CHEMISTRY

BOOKS - BRILLIANT PUBLICATION

SOLUTIONS

Questions

1. What is the mole fraction of the solute in a 2m aqueous solution?

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2. A 5.0 M solution of KOH in water contains 22.00% by mass of KOH. Calculate the density of the solution. $\left(\text{Molar mass of KOH} = 56 \text{ g mol}^{-1}\right)$

3. When N_2 gas is passed through water at 293 K, how many moles of $1N_2$ would dissolve in one litre water ? Assume that N_2 exert a partial pressure of 0.987 bar. K_H for N_2 at 293 K is 76.48 kilobar.

4. At $90°C$, liquid A has a vapour pressure of 808 torr and liquid B has a vapour pressure of 323 torr. If A and B form an ideal solution, what is the mole fraction of liquid A in a mixture of A and B that will boil at $88°C$ and 1 atmosphere pressure?

5. Vapour pressure of an aquesous of solution of glucose is 730mm at 293K. Calculate the molality and mole fraction of the solution.

6. The vapour pressure of a 10% aqueous solution of a non volatile substance at 373K is 740 mm of Hg. Calculate the molecular mass of the solute.

7. 0.25 g of a substance dissolved in 25 g of solvent boiled at a temperature higher by $0.208°C$ than that of the pure solvent. What is the molercular mass of the substance. $\left[K_b \text{ for solvent} =2.16 \text{ K kg/mol or Km}^{-1}\right]$

8. The frezing point of nitrobenzene is 278.82K. A 0.15 molal solution of nitrobenzene causes freezing point depressi on of 1.2K. Calculate the value of K_f for nitrobenzene.

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9. Molal depression constant for water is $1.86° C$. What is freezing point of a 0.05 molal solution of a non electrolyte in water?

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10. How much ethyl alcohol should be added to 1L of water so that the solution will not freeze at $-10° C.$ $\left(K_f \text{ of water} = 1.86 \text{ K kg mol}^{-1} \right).$

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11. The osmotic presssure of a solution containing 50g sucrose per litre of solution at $27°\,C$ is 3.65 atmosphere. Calculate the value of R.

12. A solution containing 5.0 g urea per litre was found to be isotonic with 0.7 percent (wt./vol.) solution of an organic, non-volatile solute. Calculate the molar mass of the organic compound (molar mass of urea=60).

13. If $\alpha = 50\,\%$ for $K_4\left[Fe(CN)_6\right]$, find out van't Hoff factor 'I'.

14. A 5% solution of anhydrous $MgCl_2$ at $0°$ developed 16 atm osmotic pressure. What is the degree of dissociation of $MgCl_2$?

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15. What mass of NaCl $\left(\text{molar mass} = 58.5 \text{ g mol}^{-1} \right)$ dissolved in 50g of water will lower the freezing point by $5°C$? The freezing point depression constant, K_p for water is 1.86 K kg mol^{-1}, van't Hoff factor for NaCl is 1.87.

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16. What is the mole fraction of the solute in a 2m aqueous solution?

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Level I

1. $0.5MH_2SO_4$ is diluted from 1 litre to 10 litre, normality of the resulting solution is:

A. 1N

B. 0.1N

C. 10N

D. 11N

Answer: B

2. The hardness of water sample containing 0.002 mol of magnesium sulphate dissolved in a litre of water is expressed as:

A. 20 ppm

B. 200 ppm

C. 2000 ppm

D. 120 ppm

Answer: B

3. Among the following substances, the lowest vapour pressure is exerted by: Water, Mercury, Kerosene, Rectified spirit

    A. Water

    B. Mercury

    C. Kerosene

    D. Rectified spirit

Answer: B

4. When mercuric iodide is added to the aqueous solution of potassium iodide the:

A. Freezing point is raised

B. Freezing point is lowered

C. Freezing point does not change

D. Boiling point does not change

Answer: A

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5. Account for the following Ethylene glycol is added to radiator in automobiles.

A. Lowering in boiling point

B. Reducing viscosity

C. Reducing specific heat

D. Lowering in freezing point

Answer: D

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6. Equimolar solutions of non ionic non volatile solute in the same solvent have

A. Same boiling point but different freezing point

B. Same freezing point but different boiling point

C. Same boiling and same freezing points

D. Different boiling and different freezing points

Answer: C

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7. Which of the following liquid pairs shows a positive deviation from Raoult's law? 1.Water-nitric acid 2.Benzene-methanol 3.Water-hydrochloric acid 4.Acetone-chloroform

A. Water-nitric acid

B. Benzene-methanol

C. Water-hydrochloric acid

D. Acetone-chloroform

Answer: B

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

A. $0.01 M Na_2SO_4$

B. 0.015 M glucose

C. 0.015 M urea

D. 0.01 M KNO_3

Answer: A

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9. At the freezing point of a solution, there is equilibrium between

1.Liquid solvent, solid solvent 2.Liquid solvent, solid solute 3.Liquid solute, solid solute 4.Liquid solute, solid solvent

A. Liquid solvent, solid solvent

B. Liquid solvent solid solute

C. Liquid solute, solid solute

D. Liquid solute, solid solvent

Answer: A

10. Pick up the wrong statement: a)Deliquescent salts are highly soluble in water. b)Vapour pressure of water in hygroscopic substances in their solution state is lower than humidity of air. c)Efflorescent crystals have higher vapour pressure of water than humidity of air. d)For isotonic solution concentrations of two solutions must be always same.

   A. Deliquescent salts are highly soluble in water.

   B. Vapour pressure of water in hygroscopic substances in their solution state is lower than humidity of air.
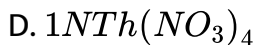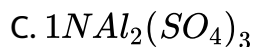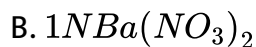
   C. Efflorescent crystals have higher vapour pressure of water than humidity of air.

D. For isotonic solution concentrations of two solutions must be always same.

Answer: D

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11. The solution having highest vapour pressure is :(Assume 100% ionisation of electrolytes)

A. $1NKNO_3$

B. $1NBa(NO_3)_2$

C. $1NAl_2(SO_4)_3$

D. $1NTh(NO_3)_4$

Answer: C

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12. Elevation in boiling point of an aqueous glucose solution is 0.6, K_b for water is 0.52 K molal^{-1}. The mole fraction of glucose in the solution is:

   A. 0.02

   B. 0.03

   C. 0.01

   D. 0.04

Answer: A

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13. The ratio of vapour pressures of two liquids A and B in pure state are 1:2. If the two liquids are mixed and the ratio of their mole

fraction in vapour phase are 2:1, the liquids A and B were mixed in the ratio of their mole: a)1 : 2 b)2 : 1 c)4 : 1 d)1 : 4

A. $1:2$

B. $2:1$

C. $4:1$

D. $1:4$

Answer: C

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14. An ideal solution has two components A and B. If A is more volatile than B and $P_A^\circ > P_T$, then the correct relation between mole fractions of A in liquid phase (X) and in vapour phase (Y) is:

A. $X_A = Y_A$

B. $X_A > Y_A$

C. $X_A < Y_A$

D. nothing can be said

Answer: C

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15. How many moles of $Th(NO_3)_4$ should be dissolved in 15 moles of water so that vapour pressure of water is reduced by 40%: a)1 b)2 c)3 d)4

A. 1

B. 2

C. 3

D. 4

Answer: B

16. An ideal solution contains two volalite liquids $A(P^{\circ}=100 \text{ tore})$ and $B(P^{\circ} = 200 \text{ torr}).$ If liquid mixture contains 1 mole of A and 4 mole of B then total vapour pressure of the mixture obtained by condensing the vapour above this solution in a beaker is :

A. 180

B. 188.8

C. 178.8

D. 198.8

Answer: B

17. 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 mole fraction of solute

C. the relative lowering of vapour pressure is proportional to the mass 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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18. 0.2 molal aqueous solution of acid HX is 20% ionised. $K_f = 1.86 \text{ K molal}^{-1}$. The freezing point of the solution is very close to:

A. $-0.45°C$

B. $-0.90°C$

C. $-0.31°C$

D. $-0.53°C$

Answer: A

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19. What mass of solute $\left(\text{molar mass}=60 \text{ g mol}^{-1}\right)$ should be dissolved in 180 g water to reduce the vapour pressure to $\frac{4}{5}$ th of pure water :

A. 120g

B. 175g

C. 150g

D. 100g

Answer: C

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20. Which of the following is the correct example of solid solution in which the solute is in gas phase?

A. Copper dissolved in gold

B. Camphor in nitrogen gas

C. Hydrogen in palladium

D. All of these

Answer: C

21. 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_2 from air dissolved in 10 mole 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

22. At $90°C$, the vapour pressure of toluene is 400 mm and that of xylene is 150 mm. The mole fraction of toluene in liquid mixture that boil at $90°C$ at a pressure of 0.5 atm is

A. 0.92

B. 0.86

C. 0.82

D. 0.73

Answer: A

23. The vapour pressure of pure benzene at $25°C$ is 639.7 mm of Hg and the vapour pressure of a solution of a solute in C_6H_6 at the same tempeature is 631.9 mm of Hg. Calculate molality of solution.

A. 0.372 mol/kg

B. 0.869 mol/kg

C. 0.635 mol/kg

D. 0.158 mol/kg

Answer: D

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24. Pure Benzene freezes at $5.4°C.$ A solution of 0.223 g of phenyl acetic acid $(C_6H_5CH_2COOH)$ in 4.4 g of benzene $\left(K_f = 5.12 \text{ K kg mol}^{-1}\right)$ freezes at $4.47°$ C. From this observation, one can conclude that

A. phenyl acetic acid exists as such in benzene

B. phenyl acetic acidundergoes partial ionization in benzene

C. phenyl acetic acid undergoes complete ionization in benzene

D. phenyl acetic acid dimerizes in benzene

Answer: D

25. The expression to compute molar mass of an ideal non volatile solute M_2 from the depression in freezing point mass of solute m_2, and mass of solvent m_1, is

A. $M_2 = \dfrac{1000K_f}{\triangle T_f} \dfrac{m_1}{m_2}$

B. $M_2 = \dfrac{\triangle T_f}{1000K_f} \dfrac{m_2}{m_1}$

C. $M_2 = \dfrac{\triangle T_f}{1000K_f} \dfrac{m_1}{m_2}$

D. $M_2 = \dfrac{1000K_f}{\triangle T_f} \dfrac{m_2}{m_1}$

Answer: D

26. What is the mole fraction of the solute in a 1m aqueous solution?

A. 0.177

B. 1.77

C. 0.0354

D. 0.0177

Answer: D

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27. A solution contains 441.0 gof H_2SO_4 in 1 L of solution. If the density of solution is 1.25 g mL^{-1}, the molarity and molality of the solution, respectively, are

A. 4.5 mol L^{-1} and 5.56 mol kg^{-1}

B. 4.5 mol L^{-1} and 4.5 mol kg^{-1}

C. 5.56 mol L^{-1} and 4.5 mol kg^{-1}

D. 5.56 mol L^{-1} and 5.56 mol kg^{-1}

Answer: A

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28. An aqueous solution of glucose containing 12 g in 100g of water was found to boil at $100.34°C$. Calculate K_b for water in K mol^{-1} kg.

A. 1.81

B. 1.02

C. 0.51

D. 0.82

Answer: C

29. 0.48g of a substance was dissolved in 10.6 g C_6H_6. The freezing point of benzene was lowered by $1.8°C$. Calculate molar mass of the substance. Molecular depression constant for benzene is $5K \; kg \; mol^{-1}$.

A. $153.6g \; mol^{-1}$

B. $125.79g \; mol^{-1}$

C. $251.6g \; mol^{-1}$

D. $89.42g \; mol^{-1}$

Answer: B

30. An aqueous solution of glucose boils at $100.01°C$. The molal elevation constant for water is $0.5\,\text{K}\,\text{mol}^{-1}\,\text{kg}$. What is the number of glucose molecules in the solution containing 100 g water?

A. 2.4×10^{21}

B. 2.4×10^{20}

C. 1.2×10^{21}

D. 1.2×10^{21}

Answer: C

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31. The molar mass of an organic compound is 58 g/mol. 24 g of this is dissolved in 600 g water, calculate its boiling point when vapour pressure of water becomes 760 mm. K_b of H_2O is $0.513\,\text{K}\,\text{kg}\,\text{mol}^{-1}$.

A. $99.371°C$

B. $100.354°C$

C. $102.07°C$

D. $98.37°C$

Answer: B

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32. Calculate the concentration of CO_2 in $molL^{-1}$ in a soft drink that is bottled with a partial pressure of CO_2 of 4 atm over the liquid at $25°C$. The Henry's law constant for CO_2 in water at $25°C$ is 3.1×10^{-2} mol/litre-atm.

A. 0.248

B. 0.326

C. 0.124

D. 0.186

Answer: C

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33. An azeotropic solution of two liquids has boiling point tower than' either of them when it

A. it is saturated.

B. it does not deviate from Raoult's law.

C. it shows negative deviation from Raoutl's law.

D. it shows positive deviation from Raoult's law.

Answer: D

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34. Calculate the relative lowering in V.P. if 10 g of a solute (molar mass 100) are dissolved in 180g water.

