CHEMISTRY

BOOKS - MBD -HARYANA BOARD

SOLUTIONS

Otq Objective Type Questions

1. Mole fraction of a solute in 2.5 molal aqueous solution is:

A. 0.43

B. 0.043

C. 4.3

D. 43

Answer: B

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2. Which of the following is independent of Temperature ?

A. Molarity

B. Formality

C. Normality

D. Molality:

Answer: A

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

A. Osmotic pressure

B. Elevation in boiling point

C. Depression in freezing point

D. None of these.

Answer: D

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4. If a is the degree of dissociation of Na_2SO_4, the Van't Hof'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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5. Which of the following will have highest boiling point ?

A. $0.1 M FeCl_3$

B. 0.1 M Urea

C. 0.1 M NaCl

D. 0.1 M Glucose.

Answer: A

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6. The number of moles of NaCl in 3 litres of 3 M solution is :

A. 3

B. 6

C. 1

D. 9

Answer: D

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7. A solution of urea (mol. mass = 56 g mol^{-1})

boils at $100.78°C$ at the atmospheric

pressure. If K_f and K_b for water are 1.86 and

0.512 K kg mol-respectively, then 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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8. What is the molality of pure water ?

A. 50.5

B. 55.5

C. 55.4

D. 65.5

Answer: B

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9. Isotonic solutions have same

A. Osmotic pressure

B. Surface tension

C. Concentration

D. Viscosity.

Answer: A

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10. Colligative properties of a solution depend upon :

A. Molarity

B. Number of moles of solute

C. Number of moles of solvent

D. Nature of solute.

Answer: B

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11. Constant boiling mixtures are called :

A. Ideal solute

B. Azeotropes

C. Isotonic

D. Zeotropes

Answer: B

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12. Correct expression for elevation in boiling point is :

A. $\Delta T_b = k_b m$

B. $\Delta = K_f m$

C. $\pi = CRT$

D. None of these.

Answer: A

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1. Define mole fraction.

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2. State Raoult's law for solution containing non-volatile solute.

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3. Define Colligative property.

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4. Define molal elevation constant.

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5. Why is osmotic pressure considered as a colligative property ?

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6. Why boiling point of water is increased on addition of non-volatile solute into it?

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7. Discuss the role of molecular interaction in a solution of alcohol and water.

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8. What is the nature of the solution when ethyl alcohol and water are mixed ?

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9. What is azeotropic solution ? Give an example of maximum boiling azeotrope and minimum boiling azeotrope.

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10. Define azeotropic mixture.

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11. What will be nature of the solution when chloroform and acetone are mixed ?

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12. Why is the vapour pressure of solution of glucose in water lower than that of water?

13. Why is boiling point of the solution gets raised when a non-volatile solute is added to it?

14. Name the method for determining the osmotic pressure of a solution.

15. Why is osmotic pressure considered as a colligative property ?

16. Out of the various methods for determining the molar mass of the solute such as protein, which is considered to be the best?

17. Out of 1M $BaCl_2$ and 1M $Al_2(SO_4)_3$, which will have more osmotic pressure ?

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18. What happens to freezing point of water if ethylene glycol is added to it?

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19. Define molal elevation constant.

20. What are the units of the molal depression constant for water?

21. Define molal depression constant. How is it related to enthalpy of fusion ?

1. Give all the characteristics of an ideal solution.

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2. Give all the characteristics of non-ideal solution.

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3. Give three differences between Ideal solution and Non-ideal solution.

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4. What type of deviations (positive or negative) from an ideal solution will be shown by the solution of cyclohexane and ethanol ?

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5. If density of some lake water is 1.25 g mL^{-1} and contains 92 g of Na^+ ions per kg of water, calculate the molality of Na^+ ion in the lake.

6. State Henry's law and mention some important applications.

7. Benzene (C_6H_6) and toluene (C_7H_8) form a nearly ideal solution. At 313 K, the vapour pressure of pure benzene is 150 mm Hg and of pure toluene is 50 mm Hg. Calculate the vapour pressure of a mixture of these two containing their equal masses at 313 K.

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8. Suggest the most important type of intermolecular attractive interaction in the following pairs : (i) n-hexane and n-octane (ii)

I_2 and CCl_4 (iii)$NaC1O_4$ and water (iv) methanol and acetone (v) acetonitrile (CH_3CN) and acetone (C_3H_6O).

