CHEMISTRY

BOOKS - MODERN PUBLICATION CHEMISTRY (KANNADA ENGLISH)

SOLUTIONS

Multiple Choice Questions Level I Basic Conceptual Qs Types Of Solutions And Expressing Concentration Of Solutions

1. Aerated drinks is an example of

A. liquid in liquid

B. gas in liquid

C. solid in liquid

D. liquid in gas.

Answer: B

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2. The example of a solution of liquid in gas in

:

A. air

B. alcohol in water

C. mercury in gold

D. moisture in air.

Answer: D

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3. What weight of sodium hydroxide should be dissolved to prepare 250 ml of 0.2 M solution ?

A. 2g

B. 8g

C. 60g

D. 4g

Answer: A

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4. 12.5 g of H_2SO_4 are dissolved in water to make 1250 ml of solution. The concentration in normality is :

A. 0.204

B. 0.102

C. 0.408

D. 0.051

Answer: A

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5. 100 ml of 0.1 M solution A is mixed with 20ml of 0.2 M solution B. The final molarity of the solution is :

A. 0.12 M

B. 0.15 M

C. 0.18 M

D. 0.21 M

Answer: A

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6. The milliequivalents in 60 ml of 4.0 M H_2SO_4 is :

A. 240

B. 48

C. 480

D. 960

Answer: C

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7. In a solution containing 1 mol of ethyl alcohol and 4 mol of water, the mole fraction of water is :

A. 0.25

B. 0.20

C. 0.75

D. 0.80

Answer: D

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8. The amount of solute required to prepare 10 L of a decimolar solution is :

A. 0.01 mol

B. 0.2 mol

C. 0.1 mol

D. 1 mol

Answer: D

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9. If 100 ml of 1.0 M NaOH solution is diluted to 1.0 L, the resulting solution contains

A. 1.0 mol of NaOH

B. 0.1 mol of NaOH

C. 10.0 mol of NaOH

D. 0.05 mol of NaOH

Answer: B

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10. A solutions 16 g of methanol and 90 g of water. The mole fraction of methanol in the solution is :

A. 0.909

B. 0.826

C. 0.091

D. 0.182

Answer: C

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11. The molality of a solution containing 0.1 mol of a substance in 100g of water is :

A. 0.5 m

B. 0.1 m

C. 1 m

D. 0.0180 m

Answer: C

12. The number of moles of NaCl in 2L of 3M NaCl solution is :

A. 0.667

B. 6

C. 1.5

D. 1

Answer: B

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13. An aqueous solution of urea containing 6 g in 500 ml has a density equal to 1.05. If the

molar mass of urea is 60, then the molality of the solution is :

A. 0.193 M

B. 0.190 M

C. 0.20 M

D. 0.10 M

Answer: A

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14. The normality of 10% (weight/volume) acetic acid is :

A. 1 N

B. 1.7 N

C. 0.83 N

D. 10 N

Answer: B

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15. The weight of calcium hydroxide, $Ca(OH)_2$ in 100 ml of 0.01 M solution will be (At. Mass of $Ca = 40$)

A. 1.48 g

B. 74.0 g

C. 14.8 g

D. 0.074 g

Answer: D

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16. The weight of $(COOH)_2.2H_2O$ needed to prepare $500cm^3$ of 0.1 M solution is :

A. 12.6 g

B. 9.0 g

C. 4.5 g

D. 6.3 g

Answer: D

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17. The normality of 2% H_2SO_4 (wt/vol) is nearly

A. 0.02 N

B. 0.04 N

C. 0.2 N

D. 0.4 N

Answer: D

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18. Molality of pure ethyl alcohol (density 0.92 g ml) is :

A. 15 m

B. 92 m

C. 46 m

D. 20 m

Answer: D

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19. If 250 ml of 0.25 M NaCl solution is diluted with water to voluem of 500 ml, the new concentration of the solution is :

A. 0.167 M

B. 0.125 M

C. 0.50 M

D. 0.0625 M

Answer: B

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20. The number of iodine atoms present in $1cm^3$ of its 0.1 M solutions is :

A. 6.02×10^{23}

B. 6.02×10^{22}

C. 6.02×10^{19}

D. 1.204×10^{20}

Answer: D

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21. A sugar syrup of weight 214.2 g contains 34.2 g of sugar (molar mass = 342). The molality of the solution is :

A. 0.0099

B. 0.56

C. 0.28

D. 0.34

Answer: B

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22. How much water should be added to 100 ml of $1MH_2SO_4$ solution to make it exactly 0.1 N ?

A. 1200 ml

B. 400 ml

C. 1800 ml

D. 1900 ml

Answer: D

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23. 5.85 g of NaCl are dissolved in 90 g of water, the mole fraction of NaCl is :

A. 0.1

B. 0.01

C. 0.2

D. 0.0196

Answer: D

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24. Which of the following concentration terms is/are independent of temperature ?

A. Molality only

B. Molality and mole fraction

C. Molarity and mole fraction

D. Molality and normality.

Answer: B

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25. 6.02×10^{20} molecules of urea are present in 100 ml of its solution. The concentration of solution is

A. 0.02 M

B. 0.01 M

C. 0.001 M

D. 0.1 M

Answer: B

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Multiple Choice Questions Level I Basic Conceptual Qs Solubility Vapour Pressure Raoult S Law Ideal And Non Ideal Solutions

1. Vapour pressure of a solution containing a non volatile solute is

A. more than the vapour pressure of pure solvent

B. less than the vapour pressure of pure solvent

C. equal to the vapour pressure of the pure solvent

D. may be more or less than vapour pressure of the pure solvent depending upon whether the solution is dilute or concentrated.