A. 0.99

B. 0.099

C. 9.9

D. 0.0099

Answer: D

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35. The solution that forms maximum boiling azeotrope is

A. carbon disulphide-acetone

B. benzene-toluene

C. acetone-chloroform

D. n-hexane-n-heptane

Answer: C

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36. The boiling point of $C_6H_6, C_6H_5NH_2, CH_3OH$ and $C_6H_5NO_2$, are $80°C, 184°C, 65°C$ and $212°C$ respectively. Which has higher vapour pressure at room temperature

A. C_6H_6

B. CH_3OH

C. $C_6H_5NH_2$

D. $C_6H_5NO_2$

Answer: B

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37. Three different solutions are prepared by dissolving 10 g each glucose, urea and sucrose in 250 mL water in separate containers. $P_1, P_2,$ and $P_3,$ are the respective osmotic pressures at 273K, the correct relation regarding $P_1, P_2,$ and $P_3,$ is

A. $P_1 > P_2 > P_3$

B. $P_3 > P_1 > P_2$

C. $P_2 > P_1 > P_3$

D. $P_2 > P_3 > P_1$

Answer: C

38. An antifreeze solution is prepared by mixing 217.0 g of ethylene glycol $(C_2H_6O_2)$ in 200g water. The molality of solution is

A. 15.5 mol kg^{-1}

B. 17.5 mol kg^{-1}

C. 18.5 mol kg^{-1}

D. 20.1 mol kg^{-1}

Answer: B

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39. The molality of an aqueous solution of methanol (CH_3OH) is 1.44 mol kg^{-1}. The mole fraction of methanol in the solution will be

A. 0.0253

B. 0.0213

C. 0.0273

D. 0.0198

Answer: A

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40. The density of 1.40 molal solution of acetic acid (CH_3COOH) is 1.084 g Ml^{-1}. The molarity of solution will be a)1.30M b)1.40M c)1.50M d)1.60M

   A. 1.30M

   B. 1.40M

   C. 1.50M

   D. 1.60M

Answer: B

41. Water saturated with air (20% 0, and 80% N) at 1 atm and 298 K contains 8.9 x 10^-3 g/ L dissolved oxygen. Its solubility under 25 atm pressure of will be a)8.9 × 10 − 3 g L − 1 b)1.1125 g L − 1 c)1.5642 g L − 1 d)1.834 × 10 − 2 g L − 1

    A. $8.9 \times 10^{-3} gL^{-1}$

    B. $1.1125 gL^{-1}$

    C. $1.5642 gL^{-1}$

    D. $1.834 \times 10^{-2} gL^{-1}$

Answer: B

42. Methanol $(p°=90 \text{ mm Hg at } 300 \text{ K})$ and ethanol $(p° = 51 \text{ mm Hg at } 300 \text{ K})$ form very nearly an ideal solution. The total vapour pressure of a solution obtained by mixing 23 g ethanol with 32g methanol would be

    A. 17 mmHg

    B. 60 mmHg

    C. 77 mmHg

    D. 82 mmHg

Answer: C

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43. A binary liquid solution exhibits positive deviation from ideal behaviour. Which of the following facts hold good? a)△ H mix > 0 and

$\triangle$ H mix < 0 b)$\triangle$ H mix < 0 and $\triangle$ G mix < 0 c)$\triangle$ H mix > 0 and $\triangle$ G mix > 0 d)$\triangle$ H mix < 0 and $\triangle$ G mix > 0

A. $\triangle H_{mix} > 0$ and $\triangle H_{mix} < 0$

B. $\triangle H_{mix} < 0$ and $\triangle G_{mix} < 0$

C. $\triangle H_{mix} > 0$ and $\triangle G_{mix} > 0$

D. $\triangle H_{mix} < 0$ and $\triangle G_{mix} > 0$

Answer: A

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44. The osmotic pressure of a solution containing 0.10g of haemoglobin in 10 cm of solution is 30 Torr at 300 K. The molar mass of haemoglobin is nearly

A. 4500 g mol^{-1}

B. 5452 g mol^{-1}

C. 6232 g mol^{-1}

D. 6932 g mol^{-1}

Answer: C

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45. The van't Hoff factor of solutes A, B and C in aqueous solutions are 0.8, 1.6 and 1.2, respectively. The freezing point of equimolar solutions follow the order

A. $A > B > C$

B. $A > C > B$

C. $B > A > C$

D. $B > C > A$

Answer: B

46. What mass of ethanol be added to 1.0kg water to have the mole fraction of ethanol equal to 0.202 a)63.89g b)6.39g c)638.89g d)683.89g

A. 63.89g

B. 6.39g

C. 638.89g

D. 683.89g

Answer: C

47. Which of following behaviours is not true for an ideal binary liquid solution?

A. Plot of p_A versus x_A, (mole fraction of A in liquid phase) is

linear

B. Plot of p_B versus x_B is linear

C. Plot of P_{total} versus x_A (or x_B) is linear

D. Plot of p_B versus x_A is linear

Answer: D

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48. An azeotropic solution of two liquids has boiling point tower than' either of them when it

A. shows negative deviation from Raoult's law

B. shows positive deviation from Raoult's law

C. shows no deviation from Raoult's law

D. is saturated

49. Which of the following solutions is expected to show positive deviations from Raoult's law? a)Pyridine-formic acid b)Ethanol-cyclohexane c)Acetone-chloroform d)Hydrochloric acid-water

A. Pyridine-formic acid

B. Ethanol-cyclohexane

C. Acetone-chloroform

D. Hydrochloric acid-water

50. The vapour pressure of water is 92.5 mm at 300 K. The V.P. of 1 molal aqueous solution of non volatile non electrolyte solute is

A. 90.86 mm

B. 87.32 mm

C. 69.50 mm

D. 53.21 mmZ

Answer: A

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Level Ii

1. The volumes of two HCl solutions A (0.5N) and B(0.1N) to be mixed for preparing 2 L of 0.2 NHCl are:

A. 0.5 L of A+1.5 L of B

B. 1.5 L of A +0.5 L of B

C. 1L of A+ 1 L of B

D. 0.75 L of A+1.25 L of B

Answer: A

2. The vapour pressure of pure benzene at $88°C$ is 957 mm and that of toluene at the same temperature is 379.5 mm. Calculate the composition of benzene toluene mixture boiling at $88°C$ at 1 atm pressure

A. $x_{\text{benzne}} = 0.66, x_{\text{toluene}} = 0.34$

B. $x_{\text{benzne}} = 0.34, x_{\text{toluene}} = 0.66$

C. $x_{\text{benzne}} = x_{\text{toluene}} = 0.5$

D. $x_{\text{benzne}} = 0.75, x_{\text{toluene}} = 0.25$

Answer: A

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3. Two solutions of glucose have osmotic pressures 1.5 and 2.5 atm. 1 litre of first solution is mixed with 2 litre of second solution. The osmotic pressure of the resultant solution will be:

A. 1.62 atm

B. 6.12 atm

C. 1.26 atm

D. 2.16 atm

Answer: D

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4. The temperature at which 10% (w/v) aqueous solution of glucose will exhibit the osmotic pressure of 16.4 atm, is:

$$\left(R = 0.082 \text{ dm}^3 \text{ atm K}^{-1}\text{mol}^{-1}\right)$$

A. $360^\circ C$

B. 180K

C. 360K

D. 300K

Answer: C

5. Which one of the statements given below concerning properties of solutions, describes a colligative effect? a)Boiling point of pure water decreases by the addition of ethanol b)Vapour pressure of pure water decreases by the addition of nitric acid c)Vapour pressure of

pure benzene decreases by the addition of naphthalene d)Boiling point of pure benzene increases by the addition of toluene

A. Boiling point of pure water decreases by the addition of ethanol

B. Vapour pressure of pure water decreases by the addition of nitric acid

C. Vapour pressure of pure benzene decreases by the addition of naphthalene

D. Boiling point of pure benzene increases by the addition of toluene

Answer: C

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6. When ethanol mixes in cyclohexane, cyclohexane reduces the intermolecular forces between ethanol molecules. In this, liquid pair shows

    A. positive deviation by Raoult's law

    B. negative deviation by Raoult's law

    C. no deviation by Raoult's law

    D. decrease in volume

Answer: A

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7. A solution of 1 molal concentration of a non volatile solute will have maximum boiling pointelevation when the solvent is

    A. Ethyl alcohol

B. Acetone

C. Benzene

D. Chloroform

Answer: D

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8. The molecular mass of acetic acid dissolved in water is less than 60 and when dissolved in benzene it is nearly 120. This difference in behaviour of CH_3COOH is because

A. acetic acid dissociates in water and associates in benzene

B. acetic acid does not fully dissolve in water

C. acetic acid fully dissolves in benzene but not in water

D. acetic acid ionize in benzene

Answer: A

9. 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 is non-ideal, showing negative deviation from Raoult's Law b)The solution is non-ideal, showing positive deviation from Raoult's Law c)n-heptane shows positive deviation while ethanol shows negative deviation from Raoult's Law d)The solution formed is an ideal solution

A. The solution is non-ideal, showing negative deviation from Raoult's Law

B. The solution is non-ideal, showing positive deviation from Raoult's Law

C. n-heptane shows positive deviation while ethanol shows negative deviation from Raoult's Law

D. The solution formed is an ideal solution

Answer: B

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

A. 90 g conc. HNO_3

B. 70 g conc. HNO_3

C. 54 g conc. HNO_3

D. 45 g conc. HNO_3

Answer: D

---

11. Azeotropic mixture of HCl in water contains

    A. 48% HCI

    B. 32.2% HCl

    C. 36% HCl

    D. 20.2% HCl

Answer: D

---

12. A liquid mixture containing two immiscible liquids, wate and an alkyl bromide $\left(\text{molar mass } 137 \text{ g mol}^{-1} \right)$ is distilled at $90° C$. The

ratio of the vapour pressure of water and alkyl bromide in the distillate is 5:1, the mass ratio of distillate is : a)1.52 : 1 b)0.657 : 1 c)1 : 5 d)5 : 1

A. $1.52 : 1$

B. $0.657 : 1$

C. $1 : 5$

D. $5 : 1$

Answer: B

13. The molal freezing point constant of water is $1.86 \ \mathrm{Km}^{-1}$. If 342 g of cane sugar $(C_{12}H_{22}O_{11})$ is dissolved in 1000 g of water, the solution will freeze at

A. $-1.86°C$

B. $1.86° C$

C. $-3.92° C$

D. $-2.42° C$

Answer: A

14. Dry air was passed successively through a solution of 5 g of a solute in 180 g of water and then through pure water. The loss in the weight of solution was 2.50 g and that of pure solvent 0.04 g. The molecular weight of the solute is.

A. 31.25

B. 3.125

C. 312.5

D. 0.3125

Answer: A

---

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

A. 0.186

B. 0.512

C. $\dfrac{0.512}{1.86}$

D. 0.0512

Answer: D

16. The vapour pressure of a solvent decreased by 10 mm of Hg when a non-volatile solute was added to the solvent. The mole fraction of solute in solution is 0.2, what would be the mole fraction of solvent if the decrease in vapour pressure is 20 mm of Hg.

    A. 0.8

    B. 0.6

    C. 0.4

    D. 0.2

Answer: B

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

A. 171.2

B. 68.4

C. 34.2

D. 136.2

Answer: B

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18. The mole fraction of component A in vapour phase is y_1, and mole fraction of component A in liquid mixture is $x_1 \left(P_A^\circ = \text{vapour pressure of pure A}, P_B^\circ = \text{vapour pressure of pure B} \right)$. Then total vapour pressure of the liquid mixture is

A. $\dfrac{P_A^\circ x_1}{y_1}$

B. $\dfrac{P_A^\circ y_1}{x_1}$

C. $\dfrac{P_B^\circ y_1}{x_1}$

D. $\dfrac{p_B^\circ x_1}{y_1}$

Answer: A

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19. The relative decrease in the vapour pressure of an aqueous solution containing 2 mol $[Cu(NH)_3CI]Cl$ in 3 mol 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

    A. 1 mol AgCl

    B. 0.25 mol AgCl

    C. 2 mol AgCl

    D. 0.40 mol AgCl

Answer: A

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20. A mixture of volatile components A and B has total vapour pressure (in torr) $P = 254 - 119\chi_A$

where χ_A is the mole fraction of Ain mixture. Hence, P_A° and P_B° are (torr)

    A. 254, 119

    B. 119, 254

    C. 135, 254

    D. 154, 119

Answer: C

21. '0.004 M' solution of 'Na_2 SO_4' is isotonic with '0.01 M' solution of glucose at, same temperature. The apparent degree of dissociation of 'Na_2 SO_4' is

A. 0.75

B. 0.5

C. 0.25

D. 0.85

Answer: A

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22. When 20 g of naphthoic acid $(C_2H_8O_2)$ is dissolved in 50 gofbenzene $(K_f=1.72 \text{ K kg mol}^{-1})$, a freezing point depression of 2 K is observed. The van't Hoff factor (i) is

A. 0.5

B. 1

C. 2

D. 3

Answer: A

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23. 25 mL of household bleach contains $CaClOCl_3$ was mixed with 30 mL of 0.50 MkI and 10 mL of 4 N acetic acid. In the titration of the liberated iodine, 48 mL of 0.25 N $Na_2S_2O_3$ was used to reach the end point. The molarity of the household bleach solution is a)0.48M b)0.96M c)0.24M d)0.024M

A. 0.48M

B. 0.96M

C. 0.24M

D. 0.024M

Answer: C

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24. 184 g ethyl alcohol is mixed with 72 gof water. The ratio of mole fraction of alcohol to water is

A. $3:4$

B. $1:2$

C. $1:4$

D. $1:1$

Answer: D

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25. The density (in gmL) of a 3.60 M sulphuric acid solution, that is, 29% H_2SO_4 $\left(\text{molar mass}=98 \text{ g mol}^{-1}\right)$ by mass will be

A. 1.45

B. 1.64

C. 1.88

D. 1.22

Answer: D

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26. A 5.25% (w/v) solution of a substance is isotonic with a 1.5%(w/v) solution of urea $\left(\text{molar mass}=60 \text{ g mol}^{-1}\right)$ in the same solvent. Molar mass of the substance will be

A. 210.0 g mol^{-1}

B. 90.0 g mol^{-1}

C. 115.0 g mol^{-1}

D. 105.0 g mol^{-1}

Answer: A

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27. How many grams of methyl alcohol should be added to 10L tank of water to prevent its freezing at 268 K? a)880.07 g b)899.04 g c)886.02 g d)868.06 g

A. 880.07 g

B. 899.04 g

C. 886.02 g

D. 868.06 g

Answer: C

28. If sodium sulphate is considered to be completely dissociated into cations and anions in aqueous solution, the change in freezing point of water $(\triangle T_f)$ when 0.01 mol of sodium sulphate is dissolved in 1 kg of water is $\left(\text{Given } K_f = 1.86\text{K mol}^{-1}\right)$

A. 0.0186 K

B. 0.0372 K.

C. 0.0558 K

D. 0.0744 K

Answer: C

29. The degree of dissociation (α) of a weak electrolyte, A_xB_y, is related to van't Hoff factor (i) by the expression

A. $\alpha = \dfrac{i-1}{x+y-1}$

B. $\alpha = \dfrac{x+y-1}{i-1}$

C. $\alpha = \dfrac{x+y+1}{i-1}$

D. $\alpha = \dfrac{i-1}{x+y+1}$

Answer: D

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30. 18 g of glucose $(C_6H_{12}O_6)$ is added to 178.2g of water. The vapour pressure of water for this aqueous solution at $100°C$ is

A. 7.60 Torr

B. 76.00 Torr

C. 752.40 Torr

D. 1

Answer: C

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31. 6.02 x 10^21' molecules of urea are present in 100 'mL' of its solution. "The concentration of urea solution is -

A. 0.02M

B. 0.01M

C. 0.001M

D. 0.1M

Answer: B

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

A. 4.8×10^5

B. 9×10^5

C. 3×10^5

D. 5.17×10^6

Answer: D

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33. Which statement about the composition of vapour over an ideal 1:1 molar mixture of benzene and toluene is correct? Assume the

temperature is constant at $25°C$.