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9. Define osmotic pressure. How does it depend upon the temperature and atmospheric pressure ?

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10. How will you differentiate between osmosis and diffusion ?

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11. Calculate the amount of KCl which must be added to 1 kg of water so that the freezing point is depressed by 3 K. (K for water = $1.86 K \mathrm{mol}^{-1}$).

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12. A solution is obtained by mixing 300 g of 25% solution and 400 g of 40% solution by mass. Calculate the mass percentage of the resulting solution.

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13. It is safe to inject solutions isotonic with blood plasma intravenously. Explain.

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14. An aqueous solution of 2% non-volatile solute exerts a pressure of 1.004 bar at the normal boiling point of the solvent. What is the molar mass of the solute ?

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15. Calculate the molarity of a solution containing 14 g of KOH in 750 ml of solution.

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16. 4.0 g of NaOH dissolved in 500 ml of solution. Calculate molarity of the solution.

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Latq Long Answer Type Questions

1. Define the following terms : (i) Mole fraction (ii) Molality (it) Molarity (iv) Mass percentage (v) Normality.

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2. Concentrated nitric acid used in the laboratory work is 68% nitric acid by mass in aquequs solution. What should be molarity of such sample of the acid if the density of solution is 1.504 g mL^{-1} ?

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3. What are ideal and non-ideal solutions ? What types of non-idealities are exhibited by

cyclohexane-ethanol and acetone-chloroform mixtures ? Give reasons for your answer.

4. Show graphically that the freezing point of a liquid will be depressed when a non-volatile solute is dissolved in it. The freezing point of a solution containing 0-3 g of acetic acid in 30-0 g of benzene is lowered by $0\text{-}45°$. Calculate the van't Hoff factor. (K for benzene = 5-12 K kg mol^{-1}).

5. Explain depression in freezing point. Show that it is a colligative property.

6. Define the following:

(i) Boiling point

(ii) Molal, depression constant.

7. Define osmosis and osmotic pressure and show that osmotic pressure is a colligative property.

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8. Why do we get sometimes abnormal molecular masses of the substances by using colligative properties of the solutions ? State the factors with suitable examples which bring abnormally in results thus obtained.

9. State Raoult's law. Why is the vapour pressure of a solvent lowered by the addition of nonvolatile solute to it? A solution containing 18 g of non-volatile solute in 200 g of water freezes at 272.07 K. Calculate the molecular mass of the solute. (Given K_f = 1.86 K/m).

10. Commercially available conc. HCl contains 38% HCl by mass and has a density 1.19 g cm^{-3}. Calculate the molarity of this HCl.

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11. Define boiling point and find out expression for the molecular mass of non-volatile solute from the elevation in boiling point.

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12. What is meant by positive and negative deviation from Raoult's law and how is the sign of ΔH_{mix} related to positive and negative deviations from Raoult's law ?

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13. Give any four characteristics of a non-ideal solution showing positive deviations.

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14. What are important characteristics of a non-ideal solution showing negative deviations ?

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15. At 298 K, 100 ml solution containing 3.002 g of solute gave an osmotic pressure of 2.55 atmospheres. Find the molecular mass of the solute.

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16. Why is osmotic pressure technique preferred over other methods to find out molar mass of solute ?

17. Boiling point of water at 750 mm is 99.63° C. How much of sucrose is to be added to 500 g of water so that it boils at 100° C. $(K_b = 0.052)$

18. The boiling point of water $(100^\circ C)$ becomes, $100.52^\circ C$ if 3 g of non-volatile solute is dissolved is 200 ml of it: Calculate the molecular weight of the solid. (K_b = 0.6 K/m)

19. 27.75 g of $CaCl_2$, dissolved in 250 ml of solutions. Find molarity of chloride ions in this solution.

20. State Raoult's law for solutions containing non-volatile solutes in volatile solvents. Derive a mathematical expression for the law.

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21. Derive Raoult's law for non-volatile solutes.

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22. Mention three characteristics of ideal solutions. What cause deviation from ideal behaviour ? Discuss the positive deviations from ideal behaviour.

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23. What are ideal and non-ideal solutions ? Explain non-ideal solution showing positive deviations ?

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24. (a) Define Ideal and Non-ideal solutions and give one example of each.

(b) Define Henry's law. Give two applications of Henry's law.

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25. Calculate the mole fraction of CH_3OH in a solution containing 30% by mass in water.

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