CHEMISTRY

BOOKS - DISHA PUBLICATION CHEMISTRY (HINGLISH)

SOLUTIONS

Exercise

1. The mass of non-volatile, non-electrolyte solute $\left(\text{molar mass} = 50 g\text{mol}^{-1}\right)$ needed to be dissolved in $114 g$ octane to reduce its vapour pressure to 75%, is :

A. 37.5g

B. 75g

C. 150 g

D. 50 g

Answer: C

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2. Two 5 molal solution are prepared by dissoliving a non elecrtroyte non volatile solute separately in the solvents X nad Y The molecular weights of the solvents are M_x and M_y respecitvely where $M_x = \dfrac{3}{4}M_y$ The relative lowering of vapour pressure of the solution in is 'm' times that of the solution in y given that the number of moles of solute is very small in comparison to that of solvent the value of "m" is :

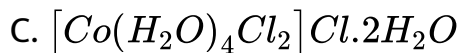A. $\dfrac{3}{4}$

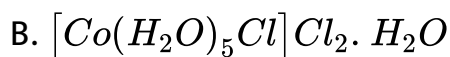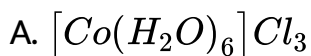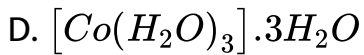B. $\dfrac{1}{2}$

C. $\dfrac{1}{4}$

D. $\dfrac{4}{3}$

Answer: A

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3. For 1 molal aqueous solution of the following compounds, which one will show the highest freezing point ?

A. $[Co(H_2O)_6]Cl_3$

B. $[Co(H_2O)_5Cl]Cl_2 . H_2O$

C. $[Co(H_2O)_4Cl_2]Cl.2H_2O$

D. $[Co(H_2O)_3].3H_2O$

Answer: D

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4. 5 g of Na_2SO_4 was dissolved in x g of H_2O . The change in freezing point was found to be $3.82°C$. If Na_2SO_4 is 81.5 % ionised , the value of x

(k_f for water $=1.86°C$ kg mol^{-1}) is apporximately :

(molar mass of S=32 g mol^{-1} and that of Na=23 g mol^{-1})

A. 15g

B. 25g

C. 45 g

D. 65 g

Answer: C

5. A solution is prepared by mixing 8.5g of CH_2Cl_2 and 11.95g of $CHCl_3$. If vapour pressure of CH_2Cl_2 and $CHCl_3$ at 298 K are 415 and 200 mm Hg respectively, the mole fraction of $CHCl_3$ in vapour form is :

$$\left(\text{Molar mass of Cl} = 35.5 \text{ g mol}^{-1}\right)$$

A. 0.162

B. 0.675

C. 0.325

D. 0.486

Answer: C

6. The freezing point of benzene decreases by $0.45°C$ when $0.2g$ of acetic acid is added to $20g$ of benzene. IF acetic acid associates to form a dimer in benzene, percentage association of acetic acid in benzene will be

$\left(K_f \text{for benzene} = 5.12 Kkgmol^{-1}\right)$

A. 0.646

B. 0.804

C. 0.746

D. 0.946

Answer: D

7. The solubility of N_2 in water at 300K at 300K and 500 torr partial pressure $0.01gL^{-1}$. The solubility (in gL^{-1}) at 750 torr partial pressure is :

A. 0.0075

B. 0.005

C. 0.02

D. 0.015

Answer: D

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8. An aqueous solution of a salt MX_2 at certain temperature has a van'f Hoff factor of 2. The degree of dissociation for this

solution of the salt is:

A. 0.5

B. 0.33

C. 0.67

D. 0.8

Answer: A

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9. $18g$ glucose $(C_6H_{12}O_6)$ is added to $178.2g$ water. The vapour pressure of water (in torr) for this aqueous solution is:

A. 752.4

B. 759

C. 7.6

D. 76

Answer: A

10. A solution at $20°C$ is composed of 1.5 mol of benzene and 3.5 mol of toluene. If the vapour pressure of pure benzene and pure toluene at this temperature are 74.7 torr and 22.3 torr, respectively, then the total vapour pressure of the solution and the benzene mole fraction in equilibrium with it will be, respectively:

A. 35.8 torr and 0.280

B. 38.0 torr and 0.589

C. 30.5 torr and 0.389

D. 30.5 torr and 0.480

Answer: B

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11. Determination of the molar mass of acetic acid in benzene using freezing point depression is affected by:

A. partial ionization

B. dissociation

C. complex formation

D. association

Answer: D

12. The vapor pressure of acetone at $20^\circ C$ is 185 torr. When $1.2g$ of a non-volatile solute was dissolved in $100g$ of acetone at $20^\circ C$, it vapour pressure was 183 torr. The molar mass $\left(gmol^{-1}\right)$ of solute is:

A. 128

B. 488

C. 32

D. 64

Answer: D

13. Choose the correct statement with respect to the vapour pressure of a liquid among the following:

A. Increases linearly with increasing temperature

B. Increases non-linearly with increasing temperature

C. Decreases linearly with increasing temperature

D. Decreases non-linearly with increasing temperature

Answer: B

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14. For an ideal solution of two components A and B, which of the following is true?