Benzene 75 mm Hg

Toluene 22 mm Hg

    A. The vapour will contain higher percentage of benzene

    B. The vapour will contain higher percentage of toluene

    C. The vapour will contain equal amount of benzene and toluene

    D. Not enough information is given to make a prediction

Answer: A

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34. On mixing, heptane and octane form an ideal solution. At 373 K, the vapour pressures ofheptane 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 is very close to

A. 144.5 kPa

B. 72.0 kPa

C. 36.1 kPa

D. 96.2 kPa

Answer: B

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35. pH of a 0.1 M weak monobasic acid is measured to be 2. Its osmotic pressure at a given temperature

A. 0.1RT

B. 0.11RT

C. 1.1RT

D. 0.01RT

Answer: B

36. Lowering of vapour pressure in 1 molal aqueous solution of non volatile non electrolyte solute at $100°C$ is:

    A. 13.44 mm Hg

    B. 14.12 mm Hg

    C. 31.2 mm Hg

    D. 35.2 mm Hg

Answer: A

37. A solution containing 0.1 g of a non-volatile organic substance P (molecular mass 100) in 100 g of benzene raises the boiling point of benzene by $0.2°C$, while a solution containing 0.1 gof another non-volatile subistance Q in the same amount of benzene raises the boiling point of benzene by $0.4°C$. What is the ratio of molecular masses of P and Q?

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: B

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38. The vapour pressure of water at T(K) is 20 mm Hg. The following solutions are prepared at T(K):

I. 6g of urea (mol.wt.=60) is dissolved in 178.2 g of water.

II. 0.01 mole of glucose is dissolved in 179.82 g of water.

III. 5.3 g of Na_2CO_3 (mol.wt. =106) is dissloved in 179.1 g of water.

Identify the correct order in which the vapour pressures of solutions increase:

   A. III,I,II

   B. II,III,I

   C. I,II,III

   D. I,III,II

Answer: A

39. A sample of liquid H_2O of mass 18.0 g is injected into an evacuated 7.6 L flask maintained at $27°C$. If vapour pressure of H_2O at $27°C$ is 24.63 mm Hg, what weight percentage of the water will be vapourised when the system comes to equilibrium? Assume water vapours behaves as an ideal gas. The volume occupied by the liquid water is negligible compared to the volume of the container:

A. 0.01

B. 0.1

C. 0.18

D. 0.2

Answer: A

40. Equal weight of a certain non volatile non electrolyte solute is dissolved in equal weight of two solvents A and B to form very dilute solution. The relative lowering of vapour pressure for solution B is twice the relative lowering ofvapour pressure for solution A. M_A and M_B are the molecular mass of solvents A and Brespectively, then: a)M A = M B b)M B = 2 × M A c)M A = 4 M B d)M A = 2 M B

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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41. One mole of a solute Ais dissolved in a given volume of a solvent. The association of the solute takes place as follows:

$nA \Leftrightarrow A_n I f$ alpha` is the degree of association of A the van't Hoff factor i is expressed as:

A. $i = 1 - \alpha$

B. $i = 1 + \dfrac{\alpha}{n}$

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

D. $i = 1$

Answer: C

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42. A very dilute saturated aqueous solution of a sparingly soluble salt X_3Y_4, has a vapour pressure of 20 mm Hg at temperature T,

while pure water exerts a pressure of 20.0126 mm Hg at the same temperature. Calculate molality (m) at temperature T:
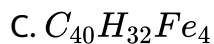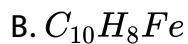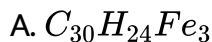
A. 6.3×10^{-4}

B. 3.5×10^{-2}

C. 5×10^{-3}

D. 8.2×10^{-2}

Answer: C

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

A. $C_{30}H_{24}Fe_3$

B. $C_{10}H_8Fe$

C. $C_{40}H_{32}Fe_4$

D. $C_{20}H_{16}Fe_2$

Answer: D

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44. A solution containing 100g ethylene glycol in 500g water is cooled to $-6.2°C$. The amount of ice that will separate out will be $\left(K_f \text{for water}=1.86\text{K kg mol}^{-1}\right)$

A. 100.8g

B. 38.7g

C. 16.1g

D. 41.1g

Answer: C

45. The temperature of a city was found to be $-9.3°C$. A car was used, whose radiator was filled with 5 L of water. What quantity of antifreczing agent ethylene glycol were added to water of radiator in order to use the car for travelling? $\left(\text{K of water } 1.86 \text{ K kg mol}^{-1} \right)$

A. 3200g

B. 1670g

C. 1550g

D. 2100g

Answer: C

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46. The osmotic pressures of 0.010 M solutions of KI and of sucrose $(C_{12}H_{22}O_{11})$ are 0.432 atm and 0.24 atm respectively. The vant's Hoff factor for KI is:

A. 1.8

B. 0.8

C. 1.2

D. 1

Answer: A

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47. At 300 K, 40 mL of O_3, (g) dissolves in 100 g of water at 1.0 atm. What mass of ozone dissolves in 400 g of water at a pressure of 4.0 atm at 300 K is nearly

A. 0.1g

B. 1.25g

C. 0.5g

D. 5g

Answer: D

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48. Two beakers A and B are present in a closed vessel. Beaker A contains 152.4 g aqueous solution of urea containing 12 gofurea. Beaker B contains 196.2 g glucose solution, containing 18 gof glucose. Both solutions are allowed to attain equilibrium. Determine the w.t.% of glucose in it's solution at equilibrium:

A. 6.71

B. 14.49

C. 16.94

D. 20

Answer: B

---

49. A 0.10 M aqueous solution of a monoprotic acid $\left(\text{d}=1.01 \text{ g/cm}^3\right)$ is 5% ionized. What is the freezing point of the solution? The mol.wt. of the acid is 300 and $K_{f(H_2O)} = 1.86°C/m$:

A. $-0.189°C$

B. $-0.194°C$

C. $-0.199°C$

D. $-0.173°C$

Answer: C

50. 1.0 g of a weak monobasic acid HA in 100 g water lowers the freezing point by 0.155 K. If 0.45 g, of same acid requires 15 mL of N/5 NaOH solution for complete neutralistion then %, degree ofionization of acid is $\left(K_f \ \text{of} \ H_2O = 1.86 \ \text{K kg mol}^{-1}\right)$. a)0.2 b)0.25 c)0.4 d)0.5

    A. 0.2

    B. 0.25

    C. 0.4

    D. 0.5

Answer: B

1. Assertion : If a liquid solute more volatile than the solvent is added to the solvent, the papour pressure of the solution may increase i.e. $p_s > p^\circ$.

Reason In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

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2. Assertion : The solubility of a gas in a liquid increases with increase of pressure.

Reason : The solubility of a gas in a liquid is directly proportional to the pressure of the gas. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

   A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

   B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

   C. If (A) is correct, but (R) is incorrect.

   D. If both (A) and (R) are incorrect.

Answer: A

3. Assertion : Higher the value of molal depression constant of solvent (K) used to prepare the solution, lower will be the freezing point of the solution.

Reason : Depression in freezing point depends upon the nature of the solvent. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

4. Assertion : Iodine is more soluble in CI_4 than in water.

Reason : Non-polar solutes are more soluble in non-polar solvents.

a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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5. Assertion : Larges the value of cryoscopic constant of the solvent lesser will be the freezing point of the solution

Reason : Depression in the freezing point depends on the nature of the solvent. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct
   explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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6. Assertion : Sodium chloride is used to clear snow on the roads.

Reason : Sodium chloride depresses the freezing point of water. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

A. If both (A) and (R) are correct and (R) is the correct explanation

of(A).

B. If both (A) and (R) are correct, but (R) is not the correct

explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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7. Assertion : The elevation in boiling point fortwo isotonic solutions

may not be same.

Reason : The boiling point depends upon the concentration of the

solute. a)If both (A) and (R) are correct and (R) is the correct

explanation of(A). b)If both (A) and (R) are correct, but (R) is not the

correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: D

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8. Assertion : At equilibrium, vapour phase will be always rich in component which is more volatile.

Reason : The composition of vapour phase in equilibrium with the

solution is determined by the partial pressures of the components. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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9. Assertion : In an ideal solution $\triangle H_{\text{mix}}$ is zero.

Reason : In an ideal solution, A-B interactions are lower than A-A and B-B interactions. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

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10. Assertion : Lowering of vapour pressure is not dependent on the number of species present in the solution.

Reason : Lowering of vapour pressure and relative lowering of vapour pressure are colligative properties. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

   A. If both (A) and (R) are correct and (R) is the correct explanation

      of(A).

   B. If both (A) and (R) are correct, but (R) is not the correct

      explanation of (A).

   C. If (A) is correct, but (R) is incorrect.

   D. If both (A) and (R) are incorrect.

Answer: D

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11. Assertion : Molecular mass of KCl calculated on the basis of colligative properties will be lower than the normal molecular mass.

Reason : Experimentally determined molar mass is always lower than the true value. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

12. Assertion : The observed molar mass of acetic acid in benzene is more than the normal molar mass of acetic acid.

Reason : Molecules of acetic acid dimerise in benzene due to hydrogen bonding. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

   A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

   B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

   C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

13. Assertion : Osnosis involves movement of solvent molecules from its lower concentration to its higher concentration.

Reason : Solutions having the same osmotic pressure are called isotonic solutions.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: B

14. Assertion : Reverse osmosis is used to purify sea water.

Reason : Solvent molecules pass from concentrate solution solvent through seipermeable membrane if pressure higher than osmotic pressure is applied on solution side.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: B

15. Assertion : The molecular weight of acetic acid determined by depression in freezing point method in benzene and water was found to be different. Reason : water is polar and Benzene is non polar a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

    A. If both (A) and (R) are correct and (R) is the correct explanation

      of(A).

    B. If both (A) and (R) are correct, but (R) is not the correct

      explanation of (A).

    C. If (A) is correct, but (R) is incorrect.

    D. If both (A) and (R) are incorrect.

Answer: A

16. Assertion : If red blood cells were removed from the body and placed in pure water, pressure the cell increases.

Reason : The concentration of the salt content in the cells increases.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

17. Assertion : The solution of carbon tetrachloride in heptane shows positive deviation from Raoult's law.

Reason : The forces of attraction between unlike molecules are stronger than those between like molecules in the solution.

    A. If both (A) and (R) are correct and (R) is the correct explanation

       of(A).

    B. If both (A) and (R) are correct, but (R) is not the correct

       explanation of (A).

    C. If (A) is correct, but (R) is incorrect.

    D. If both (A) and (R) are incorrect.

Answer: C

18. Assertion : The boiling point of chloroform-acetone solution is larger than expected from ideal behaviour.

Reason : The forces of attraction between unlike molecules are stronger than those between like molecules in the solution. This results in lower vapour pressure as compared to an ideal solution which is responsible for the higher boiling point.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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19. Assertion : The Van't Hoff factor for a weak electrolyte in water is dependent of its concentration.

Reason : The degree of dissociation of a weak electrolyte increases on dilution.

A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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20. Assertion : Molecular mass of polymers cannot be calculated using boiling point or freezing point method.

Reason : Polymer solutions do not possess a constant boiling point or freezing point. a)If both (A) and (R) are correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but (R) is not the correct explanation of (A). c)If (A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

    A. If both (A) and (R) are correct and (R) is the correct explanation of(A).

    B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

    C. If (A) is correct, but (R) is incorrect.

    D. If both (A) and (R) are incorrect.

Answer: C

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Question Level I Homework

1. Which of the following is a solid in solid solution

A. glocose in water

B. camphor in N_2

C. copper dissolved in gold

D. Amalgam of mercury with sodium

Answer:

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2. From the following, select the temperature independent concentration

A. Molarity

B. Normality

C. Molality

D. Volume %

Answer:

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3. 5L of a solution contains 25 mg of $CaCO_3$. What is its concentration in ppm? (Mol wt. of $CaCO_3$ is 100)

A. 25

B. 1

C. 5

D. 2500

Answer:

4. An'X' molal solution of a compound in benzene has mole fraction

of solute equal to 0.2 The value of 'X' is nearly

A. 3.2

B. 2

C. 4

D. 3.6

Answer:

5. The volume of water to be added to $100cm^3$ of $0.5NH_2SO_4$ to get decinormal concentration is

    A. $400cm^3$

    B. $450cm^3$

    C. $500cm^3$

    D. $100cm^3$

Answer:

6. $60ml$ of $\dfrac{N}{5}H_2SO_4$, 100 ml of $\dfrac{N}{2}HNO_3$ and 30 ml of $\dfrac{N}{10}HCl$ are mixed together. The strength of the resulting mixture is

    A. 0.1 N

    B. 0.2N

C. 0.3N

D. 0.4N

Answer:

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7. What will be the volume of 0.01 M HCl required to completely react with 4gNaOH

A. 100ml

B. 10ml

C. 1000ml

D. 10,000ml

Answer:

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8. Which among the following will greatly deviate from Henry's law in water

    A. H_2

    B. N_2

    C. CH_4

    D. CO_2

Answer:

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9. The composition of gases in oxygen cylinder of Scuba divers

    A. 11.7%He, 32.1%N_2, 56.2%N_2

    B. 32.1%N_2, 56.2% He,11.7%O_2
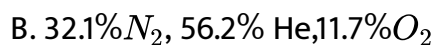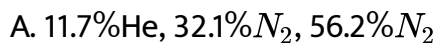
C. 11.7%He,56.2%N_2,32.1%O_2

D. 11.7%O_2, 56.2%N_2, $32.1\% \ He$

Answer:

10. Vapour pressure of liquid depend only on

    A. Surface area of liquid

    B. Temperature

    C. Nature of liquid

    D. Both 2 and 3

Answer:

11. An aqueous solution is 1 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 molal KI

Answer:

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12. Raoult's law is obeyed by each constitutent of a 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 lilke 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:

13. No solution with a vapour pressure can be prepare when

nonvolatile solute is added in a pure solvent having vapour pressure

in equal to 520 mm of Hg

A. 320 mm of Hg

B. 530 mm of hg

C. 270 mm of Hg

D. 510 mm of Hg

Answer:

14. Which of the following will show negative deviation from Raoult's law

A. alcohol + water

B. benzene +cyclohexane

C. acetone + chloroform

D. chlorobenzene + bromobenzene

Answer:

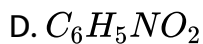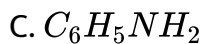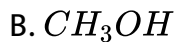**15.** $\dfrac{P^{\circ} - P_s}{P^{\circ}} = X_B$ is known as mathematical expression of

A. a. Henry's law

B. b. Raoult's law

C. c.Dalton's law

D. d. vant Hoff's rule

Answer:

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16. The boiling point of $C_6H_6, C_6H_5NH_2, CH_3OH$ and $C_6H_5NO_2,$ are $80^{\circ}C, 184^{\circ}C, 65^{\circ}C$ and $212^{\circ}C$ respectively. Which has higher vapour pressure at room temperature

A. C_6H_6

B. CH_3OH

C. $C_6H_5NH_2$

D. $C_6H_5NO_2$

Answer:

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17. Among the following which is not a colligative property ? a) Osmotic pressure b) Elevation of boiling point c) Vapour of boiling point d) Depression in freezing point

    A. Vapour pressure

    B. Depression in F.P

    C. Elevation in B.P

    D. Osmotic pressure

Answer:

---

18. Which of the following pairs of solutions can be separated into its

pure components by fractional distillation

A. Benzene -toluene

B. $H_2O - HNO_3$

C. $H_2O - HCl$

D. Acetone-chloroform

Answer:

19. The vapour pressure of pure liquid A is 10 torr and at the same temperature , when 1 g, of B is dissolved in 20 g of A, its vapour pressure reduced by 1 torr. If the mol wt.of A is 200 u, then the molecular weight of B is

A. 180u

B. 90u

C. 75u

D. 120u

Answer:

20. When 1 mole of a solute is dissolved in 1 kg of H_2O, boilling point of solution was found to be $100.5^0 C.K_b$ for H_2O is

A. 0.5

B. 100

C. 100.5

D. 95.5

Answer:

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

A. A. solid solvent $\Leftrightarrow$ liquid solvent

B. B. solid solute $\Leftrightarrow$ liquid solution

C. C. solid solute $\Leftrightarrow$ liquid solvent

D. D. solid solvent $\Leftrightarrow$ liquid solution

Answer:

22. Which has the least freezing point

    A. 1% sucrose

    B. 1% NaCl

    C. 1% $CaCl_2$

    D. 1% glucose

Answer:

23. Camphor is often used in molecular mass determination because

A. It isreadily available and chep

B. It has a very high cryopscopic constnat

C. It is volatile

D. it is a solvent for organic substances

Answer:

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24. Among the following which one of the aqueous solutions has highest boiling point?

