benzene at $20°C$ for a solution containing 78 g of benzene and 46 g of toluene in torr is

A. 50

B. 25

C. 37.5

D. 53.5

Answer: A

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54. A mixture of two completely miscible non-ideal liquids distils as such without change in its composition at a constant temperature as though it were a pure liquid. This mixture is known as

A. binary liquid mixture

B. azeotropic mixture

C. eutectic mixture

D. ideal mixture.

Answer: B

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55. Which of the following pairs shows a negative deviation from Raoult's law?

A. Acetone-benzene

B. Acetone-ether

C. Acetone-chloroform

D. Benzene-methanol

Answer: C

56. Among the following substance the lowest vapour pressure is exerted

by

    A. water

    B. mercury

    C. kerosene

    D. rectified spirit.

Answer: B

57. Raoult's Law is obeyed by a binary liquid solution when

    A. the forces of attractions between like molecules are greater than

    those between unlike molecules

B. the forces of attractions between like molecules are smaller than those between unlike molecules

C. the forces of attractions between like molecules are more or less identical with those between unlike molecules

D. the volume occupied by unlike molecules are different

Answer: C

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58. To 50 mL of water, a few mL of acetone is mixed. The vapour pressure of water above the solution becomes

A. equal to the vapour pressure of the solution

B. equal to the vapour pressure of the pure water

C. less than the vapour pressure of the pure water

D. more than the vapour pressure of the pure water.

Answer: C

59. An azeotropic mixture of chloroform and diethyl ether possesses boiling point higher than either that of chloroform or diethyl ether. The mixture shows

    A. negative deviation from Raoult's law

    B. positive deviation from Raoult's law

    C. no deviation from ideal behaviour

    D. that the solution is saturated.

Answer: A

60. Which of the following is satisfied by an ideal solution?

A. Formation of an azeotropic mixture

B. $\Delta S_{mix} = 0$

C. Raoult's law is obeyed under particular set of conditions only

D. $\Delta H_{mix} = 0$

Answer: D

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61. On mixing 25 mL of acetone with 25 mL of ethyl alcohol, the total volume of solution is

    A. = 50 mL

    B. gt 50 mL

    C. lt 50 mL

    D. unpredictable.

Answer: B

62. Partial pressure of a solution component is directly proportional to its mole fraction. This is known as

A. Henry's law

B. Raoult's law

C. Distribution law

D. Ostwald's dilution law.

Answer: B

63. The vapour pressure of a solution increases when

A. volume is increased

B. number of moles of solute is increased

C. temperature is increased

D. all of these.

Answer: C

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64. Which of the following plots does not represent the behaviour of an ideal binary liquid solution of A and B?

A. Plot of P_B versus X_B is linear.

B. Plot of P_A versus X_A is linear.

C. Plot of P_{Total} Versus X_A or X_B is linear.

D. Plot of P_{Total} versus X_A is non-linear.

Answer: D

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65. In a mixture, A and B components show negative deviation

A. $\Delta V_{mix} > 0$

B. $\Delta V_{mix} < 0$

C. A - B interaction is weaker than A - A and B - B interaction.

D. none of the above reason is correct.

Answer: B

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66. Azeotropic mixture of HCl and H_2O has

A. 36% HCl

B. 48% HCl

C. 20.2% HCl

D. 22.2% HCl

Answer: C

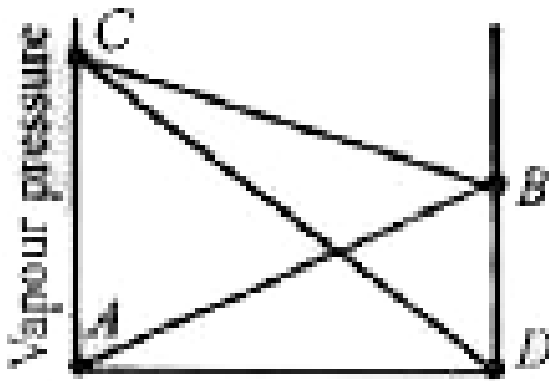**67.** If H_2SO_4 is added to water, then the solution

    A. shows positive deviation from Raoult's law

    B. shows negative deviation from Raoult's law

    C. shows ideal solution properties

    D. is not stable.

Answer: B

**68.** In the mixtures of two miscible volatile liquids obeying Raoults' law, the correct behaviour is explained by

$X_A = 1$ mole fraction $X_A = 0$

$X_B = 0$ $X_B = 1$

A. AB stands for the vapour pressure of component B in presence of

solute A

B. CD stands for the vapour pressure of solvent A in presence of

solute B

C. BC stands for the total vapour pressure in accordance with the

Dalton's law of partial pressures

D. all of the above.

Answer: D

69. In the accompanied diagram the ideal behaviour of a solution is shown by the line (s)

$P_A + P_B$

$P_A = X_A P_A^\circ$

$P_B = X_B P_B^\circ$
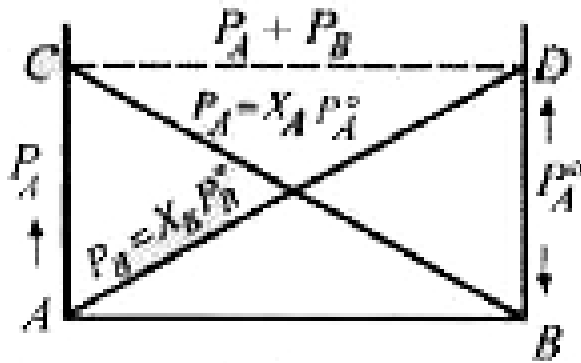
$X_A = 1$ mole fraction $X_A = 0$
$X_B = 0$ $X_B = 1$

A. D

B. CB

C. CD

D. AD,CB and CD

Answer: C

70. Which of the following statements is correct?

A. Lowering of vapour pressure takes place only in ideal solutions.

B. Lowering of vapour pressure does not depend upon the solvent at

a given concentration of the solute.

C. Solvents with higher boiling points have higher vapour pressure.

D. Relative lowering of vapour pressure does not depend upon the

solvent at a given concentration of the solute.

Answer: D

71. The vapour pressure lowering of a solvent is proportional to

A. the mole fraction of the solute

B. the mole fraction of the solvent

C. the molality of the solvent

D. the normality of the solution.

Answer: A

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72. A dilute aqueous solution of glucose shows a vapour pressure of 750 mm of Hg at 373 K. The molality of the solution is

A. 13.32

B. 0.013

C. 1.35

D. 0.74

Answer: D

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73. The freezing point of pure nitrobenzene is 278.8 K. When 2.5 g of unknown substance is dissolved in 100 g of nitrobenzene, the freezing point of solution is found to be 276.8 K, If the freezing point depression constant of nitrobenzene is 8.0 K kg/mol, what is the molar mass of unknown substance?