Answer: B

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2. The solubility of gas in liquid increases with

A. increase in temperature

B. decrease in gas temperature

C. decrease in temperature

D. amount of liquid taken.

Answer: C

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3. Solutions with components which obey Raoult's law over the entire composition range are called

A. Real solutions

B. Dilute solutions

C. Binary solutions

D. Ideal solutions.

Answer: D

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4. The law which relates the solubility of a gas to its pressure is called :

A. Raoult's law

B. Ostwald's law

C. Distribution law

D. Henry's law

Answer: D

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5. Which of the following statements is wrong concerning ideal solutions ? Ideal solutions can be formed when their components

A. have zero heat of mixing

B. have zero volume change on mixing

C. obey Raoult's law

D. can be converted into ideal gases.

Answer: D

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6. State Raoult' s law for a soluti.on of 2 volatile liquids. Give an example for liquid mixture that show negative deviation from Raoult's law.

A. Acetone-carbon disulphide

B. Carbon tetrachloride-chloroform

C. Ethyl alcohol-cyclohexane

D. Acetone-chloroform.

Answer: D

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7. Which of the following is not the correct criterion for an ideal solution ?

A. Enthalpy of mixing $= 0$

B. Volume of mixing $= 0$

C. Free energy change of mixing $= 0$

D. Obeys Raoult's law.

Answer: C

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8. Solutions which distil without change in composition or temperature are called

A. Ideal solutions

B. Azeotropic mixtures

C. Super - saturated mixtures

D. Eutectic mixtures.

Answer: B

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9. The vapour pressure of ethyl alcohol at 298K is 40mm of Hg. Its mole fraction in a solution with methyl alcohol is 0.80. what is its vapoure pressure in solution. If the mixture obeys Raoult's law.

A. 8 mm Hg

B. 32 mm Hg

C. 48 mm Hg

D. 80 mm Hg

Answer: B

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10. The vapour pressure of two pure components A and B forming an ideal solution are 100 torr and 80 torr respectively. The total pressure of the solution obtained by mixing 2 mol of A and 3 mol of B is :

A. 48 torr

B. 108 torr

C. 88 torr

D. 8 torr

Answer: C

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11. Vapour pressure of a solution of heptane and octane is given by the equation :

$P_{\text{sol}}(mmHg) = 32 + 63x$

where x is the mole fraction of heptane. Vapour pressure of pure heptane will be

A. 32 mm Hg

B. 95 mm Hg

C. 47.5 mm Hg

D. 63 mm Hg

Answer: B

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12. The vapour pressure of a solvent is 60 torr while that of its dilute solution is 52 torr. The mole fraction of the solvent is :

A. 0.867

B. 0.133

C. 0.902

D. 0.568

Answer: A

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13. Benzene and toluene form nearly ideal solutions. At $20^{\circ}C$, the vapour pressure of benzene is 75 torr and that of toluene is 22 torr. The partial vapour pressure of benzene at

$20^\circ C$ for a solution containing 78 g of benzene and 46 g of toluene in torr is

A. 50

B. 25

C. 37.5

D. 53.5

Answer: A

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14. The vapour pressure of pure components A and B are 200 torr and 100 torr respectively. Assuming a solution of these components obeys Raoult's law, the mole fraction of component. A in vapour phase in equilibrium with a solution containing equimoles of A and B is :

A. 0.22

B. 0.33

C. 0.67

D. 0.5

Answer: C

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15. A pressure cooker reduces cooking time because

A. heat is more uniformly distributed

B. the pressure tenderises the food

C. the boiling point of water inside the cooker is elevated

D. the boiling point of water inside the cooker is depressed.

Answer: C

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Multiple Choice Questions Level I Basic Conceptual Qs Colligative Properties

1. Which of the following is a colligative property ?

A. Boiling point

B. Osmotic pressure

C. Vapour pressure

D. Freezing point

Answer: B

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2. According to Raoult's law, the relative lowering in vapour pressure of a solution is equal to :

A. Number of moles of solute

B. Number of moles of solvent

C. Mole fraction of solute

D. Mole fraction of solvent.

Answer: C

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3. At higher altitudes, the boiling point of water lowers because :

A. Atmospheric pressure is low

B. Temperature is low

C. Atmospheric pressure is high

D. None of these

Answer: A

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4. The boiling point of a solvent containing a non-volatile solute

A. is depressed

B. is elevated

C. does not change

D. none of the above.

Answer: B

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5. The colligative properties of a dilute solution depend on

A. the nature of the solute

B. the nature of the solute and the solvent

C. the number of particles of solute

D. the number of particles of solvent.

Answer: C

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6. Which is true for solution with the same osmotic pressure at the same temperature ? (M is molar mass)

A. $C_1 = C_2$

B. $M_1 = M_2$

C. $C_1 M_1 = C_2 M_2$

D. $C_1 / M_1 = C_2 / M_2$

Answer: A

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7. Sea water is converted into fresh water based upon the phenomenon of

A. Diffusion

B. Osmosis

C. Plasmolysis

D. Reverse osmosis.

Answer: D

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8. If ΔT_f is the depression in freezing point for the electrolyte and ΔT_f° for the non-electrolyte of the same concentration, then Van't Hoff factor (i) is

A. $\Delta T_f \times \Delta T_f^\circ$

B. $\Delta T_f^\circ / \Delta T_f$

C. $\dfrac{\Delta T_f - \Delta T_f^\circ}{2}$

D. $\Delta T_f / \Delta T_f^\circ$

Answer: D

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9. The relative lowering of vapour pressure of a solution on the addition of non-volatile solute