A. 0.1 molar sugar solution

B. 0.1 molar glucose solution

C. 0.1 molar urea solution

D. 0.1 molar NaCl solution

Answer:

25. Which of the following colligative properties can provide molar mass of proteins (or polymers or colloids with great precision)

A. $\dfrac{\Delta P}{P_A^\circ}$

B. ΔT_b

C. ΔT_f

D. π

Answer:

26. For an ideal solution, which is less than zero

A. ΔH_{mix}

B. ΔS_{mix}

C. ΔV_{mix}

D. ΔG

Answer:

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27. The order of boiling points of four equimolar aqueous solutions is $C < B < A < D.$ The correct order of their freezing points is

A. $D < C < B < A$

B. $D > C > B > A$

C. $D < B > A < C$

D. $D < A < B < C$

Answer:

28. Among the following select the artificial semipermeable membrane

A. A. Parchment paper

B. B.Cellophane membrane

C. C.Copper ferrocyanide

D. D. All of the above

Answer:

29. 0.1 M NaCl and 0.05 $MBaCl_2$ solutions are separated by a semipermeable membrane in a container. For this system, choose the correct answer

    A. There is no movement of any solution across the membrane

    B. Water flows from $BaCl_2$ solution towards NaCl solution

    C. Water flows from NaCl solution towards $BaCl_2$ solution

    D. Osmotic pressure of 0.1 M NaCl is lower than the osmotic pressure of $BaCl_2$ (Assume complete dissociation)

Answer:

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30. Isotonic solutions are solutions having the same

    A. A. Surface tension

B. B. Vapour pressure

C. C.osmotic pressure

D. D.Viscosity

Answer:

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31. What happens when an egg is kept in saturated solution of NaCl after removing its hard shell in dil. HCl?

A. Egg will swell

B. Egg will shrink

C. Egg will remain same

D. Egg will shrink and then swell.

Answer:

32. How are osmotic pressures of 6% urea (π_1) and 6% glucose (π_2) related to each other

A. $\pi_1 > \pi_2$

B. $\pi_1 < \pi_2$

C. $\pi_1 = \pi_2$

D. $\pi_1 = 1/\pi_2$

Answer:

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

A. $AlCl_3 > BaCl_2 >$ urea

B. $BaCl_2 > AlCl_3 >$ urea

C. urea $> BaCl_2 > AlCl_3$

D. $BaCl_2 >$ urea $> AlCl_2$

Answer:

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34. 0.5 molal aqueous solutionis of each of KCl, $MgCl_2$ and $FeCl_3$ have freezing points T_1, T_2 and T_3 respectively. Which of the following is correct?

A. $T_1 > T_2 > T_3$

B. $T_3 > T_2 > T_1$

C. $T_2 > T_1 > T_3$

D. $T_1 > T_3 > T_2$

Answer:

---

35. Van't Hoff factor of $Ca(NO_3)_2$ is (100% dissociation)

A. 1

B. 2

C. 3

D. 4

Answer:

---

36. 0.2 molal aqueous solution of acid HX is 20% ionised. $K_f = 1.86 \text{ K molal}^{-1}$. The freezing point of the solution is very

close to:

A. $-0.45°C$

B. $-0.90°C$

C. $-0.31°C$

D. $-0.53°C$

Answer:

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37. The freezing point of a solution of acetic acid (mole fraction is 0.02) in benzene is 277.4 K. Acetic acid exists partly as a dimer $2A \Leftrightarrow A_2$ Determine the equilibrium constant for dimerisation. Freezing point of benzene is 278.4 K (K_f for benzene is 5)

A. $3.39 kg \mathrm{mol}^{-1}$

B. $33.9 kg \mathrm{mol}^{-1}$

C. $1.68 kg\mathrm{mol}^{-1}$

D. $16.8 kg\mathrm{mol}^{-1}$

Answer:

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38. 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 $MMgCl_2$

C. 0.1M NaCl and $0.1 Na_2SO_4$

D. $0.1 Ca(NO_3)_2$ and $0.1 M Na_2SO_4$

Answer:

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39. Concentrated nitric acid used in laboratory work is 68% nitric acid by mass in aqueous solution. What should be the molarity of such a sample of the acid if the density of the solution is $1.504gML^{-1}$?

A. 1.623M

B. 16.23M

C. 162.3M

D. 0.1623M

Answer:

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40. The boiling point elevation constant of toluene is 3.32K kg mol^{-1} and the normal boiling point of toluene is $110.7°C$. The enthalpy of vaporisation of toluene would be nearly

A. $17.0 kJmol^{-1}$

B. $34.0 kJmol^{-1}$

C. $51.0 kJmol^{-1}$

D. $68.0 kJmol^{-1}$

Answer:

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41. At 300 K 36 g of glucose present in a litre of its solution has osmotic pressure of 4.98 bar. If the osmotic pressure of the solution is 1.52 bars at the same temperature, what would be its concentration?

A. 0.061M

B. 0.61M

C. 0.0061M

D. 6.1M

Answer:

42. The ratio of the value of any colligative property of KCl solution to that for sugar is nearly.............times

A. 1

B. 0.5

C. 2

D. 2.5

Answer:

43. When 0.6 g of urea dissolved in 100 g of water water will boil at (K_b for water $0.52kJmol^{-1}$ and normal boiling point of water $= 100°C$)

   A. 373.052K

   B. 273.52K

   C. 372.48K

   D. 273.052K

Answer:

44. 1.0 molal aqueous solution of an electrolyte X_3Y_2 is 25% Ionised. The boiling point in the solutioin is (K_b for $H_2O = 0.52K$ kg mol)

   A. 375.5K

B. 374.04K

C. 377.12K

D. 373.25K

Answer:

45. Dry air was passed successively through a solution of 5 g of a solute in 180 g of water and then through pure water. The loss in the weight of solution was 2.50 g and that of pure solvent 0.04 g. The molecular weight of the solute is.

A. 31.25

B. 3.125

C. 312.5

D. None of these

Answer:

46. The value of observed and calculated molecular weights of silver nitrate are 92.64 and 170 respectively. The degree of dissociation of silver nitrate is

A. 0.6

B. 0.835

C. 0.467

D. 0.6023

Answer:

47. Benzene and naphthalene form ideal solution over the entire range of composition. The vapour pressure of pure benzene and naphthalene at 300 K are 50.71 mm Hg and 32.06 mm Hg respectively. What will be themole fraction of benzene in vapour phase if 80 g of benzene is mixed with 100 g of naphthalene?

A. 0.0675

B. 0.675

C. 0.35

D. 0.5

Answer:

48. 100 g of liquid A (molar mass $140 gmol^{-1}$) was dissolved in 1000 g of liquid B (molar mass 180 $gmol^{-1}$) . The vapour pressure of pure

liquid B was found to be 500 torr. What will be the vapour pressure of pure liquid A and its vapour pressure in the solution respectively if the total vapour pressure of the solution is 475 torr?

A. 28.7 torr and 32 torr

B. 280.7 torr and 32 torr

C. 38.7 torr and 3.2 torr

D. 280.7 torr and 3.2 torr

Answer:

Question Level Ii

1. A certain sample of well water contains 0.1% Ca^{2+} (w/w). The concentration of Ca^{2+} in the water, expressed as ppm is

A. 10^{-1}

B. 10

C. 100

D. 1000

Answer:

2. Dissolving 120 g of urea (mol wt . 60) in 1000 g of water gave a solution of densit 1.15 g/mL. The molarity of the solution is

A. 1.78M

B. 2M

C. 2.05M

D. 2.22M

Answer:

3. Equal volumes of 0.1 $M AgNO_3$ and 0.1 M NaCl solutions are mixed. The concentration of NO_3^- in the mixed solution is

A. 0.1M

B. 0.05M

C. 0.2M

D. 0.15M

Answer:

4. The mole fraction of benzene in a solution with toluene is 0.5. The mass % of benzene in the solution is

    A. 0.46

    B. 0.31

    C. 0.25

    D. 0.75

Answer:

5. A compound H_2X with molecular weight 80 is dissolved in a solvent having densit 0.4 g/mL. Assuming no change in volume upon dissolution, the molality of a 3.2 molar solution is

    A. 6

B. 8

C. 2

D. 3

Answer:

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6. Which of the following has highest Henry's constant `(K_(H)/kbar)

at 293 K

A. Ar

B. CO_2

C. $HCHO$

D. CH_4

Answer:

7. The mole fraction of helium in a saturated solution at $0°C$ is 1.2×10^{-6}. Find the pressure of helium above the solution. Henry's law constant is $6.8 \times 10^{-6} \text{atm}^{-1}$

A. 1.176atm

B. 0.716atm

C. 0.176atm

D. 0.567atm

Answer:

8. 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_2 from air dissolved in 10 mole of water at 298 K and 5 atm pressure is:

A. 4×10^{-4}

B. 4×10^{-5}

C. 5×10^{-4}

D. 4×10^{-6}

Answer:

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9. At $80°C$ the vapour pressure of pure liquid A is 520 mm Hg and that of pure liquid B is 1000 mm Hg. If a mixture solution of A and B boils at $80°C$ and 1 atm pressure, then amount of A in the mixture is

A. 48 mol percent

B. 50 mol percent

C. 52 mol percent

D. 34 mol percent

Answer:

---

10. Plot of $P_{\text{total}} VS X_B$ should be straight line in the case of ideal solution. The slope is

A. P_{total}

B. P_A°

C. P_B°

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

Answer:

11. A solution has a 1:4 mole ratio of pentane to hexane. The vapour pressure of the pure hydrocarbon at $30°C$ are 440 mm Hg for pentane and 120 mmHg for hexane. The mole fraction of pentane in the vapour phase at $30°C$ is

A. 0.2

B. 0.478

C. 0.549

D. 0.786

Answer:

12. If two substances A and B have $P_A^\circ : P_B^\circ = 1:2$ and have a mole fraction in solution 1:2, then mole fraction of A in vapours is

A. 0.33

B. 0.25

C. 0.52

D. 0.2

Answer:

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13. At a given temperature total vapour pressure (in torr) of a mixture of volatile compounds A and B given by $P_{\text{total}} = 120 - 75X_B$. Hence, vapour pressure of pure A and B respectively (in torr) are

A. 120,75

B. 120195

C. 120,45

D. 75,45

Answer:

---

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

A. a. $\Delta H_{\text{mix}} = -ve, \Delta G_{\text{mix}} = +ve, T\Delta S_{\text{mix}} = 0$

B. b. $\Delta H_{\text{mix}} = 0, \Delta G_{\text{mix}} = +ve, T\Delta S_{\text{mix}} = -ve$

C. c.$\Delta H_{\text{mix}} = 0, \Delta G_{\text{mix}} = -ve, T\Delta S_{\text{mix}} = +ve$

D. d. $\Delta H_{\text{mix}} = -ve, \Delta G_{\text{mix}} = 0, T\Delta S_{\text{mix}} = +ve$

Answer:

15. An ideal solutioni is formed by mixing two volatile liquids A and Bl. A plot of $\dfrac{1}{Y_A}$ along Y axis against $\dfrac{1}{X_A}$ along x axis gives a straight line. What is the slope of the straight line? (X_A mole fraction of A in solution, Y_A mole fraction of A in vapour phase)

A. $\dfrac{P^{\circ}B}{P^{\circ}A}$

B. $\dfrac{P^{\circ}A}{P^{\circ}B}$

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

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

Answer:

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16. The amount of solute (mol. Mass=60) that must be added to 180 g of water so that the vapour pressure of water is lowered by 10% is

A. 30g

B. 60g

C. 120g

D. 12g

Answer:

17. The vapour pressure of pure water at a given temperature is 500

torr. When 0.1 mol of a normal non volatile solute is dissolved in 9.9

moles of water at this temperature, the lowering of vapour presure

produced is

A. 5

B. 10

C. 25

D. 30

Answer:

---

18. The molal b.pconstant '(fK_h)' for water is '0.513^circ C' kgmol". When 0.1 mole of sugar is dissolved 'in '200 ~g' of water, the solution boils under a pressure of 1 atm. At

   A. $100.513°C$

   B. $100.0513°C$

   C. $100.256°C$

   D. $101.025°C$

Answer:

19. A solution of 1 molal concentration of a non volatile solute will have maximum boiling pointelevation when the solvent is

A. ethyl alcohol $(K_b = 1.23)$

B. acetone $(K_b = 1.80)$

C. benzene $(K_b = 2.64)$

D. chloroform $(K_b = 3.8)$

Answer:

20. Equal volumes of ethylene glycol and water are mixed. The depression in freezing point of water is $(K_f$ of water $=1.86$ and specific gravity of ethylene glycol is 1.11)

A. 0.0033

B. 3.33

C. 0.333

D. 33.33

Answer:

---

21. A solution containing 50 g of ethylene glycol in 200 g water is cooled to $-9.3°C$. The amount of ice that will separate out will be (K_f of water $= 1.86 KKg\text{gmol}^{-1}$)

A. 18.71g

B. 28.71g

C. 38.71g

D. 48.71g

Answer:

22. $75.2 g C_6 H_5 OH$ is dissolved in 1 kg of solvent of $K_f = 14 K kg \text{mol}^{-1}$. If the depression in freezing point is 7K, then find the percentage of dimerisation of phenol