A. $200 gmol^{-1}$
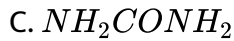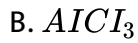
B. $100 gmol^{-1}$

C. $55 gmol^{-1}$

D. $129 gmol^{-1}$

Answer: B

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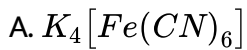
74. For which of the following van't Hoff factor cannot be greater than unity?

A. $K_4[Fe(CN)_6]$

B. $AICI_3$

C. NH_2CONH_2

D. KNO_3

Answer: C

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75. Red blood cell placed in solution having less than 0.91% NaCl will ....

and may sometimes .... because NaCl solution will have .... Osmotic

pressure than that of the fluid inside red blood cell.
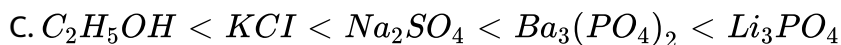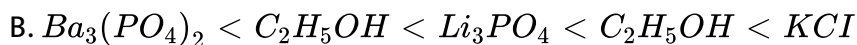
A. burst, swell, higher

B. swell, burst, higher

C. burst, swell, lower

D. swell, burst, lower

Answer: D

76. The order of increasing freezing point of C_2H_5OH, $Ba_2(PO_4)_2$, Na_2SO_4, KCl and Li_3PO_4 is

   A. $Ba_3(PO_4)_2 < Na_2SO_4 < Li_3PO_4 < C_2H_5OH < KCI$

   B. $Ba_3(PO_4)_2 < C_2H_5OH < Li_3PO_4 < C_2H_5OH < KCI$

   C. $C_2H_5OH < KCI < Na_2SO_4 < Ba_3(PO_4)_2 < Li_3PO_4$

   D. $Ba_3(PO_4)_2 < Li_3PO_4 < Na_2SO_4 < KCI < C_2H_5OH$

Answer: D

77. The degree of dissociation of $Ca(NO_3)_2$ in a dilute aqueous solution containing 14 g of the salt per 200 g of water at 100 °C is 70%. If the

vapour pressure of water is 760 mm of Hg, what will be the vapour pressure of the solution?

A. 846 mm of Hg

B. 746 mm of Hg

C. $\dfrac{846}{760}$ atm

D. 782 mm of Hg

Answer: B

▶ **View Text Solution**

78. If 0.1 M solution of glucose and 0.1 M solution of urea are placed on the two sides of a semipermeable membrane to equal heights, then it will be correct to say that

A. there will be no net movement across the membrane

B. glucose will flow towards urea solution

C. urea will flow towards glucose solution

D. water will flow from urea solution towards glucose solution.

Answer: A

▶ **View Text Solution**

79. Benzoic acid dissolved in benzene shows

    A. its normal molccular mass

    B. double of its normal molecular mass

    C. half of its normal molecular mass

    D. not definite.

Answer: B

▶ **View Text Solution**

80. The substance A when dissolved in solvent B shows the molecular mass corresponding to A_3. The van't Hoff factor will be

A. 1

B. 2

C. 3

D. $1/3$

Answer: D

▶ View Text Solution

81. Benzoic acid undergoes dimerisation in benzene solution, the van't Hoff factor 'i' is related to the degree of association 'x' of the acid as
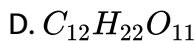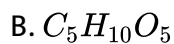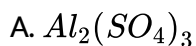
A. i= (1 - x)

B. i = (1 + x)

C. i = (1 - x/2)

D. i = (1 + x/2)

Answer: C

▶ **View Text Solution**

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82. Which of the following 0.10 m aqueous solution will have the lowest freezing point?

A. $Al_2(SO_4)_3$

B. $C_5H_{10}O_5$

C. KI

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

Answer: A

▶ **View Text Solution**

83. A 5% solution of cane sugar (M.W. = 342) is isotonic with 1% solution of substance X. The molecular weight of X is

A. 171.2

B. 68.4

C. 34.2

D. 136.2

Answer: B

▶ View Text Solution

84. When 2 g of a non-volatile solute was dissolved in 90 g of benzene the boiling point of benzene is raised by 0.88 K. Which of the following may be the solute? $\left(K_b \text{ for benzene } = 2.53 K kgmol^{-1}\right)$

A. $CO(NH_2)_2$

B. $C_6H_{12}O_6$

C. NaCl

D. None of these.

Answer: D

▶ **View Text Solution**

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85. Which one of the following statements is false about osmotic pressure?

A. It is the pressure of the hydrostatic column set up due to osmosis.

B. It is the pressure applied on the solution to prevent the entry of the solvent into it through the semi permeable membrane.

C. A solution of low osmotic pressure is termed hypertonic.

D. None of these.

Answer: C

▶ **View Text Solution**

86. Calculate the freezing point of an aqueous solution containing 10% by mass of glucose, 5% by mass of urea and 1% by mass of KCl. $K_{f(H_2O)} = 1.86 K kgmol^{-1}$

A. -2.25°

B. $0^\circ C$

C. $-3.67^\circ C$

D. $-1.63^\circ C$

Answer: C

▶ View Text Solution

87. Equimolal solutions of KCl and compound X in water shows depressions in freezing point in the ratio of 4:1. Assuming KCl to be completely ionised, the compound X in solution must

A. dissociate to the extent of 50%

B. hydrolyse to the extent of 80%

C. dimerise to the extent of 50%
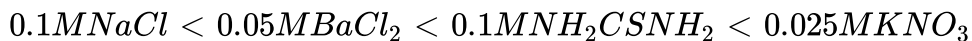
D. trimerise to the extent of 75%

Answer: D

▶ View Text Solution

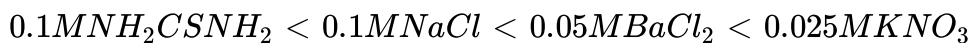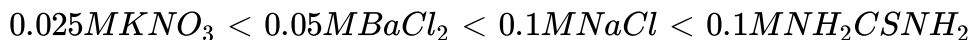**88.** Which of the following has been arranged in the increasing order of freezing point?

