Unit 9 Solutions

Choose the best answer.

1. The molality of a solution containing 1.8g of glucose dissolved in 250g of water is

   a) 0.2 M b) 0.01 M

   c) 0.02 M d) 0.04 M

2. Which of the following concentration terms is / are independent of temperature

   a) molality b) molarity

   c) mole fraction d) (a) and (c)

3. Stomach acid, a dilute solution of HCl can be neutralised by reaction with Aluminium hydroxide

   $Al(OH)_3 + 3HCl\ (aq) \rightarrow AlCl_3 + 3\ H_2O$

   How many millilitres of 0.1 M $Al(OH)_3$ solution are needed to neutralise 21 mL of 0.1 M HCl ?

   a) 14 mL b) 7 mL

   c) 21 mL d) none of these

4. The partial pressure of nitrogen in air is 0.76 atm and its Henry's law constant is 7.6×10^4 atm at 300K. What is the molefraction of nitrogen gas in the solution obtained when air is bubbled through water at 300K ?

   a) 1×10^{-4} b) 1×10^{-6}

   c) 2×10^{-5} d) 1×10^{-5}

5. The Henry's law constant for the solubility of Nitrogen gas in water at 350 K is 8×10^4 atm. The mole fraction of nitrogen in air is 0.5. The number of moles of Nitrogen from air dissolved in 10 moles of water at 350K and 4 atm pressure is

   a) 4×10^{-4} b) 4×10^4

   c) 2×10^{-2} d) 2.5×10^{-4}

6. Which one of the following is incorrect for ideal solution ?

   a) $\Delta H_{mix} = 0$

   b) $\Delta U_{mix} = 0$

   c) $\Delta P = P_{observed} - P_{Calculated\ by\ raoults\ law} = 0$

   d) $\Delta G_{mix} = 0$

7. Which one of the following gases has the lowest value of Henry's law constant ?

   a) N_2 b) He

   c) CO_2 d) H_2

8. P_1 and P_2 are the vapour pressures of pure liquid components, 1 and 2 respectively of an ideal binary solution if x_1 represents the mole fraction of component 1, the total pressure of the solution formed by 1 and 2 will be

   a) $P_1 + x_1 (P_2 - P_1)$

   b) $P_2 - x_1 (P_2 + P_1)$

   c) $P_1 - x_2 (P_1 - P_2)$

   d) $P_1 + x_2 (P_1 - P_2)$

9. Osometic pressure (π) of a solution is given by the relation

   a) $\pi = nRT$ b) $\pi V = nRT$

   c) $\pi RT = n$ d) none of these

10. Which one of the following binary liquid mixtures exhibits positive deviation from Raoults law ?

a) Acetone + chloroform

b) Water + nitric acid

c) HCl + water

d) ethanol + water

11. The Henry's law constants for two gases A and B are x and y respectively. The ratio of mole fractions of A to B is 0.2. The ratio of mole fraction of B and A dissolved in water will be

a) $\frac{2x}{y}$ b) $\frac{y}{0.2x}$

c) $\frac{0.2x}{y}$ d) $\frac{5x}{y}$

12. At 100°C the vapour pressure of a solution containing 6.5g a solute in 100g water is 732mm. If $K_b = 0.52$, the boiling point of this solution will be

a) 102°C b) 100°C

c) 101°C d) 100.52°C

13. According to Raoults law, the relative lowering of vapour pressure for a solution is equal to

a) mole fraction of solvent

b) mole fraction of solute

c) number of moles of solute

d) number of moles of solvent

14. At same temperature, which pair of the following solutions are isotonic ?

a) 0.2 M $BaCl_2$ and 0.2M urea

b) 0.1 M glucose and 0.2 M urea

c) 0.1 M NaCl and 0.1 M K_2SO_4

d) 0.1 M Ba $(NO_3)_2$ and 0.1 M Na_2 SO_4

15. The empirical formula of a non-electrolyte(X) is CH_2O. A solution containing six gram of X exerts the same osmotic pressure as that of 0.025M glucose solution at the same temperature. The molecular formula of X is