A. 7.5

B. 55

C. 75

D. 85

Answer:

23. '0.004 M' solution of 'Na_2 SO_4' is isotonic with '0.01 M' solution of glucose at, same temperature. The apparent degree of dissociation of 'Na_2 SO_4' is

A. 0.25

B. 0.5

C. 0.75

D. 0.85

Answer:

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24. For a week monobaisc acid, if $pKa = 4$, then at a concentration of 0.01 M of the acid solution, the vant Hoff factor is

A. 1.01

B. 1.02

C. 1.1

D. 1.2

Answer:

25. Acetic acid is associated in benzene to form dimer and the percentage of association is 74%. The vant Hoff factor is

A. 0.69

B. 0.63

C. 0.6

D. 0.57

Answer:

26. A 0.6% solution of urea would be isotonic with

    A. 0.1 M glucose

    B. 0.1 M KCl

    C. 0.6% glucose solution

    D. 0.6% KCl solution

Answer:

27. In the depression of freezing point experiment it is found that

(i) The vapour pressure of the solution is less than that of pure solvent

(ii) The vapour pressure of the solution is more than that of pure

solvent

(iii) Only solute molecules solidify at the freezing point

(iv) Only solvent molecules solidify at the freezing point

A. I,ii

B. ii,iii

C. I,iv

D. I,ii,iii

Answer:

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28. When 20 g of naphthoic acid $(C_2H_8O_2)$ is dissolved in 50 gofbenzene $(K_f=1.72 \, \text{K kg mol}^{-1})$, a freezing point depression of 2 K is observed. The van't Hoff factor (i) is

A. 0.5

B. 1

C. 2

D. 3

Answer:

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29. The freezing point of equimolal aqueous solution will be highest

for

A. $C_6H_5NH_3Cl$ (aniline hydrochloride)

B. $Ca(NO_3)_2$

C. $La(NO_3)_3$

D. $C_6H_{12}O_6$(glucose)

Answer:

30. 0.2 molal aqueous solution of acid HX is 20% ionised. $K_f = 1.86 \text{ K molal}^{-1}$. The freezing point of the solution is very close to:

A. $-0.45°C$

B. $-0.90°C$

C. $-0.31°C$

D. $-0.53°C$

Answer:

31. KI and sucrose solutions with 0.1 m concentration have osmotic presure of 0.465 atm and 0.245 atm respectively find α of KI

A. 0.998

B. 0.898

C. 0.798

D. 0.86

Answer:

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32. Study the following figure and pick out the correct option (s)

A. A white precipitate of AgCl is formed of $AgNO_3$ side

B. A white precipiate of Agcl is formed on $BaCl_2$ side

C. No precipitate is formed on either side

D. Precipitate is formed on either side

Answer:

---

33. The freezing point (in $^\circ C$) for a solution containing 0.1 g of $K_3\left[Fe(CN)_6\right]$ (mol wt 329) in 100 g water $\left(K_f = 1.86 K kg\mathrm{mol}^{-1}0\right.$ is

    A. -2.3×10^{-2}

    B. -5.7×10^{-2}

    C. -5.7×10^{-3}

    D. -1.2×10^{-2}

Answer:

34. If boiling point of an aqueous solution is $100.1°C$, its freezing point is (I_f of water =80 cal/g I_v of water =540 cal/g)

   A. $-0.362°C$

   B. $-362°C$

   C. $-3.62°C$

   D. $-1.8°C$

Answer:

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35. osmotic pressure of 40% urea solution is 1.64 atm and that of 3.42% cane sugar solution is 2.46 atm. When equal volume of the above solutions are mixed, o.p. of resulting solution is ....

   A. 1.64atm

B. 2.46atm

C. 4.1 atm

D. 2.05 atm

Answer:

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Question Level Ii Assertion Reason

1. Assertion: van't Hoff factor for benzoic acid in benzene is less than one

Reason: Benzoic acid behave as a weak electrolytein benzene.

A. A. If both Assertion and Reason are true and the Reason is the correct explanation of Assertion.

B. B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion

C. C. If Assertion is true but the Reason is false

D. C. If both Assertion and Reason are false

Answer:

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2. Assertion: The molecular weight of acetic acid in benzene and water is different

Reason: Water is polar and benezne is non polar.

A. A. If both Assertion and Reason are true and the Reason is the correct explanation of Assertion.

B. B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion

C. C. If Assertion is true but the Reason is false

D. D. If both Assertion and Reason are false

Answer:

3. Assertion: Ideal solutiion obeys Raoults law

Reason: In ideal solution, solute solute as well as solvent -solvent interaction are similar to solute solvent interactions.
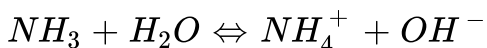
A. A. If both Assertion and Reason are true and the Reason is the correct explanation of Assertion.

B. B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion

C. C. If Assertion is true but the Reason is false

D. D. If both Assertion and Reason are false

Answer:

4. Assertion: When HgI_2 is added to KI, then freezing point increases

Reason: Number of solute particles decreases.

    A. If both Assertion and Reason are true and the Reason is the

       correct explanation of Assertion.

    B. If both Assertion and Reason are true but Reason is not the

       correct explanation of Assertion

    C. If Assertion is true but the Reason is false

    D. If both Assertion and Reason are false

Answer:

5. Assertion: Dissolution of ammonia in water doesnot follow Henry's law.

Reason: Ammonia undergoes ionisation in water as

$$NH_3 + H_2O \Leftrightarrow NH_4^+ + OH^-$$

    A. If both Assertion and Reason are true and the Reason is the correct explanation of Assertion.

    B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion

    C. If Assertion is true but the Reason is false

    D. If both Assertion and Reason are false

Answer:

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Level I

1. $0.5M H_2 SO_4$ is diluted from 1 litre to 10 litre, normality of the resulting solution is:

    A. 1N

    B. 0.1n

    C. 10N

    D. 11N

Answer: B

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2. The hardness of water sample containing 0.002 mol of magnesium sulphate dissolved in a litre of water is expressed as:

    A. 20ppm

B. 200ppm

C. 2000ppm

D. 120ppm

Answer: B

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3. Among the following substances, the lowest vapour pressure is exerted by: Water, Mercury, Kerosene, Rectified spirit

A. water

B. Mercury

C. Kerosene

D. Rectified sprit

Answer: B

4. When mercuric iodide is added to the aqueous solution of potassium iodide the:

    A. Freezing point is raised

    B. Freezing point is lowered

    C. Freezing point does not change

    D. Boiling point does not change

Answer: A

5. In cold countries, ethylene glycol is added to water in the radiators of cars during winters. It results in

A. Lowering in boiling point

B. Reducing viscosity

C. Reducing specific heat

D. Lowering in freezing point

Answer: D

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6. Equimolar solutions of non ionic non volatile solute in the same solvent have

A. Same boiling point but different freezing point

B. Same freezing point but different boiling point

C. Same boiling and same freeezing points

D. Different boiling and different freezing points

Answer: C

7. Which of the following liquid pairs shows a positive deviation from Raoult's law?

    A. Water-nitric acid

    B. Benzene-methanol

    C. Water-hydrochloric acid

    D. Acetone -chloroform

Answer: B

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

A. $0.01M Na_2 SO_4$

B. 0.015M glucose

C. 0.015M urea

D. $0.01M KNO_3$

Answer: A

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9. At the freezing point of a solution, there is equilibrium between 1.Liquid solvent, solid solvent 2.Liquid solvent, solid solute 3.Liquid solute, solid solute 4.Liquid solute, solid solvent

A. Liquid solvent, solid solvent

B. Liquid solvent, solid solute

C. Liquid solute, solid solute

D. Liquid solute, solid solvent

Answer: A

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10. Pick up the wrong statement: a)Deliquescent salts are highly soluble in water. b)Vapour pressure of water in hygroscopic substances in their solution state is lower than humidity of air. c)Efflorescent crystals have higher vapour pressure of water than humidity of air. d)For isotonic solution concentrations of two solutions must be always same.
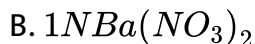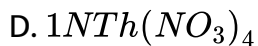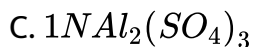
A. Deliquescent salts are highly soluble in water

B. Vapour pressure of water in hygroscopic substances in their solution state in lower than humidity of air

C. Efforescent crystal have higher vapour pressure of water than humidity of air

D. For isotonic solution concentrations of two solutions must be always same

Answer: D

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11. The solution having highest vapour pressure is :(Assume 100% ionisation of electrolytes)

A. $1N KNO_3$

B. $1N Ba(NO_3)_2$

C. $1NAl_2(SO_4)_3$

D. $1NTh(NO_3)_4$

Answer: C

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12. Elevation in boiling point of an aqueous glucose solution is 0.6, K_b for water is 0.52 K molal^{-1}. The mole fraction of glucose in the solution is:

A. 0.02

B. 0.03

C. 0.01

D. 0.04

Answer: A

13. The ratio of vapour pressures of two liquids A and B in pure state are 1:2. If the two liquids are mixed and the ratio of their mole fraction in vapour phase are 2:1, the liquids A and B were mixed in the ratio of their mole: a)1 : 2 b)2 : 1 c)4 : 1 d)1 : 4

A. $1:2$

B. $2:1$

C. $4:1$

D. $1:4$

Answer: C

14. An ideal solution has two components A and B. If A is more volatile than B and $P_A^\circ > P_T$, then the correct relation between mole fractions of A in liquid phase (X) and in vapour phase (Y) is:

A. $X_A = Y_A$

B. $X_A > Y_A$

C. $X_A < Y_A$

D. nothing can be said

Answer: C

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15. How many moles of $Th(NO_3)_4$ should be dissolved in 15 moles of water so that vapour pressure of water is reduced by 40%: a)1 b)2 c)3 d)4

A. 1

B. 2

C. 3

D. 4

Answer: B

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16. An ideal solution contains two volalite liquids $A(P°=100\,\text{tore})$ and $B(P° = 200\,\text{torr})$.` If liquid mixture contains 1 mole of A and 4 mole of B then total vapour pressure of the mixture obtained by condensing the vapour above this solution in a beaker is :

A. 180

B. 188.8

C. 178.8

D. 198.8

Answer: B

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17. 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 mole fraction of solute

C. the relative lowering of vapour pressure is proportional to the mass 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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18. 0.2 molal aqueous solution of acid HX is 20% ionised. $K_f = 1.86 \text{ K molal}^{-1}$. The freezing point of the solution is very close to:

A. $-0.45°C$

B. $-0.90°C$

C. $-0.31°C$

D. $-0.53°C$

Answer: A

19. What mass of solute $\left(\text{molar mass}=60\text{ g mol}^{-1}\right)$ should be dissolved in 180 g water to reduce the vapour pressure to $\dfrac{4}{5}$ th of pure water :

A. 120g

B. 175g

C. 150g

D. 100g

Answer: C

20. Which of the following is the correct example of solid solution in which the solute is in gas phase?

A. Copper dissolved in gold

B. Camphor in nitrogen gas

C. Hydrogen in palladium

D. All of these

Answer: C

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21. 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_2 from air dissolved in 10 mole of water at 298 K and 5 atm pressure is:

A. 4.0×10^{-4}

B. 4.0×10^{-8}

C. 5.0×10^{-4}

D. 4.0×10^{-6}

Answer: A

22. At $90°C$, the vapour pressure of toluene is 400 mm and that of xylene is 150 mm. The mole fraction of toluene in liquid mixture that boil at $90°C$ at a pressure of 0.5 atm is

A. 0.92

B. 0.86

C. 0.82

D. 0.73

Answer: A

23. The vapour pressure of pure benzene at $25°C$ is 639.7 mm of Hg and the vapour pressure of a solution of a solute in C_6H_6 at the same tempeature is 631.9 mm of Hg. Calculate molality of solution.

A. 0.372mol/kg

B. 0.869 mol/kg

C. 0.635mol/kg

D. 0.158 mol/kg

Answer: D

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24. Pure Benzene freezes at $5.4°C.$ A solution of 0.223 g of phenyl acetic acid $(C_6H_5CH_2COOH)$ in 4.4 g of benzene $\left(K_f = 5.12\,\text{K kg mol}^{-1}\right)$ 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 ionization in benzene

C. phenyl acetic acid undergoes complete ionization in benzene

D. phenyl acetic acid dimerizes in benzene

Answer: D

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25. The expression to compute molar mass of an ideal non volatile solute M_2 from the depression in freezing point mass of solute m_2, and mass of solvent m_1, is

A. $M_2 = \dfrac{1000 K_A}{\Delta T_f} \dfrac{m_1}{m_2}$

B. $M_2 = \dfrac{DetlaT_f}{1000 K_f} \dfrac{m_2}{m_1}$

C. $M_2 = \dfrac{\Delta T_f}{1000 K_f} \dfrac{m_1}{m_2}$

D. $M_2 = \dfrac{1000 K_f}{\Delta T_f} \dfrac{m_2}{m_1}$

Answer: D

26. What is the mole fraction of the solute in a 1m aqueous solution?

   A. 0.177

   B. 1.770

   C. 0.0354

   D. 0.0177

Answer: D

27. A solution contains 441.0 gof H_2SO_4 in 1 L of solution. If the density of solution is 1.25 g mL^{-1}, the molarity and molality of the

solution, respectively, are

A. $4.5 mol L^{-1}$ and $5.56 molkg^{-1}$

B. $4.5 mol L^{-1}$ and $4.5 molkg^{-1}$

C. $5.56 mol L^{-1}$ and $4.5 molkg^{-1}$

D. $5.56 mol L^{-1}$ and $5.56 molkg^{-1}$

Answer: A

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28. An aqueous solution of glucose containing 12 g in 100g of water was found to boil at $100.34°C.$ Calculate K_b for water in K mol^{-1} kg.

A. 1.81

B. 1.02

C. 0.51

D. 0.82

Answer: C

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29. 0.48g of a substance was dissolved in 10.6 g C_6H_6. The freezing point of benzene was lowered by $1.8°C$. Calculate molar mass of the substance. Molecular depression constant for benzene is $5K \text{ kg mol}^{-1}$.

A. $153.6 gmol^{-1}$

B. $125.79 gmol^{-1}$

C. $251.6 gmol^{-1}$

D. $89.42 gmol^{-1}$

Answer: B

30. An aqueous solution of glucose boils at $100.01°C$. The molal elevation constant for water is $0.5\,\mathrm{K\,mol^{-1}}$ kg. What is the number of glucose molecules in the solution containing 100 g water?

A. 2.4×10^{21}

B. 2.4×10^{30}

C. 1.2×10^{21}

D. 1.2×10^{20}

Answer: C

31. The molar mass of an organic compound is 58 g/mol. 24 g of this is dissolved in 600 g water, calculate its boiling point when vapour pressure of water becomes 760 mm. K_b of H_2O is 0.513 K kg mol^{-1}.