A.

$$0.025 M K N O_3 < 0.1 M N H_2 C S N H_2 < 0.05 M B a C l_2 < 0.1 M N a C l$$

B.

$$0.1 M N a C l < 0.05 M B a C l_2 < 0.1 M N H_2 C S N H_2 < 0.025 M K N O_3$$

C.

$$0.1MNH_2CSNH_2 < 0.1MNaCl < 0.05MBaCl_2 < 0.025MKNO_3$$

D.

$$0.025MKNO_3 < 0.05MBaCl_2 < 0.1MNaCl < 0.1MNH_2CSNH_2$$

Answer: B

▶ View Text Solution

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89. When a solution containing non-volatile solute freezes, which of the following equilibrium would exist?

A. solid solvent $\rightarrow$ liquid solvent

B. solid solute $\rightarrow$ solution

C. solid solute $\rightarrow$ liquid solvent

D. solid solvent $\rightarrow$ solution

Answer: D

90. A 5.25% solution of a substance is isotonic with a 1.5% solution of urea (molar mass $= 60 gmol^{-1}$) in the same solvent. If the densities of both the solutions are assumed to be equal to $1.0 gcm^{-3}$, molar mass of the substance will be

A. $210.0 gmol^{-1}$

B. $90.0 gmol^{-1}$

C. $115.0 gmol^{-1}$

D. $105.0 gmol^{-1}$

Answer: A

91. If P_0 and P_s are the vapour pressure of solvent and solution, respectively and N_1 and N_2 are the moles of solute and solvent then

A. $\dfrac{P_0 - P_S}{P_0} = \dfrac{N_1}{N_1 + N_2}$

B. $\dfrac{P_0 - P_S}{P_S} = \dfrac{N_1}{N_2}$

C. $P_S = P_0 \cdot \dfrac{N_2}{N_1 + N_2}$

D. All of these.

Answer: D

▶ **View Text Solution**

92. Osmotic pressure of blood is 7.65 atm at 310 K. An aqueous solution of glucose that will be isotonic with blood is .... wt./vol.

A. 0.541

B. 0.0354

C. 0.0453

D. 0.534

Answer: A

93. Yg of non-volatile organic substance of molecular mass Mis dissolved in 250 g benzene. Molal elevation constant of benzene is K. Elevation in its boiling point is given by

A. $\dfrac{M}{K_B y}$

B. $\dfrac{4K_b Y}{M}$

C. $\dfrac{K_b Y}{4M}$

D. $\dfrac{K_b Y}{M}$

Answer: B

94. Which of the following aqueous solutions will exhibit highest boiling point?

A. 0.015 M glucose

B. $0.01 M KNO_3$

C. 0.015 M urea

D. $0.01 M Na_2SO_4$

Answer: D

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95. Two elements A and B form compounds having molecular formulae AB_2 and AB_4 when dissolved in 20 g of C_6H_6. $1gAB_2$ lowers the freezing point by 2.3 K whereas 1.0 g of AB_4 lowers it by 1.3 K. The molal depression constant for benzene is $5.1 K kgmol^{-1}$. The atomic masses of A and B are, respectively

A. A = 26, B = 42.64

B. A = 31.72, B = 47.02

C. A=13.11, B=24.25

D. A = 19.17, B = 35.01

Answer: A

▶ **View Text Solution**

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96. The decreasing order of osmotic pressures of 10 g glucose (P_1), 10 g urea (P_2) and 10 g sucrose (P_3) at 273 K when dissolved in 250 mL of water separately is

A. $P_1 > P_2 > P_3$

B. $P_2 > P_3 > P_1$

C. $P_2 > P_1 > P_3$

D. $P_3 > P_2 > P_1$

Answer: C

▶ **View Text Solution**

97. The boiling point of a solution of 0.11 g of a substance in 15 g of ether was found to be $0.1°C$ higher than that of pure ether. The molecular weight of the substance will be $\left(K_b = 2.16° Ckgmol^{-1}\right)$

A. 148

B. 158

C. 168

D. 178

Answer: B

▶ View Text Solution

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98. A 0.0020 m aqueous solution of an ionic compound $\left[CO(NH_3)_5(NO_2)\right]CI$ freezes at -0.00732 $°C$. Number of moles of ions in which I mol of ionic compound produces on being dissolved in water will be $\left(K_f = -1.86°C/m\right)$

A. 3

B. 4

C. 1

D. 2

Answer: D

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99. When placed in water containing more than 0.9% (m/V) salt, blood cells collapse. This is because

A. the solution is hypertonic

B. the solution is hypotonic

C. due to loss of water by osmosis

D. both (a) and (C)

Answer: D

▶ View Text Solution

100. The boiling point of benzene is 353.23 K. When 1.80 g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point is raised to 354.11 K. Calculate the molar mass of the solute. K_b, for benzene is $2.53 K kg mol^{-1}$.

A. $58 g mol^{-1}$

B. $85 g mol^{-1}$

C. $93 g mol^{-1}$

D. $108 g mol^{-1}$

Answer: A

▶ **View Text Solution**

101. The values of observed and calculated molecular weights of silver nitrate are 92.64 and 170 respectively. The degree of dissociation of silver nitrate will be

A. 0.6

B. 0.835

C. 0.467

D. 0.6023

Answer: B

▶ **View Text Solution**

102. If 0.15 g of a solute, dissolved in 15 g of solvent, is boiled at a temperature higher by $0.216°C$, than that of the pure solvent, the molecular weight of the solute. (Molal elevation constant for the solute is $2.16°C$) is

A. 1.01

B. 10.1

C. 10

D. 100

Answer: D
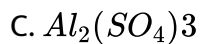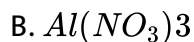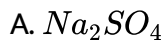
103. The vapour pressure of $CCl_4 at 25°C$ is 143 mm Hg, if 0.5 g of a non-volatile solute (mol. weight = 65) is dissolved in 100 g of CCI_4, the vapour pressure of the solution will be

A. 94.39 mm Hg

B. 199.34 mm Hg

C. 141.31 mm Hg

D. 143.99 mm Hg

Answer: C

104. Which of the following salt has the same value of van't Hoff factor as that of $K_3[Fe(CN)_6]$?

A. Na_2SO_4

B. $Al(NO_3)3$

C. $Al_2(SO_4)3$

D. Fe_3O_4
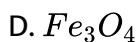
Answer: B

▶ **View Text Solution**

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105. Which of the following is a colligative property?