A. $\Delta H_{mixing} < 0$ (zero)

B. $\Delta H_{mixing} > 0$ (zero)

C. A-B interaction is stronger than A-A and B - B interations

D. A-A, B -B and A- B interactions are identical.

Answer: D

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15. The observed osmotic pressure for a $0.10M$ solution of $Fe(NH_4)_2(SO_4)_2$ at $25°C$ is $10.8atm$. The expected and experimental (observed) values of Van't Hoff factor (i) will be respectively: $\left(R = 0.082 Latmk^- mol^{-1}\right)$

A. 5 and 4.42

B. 4 and 4.00

C. 5 and 3.42

D. 3 and 5.42

Answer: A

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16. Consider separate solution of $0.500MC_2H_5OH(aq)$, $0.100MMg_3(PO_4)_2(aq)$, $0.250MKBr(aq)$ and $0.125MNa_3PO_4(aq)$ at $25°C$. Which statement is true about these solutions, assuming all salts to be strong electrolytes?

A. They all have the same osmotic pressure.

B. $0.100MMg_3(PO_4)(aq)$ has the highest osmotic pressure.

C. $0.125MNa_2PO_4$ (aq) has the highest osmotic pressure.

D. $0.500 M C_2H_5OH(aq)$ has the highest osotic pressure.

Answer: A

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17. When the solute is present in trace quantities the following expression is used

    A. gram per million

    B. milligram percent

    C. microgram precent

    D. parts per million

Answer: D

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18. Which one of the following gases has the lowest value of Henry law constant ?

A. N_2

B. He

C. H_2

D. CO_2

Answer: D

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19. Equal moles of water and user are taken in a flask. What is mass percentage of urea in the solution ?

A. 0.07692

B. 0.092

C. 0.7692

D. 0.007692

Answer: C

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20. What is the normality of 1 M H_3PO_4 solution ?

A. 0.5N

B. 1.0N

C. 2.0N

D. 3.0N

Answer: D

21. Molarity of liquid HCl with density equal to 1.17g/cc is

    A. 36.5 M

    B. 32.05M

    C. 18.25M

    D. 42.10M

Answer: B

22. An X molal solution of a compound in benzene has mol e fraction of solute $= 0.2$. The value of X is

A. 14

B. 3.2

C. 1.4

D. 2

Answer: B

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23. The normality of orthophosphoric acid having purity of 70% by weight and specific gravity 1.54 is :

A. 11N

B. 22N

C. 33N

D. 44N

Answer: C

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24. In acidic medium, equivalent weight of $K_2Cr_2O_7$ (molecular weight $= M$) is

A. M

B. M/2

C. M/3

D. M/6

Answer: D

25. The mole fraction of the solute in one molal aqueous solution is:

A. 0.009

B. 0.018

C. 0.027

D. 0.036

Answer: B

26. 5mL of $NHCI$, $20mL$ of $N/2H_2SO_4$ and 30 mL of $N/3HNO_3$ are mixed together and volume made to one litre. The normality of the resulting solution is

A. $\dfrac{N}{5}$

B. $\dfrac{N}{10}$

C. $\dfrac{N}{20}$

D. $\dfrac{N}{40}$

Answer: D

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27. Which of the following substances will lose its whose solubility with increase in temperature?

A. $NaOH$

B. Na_2CO_3

C. Na_2SO_4

D. All

Answer: D

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

A. the lowering of vapour pressure is equal to the mole fraction of solute.

B. the relative lowering of vapour pressure is equal to the mole fraction of solute.

C. the relative lowering of vapour pressure isproportional to the amount of solute in solution.

D. the vapour pressure of the solution is equal to the mole fraction of solvent.

Answer: B

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29. If P° and P_s are vapour pressure of solvent and its solution, respectively, X_1 and X_2 are mole fractions of solvent and solute, respectively, then

