

Solutions Unit Test - 1

11th Standard

Chemistry

T2 - Solutions

Total Mark : 70

Multiple Choice Question

15 x 1 = 15

- 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) 9a) and (c)
- 3) Stomach acid, a dilute solution of HCl can be neutralised by reaction with Aluminium hydroxide
$$\text{Al}(\text{OH})_3 + 3\text{HCl}(\text{aq}) \rightarrow \text{AlCl}_3 + 3\text{H}_2\text{O}$$

How many millilitres of 0.1 M $\text{Al}(\text{OH})_3$ 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 mole fraction 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) $\Delta P = P_{observed} - P_{calculated \text{ by Raoult's law}} = 0$ (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) Osmotic 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 Raoult's 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 Raoult's 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 $\text{Ba}(\text{NO}_3)_2$ and 0.1 M Na_2SO_4
- 15) The empirical formula of a nonelectrolyte(X) is CH_2O . A solution containing six gram of X exerts the same osmotic pressure as that of 0.025 M glucose solution at the same temperature. The molecular formula of X is
(a) $\text{C}_2\text{H}_4\text{O}_2$ (b) $\text{C}_8\text{H}_{16}\text{O}_8$ (c) $\text{C}_4\text{H}_8\text{O}_4$ (d) CH_2O

2 Mark Questions

6 x 2 = 12

- 16) Define (i) molality (ii) Normality.
- 17) The antiseptic solution of iodopovidone for the use of external application contains 10 % w/v of iodopovidone. Calculate the amount of iodopovidone present in a typical dose of 1.5 mL.
- 18) A litre of sea water weighing about 1.05 kg contains 5 mg of dissolved oxygen (O_2). Express the concentration of dissolved oxygen in ppm.
- 19) How much volume of 6 M solution of NaOH is required to prepare 500 mL of 0.250 M NaOH solution.
- 20) Explain why the aquatic species are more comfortable in cold water during winter season rather than warm water during the summer.

- 21) At 400 K 1.5 g of an unknown substance is dissolved in solvent and the solution is made to 1.5 L. Its osmotic pressure is found to be 0.3 bar. Calculate the molar mass of the unknown substance.

3 Mark Questions

6 x 3 = 18

- 22) If 5.6 g of KOH is present in (a) 500 mL and (b) 1 litre of solution, calculate the molarity of each of these solutions.
- 23) 2.82 g of glucose is dissolved in 30 g of water. Calculate the mole fraction of glucose and water.
- 24) What volume of 4M HCl and 2M HCl should be mixed to get 500 mL of 2.5 M HCl?
- 25) Describe how would you prepare the following solution from pure solute and solvent
- (a) 1 L of aqueous solution of 1.5 M CoCl_2 .
- (b) 500 mL of 6.0% (V/V) aqueous methanol solution.
- 26) 0.24 g of a gas dissolves in 1 L of water at 1.5 atm pressure. Calculate the amount of dissolved gas when the pressure is raised to 6.0 atm at constant temperature.
- 27) Vapour pressure of a pure liquid A is 10.0 torr at 27°C. The vapour pressure is lowered to 9.0 torr on dissolving one gram of B in 20 g of A. If the molar mass of A is 200 then calculate the molar mass of B.

5 Mark Questions

5 x 5 = 25

- 28) A sample of 12 M Concentrated hydrochloric acid has a density 1.2 gL^{-1} Calculate the molality
- 29) Henry's law constant for solubility of methane in benzene is $4.2 \times 10^{-5} \text{ mm Hg}$ at a particular constant temperature At this temperature. Calculate the solubility of methane at i) 750 mm Hg ii) 840 mm Hg
- 30) Calculate the proportion of O_2 and N_2 dissolved in water at 298 K. When air containing 20% O_2 and 80% N_2 by volume is in equilibrium with it at 1 atm pressure. Henry's law constants for two gases are $K_{\text{H}}(\text{O}_2) = 4.6 \times 10^4 \text{ atm}$ and $K_{\text{H}}(\text{N}_2) = 8.5 \times 10^4 \text{ atm}$.
- 31) Calculate the mole fractions of benzene and naphthalene in the vapour phase when an ideal liquid solution is formed by mixing 128 g of naphthalene with 39 g of benzene. It is given that the vapour pressure of pure benzene is 50.71 mmHg and the vapour pressure of pure naphthalene is 32.06 mmHg at 300 K.
- 32) 2.56 g of Sulphur is dissolved in 100g of carbon disulphide. The solution boils at 319. 692 K. What is the molecular formula of Sulphur in solution The boiling point of CS_2 is 319. 450K.

Given that K_b for $CS_2 = 2.42 \text{ K Kg mol}^{-1}$.

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