Chapter 01 Solution

Practice Section-01

Q.1 What will be the molarity of a solution containing 50g of NaCl in 500g of a solution and having a density of 0.936g/cm^3:
(1) 1.5 M (2) 1.6 M (3) 1.8 M (4) 1.2 M

Q.2 The density (in g mL^{-1}) of a 3.6M sulphuric acid solution, i.e., 29% H_2SO_4 (molar mass = 98 g mol^{-1}) by mass will be:
(1) 1.45 (2) 1.64 (3) 1.88 (4) 1.22

Q.3 1 litre solution containing 490g of sulphuric acid is diluted to 10 litre with water. What is the normality of the resulting solution?
(1) 0.5 N (2) 1.0 N (3) 5.0 N (4) 10.0 N

Q.4 250 mL of Na_2CO_3 solution contains 2.65 g of Na_2CO_3. 10 mL of this solution is added to x mL of water to obtain 0.001 M Na_2CO_3 solution. The value of x is ...... (Molar mass of Na_2CO_3 = 106 g/mol)
(1) 1000 (2) 990 (3) 9990 (4) 90

Q.5 Find out the mass of H_2SO_4 in 150 mL, $\frac{N}{7}$ H_2SO_4 solution
(1) 1.02 g (2) 1.8 g (3) 1.05 g (4) 1.5 g

Q.6 A solution of $CaCl_2$ is 0.5 mol/litre ; then the moles of chloride ion in 500 mL will be:
(1) 0.5 (2) 0.25M (3) 1.0 (4) 0.75

Q.7 0.63 g of dibasic acid was dissolved in water. The volume of the solution was made 100 mL. 20mL of this acid solution required 10 mL N/5 NaOH solution. What is the molecular mass of the acid?
(1) 63 (2) 126 (3) 252 (4) 128

Q.8 An aqueous solution of 6.3g of oxalic acid dihydrate is made upto 250 mL. The volume of 0.1N NaOH required to completely neutralize 10mL of this solution is:
(1) 40 mL (2) 20 mL (3) 10 mL (4) 4 Ml

Practice Section-02

Q.1 Henry's law constant for oxygen dissolved in water is 4.34×10^4 atm at 25°C. If the partial pressure of oxygen in air is 0.4 atm. Calculate the concentration (in moles per litre) of the dissolved oxygen in water in equilibrium with air at 25°C.
(1) 5.11×10^{-4} (2) 5.11×10^{-3} (3) 9.2×10^{-6} (4) 0.92×10^{-6}

Q.2 Henry's law constant for the solubility of N_2 gas in water at 298 K is 1.0×10^5 atm. The mole fraction of N_2 in air is 0.6. The number of moles of N_2 from air dissolved in 10 moles of water at 298 K and 5 atm pressure is:
(1) 3.0×10^{-4} (2) 4.0×10^{-5} (3) 5.0×10^{-4} (4) 6.0×10^{-6}

Q.3 Vapour pressure of pure A ($p_A°$) = 100 mm Hg
Vapour pressure of pure B ($p_B°$) = 150 mm Hg
2 mol of liquid A and 3 mol of liquid B are mixed to form an ideal solution. The vapour pressure of solution will be:
(1) 185 mm (2) 130 mm (3) 148 mm (4) 145 mm

Q.4 The vapour pressure of pure benzene at 88°C is 957 mm and that of toluene at the same temperature is 379.5 mm. The composition for benzene-toluene mixture boiling at 88°C will be
(1) $x_{benzene} = 0.66$; $x_{toluene} = 0.34$ (2) $x_{benzene} = 0.34$; $x_{toluene} = 0.66$
(3) $x_{benzene} = x_{toluene} = 0.5$ (4) $x_{benzene} = 0.75$; $x_{toluene} = 0.25$

Q.5 An aqueous solution containing 28% by mass of liquid A (mol. mass = 140) has a vapour pressure of 160mm at 30°C. Find the vapour pressure of the pure liquid A. (The vapour pressure of water at 30°C is 150 mm)
(1) 3.6015 mm (2) 360.15 mm (3) 310 mm (4) 4.2 mm

Q.6 Mole fraction of component A in vapour phase is x_1 and that of component A in liquid mixture is x_2 ; then ($p_A°$ = vapour pressure of pure A ; $p_B°$ = vapour pressure of pure B), the total vapour pressure of liquid mixture is:
(1) $p_A°$ (2) $p_A°$ (3) $p_B°$ (4) $p_B°$