A. $p_s = p^\circ / X_2$

B. $p^\circ - p_s = p^\circ X_2$

C. $p_s = p^\circ X_2$

D. $\dfrac{p^\circ - p_s}{p_s} = \dfrac{X_1}{X_1 + X_2}$

Answer: B

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30. The normal boiling point of water is 373 k. vapour of waterr at temperature T is 19 mm hg. If enthalpy of vapoursed is 40.67 kJ/mol, them temperature Twould be

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

A. 250 K

B. 291.4K

C. 230K

D. 290 K

Answer: B

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

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

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

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

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

Answer: B

32. Mixture of volatile components A and B has a total vapour pressure (in torr)p=$254 - 119x_A$is where$x_A$mole fraction of A in mixture .HenceP_A° and P_B° are(in torr)

A. 254119

B. 119254

C. 135254

D. 154, 119

Answer: D

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33. Moles ofNa_2SO_4 to be dissoved in 12 mole water to lower its vapour pressure by 10 mm Hg at a temperature at which vapour pressure of pure water is 50 mm is:

A. 1.5 mole

B. 2 mole

C. 1 mole

D. 3 mole

Answer: D

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34. Equimolar solutions in the same solvent have-

A. different boiling and different freezing points,

B. same boiling and same freezing points.

C. same freezing point but different boiling points.

D. same boiling point but different freezing points.

Answer: B

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35. The solubility of common salt is 36.0 g in 100 g of water at $20°$ C . If systems I , II and III contains $20.0, 18.0 and 15.0$ of the salt added to 50.0 g of water in each case , the vapour pressures would be in the order :

A. IltIIltIII

B. IgtIIgtIII

C. I=II gt III

D. I=II ltIII

Answer: D

36. Vapour pressure of benzene at $30^\circ C$ is 121.8 mm. When 15 g of a non-volatile solute is dissolved in 250 g of benzene its vapour pressure decreased to 120.2 mm. The molecular weight of the solute is (mol. Weight of solvent = 78)

A. 356.2

B. 456.8

C. 530,1

D. 656.7

Answer: A

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37. The vapour pressure of two liquids 'P' and 'Q' are 80 and 60 torr respectively. The total vapour pressure of solution obtained by mixing 3 mole of P and 2 mol of Q would be

A. 72 torr

B. 140 torr

C. 68 torr

D. 20 torr

Answer: A

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38. In a mixture of A and B, components show negative deviation when

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

B. $\Delta H_{mix} > 0$

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

D. A - B interaction is stronger than A - A and B - B interactions

Answer: D

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39. 18g of glucose $(C_6H_{12}O_6)$ is added to 178.2 g of water. The vapour pressure of water for this aqueous solution at $100°C$ is

:

A. 76.00 torr

B. 752.40 torr

C. 759. 00 torr

D. 7.60 torr

Answer: B

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40. The vapour pressure of pure benzene is $639.7 mmHg$ and the vapour pressure of solution of a solute in benzene at the temperature is $631.9 mmHg$. Calculate the molality of the solution.

A. 65.25

B. 130

C. 40

D. 80

Answer: D

41. An ideal solution is formed when its components same

    A. have no volume change on mixing

    B. have no enthalpy change on mixing

    C. both (a) and (b) are correct

    D. neither (a) nor (b) is correct

Answer: C

42. Strutural isomers C_2H_5OH and CH_3OCH_3 have the same value of

    A. Boiling points

    B. Vapour pressure at the same temperature

    C. Heat of vaporization

    D. Gaseous densities at the same temperature and pressure

Answer: D

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43. Which one of the following is non-ideal solution?

    A. Benzene + toluene

B. n-hexane + n - heptane

C. Ethyl bromide + ethyl iodide

D. $CCl_4 + CHCl_3$

Answer: D

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44. When common salt is dissolved in water

A. the melting point of the solution increases.

B. the boiling point of solution decreases.

C. both melting point and boiling point decrease.

D. the boiling point of the solution increases.

Answer: D

45. Camphor is often used in molecular mass determination because

A. it is readily available

B. it has a very high cryoscoic constnat

C. it is volatile

D. it is solvent for organic substances.

Answer: B

46. Normal boiling point of a liquid is that temperature which

vapour pressure of the liquid is equal to:

A. equal to 1 torr

B. equalt o 76 mm hg

C. equal to 2.0 atm

D. equal to 1 atm

Answer: D

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47. When solid SnO_2 is added to an aqueous solution of

NaOH, the

A. vapour pressure is lowered.

B. vapour pressure is raised.

C. osmotic pressure is increased.

D. boiling point is raised.

Answer: B

48. The vapour pressure (VP) of a dilute solution of non-volatile solute is P and the VP of a pure solvent is $P°$. The lowering of the VP is

