INDIAN SCHOOL MUSCAT

CHEMISTRY DEPARTMENT

QUESTION BANK

Solutions

1. Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and how are they caused? 2

2. Define the term osmosis and osmotic pressure. Osmotic pressure method is more advantageous in determining molar mass non-volatile solutes over other colligative properties. Why? 2

3. 100mg of protein is dissolved in just enough water to make a 10mL solution. If this solution has an osmotic pressure of 13.3mm Hg at 25^0C, what is the molar mass of the protein? (Given: R = 0.0821L atm K^{-1} mol^{-1}, 3

4. What do you mean by abnormal molar mass? Explain the factors. 3

5. Define the following: 7x1

   (i) mass %

   (ii) volume %

   (iii) normality

   (iv) molarity

   (v) molality

   (vi) mole fraction

   (vii) ppm

6. State: 5x1

   (i) Henry's law

   (ii) Raoult's law

   (iii) Osmosis

   (iv) Osmotic pressure

   (v) Reverse osmosis

7. Give the relation between 2

   a) solubility of gases and temperature b) solubility of gases and kH

8. Define: 8x1

    (i)   vapour pressure

   (ii)   boiling point

  (iii)   azeotropes

  (iv)   colligative properties

   (v)   ebullioscopic constant

  (vi)   cryoscopic constant

  (vii)   isotonic solutions

 (viii)   Vant Hoff factor

9. Differentiate   4x2

    (i)   substitutional and interstitial solutions

   (ii)   ideal and non-ideal solutions

  (iii)   negative and positive deviations to Raoult's law

  (iv)   osmosis and diffusion

10. Show that relative lowering of VP is a colligative property   2

11. Benzene with boiling point 353.1 K and toluene with 383.6 K are two   3
hydrocarbons which nearly form an ideal solution.At 313 K , the VP of benzene
and toluene are 160 mm and 60 mm of Hg respectively. Assuming an ideal
behaviour, calculate the partial vapour pressures of benzene and toluene and the
total pressure under the following conditions.
a] a solution made by mixing equal number of moles of benzene and toluene.
b] a solution made by mixing 4 moles of toluene and 1 mole of benzene.
c] a solution made by mixing equal masses of benzene and toluene.

12. A solution containing 2 gm of a non-volatile solute in 20 gm of water boils at   3
373.52 K. Find the molecular mass of the solute if kb for water is 0.52 K Kg/mole.

13. Calculate the elevation in Boiling point when 18 gm of glucose is added to 100 gm   3
of water if kb for water is 0.52 K Kg/mole

14. 34.2 gm of sucrose is dissolved in 1000 gm of water. Find the freezing point of the   3
solution if kf for water is 1.86 K Kg/mole.

15. The normal freezing point of nitrobenzene is 278.82 K. A 0.25 molal solution   3
containing a non-volatile solute in it causes a depression in freezing point by 2 deg.

Calculate the cryoscopic constant of nitrobenzene.

16. An aqueous solution containing 0.1gm a monobasic acid in 2.17 gm of water   3
freezes at 272.817 K. Calculate the molar mass of the acid if kf = 1.86 K Kg/mole

17. What is the i for the following solutions   a] $MgBr_2$ b] $K_4[Fe(CN)_6]$ c] $AlCl_3$ 3

18. Calculate the i value of a 0.5M acetic acid solution which is 35% dissociated.   3

19. A decimolar$K_4[Fe(CN)_6]$ is 50% dissociated. Calculate the osmotic pressure at   3
298K.

20. 5 g of a solute of molecular mass 60 is dissolved in 100g of water. The depression   3
in freezing point is 2K.Calculate degree of dissociation if m= 2

21. A 0.1m solution of H_3PO_4 in water is observed to freeze at –0.24C. Determine the   3
degree of dissociation in the acid in the solution.