A. Is equal to mole fraction of the solute

B. Is equal to the mole fraction of the solvent

C. Depends upon the nature of the solute

D. Depends upon the nature of the solute and solvent.

Answer: A

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10. Osmotic pressure is measured by

A. Ostwald's method

B. Berkeley and Hartley method

C. Pfeffer's method

D. Beckmann's method.

Answer: B

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11. The molal cryoscopic for water is $1.86\mathrm{K\ mol}^{-1}$. When 3.42 g of sugar (molar mass = 342) is dissolved in 100 g of water, the solution will freeze at

A. $1.86^{\circ}C$

B. $0.186^{\circ}C$

C. $-0.186^{\circ}C$

D. $0.914^{\circ}C$

Answer: C

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12. When 0.6 g of urea is dissolved in 100 g of water, the water will boil at (K_b for water $= 0.52Km^{-1}$ and normal boiling point of water $= 100^{\circ}C$) :

A. 372.48 K

B. 373.52 K

C. 373.052 K

D. 273.52 K

Answer: C

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13. If K_f for water is $1.86^\circ C \text{mol}^{-1}$, a 0.1 m solution of urea in water will have the freezing point of

A. $0.186^\circ C$

B. $1.86^\circ C$

C. $-0.186^{\circ} C$

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

Answer: C

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14. Six grams of urea (molar mass $= 60$) are dissolved in 90 g of water. The relative lowering of vapour pressure is equal to

A. 0.0196

B. 0.06

C. 0.01

D. 0.0202

Answer: A

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15. The osmotic pressure of a solution at 273 K is 2.5 atm. The osmotic pressure of the same solution at $273^\circ C$ is :

A. 0.5 atm

B. 4 atm

C. 5 atm

D. 273 atm

Answer: C

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16. A solution of solute 's' in benzene boils at 0.126° higher than benzene. The molality of

the solution is (K_b for benzene $= 2.52 K m^{-1}$) :

A. 2 m

B. 0.05 m

C. 1 m

D. 20 m

Answer: B

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17. The molar elevation constant for water is 0.52°. The elevation caused in the boiling point of water by dissolving 0.25 mole of a non-volatile solute in 250 g of water will be

A. $0.52^{\circ} C$

B. $0.052^{\circ} C$

C. $5.2^{\circ} C$

D. $52^{\circ} C$

Answer: A

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18. A 5% solution of glucose (molar mass $= 180$) is isotonic with a 2.5% solution of a substance X at the same temperature. The molar mass of X is :

A. 90

B. 45

C. 180

D. 360

Answer: A

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19. 6 grams of a substance 'A' dissolved in 100 g of water freezes at - $0.93^{\circ}C$. The molecular mass of 'A' is ($K_f = 1.86Km^{-1}$).

A. 60

B. 120

C. 180

D. 140

Answer: B

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20. If 10.0 g of a non-electrolyte dissolved in 100 g of water lowers the freezing point of water by $1.86^{\circ}C$, the molar mass of the non-electrolyte is ($K_f = 1.86Km^{-1}$)

A. 10.0

B. 100

C. 1000

D. 186

Answer: B

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21. The boiling point of a solution containing 2.62 g of a substance A in 100 g of water is higher by $0.0512^{\circ}C$ than the boiling point of pure water. The molar mass of the substance ($K_b = 5.12Km^{-1}$) is :

A. 131

B. 262

C. 26.2

D. 2620

Answer: D

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22. The freezing point of a solution containing 4.8 g of a compound in 60 g of benzene is 4.48. What is the molar mass of the compound

? ($K_f = 5.1 Km^{-1}$, freezing point of benzene $= 5.5^\circ C$)

A. 200

B. 40

C. 400

D. 256

Answer: C

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23. The freezing point of a 0.05 molal solution of a non-eletrolyte in water is ($K_f = 1.86 Km^{-1}$)

A. $-1.86^\circ C$

B. $-0.93^\circ C$

C. $-0.093^\circ C$

D. $0.93^\circ C$

Answer: C

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24. Osmotic pressure of a sugar solution at $24^{\circ}C$ is 2.5 atm. The concentration of the solution in gm mole per litre is :

A. 10.25

B. 1.025

C. 102.5

D. 0.1025

Answer: D

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25. The osmotic pressure of a 3.5% solution of cane sugar at $150^{\circ} C$ is :

A. 4 atm

B. 3.4 atm

C. 3.55 atm

D. 2.45 atm

Answer: C

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26. When 0.1 mole of glucose is dissolved in 10 mole of water, the vapour pressure of water is

A. Increased by 1%

B. Increased by 10%

C. Decreased by 1%

D. Decreased by 10%

Answer: C

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27. A 0.5 molal solution of ethylene glycol in water is used as coolant in a car. If the freezing point constant of water be $1.86^{\circ}C$ per mol, the mixture will freeze at

A. $0.93^{\circ}C$

B. $-0.93^{\circ}C$

C. $1.86^{\circ}C$

D. $-1.86^{\circ}C$

Answer: B

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28. A solution containing 4.2 g of urea in 500 ml was found to be isotonic with a 5% (wt./vol.)solution of an organic non-volatile solute. The molar mass of the solute is

A. 35.71

B. 325.8

C. 357.1

D. 418.6

Answer: C

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29. The osmotic pressure of 5% aqueous solution of glucose (π_1) is related to that of 5% aqueous solution of urea (π_2) as