A. $+ve$

B. $-ve$

C. $P/P°$

D. P°/P

Answer: A

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49. What would be the freezing point of aqueous solution containing 17 g of C_2H_5OH in 100 g of water $\left(K_f H_2O = 1.86 K mol^{-1} kg\right)$:

A. $-0.69^{\circ}C$

B. $-0.34^{\circ}C$

C. $0.0^{\circ}C$

D. $0.34^{\circ}C$

Answer: A

50. If a thin slice of sugar beet is placed in concentrated solution of $NaCl$, then

    A. sugar beet will lose water from its cells.

    B. sugar beet will absorb water from solution

    C. sugar beet will neither absorb nor lose water.

    D. sugar beet will dissolve in solution.

Answer: A

51. Which salt shows maximum osmotic pressure in its $1m$ solution.

    A. $AgNO_3$

    B. Na_2SO_4

    C. $(NH_4)_3PO_4$

    D. $MgCl_2$
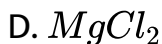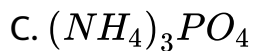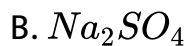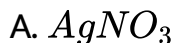
Answer: C

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52. The osmotic pressure of a sugar solution at $24°C$ is $2.5atm$. The concentration of the solution in mole per litre is

    A. 10.25

B. 1.025

C. 1025

D. 0.1025

Answer: D

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53. Which has the maximum osmotic pressure at temperature T?

A. 100mL of 1 M urea solution.

B. 300 mL of 1 M glucose solution.

C. Mixture of 100 mL of 1 M urea solution and 300 mL of 1 M glucose solution

D. All are isotonic.

Answer: D

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54. Choroform , $CHCl_3$, boils at $61.7°$C. If the K_b for choroform is $3.63°C/$molal, what is the boiling point of a solution of 15.0 kg ofCH_3 and 0.616 kg of acenaphthalene, $C_{12}H_{10}$?

A. $61.9°C$

B. $62.0°C$

C. $52.2°C$

D. $62.67°C$

Answer: D

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

    A. 0.015 M urea

    B. 0.01 M KNO_3

    C. $0.10 M Na_2 SO_4$

    D. 0.015 M glucose

Answer: C

56. When a solution containg non- volatile solute freezes, which equilibrium would exist?

    A. solid solvent $\Rightarrow$ liquid solvent

    B. solid solute $\Rightarrow$ liquid solution

    C. solid solute $\Rightarrow$ liquid solvent

    D. solid solvent $\Rightarrow$ liquid solution

Answer: D

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57. How much ethyl alcohol must be added to $1.00L$ of water so that the solution will not freeze at $-4° F$?

    A. lt 20 g

B. lt 10.75 g

C. lt 494.5 g
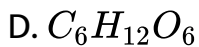
D. gt 494.5 g

Answer: D

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

A. $C_2H_4O_2$

B. C_3H_6

C. $C_4H_8O_4$

D. $C_6H_{12}O_6$

Answer: D

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59. Freezing point of the following equilibrium, liquid solvent $\Leftrightarrow$ solid solvent is :

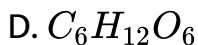A. $\dfrac{\Delta H - \Delta G}{T\Delta S}$
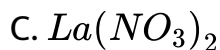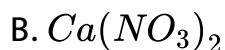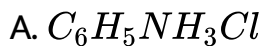
B. $\dfrac{\Delta H}{\Delta S}$

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

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

Answer: B

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60. The freezing point of equimolal aqueous solution will be highest for

A. $C_6H_5NH_3Cl$

B. $Ca(NO_3)_2$

C. $La(NO_3)_2$

D. $C_6H_{12}O_6$

Answer: D

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

A. 274. 674 K

B. 271.60 K

C. 273K

D. None of these

Answer: B

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62. In a 2.0 molal aqueus solution of a weak acid HX the degree

of disssociation is 0.25. The freezing point of the solution will

be nearest to: ($K_f = 1.86Kk$gmol^{-1})

A. $-026° C$

B. $0.465° C$

C. $-0.48°C$

D. $-0.465°C$

Answer: D

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63. Which one of the following statements is false ?

A. The correct order of osmotic pressure for 0.01 M aqueous solution of each compound is $BaCl_2 > KCl > CH_3COOH >$ socrose.

B. Isotonic solutions are those solutions which have the same osmotic pressure.

C. Raoult's law states that the vapour pressure of a component over a solution is proportional to its mole fraction in liquid state.