Q.7 At 80°C, the vapour pressure of pure liquid A is 520mm Hg and that of pure liquid B is 1000mm Hg. If a mixture of solution A and B boils at 80°C and 1 atm pressure, the amount of A in the mixture is (1 atm = 760 mm Hg)
(1) 50 mol % (2) 52 mol% (3) 34 mol% (4) 48 mol%

Q.8 Mixture of volatile components A and B has total vapour pressure (in torr): $P_{total} = 254 - 119x_A$
where x_A is the mole fraction of A in mixture. Hence $p_A°$ and $p_B°$ are (in torr):
(1) 254, 119 (2) 119, 254 (3) 135, 254 (4) 154, 119

Q.9 Negative deviations from Raoult's law are exhibited by binary mixtures:
(1) in which the molecules tend to attract each other and hence their escape into the vapour phase is retarded.
(2) in which the molecules tend to repel each other and hence their escape into the vapour phase is retarded.
(3) in which the molecules tend to attract each other and hence their escape into the vapour phase is speeded up.
(4) in which the molecules tend to repel each other and hence their escape into the vapour phase is speeded up.

Q.10 The vapour pressure of pure benzene C_6H_6 at 50°C is 268 torr. How may moles of non-volatile solute per mole of benzene are required to prepare a solution of benzene having a vapour pressure of 167 torr at 50°C?
(1) 0.377 (2) 0.605 (3) 0.623 (4) 0.395

Q.11 Two liquids A and B have vapour pressure in the ratio of $p_A°$; $p_B°$ = 1: 2 at a certain temperature. Suppose we have an ideal solution of A and B in the mole fraction ratio A: B = 1: 2. What would be the mole fraction of A in the vapour in equilibrium with the solution at a given temperature?
(1) 0.25 (2) 0.2 (3) 0.5 (4) 0.33

Q.12 The volume of 0.1 N HCl required to neutralize completely 2g of equimolar mixture of Na_2CO_3 and $NaHCO_3$ is:
(1) 316 mL (2) 158 mL (3) 632 mL (4) 237 mL

Practice Section-03

Q.1 Lowering of vapour pressure due to a solute in 1 molal aqueous solution at 100°C is

(1) 13.44 mm Hg

(2) 14.12 mm Hg

(3) 13.2 mm Hg

(4) 35.2 mm Hg

Q.2 The vapour pressure of a dilute aqueous solution of glucose is 700 mm Hg at 370 K. Calculate the mole fraction of solute.

(1) 4.76 (2) 47.6 (3) 0.921 (4) 0.0789

Q.3 The relative lowering of the vapour pressure of an aqueous solution containing a non-volatile solute is 0.0125. The molality of the solution is:

(1) 0.80 (2) 0.50 (3) 0.70 (4) 0.40

Q.4 Equal amounts of a solute are dissolved in equal amounts of two solvents A and B. The lowering of vapour pressure for solution A has twice the lowering of vapour pressure for solution B. If Mw_A and Mw_B are the molecular weights of solvents A and B, respectively, then

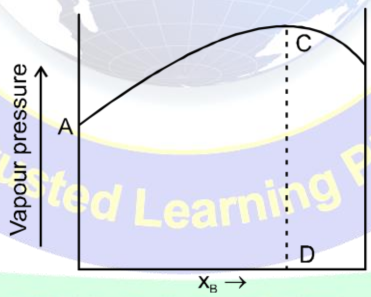
(1) $Mw_A = Mw_B$

(2) $Mw_A = Mw_B/2$

(3) $Mw_A = 4Mw_B$

(4) $Mw_A = 2Mw_B$

Q.5 The diagram given below is a vapour-pressure-composition diagram for a binary solution of A and B. In the solution, A –B interactions are:



(1) Similar to A–A and B–B interactions (2) Greater than A–A and B–B interactions

(3) Smaller than A–A and B–B interactions (4) Unpredictable.

Q.6 On dissolving 0.25g of a non-volatile substance in 30 mL benzene (density 0.8g mL^{-1}), its freezing point decreases by 0.25°C. Calculate the molecular mass of non-volatile substance (K_f = 5.1 K kg mol^{-1})

(1) 21.333 (2) 213.33 (3) 170.664 (4) 17.0664

Q.7 At 100°C vapour pressure of aqueous solution of glucose is 750 mm of Hg. Then find the mole fraction of the solute.

