

## TEST PAPER NO. 02

TOPIC : SOLUTION

M.M. 50

TIME: 3 HRS.

Name of Student \_\_\_\_\_ Roll No. \_\_\_\_\_

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1. What are substitutional and interstitial solution?
2. What is meant by molarity and molality?
3. Define mole fraction with example?
4. Calculate the mole fraction of ethylene glycol ( $C_2H_6O_2$ ) in a solution containing 20% of  $C_2H_6O_2$  by mass.
5. Calculate the molarity of a solution containing 5 gm of NaOH in 450 ml solution.
6. Calculate the mass of urea ( $NH_2CONH_2$ ) required in making 2.5 kg. of 0.25 molal aqueous solution.
7. Which of the following will have greater boiling point: 1 M KCl, 1M  $AlCl_3$  or 1M Sucrose (Give reason in support of your answer)
8. Why ethylene glycol is add to the water used for radiator in the hills and cold area?
9. What role does the molecular interaction play in a solution of alcohol and water?
10. Why does gases always tend to be less soluble in liquids as the temperature is raised?
11. State Henry's Law and mention some important application?
12. Calculate the mass of a non-volatile solute (molar mass  $40 \text{ gm mol}^{-1}$ ) which should be dissolved in 114 octane to reduce its vapour pressure to 80%.
13. What are the most important type of intermolecular attractive interaction in the following pairs:
  - a. n-hexane and n-octane
  - b.  $I_2$  and  $CCl_4$
  - c.  $NaClO_4$  and water
  - d. methanol and acetone
14. What is meant by positive and negative deviations from Raoult's Law and how is the sign of  $D_{mix}H$  related to positive and negative deviations from Raoult's Law.
15. Calculate the mass percentage of aspirin ( $C_9H_8O_4$ ) in acetonitrile ( $CH_3CN$ ) and when 6.5 gm of  $C_9H_8O_4$  is dissolved in 450 gm of  $CH_3CN$
16. Concentration nitric acid used in laboratory work is 68 % nitric acid by mass in aqueous solution. What should be the molarity of such sample of the acid if the density of the solution is  $1.504 \text{ g ml}^{-1}$ ?
17. What is meant by reverse osmosis. Explain with example.
18. What are azeotropes? Explain minimum and maximum azeotrope with example?
19. The boiling point of benzene is 353.23 K. When 1.80 gm of a non-volatile solute was dissolved in 90 gm of benzene, the boiling point is raised to 354.11 K Calculate the molar mass of the solute,  $K_b$  for benzene is  $2.53 \text{ K kg mol}^{-1}$

20. 1.00 gm of a non-electrolyte (sulfur) is dissolved in 50 gm of benzene lowered the freezing point of benzene by 0.40 K The freezing point depression constant of benzene is  $5.12 \text{ K Kg mol}^{-1}$  Find the molar mass of the solute and the atomicity of sulfur molecule ( Atomic mass of sulfur = 32 u)
21. What is meant by abnormal mass? 2 gm of benzoic acid ( $\text{C}_6\text{H}_5\text{COOH}$ ) dissolved in 25 gm. 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 % association of acid if it forms dimer in solution?
22. What is meant by term osmotic pressure? 19.5 gm of  $\text{FCH}_2\text{COOH}$  is dissolved in 500 gm of water. The depression in the freezing point of water observed is  $1^\circ \text{C}$  Calculate the van't Hoff factor and dissociation constant of fluoroacetic acid.
23. Two elements A and B form compounds having formulae  $\text{AB}_2$  and  $\text{AB}_4$  When dissolved in 20 gm of benzene, 1 gm of  $\text{AB}_2$  lowers the freezing point by 2.3 K whereas  $\text{AB}_4$  lowers it by 1.3 K The molar depression constant for benzene is  $5.1 \text{ K Kg Mol}^{-1}$  Calculate the atomic masses of A and B.
24. Determine the osmotic pressure of a solution prepared by dissolving 25 mg of  $\text{K}_2\text{SO}_4$  in 2 litre of water at  $25^\circ \text{C}$  assuming that it is completely dissociated. What hypertonic and hypotonic solution?
25. What are ideal solution? Give 2 examples of it.  
Heptane and octane form an ideal solution. At 373 K the vapour pressures of the two liquid components are 105.2 kPa and 46.8 kPa respectively. What will be the vapour pressure of a mixture of 26 gm of heptane and 35 gm of octane?
26. What is meant by Vant Hoff Factor? What are its value for electrolytes (association and dissociation) and non electrolytes?  
0.6 ml of acetic acid, having density  $1.06 \text{ g ml}^{-1}$  is dissolved in 1 litre of water The depression in freezing point observed for this strength of acid was  $0.0205^\circ \text{C}$  Calculate the van't Hoff factor and the dissociation constant of acid.  $K_f$  for water is  $1.86 \text{ K kg mol}^{-1}$  for water