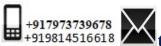
CHEMISTRY EXPERT

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<u>Class:-</u>XII (Sci.) Subject:- Chemistry Name of Student.....

Chapter-2: SOLUTIONS (10 YEAR Questions)

- What mass of NaCl (molar mass = 58.5 g mol⁻¹) must be dissolved in 65 g of water to lower the freezing point by 7.5° C? The freezing point depression constant, K_f , for water is 1.86 K kg mol⁻¹. Assume van't Hoff factor for NaCl is 1.87.
- (a) Differentiate between molarity and molality for a solution. How does a change in temperature influence their values?
 - (b) Calculate the freezing point of an aqueous solution containing 10.50 g of MgBr₂ in 200 g of water. (Molar mass of MgBr₂ = 184 g)

 $(K_f \text{ for water} = 1.86 \text{ K kg mol}^{-1})$

OR

- (a) Define the terms osmosis and osmotic pressure. Is the osmotic pressure of a solution a colligative property? Explain.
- (b) Calculate the boiling point of a solution prepared by adding 15.00 g of NaCl to 250.0 g of water. (K_b for water = 0.512 K kg mol⁻¹,

Molar mass of NaCl = 58.44 g)

State the following:

- Raoult's law in its general form in reference to solutions.
- (ii) Henry's law about partial pressure of a gas in a mixture.
- 4. A solution prepared by dissolving 8.95 mg of a gene fragment in 35.0 mL of water has an osmotic pressure of 0.335 torr at 25°C. Assuming that the gene fragment is a non-electrolyte, calculate its molar mass.

5. 15.0 g of an unknown molecular material is dissolved in 450 g of water. The resulting solution freezes at -0.34°C. What is the molar mass of the material ? (Kf for water = 1.86 K kg mol-1)

Explain the following:

- Henry's law about dissolution of a gas in a liquid
- Boiling point elevation constant for a solvent
- 6. A solution of glycerol (C3H8O3) 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 K kg mol⁻¹)
- 7. (a) Define the following terms:
 - Molarity (ii) Molal elevation constant (Kb)
 - (b) A solution containing 15 g urea (molar mass = 60 g mol-1) per litre of solution in water has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 180 g mol-1) in water. Calculate the mass of glucose present in one litre of its solution.
- 8. (a) What type of deviation is shown by a mixture of ethanol and acetone? Give reason. (b) A solution of glucose (molar mass = 180 g/mol) in water is labeled as 10% (by mass). What would be the molality and molarity of the solution? (Density of solution= i .2 g/ml)
- 9. A 10% solution (by mass) of sucrose in water has a freezing point of 269.15 K. Calculate the freezing point of 10% glucose in water if the freezing point of pure water is 273·15 K. Given: (Molar mass of sucrose = 342 g mol⁻¹) (Molar mass of glucose = 180 g mol⁻¹)

- OR
 (a) 30 g of urea (M = 60 g mol⁻¹) is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg. (b) Write two differences between ideal solutions and non-ideal solutions.
- 10.A solution prepared by dissolving 8.95 mg of a gene fragment in 35.0 mL of water has an osmotic pressure of 0.335 torr at 25° C. Assuming that the gene fragment is a non-electrolyte, calculate its molar mass.
- 11. 18 g of glucose, C₆H₁₂O₆ (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. for water = $0.52 \text{ K kg mol}^{-1}$, boiling point of pure water = 373.15 K)

- 12. Determine the osmotic pressure of a solution prepared by dissolving 2.5 × 10⁻²g of K₂SO₄ in 2L of water at 25 °C, assuming that it is completely dissociated.
 (R = 0.0821 L atm K⁻¹ mol⁻¹, Molar mass of K₂SO₄ = 174 g mol⁻¹).
- 13. 3.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing point of 1.62 K. Calculate the van't Hoff factor and predict the nature of solute (associated or dissociated). (Given: Molar mass of benzoic acid = 122 g mol⁻¹, Kf for benzene = 4.9 K kg mol-1)
- 14.Calculate the freezing· point of the solution when 31 g of ethylene glycol ($C_2H_6O_2$) is dissolved in 500 g of water. (K_f for water= l, ·86 K kg mol⁻¹)
- 15.(a) Calculate the freezing point of solution when 1.9 g of MgCl₂ (M=95 g mol⁻¹) was dissolved in 50 g of water, assuming MgCl₂ undergoes complete ionization. (K_f for water = 1.86 K kg mol⁻¹)
 - (b) (i) Out of 1 M glucose and 2 M glucose, which one has a higher boiling point and why? (ii) What happens when the external pressure applied becomes more than the osmotic pressure of solution?
- 16. (i) Gas (A) is more soluble in water than Gas (B) at the same temperature. Which one of the two gases will have the higher value of K_H (Henry's constant) and why?
 - (ii) In non-ideal solution, what type of deviation shows the formation of maximum boiling azeotropes?
- 17. Calculate the boiling point of solution when 4 g of MgSO₄ (M=120 g mol⁻¹) was dissolved in 100 g of water, assuming MgSO₄ undergoes complete ionization.

