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CBSE 12th Chemistry Chapter - 02 (Solution) Unsolved Important Questions

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SECTION- A

(Each question in this section carry 1 mark)

Q.1. **(i) Gssas (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 KH (Henry's constant) and why?**
(ii) In non-ideal solution, what type of deviation shows the formation of maximum boiling azeotropes.

Q.2. **2g each of two solutes A and B are dissolved separately in 50g each of the same solvent. Which will show greater elevation in boiling point.**

Q.3. **What are isotonic solution?**

Q.4. **(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 KH (Henry's constant) and why?**

(ii) In non-ideal solution, what type of deviation shows the formation of maximum boiling azeotropes.

SECTION- B

(Each question in this section carry 2 marks)

Q.5. **Calculate the boiling point of solution when 4 g of $MgSO_4$ ($M = 120\ g\ mol^{-1}$) was dissolved in 100 g of water, assuming $MgSO_4$ undergoes complete ionization. ($K_b\ for\ water = 0.52\ K\ kg\ mol^{-1}$)**

Q.6. **(i) On mixing liquid X and liquid Y, volume of the resulting solution decreases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would be observe after mixing liquids X and Y?**

(ii) What happens when we place the blood cell in water (hypotonic solution)? Give reason.

Q.7. **Calculate the mole fraction of benzene in solution containing 30% by mass in carbon tetrachloride.**

Q.8. **Define the terms, 'osmosis' and 'osmotic pressure'. What is the advantage of using osmotic pressure as compared to other colligative properties for the determination of molar masses of solutes in solutions?**

Q.9. **State Raoult's law for solutions, of volatile liquid components taking a suitable example, explain the meaning of positive deviation from Raoult's law.**

Q.10. **Define the term 'osmotic pressure'. Describe how the molecular mass of a substance can be determined on the basis of osmotic pressure measurement.**

Q.11. **State Henry's law correlating the pressure of a gas and its solubility in a solvent and mention two applications for the law.**

Q.12. **Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and why are they caused? Explain with one example for each type.**

Q.13. **A 1.00 molal aqueous solution of trichloroactic acid (CCl_3COOH) is its boiling point. The solution has the boiling point of 100.18^0C. Determine the Van't Hoff factor for trichloro-acetic acid. ($K_b for\ water = 0.512\ K\ Kg\ mol^{-1}$)**

Q.14. **Define the following terms:**

(i) Mole fraction

(ii) Isotonic solutions

(iii) Van't Hoff factor

(iv) Ideal solution

Q.15. **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?**

Q.16. **Calculate the mass of compound (molar mass =256 g mol^{-1}) to be dissolved in 75 g of benzene to lower its freezing point by $0.48\ K$ ($K_f = 5.12\ Kg\ mol^{-1}$)**

Q.17. Define an ideal solution and write one of its characteristics.

Q.18. What is meant by positive deviations from Raoult's law? Given an example? What is the sign of $\Delta_{mix}H$ for positive deviation?

Q.19. Define azeotropes. What type of azeotrope is formed by positive deviation from Raoult's law? Give an example.

Q.20. (a) Following reactions occur at cathode during the electrolysis of aqueous silver chloride solution:

$$Ag^+(aq) + e^- \longrightarrow Ag(s) \quad E^o = +0.80V$$

$$H^+(aq) + e^- \longrightarrow \frac{1}{2}H_2(g) \quad E^o = 0.00V$$

On the basis of their standard reduction electrode potential (E^o) values, which reaction is feasible at the cathode and why?

(b) Define limiting molar conductivity. Why conductivity of an electrolyte solution decreases with the decrease in concentration?

Q.21. Define the following terms:
(i) Colligative properties
(ii) Molality (m)

SECTION-C

(Each question in this section carry 3 marks)

Q.22. A solution is prepared by dissolving 10g of non-volatile solute in 200g of water. It has a vapour pressure of 31.84 mm Hg at 308K. Calculate the molar mass of the solute. (Vapour pressure of pure water at 308K = 32MM Hg)

Q.23. A solution containing 8 g of a substance in 100 g of diethyl ether boils at 36.86 $36.86\ ^0C$, where as pure ether boils at $36.60\ ^0C$. Determine the molecular mass of the solute. (For ether $K_b = 2.02\ k\ kg\ mol^{-1}$

Q.24. Calculate the temperature at which a solution containing 54 g of glucose, $C_6H_{12}O_6$, in 250 g of water will freeze. [K_f for water $= 1.86$ K kg mol^{-1}]

Q.25. 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 25^0C. Assuming that the gene fragment is a non-electrolyte, calculate its molar mass.