D. Two sucrose solution of same molality prepared in different solvents will have the same freezing point depression.

Answer: D

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64. 0.1 molal aqueous solution of an electrolyte AB_3 is 90% ionised. The boiling point of the solution at 1 atm is ($K_{b(H_2O)} = 0.52kg \ \text{mol}^{-1}$)

A. 273.19 K

B. 374.92 K

C. 376.4K

D. 373.19 K

Answer: D

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

A. higher vapour pressure to lower vapour pressure

B. higher concentration to lower concentration.

C. lower vapour pressure to higher vapour pressure.

D. higher osmotic pressure solutions to lower osmotic

pressure.

Answer: A

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66. Which of the following solutions would have the highest

osmotic pressure:

A. Decinormal aluminium sulphate

B. Decinormal barium chloride solution

C. Decinormal sodium sulphate solution

D. Solution of equal volumes of decinormal barium chloride

and decinormal sodium sulphate solutions

Answer: A

67. A 1% (mass/vol) KCl solution is ionised to the extent of 80%.

The osmotic pressure at $27°$ C of the solution will be :

A. 6.95 atm

B. 5.94 atm

C. 2.71 atm

D. 3.30 atm

Answer: B

68. Osmotic pressure nof blood is 7.40 atm, at $27°$ C. Number of moles of glcouse to be used per liter for an intravenous injection that is to have same osmotic pressure of blood is :

A. 0.3

B. 0.2

C. 0.1

D. 0.4

Answer: A

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69. A solution containing 4.0 g of PVcC in 2 liter of dioxane (industrial solvent) was found to have an osmotic pressure 3.0

x 10^{-4} atm at $27°\,C$. The molar mass of the polymer (g/mol) will be :

A. 1.6×10^4

B. 1.6×10^5

C. 1.6×10^3

D. 1.6×10^2

Answer: B

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70. If the elevation in boiling point of a solution of 10 g of solute (molecular weight = 100) in 100 g of water is ΔT_b, the ebullioscopic constant of water is

A. 10

B. $10\Delta T_b$

C. ΔT_b

D. $\dfrac{\Delta T_b}{10}$

Answer: C

71. The boiling point of a solution of $0.11g$ of a substance is 15g of ether was found to be $0.1°C$ higher than that of pure ether. The molecular weight of the substance will be $(K_b = 2.16)$

A. 148

B. 158

C. 168

D. 178

Answer: B

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72. Which observation (s) reflect(s) colligative properties ?

(i) A 0.5m NaBr solution has a higher vapour pressure than a 0.5 m $BaCl_2$ solution at the same temperature.

(ii) Pure water freezes at the higher temperature than pure methanol.

(iii) A 0.1 m NaOH solution freezes at a lower temperature than pure water.

Choose the correct answer from the codes given below

A. (i), (ii) and (iii)

B. (i) and (ii)

C. (ii) and (iii)

D. (i) and (iii)

Answer: D

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73. An aqueous solution freezes at

$-0.186°C(K_f = 1.86°$,$K_b = 0.512°$. What is the elevation

in boiling point?

A. $0.186°C$

B. $0.512°C$

C. $0.86°C$

D. $0.0512°C$

Answer: D

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74. At temperature $327°C$ and concentration C, the osmotic pressure of a solution is P. The same solution at concentration C/2 and a temperature $427°C$ of shows osmotic pressure of 2 atm. The value of P will be :

A. $\dfrac{12}{7}$

B. $\dfrac{24}{7}$

C. $\dfrac{6}{5}$

D. $\dfrac{5}{6}$

Answer: B

75. The relationship between osmotic pressure at $273K$ when $10g$ glucose (P_1), $10g$ urea (P_2) and $10g$ sucrose (P_3) are dissolved in $250mL$ of water is:

A. $P_1 > P_2 > P_3$

B. $P_3 > P_1 > P_2$

C. $P_2 > P_1 > P_3$

D. $P_2 > P_3 > P_1$

Answer: C

76. Consider the following statements

I : Osmosis takes place with increase of entropy.

II. Osmosis is a non-spontaeous process.

III : Free energy decreases during osmosis.

Which of the above is/are correct ?
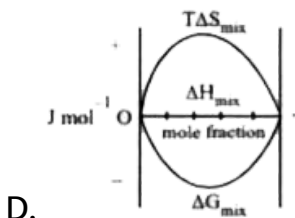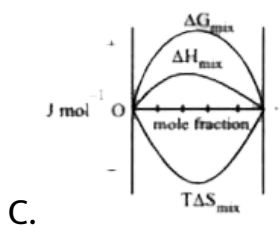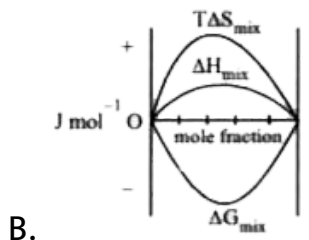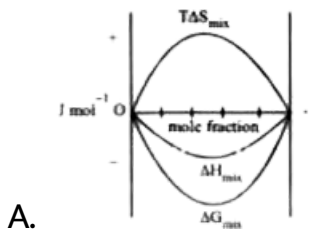
    A. I only

    B. I and II

    C. II and III

    D. I and III

Answer: D

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

A.