A. $\pi_1 = \pi_2$

B. $\pi_1 < \pi_2$

C. $\pi_1 > \pi_2$

D. $\pi_1 = \pi_2 / 2$

Answer: B

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30. Camphor is often used in molecular mass determination because

A. it has a very high cryoscopic constant

B. it is volatile

C. it is solvent for organic substances

D. it is readily available

Answer: A

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31. 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 mol 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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32. A solution of urea (mol. $= 56\ \text{g mol}^{-1}$) boils at $100.18^{\circ}C$ at the atmospheric pressure. If K_f and K_b for water are 1.86 and 0.512 K kg mol^{-1} respectively, then the above solution will freeze at :

A. $0.654^{\circ}C$

B. $-0.654^{\circ} C$

C. $6.54^{\circ} C$

D. $-6.54^{\circ} C$

Answer: B

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33. 1.00 g of a non electrolyte solute (molar mass $250 \ \mathrm{g\,mol^{-1}}$) was dissolved in 51.2 g of benzene. If the freezing point depression constant, K_f of benzene is $5 \cdot 12$ K kg $\mathrm{mol^{-1}}$,

the freezing point of benzene will be lowered by

A. 0.3 K

B. 0.5 K

C. 0.2 K

D. 0.4 K

Answer: D

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34. During osmosis, flow of water through a semi permeable membrane is

A. from both sides of semi permeable membrane with equal flow rates

B. from both sides of the semi permeable membrane with unequal flow rates

C. from solution having lower concenration only

D. from solution having higher concentration only.

Answer: B

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35. Calculate the freezing point of a solution that contains 30 g urea in 200 g water. Urea is a non-volatile, non-electrolytic solid. K_f for water $= 1.86^\circ C/m$.

A. $4.65^\circ C$

B. $-4.65^\circ C$

C. $-0.744^\circ C$

D. $+0.744^\circ C$

Answer: B

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36. A 5% solution of sugarcane (mol. wt. 342) is isotonic with 1% solution of X under similar conditions. The molecular mass of X is :

A. 136.2

B. 68.4

C. 34.2

D. 171.2

Answer: B

37. Which of the following is not the colligative property ?

A. Vapour pressure

B. Osmotic pressure

C. Elevation in boiling point

D. Depression in freezing point

Answer: A

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38. 18 g 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 $100^\circ C$ is :

A. 7.60 torr

B. 76.00 torr

C. 752.40 torr

D. 759.00 torr

Answer: C

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Multiple Choice Questions Level I Basic Conceptual Qs Colligative Properties Of Electrolyte Solutions

1. For a non-electrolyte solution, the Van't Hoff factor is equal to

A. Zero

B. 1

C. 2

D. Between 0 and 1

Answer: B

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2. Which of the following solutions have lowest freezing point ?

A. 0.1 M glucose

B. 0.1 M NaCl

C. 0.1 M $BaCl_2$

D. 0.1 M urea

Answer: C

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3. Which of the following solutions have lowest freezing point ?

A. 0.1 M NaCl

B. 0.01 M NaCl

C. 1.0 M NaCl

D. 0.001 M NaCl

Answer: C

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4. The osmotic pressure of equimolar solutions of glucose, sodium chloride and barium chloride will be in the order :

A. $BaCl_2 > NaCl >$ glucose

B. $BaCl_2 >$ glucose $>$ NaCl

C. Glucose $> BaCl_2 > NaCl$

D. $NaCl > BaCl_2 >$ glucose

Answer: A

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

A. 1.0

B. 0.5

C. 2.0

D. 2.5

Answer: C

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6. Van't Hoff factor (i) for an aqueous solution of an electrolyte is

A. Zero

B. Greater than 1

C. Equal to one

D. ≤ 0

Answer: B

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7. Equal amounts in grams of following substances were dissolved in equal amount of water. Which of these will have the highest boiling point ?

A. Urea (NH_2CONH_2)

B. Glucose $(C_6H_{12}O_6)$

C. Sodium chloride (NaCl)

D. Calcium chloride $(CaCl_2)$

Answer: C

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8. The osmotic pressure of equimolar solutions of following solutes have been measured. Which of these show minimum osmotic pressure ?

A. $MgCl_2$

B. KCl

C. $(NH_4)_3PO_4$

D. Sucrose

Answer: D

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9. A 0.6% solution of urea (molar mass $= 60$) would be isotonic with

A. 0.1 M glucose

B. 0.1 M KCl

C. 0.6% glucose solution

D. 0.6% NaCl solution

Answer: A

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10. A 0.01 M solution of glucose in water freezes at - $0.0186^{\circ}C$. A 0.01 M solution of NaCl in water will freeze at

A. $0^{\circ}C$

B. $0.0186^{\circ}C$

C. $-0.0186^{\circ}C$

D. $-0.0372^{\circ}C$

Answer: D

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11. Compared to the osmotic pressure of 0.1 M urea, the osmotic pressure of 0.01 M KCl will be (assume 100 % dissociation)

A. Approximately 1/5

B. Approximately 1/10

C. Approximately half

D. Approximately double

Answer: A

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12. The values of observed and normal molar masses of acetic acid are 118 and 60 respectively. The Van't Hoff factor is

A. 1.97

B. 0.51

C. 0.9

D. 1.6

Answer: A

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13. If in a solvent, n simple molecules of solute combine of form an associated molecule, α is the degree of association, then Van't Hoff factor is equal to

