TEST-B

SOLVED

Time: 1 hr. **Max. Marks: 30**

SECTION-A

Tick the correct option:

1. A 2% solution of cane sugar (MW = 342) is isotonic with 0.5% solution of a non-volatile, non-electrolyte solute 'X'. The molecular mass of the solute 'X' is **[1]**

   (i) 34.2 (ii) 85.5 (iii) 95.58 (iv) 126.98

2. The degree of dissociation (α) of weak electrolyte $A_x B_y$ is related to van't Hoff factor (i) by the expression **[1]**

   (a) $\alpha = \frac{x+y-1}{i-1}$ (ii) $\alpha = \frac{i-1}{x+y+1}$ (iii) $\alpha = \frac{i-1}{1-(x-y)}$ (iv) $\alpha = \frac{x+y+1}{i-1}$

3. What is the molality of a sulphuric acid solution which is 93% w/v? The density of solution is 1.80 g/ml. **[1]**

   (i) 9.90 (ii) 10.90 (iii) 11.90 (iv) 12.90

Assertion-Reason type Questions:

(i) If assertion and reason both are correct and reason is the correct explanation of assertion.

(ii) If assertion and reason both are correct and reason is not the correct explanation of assertion.

(iii) If assertion is correct and reason is wrong.

(iv) If assertion is wrong and reason is correct.

4. Assertion: 0.1 m solution of glucose has same increase in freezing point as 0.1 m solution of urea if both are prepared in water. **[1]**

   Reason: The value of molal depression constant is same for the solutions.

5. Assertion: Azeotropic mixtures are formed only by non-ideal solution and they may have boiling points either greater than both the components or lesser than both components. **[1]**

   Reason: The composition of the vapour phase is same as that of the liquid phase of an azeotrope mixture.

One word /One Sentence type Questions.

6. State Raoult's law for a solution containing both volatile components. **[1]**

7. What do you infer about the molecular state of the solute if the van't Hoff factor is less than 1? **[1]**

SECTION-B

8. What types of non-idealities are exhibited by the following system:

   (i) acetone + chloroform

   (ii) ethanol + water?

   Also, predict the sign of ΔH_{mix} for these two systems. **[2]**

9. Calculate the mass of NaCl that must be added to one kilogram of water so that the freezing point of water is depressed by 3K. Given k_f for water =1.86°C kg mol^{-1} (Atomic mass: Na = 23, Cl = 35.5). **[2]**

10. Give reason:

    (i) Oxygen diluted with helium gas is used as a breathing gas by deep sea divers.

    (ii) Blood cells placed in pure water swell and finally burst. **[2]**

11. Define osmotic pressure:

    Explain how molecular mass of a solute can be determined using osmotic pressure.

    Why is osmotic pressure preferred over other colligative properties? **[3]**

12. An antifreeze solution is prepared from 222.6 g of ethylene glycol ($C_2H_6O_2$) and 200 g water.

    (i) calculate the molecularity of the solution.

    (ii) Find freezing point of the solution

    (k_f for water = 1.86 K kg mol^{-1}) **[3]**

13. Why and when do we observe abnormal molecular masses? Explain giving suitable examples. **[3]**

14. An aqueous solution of glucose ($C_6H_{12}O_6$) boils at a temperature 0.01°C higher than that of pure water. The molal elevation constant for water is 0.52 K kg mol^{-1}. What is the number of glucose molecules in the solution containing 100 g of water? **[3]**

15. (i) What is reverse osmosis?

    (ii) $CaCl_2$ is used to clear snow from roads in hill station. Give reason:

    (iii) A bottle of sulphuric acid is labelled as 13% w/w.

    (a) what is the mole fraction of each component?

    (b) what is the molality of the solution?

    (c) Find the molarity of the solution if the density of the solution is 1.10 g/ml.

    (molecular mass of sulphuric acid = 98) **[1+ 1 + 3 = 5]**