A. Surface tension

B. Viscosity

C. Refractive index

D. Osmotic pressure

Answer: D

---

106. The use of anhydrous common salts, e.g., $NaCl$ or $CaCl_2$ is to clear snow on the roads. This causes

    A. a lowering in f.pt. of water

    B. a lowering in m.pt. of ice

    C. melting of ice at the atmospheric temperature

    D. all of the above.

Answer: D

---

107. If a thin slice of sugar beet is placed in concentrated solution of NaCl then

A. sugar beet will lose water from its cells.

B. sugar beet will absorb water from solution.

C. sugar beet will neither absorb nor lose water.

D. sugar beet will dissolve in solution.

Answer: A

▶ **View Text Solution**

108. Pure benzene freezes at $5.3°C$. A solution of 0.223 g of phenylacetic acid $(C_H - 5CH_2COOH)$ in 4.4 g of benzene $(K_f = 5.12 Kkgmol^{-1})$ freezes at $4.47°C$. From this observation, one can conclude that

A. phenyl acetic acid exists as such in benzene

B. phenyl acetic acid undergoes partial ionisation in benzene

C. phenyl acetic acid undergoes complete ionisation in benzene

D. phenyl acetic acid dimerises in benzene.

Answer: D

109. Pressure cooker reduces cooking time because

A. the heat is more evenly distributed

B. the higher pressure tenderizes the food

C. the boiling point of water inside is elevated

D. a larger flame is used

Answer: C

110. Which of the following statements is correct? For 0.1 M solution of each

A. osmotic pressure of NaCl and Na_2SO_4, solution will be same

B. osmotic pressure of NaCl solution will be more than Na_2SO_4 solution

C. osmotic pressure of Na_2SO_4 solution will be more than NaCl solution

D. osmotic pressure of Na_2SO_4 could be less or more than that of NaCl solution.

Answer: C

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111. Which of the following will have the highest f.pt. at one atmosphere?

A. 0.1 M NaCl solution

B. 0.1 M sugar solution

C. 0.1 M $BaCl_2$ solution

D. 0.1 M $FeCl_3$, solution

Answer: B

> ▶ **View Text Solution**

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112. The osmotic pressure of a solution is given by the relation

A. $\pi = RT/C$

B. $\pi = CT/R$

C. $\pi = RC/T$

D. $\pi/C = RT$

Answer: D

> ▶ **View Text Solution**

113. Which one of the following pairs of solutions 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(NO3)2 and 0.1 M Na_2SO_4

Answer: D

▶ **View Text Solution**

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114. Which inorganic precipitate acts as a semi-permeable membrane?

A. Calcium phosphate

B. Nickel phosphate

C. Calcium sulphate

D. Copper ferrocyanide

Answer: D

---

115. The van't Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is

A. 0.913

B. 0.74

C. 0.87

D. 1

Answer: C

---

116. In the phenomenon of osmosis through the semi-permeable membrane

A. solvent molecules pass from solution to solvent

B. solvent molecules pass from solvent to solution

C. solute molecules pass from solution to solvent

D. solute molecules pass from solvent to solution.

Answer: B

▶ **View Text Solution**

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117. The unit of freezing point depression constant is

A. $Kmol^{-1}$

B. $Kkg^{-1}mol^{-1}$

C. $Kkgmol^{-1}$

D. Kkg^{-1}

Answer: C

▶ **View Text Solution**

118. The expression to compute molar mass of a solute from the elevation of boiling point of a solvent is (where the various symbols have their usual meanings)

A. $M_2 = \dfrac{K_b}{\Delta T_b}\dfrac{m_1}{m_2}$

B. $M_2 = \dfrac{\Delta T_b}{K_b}\dfrac{m_2}{m_1}$

C. $M_2 = \dfrac{K_b}{\Delta T_b}\dfrac{m_1}{m_2}$

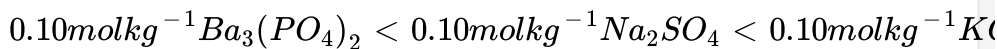D. $M_2 = \dfrac{\Delta T_b}{K_b}\dfrac{m_1}{m_2}$

Answer: C

▶ **View Text Solution**

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119. Assuming 100% ionisation, the increasing order of the freezing point of the solution will be

A.

$$0.10 molkg^{-1}Ba_3(PO_4)_2 < 0.10 molkg^{-1}Na_2SO_4 < 0.10 molkg^{-1}KC$$

B.

$$0.10 molkg^{-1}KCI < 0.10 molkg^{-1}Na_2SO_40.10 molkg^{-1}Ba_3(PO_4)_2$$

C.

$$0.10 molkg^{-1}Na_2SO_4 < 0.10 molkg^{-1}Ba_3(PO_4)_2 < 0.10 molkg^{-1}KC$$

D.

$$0.10 molkg^{-1}KCI < 0.10 molkg^{-1}Ba_3(PO_4)_2 < 0.10 molkg^{-1}Na_2S$$
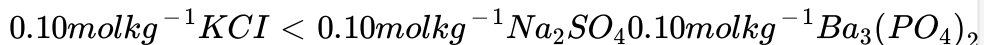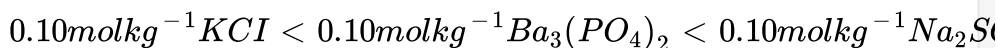
Answer: A

▶ View Text Solution

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120. The osmotic pressure of 0.1 M sodium chloride solution at $27° C$ is

A. 4.0 atm

B. 2.46 atm

C. 4.92 atm

D. 1.23 atm

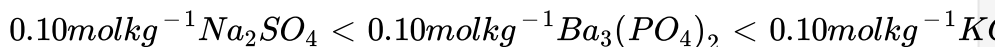**Answer: C**

▶ View Text Solution

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121. A solution prepared by dissolving 15 g of non-volatile solute in 270 g of water gave relative lowering of vapour pressure of 0.005. The molecular weight of the solute is

A. 324

B. 200

C. 225

D. 20

Answer: B

▶ View Text Solution

122. Osmotic pressure of urea solution at $10°C$ is 500 mm. The solution is diluted with temperature raised to $25°C$ till its osmotic pressure becomes 131.6 mm. The solution is diluted

A. 3 times

B. 3.5 times

C. 4 times

D. 3.8 times

Answer: C

▶ View Text Solution

123. Calculate the weight of ethylene glycol (an effective antifreeze) that must be added to 25 litre water to protect its freezing at $-24°C$. $\left(K_f = 1.86°Cm^{-1}\right)$

A. 20 kg

B. 322.5 kg

C. 200 kg

D. 32.25 kg

Answer: A

> ▶ **View Text Solution**

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124. Calculate the osmotic pressure at temperature $37°C$ of an aqueous solution of urea which freezes at $-0.52°C$. Assume molality and molarity be numerically equal. $\left(K_f = 1.86°Cm^{-1}\right)$