(1) $\frac{1}{86}$ (2) $\frac{1}{46}$ (3) $\frac{1}{98}$ (4) $\frac{1}{76}$

Q.8 10.0 g of glucose (p_1), 10.0 g of urea (p_2) and 10.0 g of sucrose (p_3) are dissolved in 250.0 mL of water at 273K (p = osmotic pressure of a solution). The relationship between the osmotic pressure of the solution is:

(1) $p_1 > p_2 > p_3$ (2) $p_3 > p_1 > p_2$ (3) $p_2 > p_1 > p_3$ (4) $p_2 > p_3 > p_1$

Q.9 Two solutions of glucose have osmotic pressures 1.5 and 2.5 atm 1 litre of first solution is mixed with 2 litre of second solution. The osmotic pressure of the resultant solution will be:
(1) 1.6 atm (2) 6.12 atm (3) 1.26 atm (4) 2.16 atm

Q.10 18 g glucose and 6g urea are dissolved in 1 litre aqueous solution at 27°C. The osmotic pressure of the solution will be:
(1) 3.826 atm (2) 4.926 atm (3) 2.92 atm (4) 9.42 atm

Q.11 A solution containing 10 g per dm^3 of urea (m.w. = 60) is isotonic with a 5% solution of a non-volatile solute. The molecular mass of this non-volatile solute is:
(1) 250 g mol^{-1} (2) 300 g mol^{-1} (3) 350 g mol^{-1} (4) 200 g mol^{-1}

Q.12 The temperature at which 10% aqueous solution of glucose will exhibit the osmotic pressure of 16.4 atm, is: (R = 0.082 dm^3 atm K^{-1} mol^{-1})
(1) 360° C (2) 180 K (3) 300 K (4) 360 K

Practice Section-04

Q.1 0.002 molar solution of NaCl having degree of dissociation of 90% at 27°C has osmotic pressure equal to:
(1) 0.94 bar (2) 9.4 bar (3) 0.094 bar (4) 9.4×10^{-4} bar

Q.2 A 0.2 molal solution of KCl freezes at –0.68°C. If K_f for H_2O is 1.86, the degree of dissociation of KCl is:
(1) 75 % (2) 83% (3) 65% (4) 92 %

Q.3 A certain substance 'A' tetramerises in water to the extent of 80%. A solution of 2.5g of A in 100 g of water lowers the freezing point 0.3°C. The molar mass of A is: (K_f = 1.86 K kg mol^{-1} for water)
(1) 1.22 (2) 31 (3) 244 (4) 62

Q.4 Van't Hoff factor of Hg_2Cl_2 in its aqueous solution will be Hg_2Cl_2 is 80% ionized in the solution:
(1) 1.6 (2) 2.6 (3) 3.6 (4) 4.6

Q.5 0.1 M aqueous solution of $MgCl_2$ at 300K is 4.92 atm. What will be the percentage ionization of the salt?
(1) 49% (2) 29% (3) 39% (4) 69%

Q.6 Which of the following solutions will exhibit highest boiling point?
(1) 0.01 M Na_2SO_4 (2) 0.01 M KNO_3
(3) 0.015 M urea (4) 0.015 M glucose

Q.7 The freezing point depression of 0.001 m $K_x[Fe(CN)_6]$ is 7.10×10^{-3}K. Determine the value of x. Given, K_f = 1.86 K kg mol^{-1} for water.
(1) 3 (2) 4 (3) 2 (4) 1

Q.8 Van't Hoff factors of aqueous solutions of X, Y, and Z are 2.8, 1.8 and 3.5, respectively. Which of the following statement(s) is (are) correct?
(1) BP: X < Y < Z (2) FP: Z < X < Y
(3) Osmotic pressure: X = Y = Z (4) VP: Y < X < Z

ANSWER KEY

PRACTICE SECTION-01

Que.	1	2	3	4	5	6	7	8
Ans.	2	4	1	2	3	1	2	1

PRACTICE SECTION-02

Que.	1	2	3	4	5	6	7	8	9	10	11	12
Ans.	1	1	2	1	2	1	1	3	1	2	2	1

PRACTICE SECTION-03

Que.	1	2	3	4	5	6	7	8	9	10	11	12
Ans.	1	4	3	4	3	2	4	3	4	2	2	4

PRACTICE SECTION-04

Que.	1	2	3	4	5	6	7	8
Ans.	3	2	4	2	1	1	1	2