Chemistry
Assignment No: 2
(Solutions)

Q1. Define osmotic pressure.

Q2. State one characteristic of an ideal solution.

Q3. State Raoult's law for solutions of non-volatile solutes.

Q4. Two liquids X and Y boil at 110^0C and 130^0C respectively. Which of them has higher vapour pressure at 50^0C?

Q5. What type of azeotrope formed on mixing nitric acid and water?

Q6. What happens when blood cells are placed in pure water?

Q7. Differentiate between molarity and molality of a solution? What is the effect of temperature on both.

Q8. 100mg of protein is dissolved in just enough to make 10.0ml of solution. If this solution has osmotic pressure of 13.3mm of Hg at 25^0C. What is the molar mass of protein (R=0.0821 L atm mol^{-1} K^{-1}).

Q9. Henry law constant for CO_2 dissolving in water is $1.67X10^8$ Pa at 298K. Calculate the quantity of CO_2 in 1L of soda water when packed under 2.5atm CO_2 pressure at 298K.

Q10. Calculate the freezing point depression expected for 0.0711 m aqueous solution of Na_2SO_4. If this solution actually freezes at -0.320^0C, what is the value of i? (K_f for water 1.86^0C mol^{-1}).

Q11. What is meant by negative deviation from Raoult's law? Draw a diagram to illustrate the relationship between vapour pressure and mole fractions of components in a solution to represent negative deviation.

Q12. 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 Kg mol^{-1}).

Q13. Heptane and octane form an ideal solution at 373K. The vapour pressure pure liquids at this temperature are 105.2KPa and 46.8KPa respectively. If the solution contain 25g of heptane and 28.5g of octane, Calculate:

1) Vapour pressure exerted by heptane.
2) Vapour pressure exerted by solution.
3) Mole fraction of octane in the vapour phase.

Q14. At 300K, 36g of glucose ($C_6H_{12}O_{6)}$ present per litre in its aqueous solution has an osmotic pressure of 4.98 bar. If the osmotic pressure of another solution of glucose is 1.52 bar at the same temperature. What would be its concentration?

Q15. (a) What are non-ideal solutions?
(b) What role does the molecular interaction play in deciding the vapour pressure of solutions :-
1) Alcohol and acetone.
2) Chloroform and acetone.

Q16. Urea form an ideal solution in water. Determine the vapour of an aqueous solution containing 10% by mass of urea at 40^0C .
(Vapour pressure of water at 40^0C =55.3mm of Hg)

Q17. A 4% solution of sucrose is isotonic with 3% solution of an unknown organic substance. Calculate the molecular mass of unknown substance (molecular mass of sucrose is 342 g mol^{-1}).

Q18. What is the mole fraction of a solute in 2.5m aqueous solution?

Q19. Give reason:
When 30ml of C_2H_5OH and 30ml of H_20 are mixed, the volume of resulting solution is more than 60ml.

Q20. 2g of C_6H_5COOH dissolved in 25g of Benzene shows a depression in freezing point equal to 1.62K. Molar depression constant for C_6H_6 is 4.9 K Kg mol^{-1}. What is the % association of acid if it exists as dimers in solution.

Q21. A solution is obtained by mixing 300g of 25% solution and 400g of 40% solution by mass. Calculate the mass% of the resulting solution.

Q22. The vapour pressure of water is 12.3pa at 300K. Calculate vapour pressure of 1 molar solution of a solute in it.

Q23. Explain why there is a rise in boiling point when a non-volatile solid is dissolved in a liquid.

Q24. An aqueous solution containing 1.248 g of barium chloride (molar mass=208.34g mol^{-1}) in 100g of H_20 boils at 10.0832^0C. Calculate the degree of dissociation of $BaCl_2$ (K_b for H_20=0.52KKg mol^{-1}).

Q25. The vapour pressure of pure liquids A and B are 450 and 700mm Hg at 350K respectively. Find the composition of the liquid mixture if total vapour pressure is 600 mm of Hg. Also find the composition of the vapour mass.

Q26. Calculate the molarity of 300ml of 0.5M H_2SO_4 diluted to 500ml.

Q27. How many ml of 0.1M HCl are required to react completely with 1g mixture of Na_2CO_3 and $NaHCO_3$ containing equimolar of two.

Q28. Calculate of ΔT_f of H_20 when 10g of $CH_3CH_2CH(Cl)-COOH$ is added to 250g of H_20. Ka=$1.4X10^{-3}$, K_f=1.86 K Kg mol^{-1}, (Molecular mass of acid=122.5gmol^{-1})