A. 720.5 atm

B. 7.1 atm

C. 71.1 atm

D. 0.85 atm

Answer: B

125. Calculate the boiling point of a solution made by dissolving 38.5 g of a solute of molecular weight 154 in 250 g of benzene if boiling point of pure benzene is $80.1°C$ and K_b for benzene is $2.61°Cm^{-1}$

A. $85.32°C$

B. $74.88°C$

C. $77.49°C$

D. $82.71°C$

Answer: D

126. A solution containing 0.5216 g of naphthalene (molecular weight = 128.16) in 50 mL of CCl_4 shows boiling point elevation of $0.402°C$. While a solution of 0.6216 g of an unknown solute in the same weight of solvent

gave a boiling point elevation of $0.647°\,C$. The molecular mass of unknown solute is

A. 94.9

B. 173

C. 159.5

D. 197.8

Answer: A

▶ **View Text Solution**

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127. Calculate the freezing point of a solution of urea in water which boils at $100.18°\,C$.

$$\left(K_f = 1.86°\,Cm^{-1}K_b = 0.512°\,Cm^{1}\right)$$

A. $-0.18°\,C$

B. $0.65°\,C$

C. $-0.65°\,C$

D. $0.18°C$

Answer: C

> ▶ View Text Solution

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128. The percentage dissociation of a 0.011 m aqueous solution of $K_3[Fe(CN)_6]$ which freezes at $-0.063°C$ is $(K_b$ for water $= 1.86°Cm^{-1})$

A. 0.75

B. 0.67

C. 0.33

D. 0.5

Answer: B

> ▶ View Text Solution

129. Calculate the osmotic pressure at $0°C$ of a 0.18 m aqueous solution of KCl which freezes at $-0.68°C$. Assume volume of solution to be that of pure H_2O.

$\left(K_f \text{ for water } = 1.86° Cm^{-1}\right)$

A. 4 atm

B. 8.1 atm

C. 3 atm

D. 0.81 atm

Answer: B

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130. The freezing point of solution made by dissolving 1.1 g of $CoCl_{2.6}NH_3$ (molecular weight = 267) in 100 g H_2O is $-0.29°C$. How many moles of solute particles exist in solution for each mole of solute introduced? $\left(K_b = 1.86° Cm^{-1}\right)$

A. 2

B. 3

C. 4

D. 1

Answer: C

▶ View Text Solution

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131. The osmotic pressure of solution increases if

A. temperature is decreased

B. solution constant is increased

C. number of solute molecules is increased

D. volume is increased.

Answer: C

▶ View Text Solution

132. An aqueous solution containing 1 g of urea boils at 100.25 °C. The aqueous solution containing 3 g of glucose in the same volume will boil at

    A. $100.75° C$

    B. $100.5° C$

    C. $100° C$

    D. $100.25° C$

Answer: D

▶ **View Text Solution**

133. The osmotic pressure of 5% (mass/volume) solution of cane sugar at $150° C$ (molecular weight of sugar = 342) is

    A. 4 atm

B. 5.07 atm

C. 3.55 atm

D. 2.45 atm

Answer: B

▶ View Text Solution

134. Which of the following method is used for measuring the osmotic pressure of the solution?

A. Ostwald method

B. Berkeley Hartley method

C. Solvay method

D. Haber's method

Answer: B

▶ View Text Solution

135. The normal boiling point of water is 373 K (at 760 mm). Vapour pressure of water at 298 K is 23 mm. If enthalpy of vaporisation is 40.656 kJ/mol, the boiling point of water at 23 mm atmospheric pressure will be

A. 250 K

B. 51.6 K

C. 298 K

D. 12.5 K

Answer: C

▶ View Text Solution

136. 1.8 g of fructose $(C_6H_{12}O_6)$ is added to 2 kg of water. The freezing point of solution is

A. $-0.0093°C$

B. $0.0093° C$

C. $-0.0186° C$

D. $-1.86° C$

Answer: A

▶ View Text Solution

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137. For determination of molar mass of colloids, polymers and protein which colligative property is preferred?

A. Diffusion pressure

B. Atmospheric pressure

C. Osmotic pressure

D. Turgor pressure

Answer: C

▶ View Text Solution

138. Molal depression constant is calculated from the enthalpy of fusion (4,H) and b.pt. of solvent using the relationb

A. $K_f = \dfrac{M_1 RT_f^2}{1000\Delta_F h}$

B. $K_f = \dfrac{1000 RT_f^2}{M_1 \Delta_f H}$

C. $K_f = \dfrac{1000 M_1 T^2 f}{R\delta_f H}$

D. $K_f = \dfrac{\Delta_f H}{1000 M_1 RT_f^2}$

Answer: A

▶ **View Text Solution**

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139. The average osmotic pressure of human blood is 7.8 bar at $27°C$. What is the concentration of an aqueous Naci solution that could be used in the blood stream?

A. 0.16 mol/litre

B. 0.32 mol/litre

C. 0.60 mol/litre

D. 0.45 mol/litre

Answer: A

▶ **View Text Solution**

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140. Camphor is often used in molecular mass determination because

A. it is a solvent for organic substance

B. it is readily available

C. it has high cryoscopic constant

D. it is volatile.

Answer: C

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141. A non-volatile electrolyte dissolved in an aqueous solution in same molal proportion as non-electrolyte produces

    A. same colligative effect

    B. higher colligative effect

    C. lower colligative effect

    D. no colligative effect.

Answer: B

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142. A 0.5 molal solution of ethylene glycol in water is used as coolant in a car. If K_b for water is $1.86°C$ per mole the mixture shall freeze at

    A. $0.93°C$

    B. $-0.93°C$

    C. $1.86°C$

D. $-1.86°C$

Answer: B

> ▶ **View Text Solution**

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143. A solution containing 6.8 g on non-ionic solute in 100 g of water was found to freeze at $-0.93°C$. The molar mass of solute is $\left(K_b = 1.86° Cm^{-1}\right)$

A. 13.6

B. 34

C. 68

D. 136

Answer: D

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144. Which of the following statement is correct?

A. The relative lowering of vapour pressure of a solution is equal to the mole fraction of the solute present in the solution.

B. Passage of solute molecules towards solution side through semipermeable membrane is osmosis.

C. The boiling point of a solution is always lower than the solvent.

D. The boiling point of a liquid is the temperature at which its vapour pressure becomes equal to 260 mm.

Answer: A

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145. An aqueous solution freezes at $-0.186°C \left(K_f = 1.86° Cm^{-1}, K_b = 0.512° Cm^{-1} \right)$. What is the elevation in boiling point?