Q.26. Calculate the temperature at which a solution containing 54g of glucose, $(C_6H_{12}O_6)$, in 250g of water will freeze. (K_f for water = 1.86 K mol^{-1} kg)

Q.27. 100 mg of a protein is dissolved in just enough water to make 10.0 mL of solution. If this solution has an osmotic pressure of 13.3 mm Hg at 25^0C, What is the molar mass of the protein? ($R = 0.0821\ L$ atm mol^{-1} k^{-1} and 760 mm Hg $= 1$ atm.)

Q.28. A solution prepared by dissolving 1.25 g of oil of winter green (methyl salicylate) in 99.0 of benzene has a boiling point of 80.31 °C. Determine the molar mass of this compound. (B.P. of pure benzene = 80.10 °C and K_b for benzene = 2.53 °C kg mol^{-1})

Q.29. Calculate the amount of KCl which must be added to 1 kg of water so that the freezing point is depressed by 2k. ($K_f\ for\ water = 1.86\ K\ Kg\ mol^{-1}$)

Q.30. **Determine the osmotic pressure of a solution prepared by dissolving 2.5×10^{-2} g of K_2SO_4 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 $K_2SO_4 = 174$ g mol^{-1}).**

Q.31. **3.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing points 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 moi^{-1}, K_f for benzene = 4.9 K Kg mol^{-1})**

Q.32. **A 10% solution (by mass) of sucrose in water has freezing point of 269.15 K. Calculate the freezing point of 10% glucose in water, if 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})

SECTION – D

(Each question in this section carry 5 marks)

Q.33. **(a) 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})

(b) Define the following terms:

(i) Molality (m)

(ii) Abnormal molar mass

Q.34. **(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.

Q.35. **(a) Define the following terms:**
(i) Molarity,
(ii) Molal elevation constant (K_b)
(b) A solution containing 15 g urea (molar mass = 60 g mol^{-1}) per lit-re 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.

Q.36. **(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^{-1}) in water is labelled as 10% (by mass). What would be the molality and molarity of the solution?
(Density of solution =1.2mL^{-1})

Q.37. **(a) State Raoult's law for a solution containing volatile components. How does Raoult's law become a special case of Henry's law.**
(b) 1.00 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. Find the molar mass of the solute. (K_f for benzene = kg mol^{-1}).

Q.38. **(a) Define the following terms:**
(i) Ideal solution
(ii) Azeotrope
(iii) Osmotic pressure
(b) A solution of glucose ($C_6H_{12}O_6$) in water is labelled as 10% by weight. What would be the molality of the solution? (Molar mass of glucose = 180 g mol^{-1})

Q.39. **(a) Define the following terms:**
(i) Mole fraction
(ii) Ideal Solution

(b) 15.0 g of an unknown molecular material is dissolved in 450 g of water. The resulting Solution freezes at – 0.34^0C. What is the molar mass of the material?
(K_f for water = 1.86 K kg mol^{-1})

Q.40. **(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 ($C_3H_8O_3$) 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 K kg mol^{-1})

Q.41. **(a) Define the following terms:**
(i) Mole fraction
(ii) Van't Hoff factor
(b) 100 mg of a protein is dissolved in enough water to male 10.0 mL of a solution. It this solution has an osmotic pressure of 13.3 mm Hg at 25^0C, What is the molar mass of protein? ($R = 0.0821\ L\ atm\ mol^{-1}$ and $760\ mm\ Hg = 1\ atm$).

Q.42. **(a) What is meant by:**
Colligative properties
(b) what concentration of nitrogen should be present in a glass of water at room temperature? Assume a temperature of 25^0 C, total pressure of 1 atmosphere and mole fraction of nitro gen in air of 0.78 [K_H] for nitrogen $= 8.42 \times \frac{10^{-7}M}{mm}$ Hgl

Q.43. **(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 $MgBr_2$ in 200 g of water. (Molar mass of $MgBr_2 = 184$ g) (K_f for water = 1.86 K kg mol^{-1})

Q.44. **(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)