B.

C.

D.

Answer: B

---

78. 1.00 g of a non-electrolyte solute (molar mass 250g mol^{-1}) was dissolved in 51.2 g of benzene. If the freezing point depression constant K_f of benzene is 5.12 K kg mol^{-1}, the freezing point of benzene will be lowered by:-

A. 0.3 K

B. 0.5 K

C. 0.4 K

D. 0.2

Answer: C

79. In a 0.2 molal aqueous solution of a weak acid HX the degree of ionization is 0.3. Taking K_f for water as 1.85, the freezing point of the solution will be nearest to

A. $-0.360°C$

B. $-0.260°C$

C. $+0.481°C$

D. $-0.481°C$

Answer: D

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80. The elevation in boiling point of a solution of 13.44g of $CuCl_2$(molecular weight =134.4, $k_b = 0.52K$molality^{-1}) in 1 kg water using the following information will be:

A. 0.16

B. 0.05

C. 0.1

D. 0.2

Answer: A

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81. The temperature at which 10% aqueous solution (w/v) of glucose will exhibit the osmotic pressure of 14 bar is -

A. $307.3°C$

B. $307.3K$

C. $34K$

D. $-34°C$

Answer: B

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82. KBr is 80% ionized in solution. The freezing point of 0.4

molal solution of KBr is :

$$K_{f(H_2O)} = 1.86\frac{Kkg}{mole}$$

A. 274.339 K

B. $-1.339K$

C. $257.3K$

D. $-1.339\degree C$

Answer: D

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83. What is the freezing point of a solution containing $8.1gBr$ in $100g$ water assuming the acid to be 90% ionised(K_f for water $=1.8K\text{mole}^{-1}$)

A. $0.85\degree K$

B. $-3.53\degree K$

C. $0\degree K$

D. $-0.35\degree K$

Answer: B

---

84. The correct order of osmotic pressure of 0.01M aqueous solution of the following is

A. Sucrose $> CH_3COOH > KCl$

B. $CH_3COOH >$ Sucrose $> KCl$

C. Sucrose $> KCl > CH_3COOH$

D. $KCl > CH_3COOH >$ Sucrose

Answer: D

85. A solution of urea boils at $100.18°C$ at the atmospheric pressure. If K_f and K_b for water are 1.86 and $0.512Kkgmol^{-1}$ respectively, the above solution will freeze at,

    A. $0.654°C$

    B. $-0.654°C$

    C. $6.54°C$

    D. $-6.54°C$

Answer: B

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86. Consider the followign statements

1. Isotonic solutions have the same molar concentration at a given temperature

2. The molal elevation constant K_b is a characteristic of a solvent, and is independent of the solute added

3. The freezing point of a 0.1 M aqueous $AlCl_3$ solution.

Which of these statements is correct

A. 1 and 2

B. 2 and 3

C. 1 and 3

D. 1,2 and 3

Answer: D

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

Y_A (mole fraction of A in vapour phase) is correct:

A. $y_A < y_B$

B. $x_A > x_B$

C. $\dfrac{y_A}{y_B} > \dfrac{x_A}{x_B}$

D. $\dfrac{y_A}{y_B} < \dfrac{x_A}{x_B}$

Answer: C

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88. Formation of a solution from two componenets can be considered as :

(i) pure sovent $\rightarrow$ separated solvent molecules, $\triangle H_1$

(ii) Pure solute $\rightarrow$ separated molecules, $\triangle H_2$

(iii) separated sovent and solute molecules $\rightarrow$ solution, $\triangle H_3$

solution so formed will be ideal if :

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

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

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

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

Answer: B

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89. The volumes of $4NHCI$ and $10NHCI$ required to make 1 litre of $6NHCI$ are

A. 0.75 litre of 10 NHCl and 0.25 litre of 4NHCl

B. 0.50 litre of 4NHCl and 0.50 litre of10 NHCl

C. 0.67 litre of 4 NHCl and 0.33 litre of 10 NHCl

D. 0.80 litre of 4NHCl and 0.20 litre of 10 NHCl

Answer: C

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90. The mole fraction of water in $20\%\,(wt./wt.)$ aqueous solution of H_2O_2 is:

A. $\dfrac{77}{68}$

B. $\dfrac{68}{77}$

C. $\dfrac{20}{80}$

D. $\dfrac{80}{20}$

Answer: B

91. 25 mL of a solution of barium hydroxide on titration with 0.1

molar solution of hydrochloric acid gave a titre value of 35 mL.