A. $\frac{1}{1-n\alpha}$

B. $\frac{1-\alpha+n\alpha}{1}$

C. $\frac{1-\alpha+\alpha/n}{1}$

D. $\frac{\frac{\alpha}{n}-1+\alpha}{1}$

Answer: C

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14. The Van't Hoff factor for calcium nitrate $\left(Ca(NO_3)_2\right.$ is 2.5 . Using the dissociation equilibrium,

$Ca(NO_3)_2 \Leftrightarrow Ca^{2+} + 2NO_3^-$

the degree of dissociation is :

A. 0.25

B. 0.33

C. 0.66

D. 0.75

Answer: D

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

A. 0.913

B. 0.87

C. 1

D. 0.74

Answer: B

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16. 0.2 m aqueous solution of a weak acid (HX) is 20% dissociated. The boiling point of this solution is (K_b for water $= 0.52Km^{-1}$)

A. $101.04^\circ C$

B. $100.104^\circ C$

C. $100.1248^\circ C$

D. $100.52^\circ C$

Answer: C

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17. The elevation in boiling point for 1 M urea, 1 M glucose, 1 M NaCl and 1 M K_2SO_4 are in the ratio :

A. $1:1:2:3$

B. $3:2:1:1$

C. $1:2:3:4$

D. $2:2:3:4$

Answer: A

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Multiple Choice Questions Level Ii Comprehensive Qs

1. Which of the following statements is wrong ?

A. Non-polar solutes are generally insoluble in water

B. Pressure has tremendous effect on the solubility of gases in liquids

C. Polar solutes are generally soluble in all solvents

D. The increase in temperature does not always increase the solubility

Answer: C

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2. Which of the following statements is not correct ?

A. Osmotic pressure is directly proportional to molar concentration

B. A hypertonic solution will be less concentrated with respect to other solution

C. Isotonic solutions have same molar concen-trations

D. Osmotic pressure depends upon temperature

Answer: B

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3. Which of the following conditions is not true for a solution of ethyl alcohol and cyclohexane ?

A. The enthalpy of mixing is positive

B. The heating will decrease the solubility of the solution

C. There will be increase in volume on mixing

D. The solution shows positive deviation from ideality.

Answer: B

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4. What volume of 36 N and 1N sulphuric acid must be mixed to get 1L of 6N sulphuric acid

A. 96.7 ml of 36 N + 903.3 ml of 1N

B. 142.8 ml of 36 N + 857.2 ml of 1N

C. 903.3 ml of 36 N + 96.7 ml of 1N

D. 100 ml of 36 N + 900 ml of 1N

Answer: B

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5. To a 4 L of 0.2 M solution of NaOH, 2L of 0.5 M NaOH are added. The molarity of the resulting solution is :

A. 0.7 M

B. 0.3 M

C. 1.8 M

D. 1.18 M

Answer: B

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6. Ten grams of potassium chloride are dissolved in 10^3 kg of solution, its strength may be expressed as

A. 1 ppm

B. 10 ppm

C. 100 ppm

D. 1000 ppm

Answer: B

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7. What is the molality of pure water

A. 55.6

B. 18

C. 1

D. 5.56

Answer: A

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8. An azeotropic solution of two liquids has boiling point lower than either of them when it

A. Shows negative deviation from Raoult's law

B. Shows no deviation from Raoult's law

C. Shows positive deviation from Raoult's law

D. Is saturated

Answer: C

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9. Which of the following solutions will have maximum freezing point ?

A. 0.01 M urea

B. 0.01 M KCl

C. 0.01 M $BaCl_2$

D. 0.01 M NaCl

Answer: A

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10. Which of the following as an aqueous solution has a freezing point most nearly equal to that of an equimolar solution of $K_4\left[Fe(CN)_6\right]$ (assume complete ionisation of electrolytes)

A. K_2SO_4

B. sucrose

C. $Al_2(SO_4)_3$

D. $K_3\left[Fe(CN)_6\right]$

Answer: C

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11. Two liquids A and B have vapour pressures 500 and 200 torr respectively at a certain temperature. In an ideal solution of the two,

the mole fraction of A at which two liquids have equal partial pressures is :

A. 0.50

B. 0.20

C. 0.286

D. 0.714

Answer: C

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12. What is the mole fraction of acetic acid in a solution obtained by mixing 120 g of acetic acid and 100 g of ethyl alcohol ?

A. 0.52

B. 0.26

C. 0.48

D. 0.36

Answer: A

 Watch Video Solution

13. How many grams of CH_3OH should be added to water to prepare 150 ml solution of 2.0 M CH_3OH ?

A. 9.6

B. 2.4

C. 9.6×10^3

D. 2.4×10^3

Answer: A

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14. A litre of public water contains 5 mg of chlorine. The concentration of chlorine in ppm is

A. 5×10^{-4}

B. 5

C. 50

D. 0.5

Answer: B

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15. An aqueous solution containing one gram of urea boils at $100.30^\circ C$. The aqueous solution containing 3.0 g of glucose in the same volume will boil at

A. $100.90^\circ C$

B. $100.60^\circ C$

C. $100^\circ C$

D. $100.30^\circ C$

Answer: D

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16. To a 4 L of 0.2 M solution of NaOH, 2L of 0.5 M NaOH are added. The molarity of the resulting solution is :

A. 0.9 M

B. 0.3 M

C. 1.8 M

D. 0.18 M

Answer: B

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17. 250 ml of 6 M HCl and 650 ml of 3 M HCl were mixed together. What volume of water is to be added so that the molarity of the final solution is 3 M ?

