

Solution and Colligative properties

Self Evaluation Test -4

- The 2N aqueous solution of H_2SO_4 contains
 - 49 gm of H_2SO_4 per litre of solution
 - 4.9 gm of H_2SO_4 per litre of solution
 - 98 gm of H_2SO_4 per litre of solution
 - 9.8 gm of H_2SO_4 per litre of solution
- The amount of $KMnO_4$ required to prepare 100 ml of 0.1N solution in alkaline medium is [CPMT 1986]
 - 1.58 gm
 - 3.16 gm
 - 0.52 gm
 - 0.31 gm
- What weight of hydrated oxalic acid should be added for complete neutralisation of 100ml of 0.2N-NaOH solution? [MP PMT 1997]
 - 0.45 g
 - 0.90 g
 - 1.08 g
 - 1.26 g
- A 500 g tooth paste sample has 0.2g fluoride concentration. What is the concentration of F in terms of ppm level [AIIMS 1992]
 - 250
 - 200
 - 400
 - 1000
- To 5.85 gm of NaCl one kg of water is added to prepare of solution. What is the strength of NaCl in this solution (mol. wt. of NaCl = 58.5) [CPMT 1990; DPMT 1987]
 - 0.1 Normal
 - 0.1 Molal
 - 0.1 Molar
 - 0.1 Formal
- The degree of dissociation of $Ca(NO_3)_2$ in a dilute aqueous solution containing 14g of the salt per 200g of water $100^\circ C$ is 70 percent. If the vapour pressure of water at $100^\circ C$ is 760 cm. Calculate the vapour pressure of the solution [UPSEAT 2000]
 - 746.3 mm of Hg
 - 757.5 mm of Hg
 - 740.9 mm of Hg
 - 750 mm of Hg
- The vapour pressure of pure benzene at a certain temperature is 200 mm Hg. At the same temperature the vapour pressure of a solution containing 2g of non-volatile non-electrolyte solid in 78g of benzene is 195 mm Hg. What is the molecular weight of solid [UPSEAT 2001]
 - 50
 - 70
 - 85
 - 80
- Which one of the following non-ideal solutions shows the negative deviation
 - $CH_3COCH_3 + CS_2$
 - $C_6H_6 + CH_3COCH_3$
 - $CCl_4 + CHCl_3$
 - $CH_3COCH_3 + CHCl_3$
- The O.P. of equimolar solution of Urea, $BaCl_2$ and $AlCl_3$, will be in the order [DCE 2000]
 - $AlCl_3 > BaCl_2 > \text{Urea}$
 - $BaCl_2 > AlCl_3 > \text{Urea}$
 - $\text{Urea} > BaCl_2 > AlCl_3$
 - $BaCl_2 > \text{Urea} > AlCl_3$
- The osmotic pressure of a 5% solution of cane sugar at $150^\circ C$ is (mol. wt. of cane sugar = 342) [CPMT 1986; Manipal MEE 1995]
 - 4 atm
 - 3.4 atm
 - 5.07 atm
 - 2.45 atm
- Which one of the following pairs of solutions can we expect to be isotonic at the same temperature [NCERT 1987]
 - 0.1M urea and 0.1M NaCl
 - 0.1M urea and 0.2M $MgCl_2$
 - 0.1M NaCl and 0.1M Na_2SO_4
 - 0.1M $Ca(NO_3)_2$ and 0.1M Na_2SO_4
- Which of the following would have the highest osmotic pressure (assume that all salts are 90% dissociated) [NCERT 1982]
 - Decimolar aluminium sulphate
 - Decimolar barium chloride
 - Decimolar sodium sulphate
 - A solution obtained by mixing equal of (b) and (c) and filtering
- Which solution will have the highest boiling point [NCERT 1981]
 - 50
 - 70
 - 85
 - 80

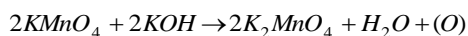
- (a) 1% solution of glucose in water
(b) 1% solution of sodium chloride in water
(c) 1% solution of zinc sulphate in water
(d) 1% solution of urea in water
14. The boiling point of a solution of 0.11 gm of a substance in 15 gm of ether was found to be 0.1°C higher than that of the pure ether. The molecular weight of the substance will be ($K_b = 2.16$) [MP PET 2002]
- (a) 148 (b) 158
(c) 168 (d) 178
15. The boiling point of benzene is 353.23 K. When 1.80 gm of a nonvolatile solute was dissolved in 90 gm of benzene, the boiling point is raised to 354.11 K. the molar mass of the solute is [K_b for benzene = 2.53 K mol^{-1}] [DPMT 2004]
- (a) 5.8 g mol^{-1}
(b) 0.58 g mol^{-1}
(c) 58 g mol^{-1}
(d) 0.88 g mol^{-1}
16. The boiling point of 0.1 molal aqueous solution of urea is 100.18°C at 1 atm. The molal elevation constant of water is
- (a) 1.8 (b) 0.18 (c) 18 (d) 18.6
17. The freezing point of a solution containing 4.8 g of a compound in 60 g of benzene is 4.48 . What is the molar mass of the compound ($K_f = 5.1\text{ km}^{-1}$), (freezing point of benzene = 5.5°C)
- (a) 100 (b) 200
(c) 300 (d) 400
18. When 0.01 mole of sugar is dissolved in 100 g of a solvent, the depression in freezing point is 0.40° . When 0.03 mole of glucose is dissolved in 50 g of the same solvent, the depression in freezing point will be
- (a) 0.60° (b) 0.80°
(c) 1.60° (d) 2.40°
19. The freezing point of equimolal aqueous solution will be highest for [IIT 1990; DCE 2001]
- (a) $\text{C}_6\text{H}_5\text{NH}_3^+\text{Cl}^-$ (aniline hydrochloride)
(b) $\text{Ca}(\text{NO}_3)_2$
(c) $\text{La}(\text{NO}_3)_3$
(d) $\text{C}_6\text{H}_{12}\text{O}_6$ (glucose)
20. The Van't Hoff factor of the compound $\text{K}_3\text{Fe}(\text{CN})_6$ is
- (a) 1 (b) 2
(c) 3 (d) 4