   A. $99.371°C$

   B. $100.354°C$

   C. $102.07°C$

   D. $98.37°C$

Answer: B

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32. Calculate the concentration of CO_2 in $molL^{-1}$ in a soft drink that is bottled with a partial pressure of CO_2 of 4 atm over the

liquid at $25°C$. The Henry's law constant for CO_2 in water at $25°C$ is 3.1×10^{-2} mol/litre -atm.

A. 0.248

B. 0.326

C. 0.124

D. 0.186

Answer: C

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33. An azeotropic solution of two liquids has boiling point tower than' either of them when it

A. it is saturated

B. it does not deviate from Raoult's law

C. It shows negative deviation from Raoutl's law

D. It shows positive deviation from Raoult's law.

Answer: D

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34. Calculate the relative lowering in V.P. if 10 g of a solute (molar mass 100) are dissolved in 180g water.

A. 0.99

B. 0.099

C. 9.9

D. 0.0099

Answer: D

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35. The solution that forms maximum boiling azeotrope is

    A. carbon disulphide acetone

    B. benzene -toluene

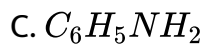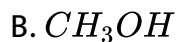   C. acetone- chloroform
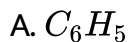
    D. n-hexane -n-heptane

Answer: C

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36. The boiling point of $C_6H_6, C_6H_5NH_2, CH_3OH$ and $C_6H_5NO_2,$ are $80°C, 184°C, 65°C$ and $212°C$ respectively. Which has higher vapour pressure at room temperature

A. C_6H_5

B. CH_3OH

C. $C_6H_5NH_2$

D. $C_6H_5NO_2$

Answer: B

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37. Three different solutions are prepared by dissolving 10 g each glucose, urea and sucrose in 250 mL water in separate containers. $P_1, P_2,$ and $P_3,$ are the respective osmotic pressures at 273K, the correct relation regarding $P_1, P_2,$ and $P_3,$ is

A. $P_1 > P_2 > P_3$

B. $P_3 > P_1 > P_2$

C. $P_2 > P_1 > P_3$

D. $P_2 > P_3 > P_1$

Answer: C

38. An antifreeze solution is prepared by mixing 217.0 g of ethylene glycol $(C_2H_6O_2)$ in 200g water. The molality of solution is

A. $15.5 molkg^{-1}$

B. $17.5 molkg^{-1}$

C. $18.5 molkg^{-1}$

D. $20.1 molkg^{-1}$

Answer: B

39. The molality of an aqueous solution of methanol (CH_3OH) is 1.44 mol kg^{-1}. The mole fraction of methanol in the solution will be

A. 0.0253

B. 0.0213

C. 0.0273

D. 0.0198

Answer: A

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40. The density of 1.40 molal solution of acetic acid (CH_3COOH) is 1.084 g Ml^{-1}. The molarity of solution will be a)1.30M b)1.40M c)1.50M d)1.60M

A. 1.30M

B. 1.40M

C. 1.50M

D. 1.60M

Answer: B

41. Water saturated with air (20% 0, and 80% N) at 1 atm and 298 K contains 8.9 x 10^-3 g/ L dissolved oxygen. Its solubility under 25 atm pressure of will be a)8.9 × 10 − 3 g L − 1 b)1.1125 g L − 1 c)1.5642 g L − 1 d)1.834 × 10 − 2 g L − 1

A. $8.9 \times 10^{-3} gL^{-1}$

B. $1.1125 gL^{-1}$

C. $1.5642 gL^{-1}$

D. $1.834 \times 10^{-2} gL^{-1}$

Answer: B

42. Methanol $(p° = 90 \text{ mm Hg at } 300 \text{ K})$ and ethanol $(p° = 51 \text{ mm Hg at } 300 \text{ K})$ form very nearly an ideal solution. The total vapour pressure of a solution obtained by mixing 23 g ethanol with 32g methanol would be

A. 17mmHg

B. 60mmHg

C. 77mmHg

D. 82mmHg

Answer: C

43. A binary liquid solution exhibits positive deviation from ideal behaviour. Which of the following facts hold good? a)△ H mix > 0 and △ H mix < 0 b)△ H mix < 0 and △ G mix < 0 c)△ H mix > 0 and △ G mix > 0 d)△ H mix < 0 and △ G mix > 0

A. $\Delta H_{\text{mix}} > 0$ and $\Delta G_{\text{mix}} < 0$

B. $\Delta H_{\text{mix}} < 0$ and $\Delta G_{\text{mix}} < 0$

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

D. $\Delta H_{\text{min}} < 0$ and $\Delta G_{\text{min}} > 0$

Answer: A

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44. The osmotic pressure of a solution containing 0.10g of haemoglobin in 10 cm of solution is 30 Torr at 300 K. The molar mass of haemoglobin is nearly

A. $4500 gmol^{-1}$

B. $5452 gmol^{-1}$

C. $6232 gmol^{-1}$

D. $6932 gmol^{-1}$

Answer: C

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45. The van't Hoff factor of solutes A, B and C in aqueous solutions are 0.8, 1.6 and 1.2, respectively. The freezing point of equimolar solutions follow the order

A. $A > B > C$

B. $A > C > B$

C. $B > A > C$

D. $B > C > A$

Answer: B

46. What mass of ethanol be added to 1.0kg water to have the mole fraction of ethanol equal to 0.202 a)63.89g b)6.39g c)638.89g d)683.89g

A. 63.89g

B. $6.39g$

C. $638.89g$

D. $683.89g$

Answer: C

47. Which of following behaviours is not true for an ideal binary liquid solution?

A. Plot of p_A versus x_A (mole fraction of A in liquid phase) is linear

B. Plot of P_B versus x_B is linear

C. Plot of P_{total} versus x_A (or x_B) is linear

D. Plot of p_{total} versus x_A (or x_B) is non linear

Answer: D

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48. An azeotropic solution of two liquids has boiling point tower than' either of them when it

A. shows negative deviation from Raoult's law

B. shows positive deviation from Raoult's

C. shows no deviation from Raoult's law

D. is saturated

Answer: B

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49. Which of the following solutions is expected to show positive deviations from Raoult's law? a)Pyridine-formic acid b)Ethanol-cyclohexane c)Acetone-chloroform d)Hydrochloric acid-water

A. Pyridine- formic acid

B. Ethanol- cyclo hexane

C. acetone- chloroform

D. Hydrochloric acid-water

Answer: B

50. The vapour pressure of water is 92.5 mm at 300 K. The V.P. of 1 molal aqueous solution of non volatile non electrolyte solute is

    A. 90.84mm

    B. 87.32mm

    C. 69.50mm

    D. 53.21mm

Answer: A

Level Ii

1. The volumes of two HCl solutions A (0.5N) and B(0.1N) to be mixed for preparing 2 L of 0.2 NHCl are:

    A. 0.5 L of $A^+1.5L$ of B

    B. 1.5L of $A + 0.5L$ of B

    C. 1L of $A + 1L$ of B

    D. 0.75L of $A + 1.25L$ of B

Answer: A

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2. The vapour pressure of pure benzene at $88°C$ is 957 mm and that of toluene at the same temperature is 379.5 mm. Calculate the composition of benzene toluene mixture boiling at $88°C$ at 1 atm pressure

A. $x_{benzene} = 0.66$, $x_{toluene} = 0.34$

B. $x_{benzene} = 0.34$, $x_{toluene} = 0.66$

C. $x_{benzene} = x_{toluene} = 0.5$

D. $x_{benzene} = 0.75$, $x_{toluene} = 0.25$

Answer: A

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3. Two solutions of glucose have osmotic pressures 1.5 and 2.5 atm. 1 litre of first solution is mixed with 2 litre of second solution. The osmotic pressure of the resultant solution will be:

A. 1.62 atm

B. 6.12 atm

C. 1.26 atm

D. 2.16 atm

Answer: D

4. The temperature at which 10% (w/v) aqueous solution of glucose will exhibit the osmotic pressure of 16.4 atm, is: $\left(R = 0.082 \ dm^3 \ atm \ K^{-1}mol^{-1}\right)$

A. $360° C$

B. 180K

C. 360K

D. 300K

Answer: C

5. Which one of the statements given below concerning properties of solutions, describes a colligative effect? a)Boiling point of pure water decreases by the addition of ethanol b)Vapour pressure of pure water decreases by the addition of nitric acid c)Vapour pressure of pure benzene decreases by the addition of naphthalene d)Boiling point of pure benzene increases by the addition of toluene

A. Boiling point of pure water decreases by the addition of ethanol

B. Vapour pressure of pure water decreases by addition of nitric acid

C. Vapour pressure of pure benzene decreases by the addition of naphthalene

D. Boiling point of pure benzene increases by the addition of toluene

Answer: C

6. When ethanol mixes in cyclohexane, cyclohexane reduces the intermolecular forces between ethanol molecules. In this, liquid pair shows

    A. positive deviation by Raoult's law

    B. negative deviation by Raoult's law

    C. no deviation by Raoult's law

    D. decrease in volume

Answer: A

7. A solution of 1 molal concentration of a non volatile solute will have maximum boiling pointelevation when the solvent is

    A. Ethyl alcohol

    B. Acetone

    C. Benzene

    D. Chloroform

Answer: D

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8. The molecular mass of acetic acid dissolved in water is less than 60 and when dissolved in benzene it is nearly 120. This difference in behaviour of CH_3COOH is because

    A. acetic acid dissociates in water and associates in benzene

B. acetic acid does not fully dissolve in water

C. acetic acid fully dissolves in benzene but not in water

D. acetic acid ionize in benzene

Answer: A

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9. 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 is non-ideal, showing negative deviation from Raoult's Law b)The solution is non-ideal, showing positive deviation from Raoult's Law c)n-heptane shows positive deviation while ethanol shows negative deviation from Raoult's Law d)The solution formed is an ideal solution

A. The solution is non-ideal, showing negative deviation from Raoult's law

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

C. n-heptane shows positive deviation while ethanol shows negative deviation from Raoult's law

D. The solution formed is an ideal solution

Answer: B

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

A. 90g conc. HNO_3

B. 70g conc. HNO_3

C. 54g conc. HNO_3

D. 45 g conc. HNO_3

Answer: D

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11. Azeotropic mixture of HCl in water contains

A. 48% HCl

B. 32.2% HCl

C. 36%HCl

D. 20.2% HCl

Answer: D

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12. A liquid mixture containing two immiscible liquids, wate and an alkyl bromide $\left(\text{molar mass } 137 \text{ g mol}^{-1}\right)$ is distilled at $90°C$. The ratio of the vapour pressure of water and alkyl bromide in the distillate is 5:1, the mass ratio of distillate is : a)1.52 : 1 b)0.657 : 1 c)1 : 5 d)5 : 1

A. $1.52 : 1$

B. $0.657 : 1$

C. $1 : 5$

D. $5 : 1$

Answer: B

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13. The molal freezing point constant of water is 1.86 Km^{-1}. If 342 g of cane sugar $(C_{12}H_{22}O_{11})$ is dissolved in 1000 g of water, the solution will freeze at

A. $-1.86°C$

B. $1.86°C$

C. $-3.92°C$

D. $2.42°C$

Answer: A

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14. Dry air was passed successively through a solution of 5 g of a solute in 180 g of water and then through pure water. The loss in the weight of solution was 2.50 g and that of pure solvent 0.04 g. The molecular weight of the solute is.

A. 31.25

B. 3.125

C. 312.5

D. 0.3125

Answer: A

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

A. 0.186

B. 0.512

C. $\dfrac{0.512}{1.86}$

D. 0.0512

Answer: D

16. The vapour pressure of a solvent decreased by 10 mm of Hg when a non-volatile solute was added to the solvent. The mole fraction of solute in solution is 0.2, what would be the mole fraction of solvent if the decrease in vapour pressure is 20 mm of Hg.

A. 0.8

B. 0.6

C. 0.4

D. 0.2

Answer: B

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

A. 171.2

B. 68.4

C. 34.2

D. 136.2

Answer: B

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18. The mole fraction of component A in vapour phase is y_1, and mole fraction of component A in liquid mixture is $x_1 \left(P_A^\circ = \text{vapour pressure of pure A}, P_B^\circ = \text{vapour pressure of pure B} \right)$. Then total vapour pressure of the liquid mixture is

A. $\dfrac{P_A^\circ x_1}{y_1}$

B. $\dfrac{P_A^\circ y_1}{x_1}$

C. $\dfrac{P_B^\circ y_1}{x_1}$

D. $\dfrac{P_B^\circ x_1}{y_1}$

Answer: A

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19. The relative decrease in the vapour pressure of an aqueous solution containing 2 mol $[Cu(NH)_3CI]Cl$ in 3 mol 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

A. 1mol AgCl

B. 0.25mol AgCl

C. 2mol AgCl

D. 0.40 mol AgCl

Answer: A

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20. A mixture of volatile components A and B has total vapour pressure (in torr) $P = 254 - 119\chi_A$ where χ_A is the mole fraction of A in mixture. Hence, P_A° and P_B° are (torr)

A. 254119

B. 119254

C. 135254

D. 154119

Answer: C

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21. '0.004 M' solution of 'Na_2 SO_4' is isotonic with '0.01 M' solution of glucose at, same temperature. The apparent degree of dissociation of 'Na_2 SO_4' is

A. 75 %

B. 50 %

C. 25 %

D. 85 %

Answer: A

22. When 20 g of naphthoic acid $(C_2H_8O_2)$ is dissolved in 50 gofbenzene $\left(K_f=1.72\,\text{K kg mol}^{-1}\right)$, a freezing point depression

of 2 K is observed. The van't Hoff factor (i) is

A. 0.5

B. 1

C. 2

D. 3

Answer: A

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23. 25 mL of household bleach contains $CaClOCl_3$ was mixed with 30 mL of 0.50 MkI and 10 mL of 4 N acetic acid. In the titration of the liberated iodine, 48 mL of 0.25 N $Na_2S_2O_3$ was used to reach the end point. The molarity of the household bleach solution is a)0.48M b)0.96M c)0.24M d)0.024M

A. $0.48M$

B. $0.96M$

C. $0.24M$

D. $0.024M$

Answer: C

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24. 184 g ethyl alcohol is mixed with 72 gof water. The ratio of mole fraction of alcohol to water is

A. $3:4$

B. $1:2$

C. $1:4$

D. $1:1$

Answer: D

25. The density (in gmL) of a 3.60 M sulphuric acid solution, that is,

29% H_2SO_4 $\left(\text{molar mass} = 98 \text{ g mol}^{-1}\right)$ by mass will be

A. 1.45

B. 1.64

C. 1.88

D. 1.22

Answer: D

26. A 5.25% (w/v) solution of a substance is isotonic with a 1.5%(w/v)

solution of urea $\left(\text{molar mass} = 60 \text{ g mol}^{-1}\right)$ in the same solvent.