a) $C_2H_4O_2$ b) $C_8H_{16}O_8$

c) $C_4H_8O_4$ d) CH_2O

16. The K_H for the solution of oxygen dissolved in water is 4×10^4 atm at a given temperature. If the partial pressure of oxygen in air is 0.4 atm, the mole fraction of oxygen in solution is

a) 4.6×10^3 b) 1.6×10^4

c) 1×10^{-5} d) 1×10^5

17. Normality of 1.25M sulphuric acid is

a) 1.25 N b) 3.75 N c) 2.5 N d) 2.25 N

18. Two liquids X and Y on mixing gives a warm solution. The solution is

a) ideal

b) non-ideal and shows positive deviation from Raoults law

c) ideal and shows negative deviation from Raoults Law

d) non-ideal and shows negative deviation from Raoults Law

19. The relative lowering of vapour pressure of a sugar solution in water is 3.5×10^{-3}. The mole fraction of water in that solution is

a) 0.0035 b) 0.35

c) 0.0035 / 18 d) 0.9965

20. The mass of a non-voltaile solute (molar mass 80 g mol^{-1}) which should be dissolved in 92g of toluene to reduce its vapour pressure to 90%

a) 10g b) 20g

c) 9.2 g d) 8.89g

21. For a solution, the plot of osmotic pressure (π) verses the concentration (c in mol L^{-1}) gives a straight line with slope 310R where 'R' is the gas constant. The temperature at which osmotic pressure measured is

a) 310×0.082 K b) 310°C

c) 37°C d) $\frac{310}{0.082}$ K

22. 200ml of an aqueous solution of a protein contains 1.26g of protein. At 300K, the osmotic pressure of this solution is found to be 2.52×10^{-3} bar. The molar mass of protein will be (R = 0.083 L bar mol^{-1} K^{-1})

a) 62.22 Kg mol–1 b) 12444g mol^{-1}
c) 300g mol^{-1} d) none of these

23. The Van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is (NEET)

a) 0 b) 1

c) 2 d) 3

24. What is the molality of a 10% W/W aqueous sodium hydroxide solution ?

a) 2.778 b) 2.5

c) 10 d) 0.4

25. The correct equation for the degree of an associating solute, 'n' molecules of which undergoes association in solution, is

a) $\alpha = \frac{n(i-1)}{n-1}$ b) $\alpha^2 = \frac{n(1-i)}{(n-1)}$

c) $\alpha = \frac{n(i-1)}{1-n}$ d) $\alpha = \frac{n(1-i)}{n(1-i)}$

26. Which of the following aqueous solutions has the highest boiling point ?

a) 0.1M KNO_3 b) 0.1 M Na_3PO_4

c) 0.1 M $BaCl_2$ d) 0.1 M K_2SO_4

27. The freezing point depression constant for water is 1.86° K $Kgmol^{-1}$. If 5g Na_2SO_4 is dissolved in 45g water, the depression in freezing point is 3.64°C. The Vant Hoff factor for Na_2SO_4 is

a) 2.50 b) 2.63

c) 3.64 d) 5.50

28. Equimolal aqueous solutions of NaCl and KCl are prepared. If the freezing point of NaCl is –2°C, the freezing point of KCl solution is expected to be

a) –2°C b) – 4°C

c) – 1°C d) 0°C

29. Phenol dimerises in benzene having van't Hoff factor 0.54. What is the degree of association ?

a) 0.46 b) 92 c) 46 d) 0.92

30. **Assertion : An ideal solution obeys Raoults Law**

Reason : In an ideal solution, solvent - solvent as well as solute-solute interactions are similar to solute-solvent interactions.

a) both assertion and reason are true and reason is the correct explanation of assertion

b) both assertion and reason are true but reason is not the correct explanation of assertion

c) assertion is true but reason is false

d) both assertion and reason are false