AS Answers and Solutions

(SET -4)

1. (c) Wt. of H_2SO_4 per litre = $N \times \text{eq. mass} = 2 \times 49 = 98g$.

2. (a) In alkaline medium $KMnO_4$ act as oxidant as follows.



Hence its eq. wt. = m. wt. = 158

$$\text{Now, Normality} = \frac{\text{Mass}}{\text{Eq. mass}} \times \frac{1}{V(L)}$$

$$\text{mass} = 0.1 \times 158 \times \frac{100}{1000} g = 1.58 g.$$

3. (d) For complete neutralization equivalent of oxalic acid = equivalent of $NaOH$ =

$$\frac{w}{\text{eq. wt.}} = \frac{NV}{1000} \quad \therefore \frac{w}{63} = \frac{0.2 \times 100}{1000} \Rightarrow w = 1.26 gm.$$

4. (c) F^- ions in $PPm = \frac{0.2}{500} \times 10^6 = 400$

5. (b) $5.85 g NaCl = 0.1 mol$ as it present in 1 kg of

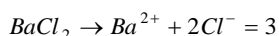
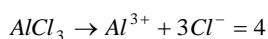
$$\text{water ; molality} = \frac{\text{wt.}}{\text{m wt.} \times l} = \frac{5.85}{58.5 \times 1} = 0.1 molal$$

6. (a)

$$7. (d) \frac{P^o - P_s}{P^o} = \frac{n}{n + N}; \frac{P^o - P_s}{P^o} = \frac{w \times M}{m \times W} = 80$$

8. (d) $CH_3COCH_3 + CHCl_3$ is non ideal solution which shown negative deviation.

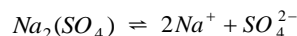
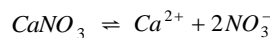
9. (a) The particle come of $AlCl_3$ solution will be maximum due to ionisation less in $BaCl_2$ and minimum in urea



More the number of particles in solution more is the osmotic pressure a colligative properties.

$$10. (c) \pi = \frac{5 \times 0.0821 \times 1000 \times 423}{342 \times 100} = 5.07 atm.$$

11. (d) Osmotic pressure is a colligative properties equimolar solution of $Ca(NO_3)_2$ and Na_2SO_4 will produce same number of solute particles.



12. (a) $Al_2(SO_4)_3$ Deci-molar gives maximum ion. ***
Hence, its osmotic pressure is maximum.

13. (b) $NaCl$ and $ZnSO_4$ gives 2 ions but $NaCl$ is more ionic than $ZnSO_4$.

$$14. (b) m = \frac{K_b \times w \times 1000}{\Delta T_b \times W}$$

$$K_b = 2.16, w = 0.11, W = 15 g, \Delta T_b = 0.1$$

$$m = \frac{2.16 \times 0.11 \times 1000}{0.1 \times 15} = 158.40 \approx 158.$$

15. (c) The elevation (ΔT_b) in the boiling point

$$= 354.11 K - 353.23 K = 0.88 K$$

Substituting these values in expression

$$M_{\text{Solute}} = \frac{K_b \times 1000 \times w}{\Delta T_b \times W}$$

Where, w = weight of solute, W = weight of solvent

$$M_{\text{solute}} = \frac{2.53 \times 1.8 \times 1000}{0.88 \times 90} = 58 gmol^{-1}$$

Hence, molar mass of the solute = $58 gmol^{-1}$

$$16. (a) K_b = \frac{0.18}{0.1} = 1.8$$

$$17. (d) m = \frac{K_f \times 1000 \times w}{W \times \Delta T_f} = \frac{5.1 \times 1000 \times 4.8}{60 \times 1.02} = 400.$$

$$18. (d) \Delta T_f = mk_f$$

$$0.40 = \frac{0.01 \times 1000}{100} \times k_f \Rightarrow k_f = 4$$

$$\text{again } \Delta T_f = mk_f$$

$$= \frac{0.03 \times 1000}{50} \times 4$$

$$= 2.4$$

19. (d) $La(NO_3)_3$ will furnish four ions and thus will develop more lowering in freezing point whereas glucose gives only one particle and thus minimum lowering in freezing point.