A. 300 ml

B. 1150 ml

C. 250 ml

D. 135 ml

Answer: C

 Watch Video Solution

18. At $25^{\circ}C$ the highest osmotic pressure is exhibited by 0.1 M solution of

A. $CaCl_2$

B. KCl

C. Glucose

D. Urea

Answer: A

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19. The volume of 10 N and 4 N HCl required to make 1L of 6N HCl are :

A. 0.75 L of 10 N HCl and 0.25 L of 4 N HCl

B. 0.80 L of 10 N HCl and 0.20 L of 4 N HCl

C. 0.33 L of 10 N HCl and 0.67 L of 4 N HCl

D. 0.5 L of 10 N HCl and 0.5 L of 4 N HCl.

Answer: C

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20. When 1 g of arsenic is added to 80 g of benzene, the freezing point of benzene is lowered by $0.19^\circ C\left(K_f = 4.9\right)$. The formula of arsenic is (At. wt. of As = 75) :

A. As

B. As_2

C. As_3

D. As_4

Answer: D

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21. An aqueous solution containing 0.25 moles of a strong electrolyte A in 500 g of water freezes at $-2.8^\circ C$. How many ions are formed per formula unit of A $\left(K_f = 1.86^\circ C\right)$?

A. 1

B. 2

C. 3

D. 4

Answer: C

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22. The freezing point of a 0.05 m $BaCl_2$ in water (100% ionisation) is about $\left(K_f = 1.86 Km^{-1}\right)$:

A. $-0.279^\circ C$

B. $-0.558^\circ C$

C. $-0.093^\circ C$

D. $-0.186^\circ C$

Answer: A

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23. 0.85% aqueous solution of $NaNO_3$ is apparently 90% dissociated . The osmotic pressure of solution at 300 K is

A. 4.674 atm

B. 46.74 atm

C. 2.46 atm

D. 4.674 mm Hg

Answer: A

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24. 36 g of a liquid (molar mass $= 72$) are dissolved in 72 g of H_2O to form an ideal solution. If the vapour pressure of pure water

at a given temperature is 18 mm Hg, which one is the vapour pressure of water in the solution ?

A. 16 mm Hg

B. 18 mm Hg

C. 36 mm Hg

D. 98 mm Hg

Answer: A

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25. A solution of glucose at $27^{\circ}C$ has an osmotic pressure equal to 3×10^{3} Pa. If molecualr weight of glucose is 180, then the number of grams of glucose present in one litre of solution is

A. 0.216

B. 1.52

C. 0.324

D. 1.80

Answer: A

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26. 0.01 M solution each of urea, common salt and Na_2SO_4 are taken, the ratio of depression of freezing point is :

A. $1:1:1$

B. $1:2:1$

C. $1:2:3$

D. $2:2:3$

Answer: C

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27. Two moles of a nonvolatile solute are dissolved in 5 moles of water. The vapour pressure of the solute relative to that of water is

A. $\frac{2}{5}$

B. $\frac{2}{7}$

C. $\frac{4}{7}$

D. $\frac{5}{7}$

Answer: D

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28. A solutions 16 g of methanol and 90 g of water. The mole fraction of methanol in the solution is :

A. 0.200

B. 0.549

C. 0.786

D. 0.478

Answer: D

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29. 0.5 molal aqueous solution of a weak acid (HX) is 20% ionised. If K_f of water is 1.86 K kg mol^{-1} , the lowering in freezing point of the solution is :

A. 0.56 K

B. 1.12 K

C. -0.56 K

D. -1.12 K

Answer: B

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30. A 0.0020 M aqueous solution of an ionic compound $Co(NH_3)_4(NO_2)_2Cl$ freeze at -$0.00732^\circ C$. Number of moles of ions which 1 mol of ionic compound produces on being dissolved in water will be $\left(K_f = 1.86^\circ C/m\right)$.

A. 3

B. 4

C. 1

D. 2

Answer: D

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31. A 300 K the vapour pressure of an ideal solution containing 1 mole of liquid A and 2 moles of liquid B is 500 mm of Hg. The vapour pressure of the solution increases by 25 mm of

Hg if one more mole of B is added to the above ideal solution at 300 K. Then vapour pressure of A in its pure state is :

A. 300 mm of Hg

B. 40 mm of Hg

C. 500 mm of Hg

D. 600 mm of Hg.

Answer: A

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

A. $-0.360^\circ C$

B. $-0.206^\circ C$

C. $+0.480^\circ C$

D. $-0.480^\circ C$

Answer: D

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

A. Water-nitric acid

B. Benzene-methanol

C. Water-hydrochloric acid

D. Acetone-chloroform.

Answer: B

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34. If α is the degree of dissociation of Na_2SO_4, the Vant Hoff's factor (i) used for calculating the molecular mass is

A. $1 + \alpha$

B. $1 - \alpha$

C. $1 + 2\alpha$

D. $1 - 2\alpha$

Answer: C

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35. Density of a 2.05 M solution of acetic acid in water is 1.02 g/ml. The molarity of the solution is :

A. 3.28 mol kg^{-1}

B. 2.28 mol kg^{-1}

C. 0.44 mol kg^{-1}

D. 2.14 mol kg^{-1}

Answer: B

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36. When 20 g of naphthoic acid $(C_{11}H_8O_2)$ is dissolved in 50 g of benzene ($K_f = 1.72\text{K kg mol}^{-1}$) a freezing point depression of 2K is observed. The Van't Hoff factor (i) is :

A. 0.5

B. 1

C. 2

D. 3

Answer: A

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37. At $80^\circ C$, the vapour pressure of pure liquid 'A' is 520 mm Hg and that of pure liquid 'B' is 1000 mm Hg. If a mixture of solution of 'A' and 'B' boils at $80^\circ C$ and 1 atm pressure, the amount of 'A' in the mixture is (1 atm $= 760$ mm Hg.)