A. 0.186

B. 0.512

C. 0.80

D. 0.0512

Answer: D

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146. In a 0.2 molal aqueous solution of a weak acid HX the degree of ionisation is 0.3. Taking K, for water as $1.85° Cm^{-1}$, the freezing point of solution will be nearest to

A. $-0.480° C$

B. $-0.360° C$

C. $-0.260° C$

D. $+0.480° C$

Answer: D

---

147. If α is the degree of dissociation of Na_2SO_4 the van't Hoff factor (i) used for calculating molecular mass is

   A. $1 + \alpha$

   B. $1 - \alpha$

   C. $1 + 2\alpha$

   D. $1 - 2\alpha$

Answer: A

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148. Vapour pressure of a solution of 5 g of non-electrolyte in 100 g of water at a particular temperature is $2985 N/m^2$. The vapour pressure of

pure water is $3000\dfrac{N}{m^2}$, the molecular weight of the solute is

A. 90

B. 200

C. 180

D. 380

Answer: C

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149. Which of the following would exert maximum osmotic pressure?

A. Decinormal aluminium sulphate

B. Decinormal barium chloride

C. Decinormal sodium chloride

D. A solution obtained by mixing equal volumes of (b) and (c) and

filtering

Answer: A

150. X is dissolved in water. Maximum boilling point is observed when X is

.... (0.1 M each)

A. $CuSO_4$

B. $BaCl_2$

C. NaCl

D. urea

Answer: B

151. Which of the following is true?

A. The ideal behaviour of a liquid solution is due to the fact that the different molecules present in it do not interact with one another.

B. Henry's law deals with the variation of solubility of gas with temperature.

C. The constituents of an ideal solution follow Raoult's law under all conditions of temperature and pressure.

D. The addition of a non-volatile solute to a volatile solvent decreases the boiling point of the later.

Answer: C

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152. If 0.5 m of $Ca(NO_3)_2$ and 0.75 m of KOH is taken, then the depression in freezing point is

A. greater in $Ca(NO_3)_2$ because number of ions are greater

B. greater in KOH because concentration is high

C. equal in both and freezing point is less than $0°C$ because ionic

   concentration is same

D. equal to $0°C$ in both because ionic concentration is negligible.

Answer: C

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153. Which has minimum osmotic pressure?

A. 200 mL of 2 M NaCl solution

B. 200 mL of 1 M glucose solution

C. 200 mL of 2 M urea solution

D. All have same.

Answer: B

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154. Solution A contains 7 g/L of $MgCl_2$ and solution B contains 7 g/L of NaCl. At room temperature, the osmotic pressure of

    A. solution A is greater than B

    B. both have same osmotic pressure

    C. solution B is greater than A

    D. can't determine.

Answer: A

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155. Boiling point of chloroform was raised by 0.323 K, when 0.5143 g of anthracene was dissolved in its 35 g. Molecular mass of anthracene is $\left(K_b \text{ for } CHCl_3 = 3.9 Kkgmol^{-1}\right)$

    A. 132.32 g/mol

B. 242.32 g/mol

C. 177.42 g/mol

D. 79.42 g/mol

Answer: C

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156. Vapour pressure of benzene at $30°C$ is 121.8 mm. when 15 g of a non-volatile solute is dissolved in 250 g of benzene, its vapour pressure is decreased to 120.2 mm. The molecular weight of the solute is

A. 35.67 g

B. 356.7 g

C. 432.8 g

D. 502.7 g

Answer: B

157. K_f for water is $1.86 K kgmol^{-1}$. If your automobile radiator holds 1.0 kg of water, how many grams of ethylene glycol $(C_2H_2O_2)$ you must add to get the freezing point of the solution lowered to $-2.8° C$

A. 93 g

B. 39 g

C. 27 g

D. 72 g

Answer: A

158. Lowering of vapour pressure, Δp, elevation in boiling point, ΔT, and depression in freezing point, ΔT_f of a solvent for the same molar

concentration of each of the three solutes :

$(A) sugar$, $(B) NaCl$, and $(C) BaCl_2$, follow the sequence :

A. $\Delta p: A < B < C$

B. $\Delta T_b: C > B > A$

C. $\Delta T_f: A < B < C$

D. all of these

Answer: D

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159. The osmotic pressure of 253 mL of a solution dissolving 34.2 g of sugar at $27°C$ will be

A. 7.12 atm

B. 5.26 atm

C. 3.96 atm

D. 9.73 atm

Answer: D

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160. A 0.0020 in aqueous solution of an ionic compound $[CO(NH_3)_5(NO_2)]Cl$ freezes at $-0.00732°C$. Number of moles of ions which I mol of ionic compound produces on being dissolved in water will be $(K_f = -1.86°C/m)$

A. 3

B. 4

C. 1

D. 2

Answer: D

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1. The osmotic pressure of a urea solution is 500 mm Hg at $10°C$. The solution is diluted and its temperature is raised to $25°C$. It is now found that osmotic pressure of the solution is reduced to 105.3 mm Hg. The extent of dilution of the solution is

   A. 3 times

   B. 4 times

   C. 5 times

   D. 6 times.

Answer: C

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2. Relative decrease in vapour pressure of an aqueous solution containing 2 moles of $[Cu(NH_3)_3Cl]CI$ in 3 moles of H_2O is 0.50. On reaction with

$AgNO_3$, this solution will form

A. 1 mol AgCl

B. 0.25 mol AgCl

C. 2 mol AgCl

D. 0.40 mol AgCl.

Answer: A

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3. The partial pressure of ethane over a saturated solution containing $6.56 \times 10^{-2} g$ of ethane is 1 bar. If the solution contains 5.00×10^{-2} g of ethane, then what will be the partial pressure of the gas?

A. 0.625 bar

B. 0.762 bar

C. 0.529 bar

D. 0.232 bar

Answer: B

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4. Dry air contains $79\ \%\ N_2$ and $21\ \%\ O_2$. Determine the proportion of

N_2 and O_2 in terms of mole fractions) dissolved in water at 1 atm

pressure.   Henry's   law   constant   for

N_2 and O_2 in H_2O are 8.54×10^4 atm and 4.56×10^4 atm

respectively.