The molarity of barium hydroxide solution was

A. 0.07

B. 0.14

C. 0.28

D. 0.35

Answer: A

92. A simple of thliqid H_2O at 18.0 g is inlected into an evacuated 7.6 L flask maintained at $27.0°C$. If vapour pressure of H_0O at $27.0°C$ is 24.63 mm Hg, what wight percentage of the water will be vaproueied when the ssystem 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

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

A. 150

B. 180

C. 188.88

D. 198.88

Answer: C

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94. Vapour pressure of solution containing 2 mol of liquid A ($P_A° = 80$ torr) and 3 mol of liquid B ($P_B° = 100$ torr) is 87 torr.

We canconclude that

A. there is negative deviation from Raoult's law

B. boiling point is higher than that expected for ideal solution

C. molecular attractions between unlike molecules arestronger than those between like molecules

D. all of these statements are correct

Answer: D

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95. Liquids A and B from an ideal solution and the former has stronger intermolecular forces. If X_A and X'_A are the mole fractions of A in the solution and vapour inequilibrium, then

A. $\dfrac{X'_A}{X_A} = 1$

B. $\dfrac{X'_A}{X_A} > 1$

C. $\dfrac{X'_A}{X_A} = 1$

D. $X'_A + X_A = 1$

Answer: C

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96. A solution is prepared by mixing 8.5g of CH_2Cl_2 and 11.95g of $CHCl_3$. If vapour pressure of CH_2Cl_2 and $CHCl_3$ at 298 K are 415 and 200 mm Hg respectively, the mole fraction of $CHCl_3$ in vapour form is :

$\left(\text{Molar mass of Cl} = 35.5 \text{ g mol}^{-1}\right)$

A. 0.162

B. 0.675

C. 0.325

D. 0.416

Answer: D

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97. A solution at $20°C$ is composed of 1.5 mol of benzene and 3.5 mol of toluene. If the vapour pressure of pure benzene and pure toluene at this temperature are 74.7 torr and 22.3 torr, respectively, then the total vapour pressure of the solution and the benzene mole fraction in equilibrium with it will be, respectively:

A. 35.8 torr and 0.280

B. 38.0 torr and 0.589

C. 30.5 torr and 0.389

D. 30.5 torr and 0.480

Answer: B

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98. The vapour pressure at a given temperature of an ideal solution containing $0.2mol$ of non-volatile solute and $0.8mol$ of a solvent is $60mm$ of Hg. The vapour pressure of the pure solvent at the same temperature will be

A. 150 mm of Hg

B. 60mm of Hg

C. 75 mm of Hg

D. 120 mm of Hg

Answer: C

99. Select correct statement

A. Heats of vaporisation for a pure solvent and for a solution are similar because similar intermolecular forces between solvent molecules must be overcome in both cases.

B. Entropy change between solution and vapour is smaller than the entropy change between pure solvent and vapour.

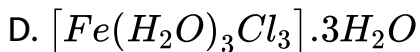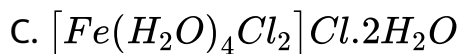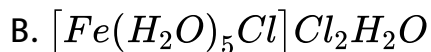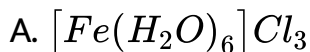C. Boiling point of the solution is larger than that of the pure solvent.

D. All are correct statements.

Answer: D

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

A. $\left[Fe(H_2O)_6\right]Cl_3$

B. $\left[Fe(H_2O)_5Cl\right]Cl_2H_2O$

C. $\left[Fe(H_2O)_4Cl_2\right]Cl.2H_2O$

D. $\left[Fe(H_2O)_3Cl_3\right].3H_2O$

Answer: A

---

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

A. 1

B. 4

C. 2

D. 3

Answer: C

102. Which of the following aquous solutions should have the highest osmotic pressure?

 A. 0.011 M $AlCl_3$ at $50°C$

 B. 0.03 M NaCl at $25°C$

 C. $0.012M(NH_4)_2SO_4$ at $25°C$

 D. 0.03 m NaCl at $50°C$

Answer: D

103. At 760 torr pressure and $20°C$ tempreature , 1 L of water dissolves 0.04 gm of pure oxygen or 0.02 gm of pure nitrogen.