A. 50 mol per cent

B. 52 mol per cent

C. 34 mol per cent

D. 48 mol per cent

Answer: A

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38. Which of the following solutions are isotonic with one another ?

(1) 0.15 M urea

(2) 0.15 M $CaCl_2$

(3) 0.1 M $MgSO_4$

(4) 0.15 M glucose

Select the correct answer using the codes given below :

A. 1 and 4

B. 2 and 4

C. 1, 2 and 4

D. 2, 3 and 4

Answer: C

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39. The amount of solute (molar mass 60 g mol^{-1}) that must be added to 180 g of water so that the vapour pressure of water is lowered by 10% is

A. 30 g

B. 60 g

C. 120 g

D. 12 g

Answer: B

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40. The solubility of a gas in water at 300 K under a pressure of 100 atmospheres is $4 \times 10^{-3} \mathrm{kg\,L^{-1}}$. Therefore, the mass of the gas in kg dissolved in 250 mL of water under a pressure of 250 atmospheres at 300 K is

A. 2.5×10^{-3}

B. 2.0×10^{-3}

C. 1.25×10^{-3}

D. 5.0×10^{-3}

Answer: A

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

A. less than one and greater than one

B. less than one and less than one

C. greater than one and less than one

D. greater than one and greater than one

Answer: C

 Watch Video Solution

42. The mole fraction of methanol in its 4.5 molal aqueous solution is

A. 0.250

B. 0.125

C. 0.100

D. 0.075

Answer: D

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

A. $p_A + x_A(p_B - p_A)$

B. $P_A + x_A(p_A - p_B)$

C. $p_B + x_A(p_B - p_A)$

D. $p_B + x_A(p_A - p_B)$

Answer: D

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44. The average osmotic pressure of human blood is 7.8 bar at $37^\circ C$. The concentration of aqueous NaCl solution that could be used in the blood stream is

A. 7.8 mol L^{-1}

B. 1.5 mol L^{-1}

C. 0.075 mol L^{-1}

D. 0.15 mol L^{-1}

Answer: D

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45. Which of the following equimolar solution is expected to have lowest freezing point ?

A. $0.5MH_3PO_3$

B. $0.5MNa_3PO_4$

C. 0.5 M NaCl

D. 0.5 M Aniline

Answer: B

Watch Video Solution

46. The measured freezing point depression for a 0.1 m aqueous acetic acid solution is

$0.19^{\circ}C$. The acid dissociation constant K_a at this concentration will be $\left(K_f = 1.86\mathrm{Km}^{-1}\right)$

A. 4.76×10^{-5}

B. 4×10^{-5}

C. 8×10^{-5}

D. 2×10^{-5}

Answer: B

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

A. 90.0 g conc. HNO_3

B. 70.0 g conc. HNO_3

C. 54.0 g conc. NHO_3

D. 45.0 g conc. HNO_3

Answer: D

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48. Equimolar solutions of NaCl and $BaCl_2$ are prepared . If the freezing point of NaCl is $-2^\circ C$, the freezing point of $BaCl_2$ is expected to be

A. $-2^\circ C$

B. $-3^\circ C$

C. $-1.5^\circ C$

D. $-1.66^\circ C$

Answer: B

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49. If the elevation in boiling point of a solution of non-volatile, non-electrolytic and non-associating solute in a solvent ($K_b = x\mathrm{K\ kg\ mol^{-1}}$) is y K, then the depression in freezing point of the same concentration would be (K_f of the solvent $= z\mathrm{K\ kg\ mol^{-1}}$)

A. $\frac{2xz}{y}$

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

C. $\frac{xz}{y}$

D. $\frac{xz}{2y}$

Answer: B

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50. Which of the following aqueous solution has the highest freezing point ?

A. 1% (w/w) glucose

B. 1% (w/w) NaCl

C. 1% (w/w) sucrose

D. 1% (w/w) $CaCl_2$

Answer: B

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Multiple Choice Questions Level Iii Questions From Aieee Jee Examinations

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

A. 200 and 300

B. 300 and 400

C. 400 and 600

D. 500 and 300

Answer: C

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

A. The solution formed is an ideal solution.

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

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

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

Answer: B

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

A. 0.0744 K

B. 0.0186 K

C. 0.0372 K

D. 0.0558 K

Answer: D

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4. On mixing, heptane and octane form an ideal solution. At 373 K, the vapour pressure of the two liquid components (heptane and octane) are 105 kPa and 45 kPa respectively. Vapour pressure of the solution obtained by mixing 25.0 g of heptane and 35 g of octane will be (molar mass of heptane

$= 100 \text{g mol}^{-1}$ and of octane $= 114 \text{g mol}^{-1}$

):

A. 96.2 kPa

B. 144.5 kPa

C. 72.0 kPa

D. 36.1 kPa

Answer: C

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5. A 5.2 molal aqueous solution of methyl alcohol, CH_3OH, is supplied. What is the mole fraction of methyl alcohol in the solution ?