   A. $1:2$

   B. $3:1$

   C. $1:3$

   D. $2:1$

Answer: D

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5. A solution of A and B with 30 mole percent of A is in equilibrium with its vapour which contains 60 mole percent of A. Assuming that the solution and the vapour behave ideally, the ratio of the vapour pressures of pure A and pure B is

  A. 1.5

  B. 2.5

  C. 3.5

  D. 4.5

Answer: C

6. If a substance exists as trimer in the solution, then which of the following alternative is possible for depression in freezing point of m molal solution?

A. $\dfrac{mK_f}{3}$

B. $\dfrac{mK_f}{4}$

C. $\dfrac{mK_f}{5}$

D. $\dfrac{mK_f}{8}$

Answer: A

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7. For a dilute solution containing 2.5 g of a non-volatile, non-electrolyte solute in 100 g of water, the elevation in boiling point at 1 atm pressure is $2°C$. Assuming concentration of solute is much lower than the concentration of solvent, the vapour pressure (mm of Hg) of the solution is $\left(K_b = 0.76Kkgmol^{-1}\right)$

A. 726

B. 740

C. 736

D. 718

Answer: A

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8. 1.00 g of a non-electrolyte solute (molar mass $250gmol^{-1}$) was dissolved in 51.2 g of benzene. If the freezing point depression constant, Ky of benzene is $5.12Kkgmol^{-1}$, the freezing point of benzene will be lowered by

A. 0.5 K

B. 0.2 K

C. 0.4 K

D. 0.3 K

Answer: C

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9. The use of common salts, e.g., $NaCl$ or $CaCl_2$ anhydrous, is made to clear snow on the roads. This causes

    A. a lowering in the freezing point of water

    B. a lowering in the melting point of ice

    C. ice melts at the temperature of atmosphere present at that time

    D. all of these.

Answer: A

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10. What will be the osmotic pressure (atm) of 20%(w/V) anhydrous $Ca(NO_3)_2$ solution at $0°C$? (Assuming 100% ionisation.)

    A. 72.33

    B. 82

    C. 52.13

D. 67.51

Answer: B

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11. For 1% solutions of KCl (I), NaCl (II), BaCl2 (III) and urea (IV), osmotic pressures at the same temperature in the ascending order will be (Assume 100% ionisation of the electrolytes at this temperature.)

A. IltIII ltII ltIV

B. IIIltIltIIIltIV

C. IltIItIII ltIV

D. III ltIV ltIltII

Answer: D

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12. A solution of A and B with 30% moles of A in solution is in equilibrium with its vapour which contains 60% moles of A. What will be the ratio of the vapour pressure of pure A to that of pure B? (Assume ideal nature)

A. 1.5

B. 2.5

C. 3.5

D. 4.5

Answer: C

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13. When 1.9 g of a substance is dissolved in 128 g water, freezing point of solution is depressed by $-0.35°C$. Calculate molecular mass of the substance. $\left(K_f \text{ of water is } 1.86 K kgmol^{-1}\right)$

A. 58.12

B. 69.32

C. 78.88

D. 101.25

Answer: C

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14. The vapour pressure of benzene at $25°C$ is 63.7 mm of Hg and the vapour pressure of a solution of a solute in C_6H_6 at the same temperature is 63.9 mm of Hg. The molality of solution is

A. 0.269

B. 0.158

C. 0.486

D. 0.108

Answer: B

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15. At $27°C$ 1.25 L of a solution containing 7.6 g KBr shows an osmotic pressure of 1.804 atm. What is the value of van't Hoff factor?

A. 1.4

B. 1.8

C. 2.1

D. 0.8

Answer: A

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16. In 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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17. 1,00 g of a non-electrolyte solute (molar mass $250 gmol^{-1}$) was dissolved in 51.2 g of benzene. If the freezing point depression constant, K_f of benzene is $5.12 Kkgmol^{-1}$, the freezing point of benzene will be lowered by

A. 0.3 K

B. 0.5K

C. 0.2K

D. 0.4K

Answer: D

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18. Consider the following solutions :

I. M sucrose

II. IMKCl

III. 1 M benzoic acid in benzene

IV. 1 $M(NH_4)_3PO_4$

Which of the following is not true?

   A. II is hypotonic of I.

   B. III is hypotonic of I, II, and IV.

   C. I, II, and III are hypotonic of IV.

   D. IV is hypertonic of I, II, and III.

Answer: A

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19. Which of the following solutions has minimum freezing point?

A. 0.01 M NACl

B. $0.005MC_2H_5OH$

C. $0.005MMgl_2$

D. $0.005MMgSO_4$

Answer: A

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20. How much C_2H_5OH must be added to 1.0 L of H_2O so that solution

should not freeze at -4° F?

$$\left[K_{f(C_2H_5OH)} = 1.86°C/m\right]$$

A. lt 10.75 g

B. gt 494.5 g

C. lt 20 g

D. 494.5 g

Answer: B

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21. Benzoic acid undergoes dimerisation in benzene solution. The van't Hoff factor (i) is related to the degree of association (α) of the acid as

A. $i = 2 - \alpha$

B. $i = 1 + (\alpha/3)$

C. $i = 1 - (\alpha/2)$

D. $i = 1 + (\alpha/2)$

Answer: C

---

22. For a solution of a non-electrolyte in water, the van't Hoff factor is

A. always equal to 0

B. ≤ 2

C. always equal to 1

D. > 1 but < 2

Answer: C

23. Two liquids A and B form an ideal solution at 300 K, the vapour pressure of a solution containing 1 mol of A and 3 mol of B is 550 mm Hg. At the same temperature if one mol B is added to this solution, the vapour pressure of the solution increases by 10 mm Hg. The vapour pressure of pure A is

A. 600 mm Hg

B. 100 mm Hg

C. 400 mm Hg

D. 500 mm Hg

Answer: C

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24. Relative decrease in vapour pressure of an aqueous glucose dilute solution is found to be 0.018. Hence, elevation in boiling point is : (It is given that 1 molal aqueous urea solution boils at $100.54°C$ at 1 atm pressure)

   A. 0.018 K

   B. 0.18 K

   C. 0.54 K

   D. 0.03 K

Answer: C

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25. Solutions showing negative deviations from Raoult's law

    A. ethyl alcohol + water

    B. nitric acid + water

    C. acetone + carbon disulphide

    D. acetone + benzene.

Answer: B

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Aipmt Neet Mcqs

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

    A. Addition of NaCl

    B. Addition of Na_2SO_4

C. Addition of 1.00 molal KI

D. Addition of water

Answer: D

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2. A solution of sucrose (molar mass $= 342 gmol^{-1}$) has been prepared by dissolving 68.5 g of sucrose in 1000 g of water. The freezing point of the solution obtained will be $\left(K_f \text{ for water } = 1.86 Kkgmol^{-1} \right)$