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

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27. How many grams of methyl alcohol should be added to 10L tank of water to prevent its freezing at 268 K? a)880.07 g b)899.04 g c)886.02 g d)868.06 g

A. 880.07g

B. 899.04g

C. 886.02g

D. 868.06g

Answer: C

---

28. If sodium sulphate is considered to be completely dissociated into cations and anions in aqueous solution, the change in freezing point of water $(\triangle T_f)$ when 0.01 mol of sodium sulphate is dissolved in 1 kg of water is $\left(\text{Given } K_f = 1.86\text{K mol}^{-1}\right)$

A. 0.0186K

B. 0.0372K

C. 0.0558K

D. 0.0744K

Answer: C

29. The degree of dissociation (α) of a weak electrolyte, A_xB_y, is related to van't Hoff factor (i) by the expression

A. $\alpha = \dfrac{i-1}{x+y+1}$

B. $\alpha = \dfrac{x+y-1}{i-1}$

C. $\alpha + \dfrac{x+y+1}{i-1}$

D. $\alpha = \dfrac{i-1}{(x+y-1)}$

Answer: D

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30. 18 g of glucose $(C_6H_{12}O_6)$ is added to 178.2g of water. The vapour pressure of water for this aqueous solution at $100°C$ is

A. 7.60Torr

B. 76.00Torr

C. 752.40Torr

D. 759.00Torr

Answer: C

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31. 6.02 x 10^21' molecules of urea are present in 100 'mL' of its solution. "The concentration of urea solution is -

A. 0.02M

B. 0.01M

C. 0.001M

D. 0.1M

Answer: B

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32. Insulin $(C_2H_{10}O_5)_n$, is dissolved in a suitable solvent and the osmotic pressure (π) of solutions of various concentrations (g/cc) C is measured at $20°C$. The slope of the plot of t against 'C' is found to be 4.65×10^{-3}. The molecular weight of insulin is:

A. 4.8×10^5

B. 9×10^5

C. 3×10^5

D. 5.17×10^6

Answer: D

33. Which statement about the composition of vapour over an ideal 1:1 molar mixture of benzene and toluene is correct? Assume the

temperature is constant at $25°C$.

Benzene 75 mm Hg

Toluene 22 mm Hg

    A. The vapour will contain higher percentage of benzene

    B. The vapour will contain higher percentage of toluene

    C. The vapour will contain equal amount of benzene and toluene

    D. Not enough information is given to make a prediction

Answer: A

34. On mixing, heptane and octane form an ideal solution. At 373 K, the vapour pressures ofheptane 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 is very close to

A. 144.5kPa

B. 72.0kPa

C. 36.1kPa

D. 96.2kPa

Answer: B

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35. pH of a 0.1 M weak monobasic acid is measured to be 2. Its osmotic pressure at a given temperature

A. 0.1RT

B. 0.11RT

C. 1.1RT

D. 0.01RT

Answer: B

36. Lowering of vapour pressure in 1 molal aqueous solution of non volatile non electrolyte solute at $100^\circ C$ is:

    A. 13.44mmHg

    B. 14.12mmHg

    C. 31.2mmHg

    D. 35.2mmHg

Answer: A

37. A solution containing 0.1 g of a non-volatile organic substance P (molecular mass 100) in 100 g of benzene raises the boiling point of benzene by $0.2°C,$ while a solution containing 0.1 gof another non-volatile subistance Q in the same amount of benzene raises the boiling point of benzene by $0.4°C.$ What is the ratio of molecular masses of P and Q?

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: B

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38. The vapour pressure of water at T(K) is 20 mm Hg. The following solutions are prepared at T(K):

I. 6g of urea (mol.wt.=60) is dissolved in 178.2 g of water.

II. 0.01 mole of glucose is dissolved in 179.82 g of water.

III. 5.3 g of Na_2CO_3 (mol.wt. =106) is dissloved in 179.1 g of water.

Identify the correct order in which the vapour pressures of solutions increase:

    A. III, I, II

    B. II, III, I

    C. I, II, III

    D. I, III, II

Answer: A

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39. A sample of liquid H_2O of mass 18.0 g is injected into an evacuated 7.6 L flask maintained at $27°C$. If vapour pressure of H_2O at $27°C$ is 24.63 mm Hg, what weight percentage of the water will be vapourised when the system comes to equilibrium? Assume water vapours 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

40. Equal weight of a certain non volatile non electrolyte solute is dissolved in equal weight of two solvents A and B to form very dilute solution. The relative lowering of vapour pressure for solution B is twice the relative lowering ofvapour pressure for solution A. M_A and M_B are the molecular mass of solvents A and Brespectively, then: a)M A = M B b)M B = 2 × M A c)M A = 4 M B d)M A = 2 M B

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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41. One mole of a solute Ais dissolved in a given volume of a solvent. The association of the solute takes place as follows:

$nA \Leftrightarrow A_n$ If alpha` is the degree of association of A the van't Hoff factor i is expressed as:

A. $i = I - \alpha$

B. $i = I + \dfrac{\alpha}{n}$

C. $i = \dfrac{I - \alpha + \frac{\alpha}{n}}{1}$

D. $i = 1$

Answer: C

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42. A very dilute saturated aqueous solution of a sparingly soluble salt X_3Y_4, has a vapour pressure of 20 mm Hg at temperature T,

while pure water exerts a pressure of 20.0126 mm Hg at the same temperature. Calculate molality (m) at temperature T:
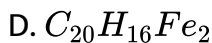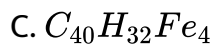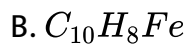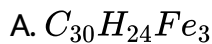
A. 6.3×10^{-4}

B. 3.5×10^{-2}

C. 5×10^{-3}

D. 8.2×10^{-2}

Answer: C

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

A. $C_{30}H_{24}Fe_3$

B. $C_{10}H_8Fe$

C. $C_{40}H_{32}Fe_4$

D. $C_{20}H_{16}Fe_2$

Answer: D

44. A solution containing 100g ethylene glycol in 500g water is cooled to $-6.2°C$. The amount of ice that will separate out will be $\left(K_f \text{for water} = 1.86\text{K kg mol}^{-1}\right)$

A. 100.8g

B. 38.7g

C. 16.1g

D. 41.1g

Answer: C

45. The temperature of a city was found to be $-9.3°C$. A car was used, whose radiator was filled with 5 L of water. What quantity of antifreczing agent ethylene glycol were added to water of radiator in order to use the car for travelling? $\left(\text{K of water } 1.86 \text{ K kg mol}^{-1} \right)$

A. 3200g

B. 1670g

C. 1550g

D. 2100g

Answer: C

46. The osmotic pressures of 0.010 M solutions of KI and of sucrose $(C_{12}H_{22}O_{11})$ are 0.432 atm and 0.24 atm respectively. The vant's Hoff factor for KI is:

A. 1.80

B. 0.80

C. 1.2

D. 1.0

Answer: A

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47. At 300 K, 40 mL of O_3, (g) dissolves in 100 g of water at 1.0 atm. What mass of ozone dissolves in 400 g of water at a pressure of 4.0 atm at 300 K is nearly

A. 0.1g

B. 1.25g

C. 0.5g

D. 5g

Answer: D

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48. Two beakers A and B are present in a closed vessel. Beaker A contains 152.4 g aqueous solution of urea containing 12 gofurea. Beaker B contains 196.2 g glucose solution, containing 18 gof glucose. Both solutions are allowed to attain equilibrium. Determine the w.t.% of glucose in it's solution at equilibrium:

A. 6.71

B. 14.49

C. 16.94

D. 20

Answer: B

49. A 0.10 M aqueous solution of a monoprotic acid $\left(\text{d}=1.01 \text{ g/cm}^3\right)$ is 5% ionized. What is the freezing point of the solution? The mol.wt. of the acid is 300 and $K_{f(H_2O)} = 1.86°C/m$:

A. $-0.189°C$

B. $-0.194°C$

C. $-0.199°C$

D. $-0.173°C$

Answer: C

50. 1.0 g of a weak monobasic acid HA in 100 g water lowers the freezing point by 0.155 K. If 0.45 g, of same acid requires 15 mL of N/5 NaOH solution for complete neutralistion then %, degree ofionization of acid is $\left(K_f \text{ of } H_2O = 1.86 \text{ K kg mol}^{-1}\right)$. a)0.2 b)0.25 c)0.4 d)0.5

A. 20 %

B. 25 %

C. 40 %

D. 50 %

Answer: B

1. Two components A and B form an ideal solution. The mole fractions of A and B in solution are X_A and X_B, while that in vapour phase are Y_A and Y_B. The slope and intercept of plot of $\dfrac{1}{Y_A}$ vs $\dfrac{1}{X_A}$ will be

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

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

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

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

Answer: B

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2. The mole fraction of liquid A in a binary liquid solution of A (vapour pressure $p_A = 300$ Torr) and B (Vapour pressure, $p_B = 800$ Torr) is 0.6. The external pressure on this is slowly reduced from 760 Torr. The pressure at which first bubble of vapour appears and the mole fraction of A in this vapour, respectively, are

A. 400Torr and 0.24

B. 500 Torr and 0.50

C. 500 Torr and 0.36

D. 600 Torr and 0.25

Answer: C

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3. A solution containing 8g of a substance in 100g a diethyl ether bolls at $36.86° C$, whereas pure ether boils at $35.60° C$. Determine

the molecular mass of the solute (for ether k_b=2.02 K kg mol^-1)

A. 387

B. 374

C. 3740

D. 340

Answer: B

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

A. 58.25torr

B. 33torr

C. 42.1 torr

D. 52.25 torr

Answer: A

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

A. 400 and 600

B. 500 and 600

C. 200 and 300

D. 300 and 400

Answer: A

6. For a dilute solution containing 2.5g of a non -volatile non-electrolyte solute in 100g 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 at $100°C$ is (take $K_b = 0.76kgmol^{-1}$)

A. 724

B. 740

C. 736

D. 718

Answer: A

7. Calculate the normal boiling point of a sample of sea water containing 3.5% of NaCl and 0.13% of $MgCl_2$ by mass. The normal boiling point of water is $100°C$ and K_b for water =0.51K kg mol^{-1}. Assume that both the salts are completely ionised.

A. $-373.655K$

B. 386.73K

C. 392.86K

D. 379.93K

Answer: A

8. The freezing point (in $^\circ C$) for a solution containing 0.1 g of $K_3[Fe(CN)_6]$ (mol wt 329) in 100 g water $\left(K_f = 1.86 K kgmol^{-1}0\right.$ is

A. 273.127K

B. 272.92K

C. 273.023K

D. 273.173K

Answer: A

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Level Iii Multiple Correct Answer Type

1. Which of the following statements are correct ?

A. Relative lowering of vapour pressure is independent of the nature of solute

B. The vapour pressure is a colligative property

C. Vapour pressure of a solution of non volatile solute is lower than the vapour pressure of the solvent

D. The relative lowering of vapour pressure is directly proportional to the original pressure

Answer: A::C

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2. At the same temperature, which of the following solution will not be isotonic ?

A. 3.24g of sucrose per litre of water and 0.18g of glucose per litre of water

B. 3.24g of sucrose per litre of water and 0.585g of sodium chloride per litre of water

C. 3.42g of sucrose per litre of water and 1.17g of sodium chloride per litre of water

D. 3.42g of sucrose per litre and 0.18g of glucose in 0.1 litre water

Answer: A::B::C

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3. Select the incorrect statements for vapour pressure of pure liquid

A. It increases on increasing temperature

B. It increases on increasing equilibrium pressure

C. It increases on increasing amount of liquid

D. It increases on increasing surface area of container

Answer: B::C::D

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4. An ideal solution has two components A and B. If A is more volatile than B and $P_A^\circ > P_T$, then the correct relation between mole fractions of A in liquid phase (X) and in vapour phase (Y) is:

A. On increasing mole fraction of B, vapour pressure of solute will be decrease

B. On increasing mole fraction of A, vapour pressure of solute will increase

C. Total V.P will lies between P_B° and P_A°

D. For solution of A and B, $P_B^\circ \leq P_T \leq P_A^\circ$ will hold

Answer: A::B::C

5. A mixture of two immiscible liquids A and B, having vapour pressure in pure state P_A and P_B obeys the following relationship if ch_A and χ_B are mole fractions of A and B in vapour phase over the solution

A. $P'_A = P_M \chi'_A$

B. $\dfrac{P'_A}{P'_B} = \dfrac{W_A \times Mw_B}{Mw_A \times W_B}$

C. $P'_A > P'_B$ then $\chi'_A < \chi'_B$

D. $P'_A > P'_B$ then $n_A > n_B$

Answer: A::B::D

6. Which of the following is/are true ?

A. For the same solution, elevation in boiling point = depression

in freezing point

B. The Van't Hoff factor for a dilute aqueous solution of $BaCl_2$ is

3.

C. The elevation in boiling point is due to increase in vapour

pressure

D. The depression in freezing point is due to decrease in vapour

pressure.

Answer: B::D

7. To 10 mL of 1m $BaCl_2$ solution 5mL of 0.5 M K_2SO_4 is added $BaSO_4$ is precipitated out. What will haapen?

    A. Freezing point will increase

    B. Boiling point will increase

    C. Freezing point will lower down

    D. Boiling point lower down.

Answer: A::D

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8. Which of the following statements is/are correct ?

    A. The freezing point of water is depressed by the addition of glucose

B. The degree of dissociation of a weak electrolyte decrease as its concentration decreases

C. Energy is released when a substance dissolves in water provided that the hydration energy of the substance is more than its lattice energy.

D. If two liquids that form an ideal solution are mixed, the change inentropy is positive.

Answer: A::C::D

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9. Consider the two solutions

I. 0.5M NaCl aqueous solution at $25°C$, NaCl is complete ionized

II. $2.0M C_6H_5COOH$ in benzene at $25°C$, C_6H_5COOH dimerizes

to the full extent.

Which of the following statement(s) is (are) correct ?

A. Both the solutions display equal osmotic pressure

B. Both have equal vapour pressure

C. Solution II is hypertonic

D. Solution II has greater depression in freezing point than

solution I

Answer: A::D

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10. Which of the following statements are correct ?

A. Water has maximum density of $4°C$

B. The unit of K_f is Kkg^{-1}

C. Isotonic solution, solutions have same osmotic pressures

D. Osmotic pressure of 0.1 molar sodium chloride solution is the same as the of 0.1 molar glucose solution

Answer: A::C

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11. Which of the following statement are correct ?

A. The increasing order of osmotic pressure of 0.1M aqueous solution is as follows 0.1M Glucose $< 0.1M$ Sodium chloride $< 0.1M$ Magnesium chloride.

