

UNIT - 2

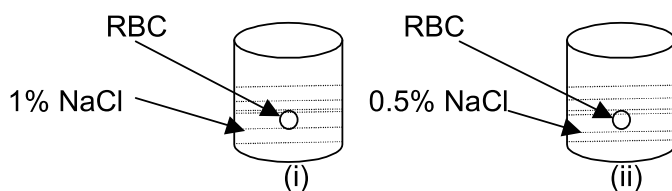
SOLUTIONS

1 Marks Questions

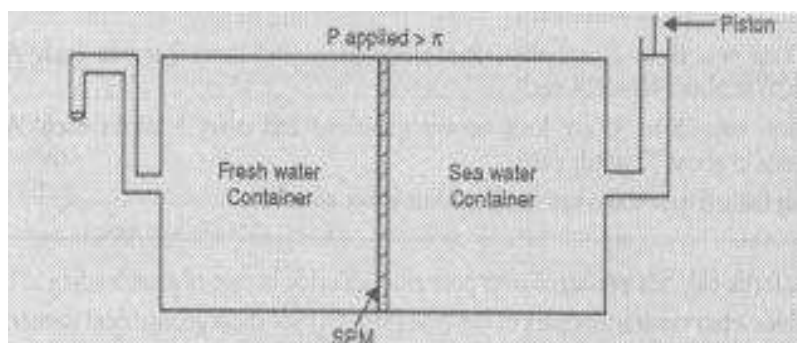
1. A 500 gm of toothpaste sample has 0.2 g of fluoride concentration. What is the concentration of fluoride in terms of ppm level?
2. Two liquids A and B boil at 135°C and 185°C respectively. Which of them has a higher vapour pressure at 80°C ?
3. Write the possible structural arrangement of a mixture of chloroform and acetone to form a solution.
4. What is Van't Hoff's factor for a compound which undergoes tetramerization in an organic solvent?
5. Aquatic species are more comfortable in cold waters rather than in warm water. Give reason.

2 marks questions

6. RBC's are placed in the given solutions as in figure (i) and (ii). What happens to RBC in test tube (i) and test tube (ii).



7. Given below is the sketch of a plant carrying out a process.



- (i) Name the process occurring in the above plant.
- (ii) To which container does the net flow of the solvent takes place?
- (iii) Name one SPM which can be used in this plant.
- (iv) Give one practical use of the plant.

8. A solution of sucrose (Molar mass 342 g mol^{-1}) is prepared by dissolving 68.4 g in 1000 g of water. What is the

- (i) Vapour pressure of the solution at 293 K .
- (ii) Osmotic pressure at 293 K .
- (iii) Boiling point of the solution.
- (iv) Freezing point of the solution.

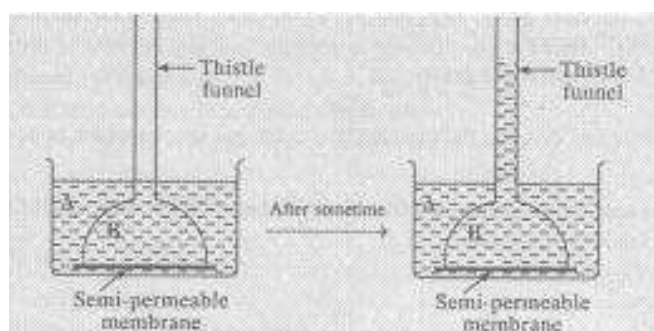
The vapour pressure of the water at 293 K is 0.023 atm . $k_b = 0.52 \text{ K kg mol}^{-1}$ & $k_f = 1.86 \text{ K kg mol}^{-1}$. Assume the solution to behave ideally.

9. Why calculations based on colligative properties of solutions sometimes do gives abnormal molecular mass values for solute? What are the nature of the abnormalities. 2 g of $\text{C}_6\text{H}_5\text{COOH}$ dissolved in 25 g of benzene shows a depression in freezing point equal to 1.62 K . Molal depression constant for benzene is $4.9 \text{ K kg mol}^{-1}$. What is the Percentage(%) of association of acid, if it forms a dimer in solution?
10. Assuming complete dissociation, calculate the freezing point of a solution prepared by dissolving 6 g of glaubers salt ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$) in 0.100 kg of H_2O . Given $k_f = 1.86 \text{ K kg mol}^{-1}$ Atomic mass of $\text{H}_2\text{O} : 18$, Na : 23, S : 32, O : 16, H : 1 all in amu units.

3 Marks Questions

11. A) Addition of HgI_2 to aq. KI solution shows an increase in the vapour pressure why?
- B) A person suffering from high blood pressure is advised to take minimum quantity of common salt. Give reason.