Assuming that dry air is compound of 20% oxygen and 80% nitrogen (by volume), the masses (in g/L) of oxygen and nitrogen dissolved by 1 L of water at $20°C$ exposed to air at a total pressur of 706 torr are respectively :

A. 0.008,0.016

B. 0.016,0.008

C. 0.16.0.08

D. 0.04,0.02

Answer: A

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104. The correct equation for the degree of association $'\alpha'$ of an associating solute, 'n' molecules of which undergoes

association in solution, is

A. $\alpha = \dfrac{n(i-1)}{1-n}$

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

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

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

Answer: A

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105. Osmotic pressure of a solution at a given temperature

A. increases with concentration

B. decreases with concentration

C. remains same

D. initially increases and then decreases

Answer: A

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106. The solution containing $4.0gm$ of a polyvinyl chloride polymer in 1 litre dioxane was found to have an osmotic pressure 6.0×10^{-4} atmosphere at $300K$, the value of R used is 0.082 litre atmosphere mole $^{-1}K^{-1}$. The molecular mass of the polymer was found to be

A. 3.0×10^2

B. 1.6×10^5

C. 5.6×10^4

D. 6.4×10^2

Answer: B

107. π_1, π_2, π_3 and π_4 are the osmotic pressure of $5\% \left(\dfrac{W}{V}\right)$ solution of ure ,frutose ,sucrose and KCl respectively at certain temperatures.The correct order of their magnitude is

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

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

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

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

Answer: C

108. In countries nearer to polar region, the roads are sprinkled with $CaCl_2$. This is

   A. to minimise the snow fall

   B. to minimise pollution

   C. to minimise the accumulation of dust on the road

   D. to minimise the wear and tear of the roads

Answer: A

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109. If the various terms in the following expressions have usual meanings, the van't Hoff factor 'i' cannot be calculated by which of the following expression ?

A. $\pi V = \sqrt{in}RT$

B. $\Delta T_f = iK_f \cdot m$

C. $\Delta T_b = iK_b \cdot m$

D. $\dfrac{P^\circ_{solvent} - P_{solution}}{P^\circ_{solvent}} = i\left(\dfrac{n}{N+n}\right)$
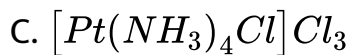
Answer: A

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110. A 0.001 molal solution of $\left[Pt(NH_3)_4CI_4\right]$ in water had a freezing point depression of $0.0054^\circ C$. If K_f for water is 1.80, the correct formulation for the above molecule is

A. $\left[Pt(NH_3)_4Cl_3\right]Cl$

B. $\left[Pt(NH_3)_4Cl_2\right]Cl_2$

C. $[Pt(NH_3)_4Cl]Cl_3$

D. $[Pt(NH_3)_4Cl_4]$
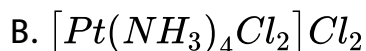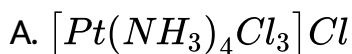
Answer: B

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111. Which of the following has the highest freezing point ?

A. 0.1 m sucrose

B. 0.1 m urea

C. 0.1 m ethanol

D. 0.1 m glucose

Answer: C

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112. Which has the minimum freezing point ?

A. One molal NaCl aq. Solution

B. One molal $CaCl_2$ aq. Solution

C. One molal KCl aq. Solution

D. One molal urea aq. Solution

Answer: B

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113. The freezing point (in $.^{\circ}C$) of a solution containing $0.1g$ of $K_3[Fe(CN)_6]$ (Mol. wt. 329) in $100g$ of water $(K_f = 1.86Kkgmol^{-1})$ is :

A. -2.3×10^{-2}

B. -5.7×10^{-2}

C. -5.7×10^{-3}

D. -1.2×10^{-2}

Answer: A

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114. For a silute solution conatining $2.5g$ 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 (take $K_b = 0.76K kgmol^{-1}$)

A. 724

B. 740

C. 736

D. 718

Answer: A

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115. Which of the following statements is correct if the intermolecular forces in liquid A, B and C are in the order $A < B < C$?

A. B evaporates more readily than A

B. B evaporates less readily than C

C. A and B evaporates at the same rate

D. A evaporates more readily than C

Answer: D

---

116. The relationshp between the values of osmotic pressure of

0.1 M solution of $KNO_3(P_1)$ and $CH_3COOH(P_2)$ is :

A. $\dfrac{P_1}{P_1 + P_2} = \dfrac{P_2}{P_1 + P_2}$

B. $P_1 > P_2$

C. $P_2 > P_1$

D. $P_1 = P_2$

Answer: B