

1. Which gas will dissolve in water to a greater extent if partial pressures of A and B in the mixture are the same, and Henry's law constant of gas A is greater than that of gas B? [1]
2. When is the experimentally obtained vapour pressure of a binary liquid solution greater than that calculated from Raoult's law? [1]
3. Why does a red blood cell placed in a 0.84% NaCl solution neither expand nor shrivel? [1]
4. Which one of the colligative properties is used for determining the molar mass of polymer? [1]
5. What will be the van't Hoff factor for Na_3PO_4 in its as solution if Na_3PO_4 dissociates completely in the solution? [1]
6. Molality of the aqueous solution of NaCl and Na_2SO_4 is the same. What will be the freezing point of Na_2SO_4 solution if the freezing point of NaCl solution is 1.5°C ? (assume complete dissociation of NaCl and Na_2SO_4 in solution) [1]
7. Which of the given aqueous solutions has a lower vapour pressure, 0.1m Na_3PO_4 or 0.1m BaCl_2 ? [1]
8. Which one of the following solutions is more concentrated, (M/2) H_2SO_4 or, (N/2) H_2SO_4 ? [1]
9. Write the components present when an equilibrium established at the freezing point of an aqueous solution containing a non-volatile solute. [1]
10. Which of the following aqueous solutions would have the same freezing point? (a) 0.1m urea (b) 0.1m NaCl (c) 0.1 m sugar [1]

11. What is an azeotropic mixture? Give one example for each of maximum and minimum boiling point azeotropic mixture. [2]
12. Between 1M and 1m aqueous solutions, which one is more concentrated and why? [2]
13. What do you understand by negative deviation from Raoult's law. Give an example of a binary solution showing negative deviation. [2]
14. What is Henry's law constant? On what factors does it depend? [2]
15. When the cap of a soda water bottle is removed, CO₂ gas comes out with fizzing sound. Explain with reason. [2]
16. Show that, relative lowering of vapour pressure of a solution containing a non-volatile solute is a colligative property. [2]
17. What is cryoscopic constant? Does it depend on the nature of solvent or solute? Write its SI unit. [2]
18. The molal boiling point elevation constant for water is 0.52 K kg mol⁻¹. What does it mean? What will be its value for 100g water? [2]
19. Why does the addition of mercuric iodide in an aqueous solution of KI increases the vapour pressure of the solution? [2]
20. Based on solute-solvent interactions, arrange the following in order of increasing solubility in n-octane and explain. Cyclohexane, KCl, CH₃OH, CH₃CN. [2]
21. What amount (g) of glucose dissolved in one litre solution will be isotonic with blood? Given: osmotic pressure of blood at 37°C = 7.65 atm. [3]
22. The osmotic pressure of a glucose solution is 365.65 mm Hg at 20°C. The osmotic pressure decreases to 75.62 mm Hg if the solution is diluted and the temperature is increased to 30°C. How many times the solution is diluted? [3]

23. 75.2g phenol is dissolved in 1kg of solvent ($k_f = 14$). If the depression of freezing point of the resulting solution is 7K, then calculate the percentage of phenol that dimerises in solution, [3]
24. Molal depression of freezing point of water = $1.86^\circ\text{C kg mol}^{-1}$. The freezing point of water decreases by 0.413°C when 3.33g of urea is dissolved in 250g of water. Find out the molar mass of urea. [3]
25. Percentage strength of a H_2SO_4 solution is 15%(W/W) and concentration is 1.020gcm^{-3} . Calculate molarity and molality of the solution. [3]
26. The vapour pressure of pure water is 31.83mm Hg at 30°C . If 10g glucose is added to 100g water, then what will be the vapour pressure of the resulting solution? [3]
27. The vapour pressure of a pure solvent is 450 mm Hg at room temperature. If 100g of the solute is added to 500g of solvent, the vapour pressure of the resulting solution becomes 420mm Hg. The molar mass of the solvent is 74. Calculate the molar mass of the solute. [3]
28. 1.22 g benzoic acid is dissolved separately in (i) 100g acetone ($k_b = 1.7$) and (ii) 100g benzene ($k_b = 2.6$) to prepare two separate solutions. The elevation of boiling points are 0.17°C and 0.13°C , respectively. (a) calculate the molecular mass of benzoic acid in both the solutions. (b)What concentration will you draw about the molecular structure of benzoic acid in acetone and benzene from the obtained results. [3]
29. Calculate the boiling point of 1(M) aqueous solution of KCl (density = 1.04 cm^{-3}). Given: k_b for water = 0.52 Kkgmol^{-1} . Consider KCl dissociates completely in aqueous solution. [3]
30. Calculate the pH of the 0.025(M) aqueous solution of a monobasic weak acid (HX), if the depression of freezing point is 0.06°C . Given: Molality of the solution = molarity of the solution, k_f for water = 1.86Kkgmol^{-1} . [3]