12. A) Why the vapour pressure of a solution of glucose in water lower than that of water?
- B) 0.1 molal solution of glucose and NaCl respectively. Which one will have higher boiling point?
13. H_2S , a toxic gas with rotten egg like smell is used for qualitative analysis. If the solubility of H_2S in water at STP is 0.195 m, calculate Henry's law constant ($k_H=282 \text{ bar}$)
14. Examine the following illustrations and answer the following questions



- 1) Identify the liquid A (pure water or sugar solution).
 - 2) Identify the liquid B (pure water or sugar solution).
 - 3) Why the level of liquid in thistle funnel has risen after sometime?
 - 4) Name the phenomenon involved in this experiment and define it.
15. A storage battery contains a solution of H_2SO_4 38% by weight. At this concentration van't Hoff factor is 2.50. At what temperature will the battery contents freeze?
- (k_f for water = 1.86k kg/ mol)
16. Following are the graphs for the vapour pressure of two component system as a function of composition. Answer the following questions.

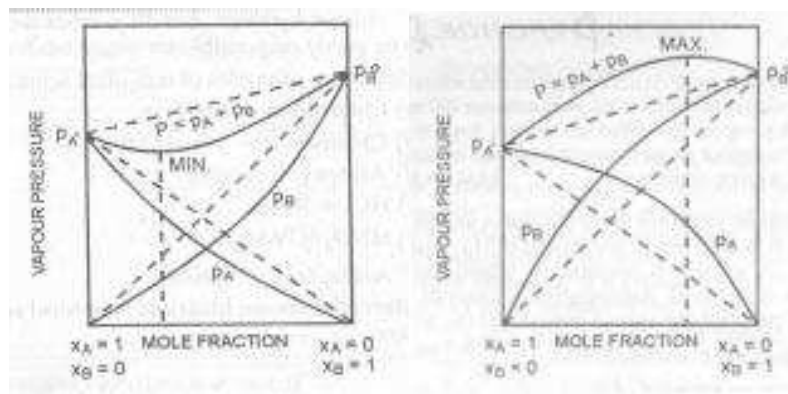


Fig (a)

Fig. (b)

- (i) What type of deviation is shown in fig.(a) and (b)?
 - (ii) Give one example of solutions showing deviations in fig (a) (b).
 - (iii) What change in the volume and temperature is observed in solutions of this type?
17. How does osmotic pressure depend on temperature and atmospheric pressure, what is the molar concentration of solute particles in the human blood, if the osmotic pressure is 7.2 atm at the body temperature of 37°C ?
 18. The vapour pressure of dilute aqueous solution of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) is 750 mm of mercury at 373K. Calculate
 - 1) Molality
 - 2) Mole fraction of the solute

5 Marks Questions

19. The elements A and B form purely covalent compounds having molecular formulae AB_2 and AB_4 . When dissolved in 20g of benzene, 1g of AB_2 lowers the freezing point by 2.3K, whereas 1g of AB_4 lowers it by 1.3K. the molal depression constant for benzene is 5.1 K kg/mol, calculate the atomic mass of A and atomic mass of B. **(A=25.59, B=42.64)**
20. a) Why constant boiling mixtures behave like a single component when subjected to distillation.

b) What type of Azeotropic mixtures are formed by the following solution

- i) H₂O and HCl ii) H₂O and C₂H₅OH

c) Give one practical application of depression of freezing point?

d) A Solid solution is formed between two substances. One whose particles are very large and the other particles are very small. What type of solid solution is this likely to be?

e) Write the Raoult's Law for each component of a binary solution and show that the total vapour pressure of the solution may be expressed as $P = P^0_A + (P^0_B - P^0_A) X_B$

21. Vapour pressure of pure benzene at a certain temperature is 640 mm Hg. A non-volatile non-electrolyte solid weighing 2.175g is added to 39.0 of benzene. The vapour pressure of solution is 600 mm Hg. What is the molecular mass of solid substance? **(65.9g mol⁻¹)**
22. The degree of dissociation of Ca(NO₃)₂ in dilute solution aqueous solution containing 7.0g of the solute per 100g of water at 100⁰ C is 70 percent. If the vapour pressure of water at 100⁰ C is 760mm, calculate the vapour pressure of the solution. **(746.02mm)**
23. What mass of a non-volatile solute urea (NH₂CONH₂) need to be dissolved in 100g of water in order to decrease the vapour pressure of water by 25%? also calculate the molality of the solution. **(18.52m)**
24. 8.0575 X 10⁻² kg of Glauber's salt is dissolved in water to obtain 1 dm³ of a solution of density 1077.2 kg m⁻³. Calculate the molarity, molality & mole fraction of Na₂SO₄ in the solution. **(0.2508m, 0.0045, 0.25M)**
25. To 500 cm³ of water 3.0 X 10⁻³ kg of acetic acid is added. If 23% of acetic acid is dissociated, what will be the depression in freezing point? K_f and density of water are 1.86 K kg mol⁻¹ & 0.997 g cm⁻³ respectively. **(0.229K)**