A. $-0.372^{\circ}C$

B. $-0.520^{\circ}C$

C. $+0.372^{\circ}C$

D. $-0.570^{\circ}C$

Answer: A

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3. The freezing point depression constant for water is $= 1.86°C$ m . If 5.00 g $NaSO_4$ is dissolved in 45.0 g H,O, the freezing point is changed by $-3.82°C$. Calculate the van't Hoff factor for $NaSO_4$

A. 2.05

B. 2.63

C. 3.11

D. 0.381

Answer: B

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4. The van't Hoff factor i for a compound which undergoes dissociation in one solvent and association in other solvent is respectively

A. less than one and greater than one

B. less than one and less than one

C. greater than one and less than one

D. greater than one and greater than one.

Answer: C

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5. Mole fraction of the solute in a 1.00 molal aqueous solution is

A. 0.177

B. 0.0177

C. 0.0344

D. 1.77

Answer: B

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6. A 0.1 molal aqueous solution of a weak acid is 30% ionised. If K_f for water is $1.86° C/m$, the freezing point of the solution will be

    A. $-0.18° C$

    B. $-0.54° C$

    C. $-0.36° C$

    D. $-0.24° C$

Answer: D

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7. 200 mL of an aqueous solution of a protein contains its 1.26 g. The osmotic pressure of this solution at 300 K is found to be 2.57×10^{-3} bar. The molar mass of protein will be

$(R = 0.083L \ \text{bar} \ mol^{-1}K^{-1})$

    A. $51022 gmol^{-1}$

B. $122044 gmol^{-1}$

C. $31011 gmol^{-1}$

D. $61038 gmol^{-1}$

Answer: D

8. P_A and P_B are the vapour pressure of pure liquid components, A and B, respectively of an ideal binary solution. If x_A represents the mole fraction of component A, the total pressure of the solution will be

A. $P_A + x_A(P_B - P_A)$

B. $P_A + x_A(P_A - P_B)$

C. $P_B + x_A(P_B - P_A)$

D. $P_B + x_A(P_A - P_B)$

Answer: D

9. Vapour presure of chloroform $(CHCl_3)$ and dichloromethane (CH_2Cl_2) at 25 $^\circ C$ are 200 mm Hg and 41.5 mm Hg respectively. Vapour pressure of the solution obtained by mixing 25.5 g of $CHCl_3$ and 40 g of CH_2Cl_2 at the same temperature will be

(Molecular mass of $CHCl_3$ = 119.5 u and molecular mass of $CH_2Cl_2 = 85$)

A. 173.9 mm Hg

B. 615.0 mm Hg

C. 347.9 mm Hg

D. 285.5 mm Hg

Answer:

10. How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO_3 ? The concentrated acid is 70% HNO_3.

    A. 70.0g conc. HNO_3

    B. 54.0g conc. HNO_3

    C. 45.0g conc. HNO_3
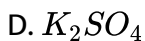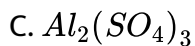
    D. 90.0g conc. HNO_3

Answer: C

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11. Of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression?

    A. KCl

    B. $C_6H_{12}O_6$

C. $Al_2(SO_4)_3$

D. K_2SO_4

Answer: C

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**12.** The boiling point of $0.2 molkg^{-1}$ solution of X in water is greater than equimolal solution of Y in water. Which one of the following statements is true in this case?

A. Molecular mass of X is less than the molecular mass of Y.

B. Y is undergoing dissociation in water while X undergoes no change.

C. X is undergoing dissociation in water.

D. Molecular mass of X is greater than the molecular mass of Y

Answer: C

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13. Which one of the following electrolytes has the same value of van't Hoff factor (i) as that of Al(SO4)(if all are 100% ionised)?

A. $AI(NO_3)_3$

B. $K_4[Fe(CN)_6]$

C. K_2SO_4

D. $K_3[Fe(CN)_6]$
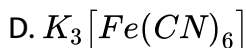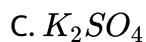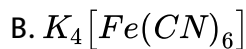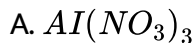
Answer: B

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14. Which of them is not equal to zero for an ideal solution?

A. ΔV_{mix}

B. $\Delta P = P_{observed} - P_{Raoult}$

C. ΔH_{mix}

D. ΔS_{mix}

Answer: D

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15. What is the mole fraction of the solute in a 1.00 m aqueous solution?

A. 1.77

B. 0.0354

C. 0.0177

D. 0.177

Answer: C

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16. Which of the following statements about the composition of the vapour over an ideal 1: 1 molar mixture of benzene and toluene is correct? Assume that the temperature is constant at $25°C$. (Given, vapour pressure data at $25°C$, benzene = 12.8 kPa, toluene = 3.85 kPa)

A. The vapour will contain equal amounts of benzene and toluene.

B. Not enough information is given to make a prediction.

C. The vapour will contain a higher percentage of benzene.

D. The vapour will contain a higher percentage of toluene.

Answer: C

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17. At $100°C$ the vapour pressure of a solution of 6.5 g of a solute in 100 g water is 732 mm. If $k_b = 0.52$, the boiling point of this solution will be

A. $102°C$

B. $103°C$

C. $101°C$

D. $100°C$

Answer: C

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18. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is

A. 0

B. 1

C. 2

D. 3

Answer: D

19. Which one of the following is incorrect for ideal solution?

A. $\Delta H_{mix} = 0$

B. $\Delta U_{mix} = 0$

C. $\Delta P = P_{obs} - P_{\text{calculated by Raoult's law}} = 0$

D. $\Delta G_{mix} = 0$

Answer: D

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20. If molality of the dilute solution is doubled, the value of molal depression constant (K_f) will be

A. halved

B. tripled

C. unchanged

D. doubled.

Answer: C

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21. Which of the following is dependent on temperature?

A. Molarity

B. Mole fraction

C. Weight percentage

D. Molality

Answer: A

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22. For an ideal solution, the correct option is

A. $\Delta_{mix}G = 0$ at constant T and P

B. $\Delta_{mix}S = 0$ at constant T and P

C. $\Delta_{mix}V \neq 0$ at constant T and P

D. $\Delta_{mix}H = 0$ at constant T and P

Answer: D

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23. The mixture that forms maximum boiling azeotrope is

   A. heptane + octane

   B. water + nitric acid

   C. ethanol + water

   D. acetone + carbon disulphide.

Answer: B

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