B. Density of a solution in independent of temperature

C. Camphor has comparatively larger value of K_f as compared to other common solvents

D. Limiting value of van't Hoff factor of $K_4[Fe(CN)_6]$ is 11.

Answer: A::C

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1. The mass of glucose that should be dissolved in 50g of water in order to produce the same lowering of vapour pressure as is produced by dissolving 1g of urea in the same quantity of water is

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2. A 0.0020 m aqueous solution of an ionic compound $Co(NH_3)_3(NO_2)Cl$ freezes at $-0.00732°C$. Number of moles of

ions which 1 mol of ionic compound produces on being dissolved in water will be $\left(K_f = 1.86° C/m\right)$.

3. The depression in freezing point for 1M urea, 0.5M glucose, 1M NaCl, and $1 M K_2SO_4$ are in the ratio $x:1:y:z$. The value of x+z is ....

4. An aqueous solution contain 5% by weight of urea and 10% by weight of glucose. What will be the ΔT_f of solution ? (Given that K_f for H_2O is $1.86° Ckgmol^{-1}$).

5. Compound $PdCl_4, 6H_2O$ is a hydrated complex, 1 m aqueous solution of it has freezing point 269.28K. Assuming 100% ionization of complex, calculate the number of ions furnished by complex in the solution.

6. The osmotic pressure of urea solution at $10°C$ is 200mm. It becomes 105.3 mm when it is diluted and temperature raised to $25°C$. The extent of dilution is

7. How many millitres of 29.2% (w/w) aqueous solution of HCl of density of $1.25gmL^{-1}$ is required to prepare 200mL of 0.4 M HCl?

8. A compound H_2X with molecular weight 80 is dissolved in a solvent having densit 0.4 g/mL. Assuming no change in volume upon dissolution, the molality of a 3.2 molar solution is

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1. Match the columns
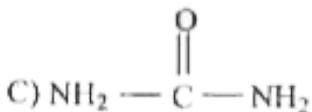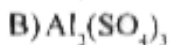
Column-I		Column-II	
a	Vapour pressure of pure liquid	p	Depends upon temperature
b	Total V.P. of liquid A and liquid B (ideal behaviour)	q	Depends upon external pressure
c	Osmotic pressure	r	Depend upon the amount of liquid
d	Boiling point of insoluble mixture of liquid A and liquid B	s	Independent of amount of liquid

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2. Match the solution in Column-I with the van't Hoff factors in Column -II

Column-I	Column-II
A) $K_4[Fe(CN)_6]$	P) $1 + \alpha$
B) $Al_2(SO_4)_3$	Q) Greater than 1
C) $NH_2 - \overset{\overset{O}{\|\|}}{C} - NH_2$	R) $(1 + 4\alpha)$
D) $CaCl_2$	S) 1

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3. Match the solutions in Column-I with their nature in Column-II

Column-I	Column-II
A) Benzene + toluene	P) Non-ideal solution
B) Ethanol +water	Q) Ideal solution
C) Benzene + chloroform	R) $\Delta H_{mix} > 0$
D) Carbon tetrachloride + chloroform	S) $\Delta H_{mixing} = 0$

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4. Mw_N = Normal molecular mass of solute

Mw_2 = Observed molecular mass of solute from colligative property measurement

Column-I	Column-II
A) $Mw_2 < Mw_N$	P) 0.1 M CH_3COOH in benzene
B) $Mw_2 \approx Mw_N/3$	Q) 0.1 M urea in water
C) $Mw_2 > Mw_N$	R) 0.05 M barium chloride in water
D) $Mw_2 = Mw_N$	S) 0.1 M CH_3COOH in water

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5. P_A = partial pressure of component A in liquid mixture, P_A° = vapour pressure of A, χ_A = mole fraction of A in

Column-I	Column-II
A) $C_2H_5OH + H_2O$	P) Azeotropic mixture
B) $C_2H_5Br + C_2H_5I$	Q) Obeys Raoult's law
C) $P_A = \chi_A P_A^\circ$	R) Non-ideal solution with positive deviation
D) $H_2O + H_2SO_4$	S) Non-ideal solution with negative deviation
	T) Ideal solution

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Level Iii Statement Type

1. Statement 1: Two sucrose solutions of same molality prepared in different solvents will have the same freezing point depression

Statement 2: Different solvents will have different value of K_f

    A. Statement 1 is True, Statement 2 is true, Statement 2 is correct explanation for Statement 1

    B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1

    C. Statement 1 is True, Statement 2 is False

    D. Statement 1 is False, Statement 2 is True

Answer: D

2. Statement 1: The concentration of pollutants in water or atmosphere is often expressed in term of ppm.

Statement 2 Concentration in parts per million can be expressed as mass to mass, volume to volume and mass to volume.

    A. Statement 1 is True, Statement 2 is true, Statement 2 is correct explanation for Statement 1

    B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1

    C. Statement 1 is True, Statement 2 is False

    D. Statement 1 is False, Statement 2 is True

Answer: B

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3. Statement 1: If more and more solute is dissolved in a certain amount of solvent, the freezing point of the solution keeps on reducing.

Statement 2 Presence of large amount of dissolved non volatile solute does not allow the solution to freeze.

    A. Statement 1 is True, Statement 2 is true, Statement 2 is correct explanation for Statement 1

    B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1

    C. Statement 1 is True, Statement 2 is False

    D. Statement 1 is False, Statement 2 is True

Answer: C

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4. Statement 1: The process of mixing of CH_3OH and CCl_4 is accompanied by increase in enthalpy and is a spontaneous process.

Statement 2: When CCl_4 and CH_3OH are mixed, weaker forces of attraction are replaced by stronger force of attraction.

A. Statement 1 is True, Statement 2 is true, Statement 2 is correct explanation for Statement 1

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1

C. Statement 1 is True, Statement 2 is False

D. Statement 1 is False, Statement 2 is True

Answer: D

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5. Statement 1: 0.1M solution of NaCl has greater osmotic pressure than 0.1M solution of glucose at same temperature.

Statement 2: In solution, NaCl dissociates to produce more number of particles.

    A. Statement 1 is True, Statement 2 is true, Statement 2 is correct explanation for Statement 1

    B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1

    C. Statement 1 is True, Statement 2 is False

    D. Statement 1 is False, Statement 2 is True

Answer: A

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6. Assertion : If a liquid solute more volatile than the solvent is added to the solvent, the papour pressure of the solution may increase i.e. $p_s > p^\circ$.

Reason In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not.

    A. Statement 1 is True, Statement 2 is true, Statement 2 is correct explanation for Statement 1

    B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1

    C. Statement 1 is True, Statement 2 is False
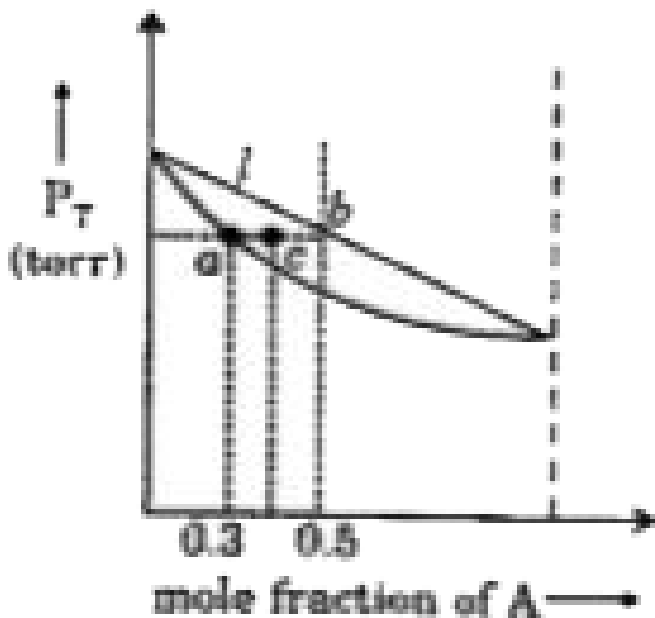
    D. Statement 1 is False, Statement 2 is True

Answer: C

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Level Iii Linked Comprehension Type

1. 1 mole of A and 1 mole B are mixed together to form an ideal solution at $25°C$. Solution is placed in a vessel fitted with piston. If pressure on the solution is reduced isothermally.

Correct relationship between P_A° and P_B° is

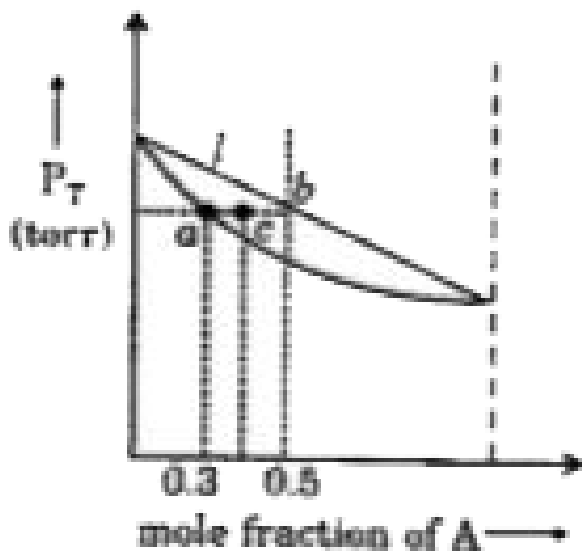A. $3P_A^\circ = 7P_B^\circ$

B. $P_A^\circ > P_B^\circ$

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

D. $3P_B^\circ = 7P_A^\circ$

Answer: D

2. 1 mole of A and 1 mole B are mixed together to form an ideal solution at $25°C$. Solution is placed in a vessel fitted with piston. If pressure on the solution is reduced isothermally.

Composition of first vapour formed from liquid mixture with $x_A = 0.5$ will have mole fraction of y_A and y_B in the vapour phase are
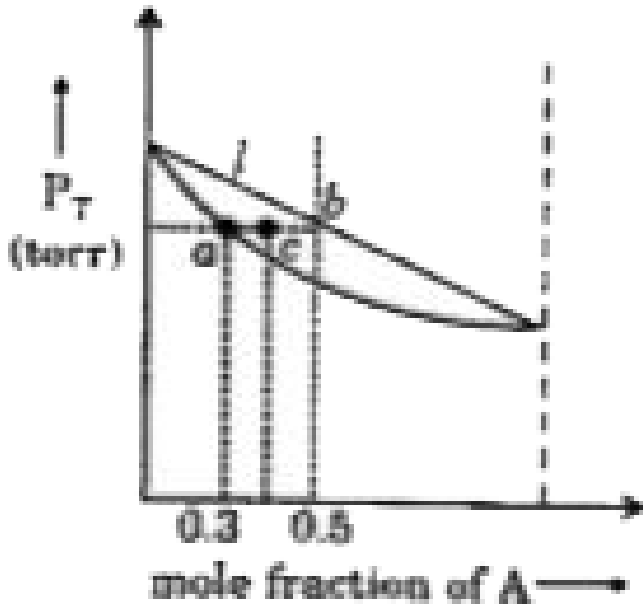
A. $y_A = 0.7, y_B = 0.3$

B. $y_A = 0.3, y_B = 0.7$

C. $y_A = 0.5, y_B = 0.5$

D. data insufficient

Answer: B

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3. 1 mole of A and 1 mole B are mixed together to form an ideal solution at $25° C$. Solution is placed in a vessel fitted with piston. If pressure on the solution is reduced isothermally.

Composition of vapour phase, when last droplet is going to be diasppeared for $x_A = 0.5$

A. $y_A = 0.3$, $y_B = 0.7$

B. $y_B = 0.7$, $y_B = 0.3$

C. $y_A = 0.5$, $y_B = 0.5$

D. none of these

Answer: C

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4.

A substance trimerises when dissovled in a solvent A. The van't Hoff factor 'i' for the solution is

   A. 1

   B. $\dfrac{1}{3}$

   C. 3

   D. unpredictable

Answer: B

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5.

0.1M $K_4\big[Fe(CN)_6\big]$ is 60% ionized. What will be its van't Hoff factor ?

A. 1.4

B. 2.4

C. 3.4

D. 4.4

Answer: C

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6.

The molar mass of the solute sodium hydroxide obtained from the measurement of the osmotic pressure of its aqueous solution at $27°C$ is $25gmol^{-1}$. Therefore, its dissociation percentage in this solution is

A. 75

B. 60

C. 80

D. 70

Answer: B

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7. The osmotic pressure π depends on the molar concentration of the solution $(\pi = CRT)$. If two solutions are of equal solute concentration and, hence, have the same osomotic pressure, they are said to be isotonic. If two solutions are of unequal oxmotic pressure, the more concentrated solution is said to be hypertonic and the more diluted solution is described as hypotonic. Osmosis is the major mechanism for transporting water upward in the plants.

Answer the following questions

A plant cell shrinks when it is kept in

A. Hypotonic solution

B. Hypertonic solution

C. Isotonic solution

D. Pure water

Answer: B

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8. The osmotic pressure π depends on the molar concentration of the solution $(\pi = CRT)$. If two solutions are of equal solute concentration and, hence, have the same osomotic pressure, they are said to be isotonic. If two solutions are of unequal oxmotic pressure, the more concentrated solution is said to be hypertonic and the more diluted solution is described as hypotonic. Osmosis is the major mechanism for transporting water upward in the plants. Answer the following questions

What would be the percent strength of solution of urea that would be isotonic with 4.5% solution of glucose ?

A. 4.5 %

B. 13.5 %

C. 1.5 %

D. 9 %

Answer: C

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9. The osmotic pressure π depends on the molar concentration of the solution $(\pi = CRT)$. If two solutions are of equal solute concentration and, hence, have the same osomotic pressure, they are said to be isotonic. If two solutions are of unequal oxmotic pressure, the more concentrated solution is said to be hypertonic and the more diluted solution is described as hypotonic. Osmosis is the

major mechanism for transporting water upward in the plants.

Answer the following questions

The glucose solution to be injected into the bloodstream and the blood itself should have same.

A. Molarity

B. Vapour pressure

C. Osmotic pressure

D. Viscosity

Answer: C

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

be varied. The solution is slowly vapourized at temperature T by decreasing the applied pressure, starting with a pressure of about 1 atm. Based on this information, answer the following questions

The composition of the first bubble of vapour will be

A. $y_A = 0.36$

B. $y_A = 0.64$

C. $y_A = 0.46$

D. $y_A = 0.54$

Answer: A

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

be varied. The solution is slowly vapourized at temperature T by decreasing the applied pressure, starting with a pressure of about 1 atm. Based on this information, answer the following questions

The composition of the last droplet of liquid will be

A. $x_A = 0.40$

B. $x_A = 0.60$

C. $x_A = 0.80$

D. $x_A = 0.90$

Answer: C

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

be varied. The solution is slowly vapourized at temperature T by decreasing the applied pressure, starting with a pressure of about 1 atm. Based on this information, answer the following three questions

The pressure of the vapour when the last droplet of liquid remains will be

A. 300 torr

B. 400 torr

C. 500 Torr

D. 600 torr

Answer: B

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