



INDIAN SCHOOL MUSCAT
SENIOR SECTION
DEPARTMENT OF CHEMISTRY
CLASS XII
CHAPTER – SOLUTIONS
WORKSHEET – 7

Why do gases always tend to be less soluble in liquids as the temperature is raised?

Give reasons for the following :

- Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers.
- Elevation of boiling point of 1 M KCl solution is nearly double than that of 1 M sugar solution

‘The osmotic pressure measured when benzoic acid is dissolved in benzene is less than the expected value’. Comment.

Which is the best colligative property to measure the molar masses of macro molecules? Why?

18 g of glucose, $C_6H_{12}O_6$ (molar mass = 180 g mol^{-1}) is dissolved in 1 kg of water in a sauce pan. At what temperature will this solution boil?

(K_b for water = $0.52 \text{ k kg mol}^{-1}$, boiling point of pure water = 373.15 K)

Define an ideal solution and write one of its characteristics.

Compare solubility of oxygen gas at 293 K ($K_H = 35 \text{ kbar}$) & at 393 K ($K_H = 47 \text{ kbar}$)

What are azeotropic mixtures? What are its types?

- Why are aquatic species more comfortable in cold water than in warm water?
- What happens when we place the blood cell in saline water solution (hypertonic solution)? Give reason.

Calculate the amount of KCl which must be added to 1 kg of water so that the freezing point is depressed by 2 K . (K_f for water = 1.86 kg mol^{-1})

Determine the osmotic pressure of a solution prepared by dissolving $2.5 \times 10^{-2} \text{ g}$ of K_2SO_4 in 2 L of water at 25°C , assuming that it is completely dissociated.

($R = 0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}$, molar mass of $K_2SO_4 = 174 \text{ g mol}^{-1}$)

A solution of glucose in water is labelled as 10% w/w, what would be the molality and mole fraction of each component in the solution? If the density of solution is 1.2 g mL^{-1} , then what shall be the molarity of the solution?

A solution containing 30 g of non-volatile solute exactly in 90 g of water has a vapour pressure

of 2.8 kPa at 298 K . Further, 18 g of water is then added to the solution and the new vapour pressure becomes 2.9 kPa at 298 K . Calculate: (i) Molar mass of the solute (ii) Vapour pressure of water at 298 K .

Calculate the depression in the freezing point of water when 10 g of $\text{CH}_3\text{CH}_2\text{CHClCOOH}$ is added to 250 g of water. $K_a = 1.4 \times 10^{-3}$, $K_f = 1.86 \text{ K kg mol}^{-1}$.

Two elements A and B form compounds having formula AB_2 and AB_4 . When dissolved in 20 g of benzene (C_6H_6), 1 g of AB_2 lowers the freezing point by 2.3 K whereas 1.0 g of AB_4 lowers it by 1.3 K. The molar depression constant for benzene is $5.1 \text{ K kg mol}^{-1}$. Calculate atomic masses of A and B.

Vapour pressure of water at 20°C is 17.5 mmHg. Calculate the vapour pressure of water at 20°C when 15 g of glucose (Molar mass = 180 g mol^{-1}) is dissolved in 150 g of water.

- a) Explain the following:
 - i. Henry's law about dissolution of a gas in a liquid.
 - ii. Boiling point elevation constant for a solvent.
- b) A solution of glycerol ($\text{C}_3\text{H}_8\text{O}_3$) in water was prepared by dissolving some glycerol in 500 g of water. This solution has a boiling point of 100.42°C . What mass of glycerol was dissolved to make this solution? (K_b for water = $0.512 \text{ K kg mol}^{-1}$)
- a) On mixing acetone with chloroform, a reduction occurs in total volume. What type of deviations from ideal behavior for solutions is shown in this case and why?
- b) Phenol associates in benzene to certain extent to form a dimer. A solution containing 20 g of phenol in 1.0 kg of benzene has its freezing point lowered by 0.69 K. Calculate the fraction of phenol that has dimerised. Given K_f for benzene = 5.1 K m^{-1}
- a) What is van't Hoff factor? What types of values can it have if in forming the solution the solute molecules undergo
 - i) Dissociation
 - ii) Association
- b) How many mL of a 0.1 M HCl solution are required to react completely with 1 g of a mixture of Na_2CO_3 and NaHCO_3 containing equimolar amounts of both?

Define the term osmotic pressure. Describe how the molecular mass of a substance can be determined by a method based on measurement of osmotic pressure.