 $(K_b \text{ for water} = 0.52 \text{ K kg mol}^{-1})$

- 18. Write two differences between a solution showing positive deviation and a solution showing negative deviation from Raoult's law.
- For a 5% solution of urea (Molar mass = 60 g/mol), calculate the osmotic pressure at 300 K. [R = 0.0821 L atm K⁻¹ mol⁻¹]

OR

Visha took two aqueous solutions — one containing 7.5 g of urea (Molar mass = 60 g/mol) and the other containing 42.75 g of substance Z in 100 g of water, respectively. It was observed that both the solutions froze at the same temperature. Calculate the molar mass of Z.

- Write the colligative property which is used to find the molecular mass of macromolecules.
 - (ii) In non-ideal solution, what type of deviation shows the formation of minimum boiling azeotropes?

- 21.A solution containing 1·9 g per 100 mL of KCl (M = 74·5 g mol⁻¹) is isotonic with a solution containing 3 g per 100 mL of urea (M = 60 g mol⁻¹). Calculate the degree of dissociation of KC*l* solution. Assume that both the solutions have same temperature.
- 22.A 4% solution(w/w) of sucrose (M = 342 g mol⁻¹) in water has a freezing point of 271.15 K. Calculate the freezing point of 5% glucose (M = 180 g mol⁻¹) in water. (Given: Freezing point of pure water = 273.15 K)
- 23.State Raoult's law for a solution containing volatile components. Write two characteristics of the solution which obeys Raoult's law at all concentrations.
- 24. Calculate the freezing point of an aqueous solution containing 10.5 g of Magnesium bromide in 200 g of water, assuming complete dissociation of Magnesium bromide. (Molar mass of Magnesium bromide = 184 g mol^{-1} , K_f for water = $1.86 \text{ K kg mol}^{-1}$).
- 25. Why a mixture of Carbon disulphide and acetone shows positive deviation from Raoult's law? What type of azeotrope is formed by this mixture?
- 26.A solution of glucose (Molar mass = 180 g mol^{-1}) in water has a boiling point of $100 \cdot 20^{0}$ C. Calculate the freezing point of the same solution. Molal constants for water K_f and Kb are $1 \cdot 86 \text{ K kg mol}^{-1}$ and $0 \cdot 512 \text{ K kg mol}^{-1}$ respectively.
- 27. (a) Calculate the boiling point of solution when 2 g of Na_2SO_4 ($M=142~g~mol^{-1}$) was dissolved in 50 g of water, assuming Na_2SO_4 undergoes complete ionization. (K_b for water = 0.52 K kg mol⁻¹)
 - (b) When 2.56 g of sulphur was dissolved in 100 g of CS_2 , the freezing point lowered by 0.383 K. Calculate the formula of sulphur (S_x) .

(K $_{\rm f}$ for CS $_{\rm 2}$ = 3.83 K kg mol $^{-1}$ Atomic mass of Sulphur = 32 g mol $^{-1}$)

- (c) Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we place blood cells in a solution containing?
 - (i) 1.2% sodium chloride solution (ii) 0.4% sodium chloride solution

28.

For a 5% solution of urea (Molar mass = 60 g/mol), calculate the osmotic pressure at 300 K. [R = 0.0821 L atm K^{-1} mol⁻¹]

OR

Visha took two aqueous solutions — one containing 7.5 g of urea (Molar mass = 60 g/mol) and the other containing 42.75 g of substance Z in 100 g of water, respectively. It was observed that both the solutions froze at the same temperature. Calculate the molar mass of Z.

29. Calculate the mass of ascorbic acid (Molar mass = 176 g mol⁻¹) to be dissolved in 75 g of acetic acid, to lower its freezing point by 1.5°C.
(K₂ = 3.9 K kg mol⁻¹)

30. (a) A solution contains 5.85 g NaCl (Molar mass = 58.5 g mol⁻¹) per litre of solution. It has an osmotic pressure of 4.75 atm at 27°C. Calculate the degree of dissociation of NaCl in this solution.

(Given : $R = 0.082 L atm K^{-1} mol^{-1}$)

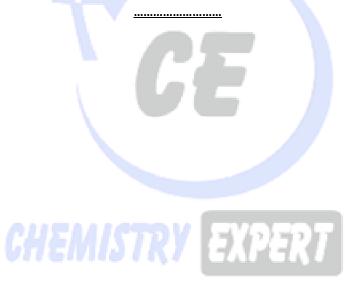
(b) State Henry's law. Why is air diluted with helium in the tanks used by scuba divers?

OR

(a) When 19·5 g of F − CH₂ − COOH (Molar mass = 78 g mol⁻¹) is dissolved in 500 g of water, the depression in freezing point is observed to be 1°C. Calculate the degree of dissociation of F − CH₂ − COOH.

[Given : K_f for water = 1.86 K kg mol⁻¹]

- (b) Give reasons:
 - 0.1 M KCl has higher boiling point than 0.1 M Glucose.
 - (ii) Meat is preserved for a longer time by salting.



"Mr. Rakesh Kumar"