A. 0.086

B. 0.050

C. 0.100

D. 0.190

Answer: A

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6. Ethylene glycol is used as an antifreeze in a cold climate. Mass of ethylene glycol which should be added to 4 kg of water to prevent it from freezing at - $6^{\circ}C$ will be (K for water $= 1.86\mathrm{K\ kg\ mol}^{-1}$, and molar mass of ethylene glycol $= 62g\mathrm{mol}^{-1}$)

A. 400.00 g

B. 304.60 g

C. 804.32 g

D. 204.30 g

Answer: C

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

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

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

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

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

Answer: C

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8. The molality of a urea solution in which 0.0100 g of urea, $\left[(NH_2)_2CO\right]$ is added to $0.3000dm^3$ of water at STP is :

A. $5.55 \times 10^{-4}m$

B. 33.3 m

C. 3.33×10^{-2}m

D. 0.555 m

Answer: A

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9. A 5% solution of sugarcane (mol. wt. 342) is isotonic with 1% solution of X under similar conditions. The molecular mass of X is :

A. 171.2

B. 68.4

C. 34.2

D. 136.2

Answer: B

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10. The density of a solution prepared by dissolving 120 g of urea (mol. $\mathrm{mass} = 60u$) in

1000 g of water is 1.15 g/mL. The molarity of this solution is :

A. 2.05 M

B. 0.50 M

C. 1.78 M

D. 1.02 M

Answer: A

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11. K_f for water is 1.86 K kg mol^{-1}. If your automobile radiator holds 1.0 kg of water, how many grams of ethylene glycol $(C_2H_6O_6)$ must you add to get the freezing point of the solution lowered to - $2.8^\circ C$?

A. 27 g

B. 72 g

C. 93 g

D. 39 g

Answer: C

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12. The molarity of a solution obtained by mixing 750 mL of 0.5 (M) HCl with 250 mL of 2(M) HCI will be:

A. 0.875 M

B. 1.00 M

C. 1.75 M

D. 0.975 M

Answer: A

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13. Consider separate solutions of 0.500 M $C_2H_5OH(aq)$, $0.100MMg_3(PO_4)_2(aq)$, 0.125 M Na_(3)PO_(4)(aq)$at25$ 0 C`. Which statement is true about these solutions, assuming all salts to be strong electrolytes ?

A. They all have same osmotic pressure.

B. 0.100 M $Mg_3(PO_4)_2$ (aq) has the highest osmotic pressure.

C. 0.125 M Na_3PO_4(aq) has the highest osmotic pressure

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

Answer: A

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14. The vapour pressure of acetone at $20^\circ C$ is 185 torr. When 1.2 g of a non-volatile substance was dissolved in 100 g of acetone at $20^\circ C$, its

vapour pressure was 183 torr. The molar mass $\left(\text{g mol}^{-1} \right)$ of the substance is :

A. 32

B. 64

C. 128

D. 488

Answer: B

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Recent Examination Questions

1. Vapour pressure of pure 'A' is 70 mm of Hg at $25^\circ C$. It forms an ideal solution with 'B' in which mole fraction of A is 0.8 . If the vapour pressure of the solution is 84 mm of Hg at $25^\circ C$, the vapour pressure of pure 'B' at $25^\circ C$ is :

A. 56 mm

B. 70 mm

C. 140 mm

D. 28 mm

Answer: C

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2. A 6% solution of urea is isotonic with

A. 0.05 M solution of glucose

B. 6% solution of glucose

C. 25% solution of glucose

D. 1 M solution of glucose

Answer: D

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

A. To minimise the show 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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4. The mass of a non-volatile solute of molar mass 40g mol^{-1} that should be dissolved in 114 g of octane to lower its vapour pressure by 20% is :

A. 10 g

B. 11.4 g

C. 9.8 g

D. 12.8 g

Answer: A

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5. The vapour pressure of two liquids A and B in their pure states are in ratio of $1:2$. A binary solution of A and B contains A and B in the mole proportion of $1:2$. The mole fraction of A in the vapour phase of the solution will be

A. 0.33

B. 0.2

C. 0.25

D. 0.52

Answer: B

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

A. Elevation of boiling point

B. Depression in freezing point

C. Osomtic pressure

D. Lowering of vapour pressure

Answer: D

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7. 3g of urea is dissolved in 45g of H_2O. The relative lowering in vapour pressure is

A. 0.05

B. 0.04

C. 0.02

D. 0.01

Answer: C

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

A. 0.01 M urea

B. 0.01 M KNO_3

C. $0.01MNa_2SO_4$

D. $0.015MC_6H_{12}O_6$

Answer: C

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9. A solution of 1.25 g of P in 50 g of water lowers freezing point by $0.3^\circ C$. Molar mass of P is 94 and K_f (water) $= 1.86\text{K kg mol}^{-1}$.

The degree of association of P if it forms dimers in water is :

A. 0.8

B. 0.6

C. 0.65

D. 0.75

Answer: A

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10. 0.06% (w/v) aqueous solution of urea is isotonic with:

A. 0.01 M glucose solution

B. 0.06% glucose solution

C. 0.01 M glucose solution

D. 0.6% glucose solution

Answer: A

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11. Which of the following aqueous solution has the highest freezing point ?

A. 0.1 M NaCl

B. 0.1 M Sucrose

C. $0.01 M Na_2SO_4$

D. 0.01 M NaCl

Answer: D

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12. After adding non-volatile solute freezing point of water decreases to $-0.186^{\circ}C$. Calculate ΔT_b if $K_f = 1.86 \ \ \mathrm{K\,kg\,mol^{-1}}$ and $K_b = 0.21 \mathrm{K\,kg\,mol^{-1}}$.

A. 1.86

B. 0.521

C. 0.0186

D. 0.0521

Answer: D

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13. Which of the following compounds have the same value of vant Hoff's factor (i) as that of $Al_2(SO_4)_3$?

A. $K_4\left[Fe(CN)_6\right]$

B. NaCl

C. $Al(NO_3)_3$

D. Na_2SO_4

Answer: A

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