Solved Example

Ex.1 1.82 a metal required 32.5 mL of N HCl to dissolve it. What is equivalent weight for metal?

[1] 65 [2] 75 [3] 56 [4] 90

Sol. $\therefore$ Meq. of metal = Meq. of HCl or $\frac{1.82}{E} \times 1000 = 32.5 \times 1$

$\therefore$ E = 56

Ex.2 Calculate the amount of oxalic acid ($H_2C_2O_4 . 2H_2O$) required to obtain 250 ml of semimolar solution.

[1] 15.75 g [2] 1.575 g [3] 157.5 g [4] None

Sol. Molarity of solution = 0.5 M

Volume of solution = 250 ml

$\therefore$ milli mole oxalic acid = M x V (ml) = $\frac{1}{2} \times 250$ or $\frac{w}{M} \times 1000 = 0.5 \times 250$

$\therefore$ $w = \frac{250 \times 126}{2 \times 1000} = 15.76$ g

Ex.3 The vapour pressure of pure liquid 'A' at 310ºC is 120 torr. The vapour pressure of this liquid in solution with liquid B is 72 torr. Calculate the mole fraction of 'A' in solution if the mixture obeys Raoult's law.

[1] 0.06 [2] 0.9 [3] 0.3 [4] 0.6

Sol. Given is vapour pressure of pure component 'A', $P^o_A = 120$ torr

Partial pressure of A, $P_A = 72$ torr

Suppose its mole fraction is solution is X_A, then according to Raoult's law.

$PA = P^oA . xA$

$72 = 120 \times xA$ or $xA = \frac{72}{120} = 0.6$

Ex.4 If latent heat of fusion of ice is 80 cals per g at 0ºC, calculate molal depression constant for water.

[1] 18.63 [2] 186.3 [3] 1.863 [4] 0.1863

Sol. $K_f = \frac{RT_f^2}{1000 l_v}$ Here R = 2 cals, $T_f = 0 + 273 = 273$ K, $l_f = 80$ cals

$K_f = \frac{2 \times 273 \times 273}{1000 \times 80} = 1.863$

Ex.5 Calculate the molal elevation constant of water evaporates at 100ºC with the absorption of 536 calories per gm (R = 2 cals)

[1] 0.519ºC [2] 0.0519ºC [3] 1.519ºC [4] 2.519ºC

Sol Molal elevation constant of the solvent.

$Kb = \frac{RT_b^2}{l_v \times 1000} = \frac{2 \times 373 \times 373}{536 \times 1000} = 0.519$ºC

Ex.6 214.2 gram of sugar syrup contains 34.2 gram of sugar. Calculate (i) molality of the solution and (ii) mole fraction of the sugar in the syrup –

[1] 0.555m, 0.0099 [2] 0.455m, 0.0110 [3] 0.355m, 0.0199 [4] None of these

Sol. (i) Mass of sugar = 34.2 gram. Number of moles of sugar = $\frac{34.2}{\text{mol. mass}} = \frac{34.2}{34.2} = 0.1$

Mass of water = (214.2 – 34.2) = 180 gram or $\frac{180}{1000}$ kg

Number of moles of water = $\frac{180}{18}$ = 10

Molality = $\frac{\text{No. of moles of sugar}}{\text{Mass of water in kg}}$ = $\frac{0.1}{180}$ x 1000 = 0.555 m

(ii) Total no. of moles = 10.0 + 0.1 = 10.1

Mole fraction of sugar = $\frac{\text{No. of moles of sugar}}{\text{Total number of moles}}$ = $\frac{0.1}{10.1}$ = 0.0099

Ex.7 15 gram of methyl alcohol is dissolved in 35 gram of water. What is the mass percentage of methyl alcohol in solution?

[1] 30% [2] 50% [3] 70% [4] 75%

Sol. Total mass of solution = (15 + 35) gram = 50 gram

mass percentage of methyl alcohol = $\frac{\text{Mass of methyl alcohol}}{\text{Mass of solution}}$ x 100 = $\frac{15}{50}$ x 100 = 30%

Ex.8 Osmotic pressure of a sugar solution at 24ºC is 2.5 atmospheres. Determine the concentration of the solution in gm mole per litre.

[1] 0.0821 moles/litre [2] 1.082 moles/litre

[3] 0.1025 moles/litre [4] 0.0827 moles/litre

Sol. Here it is given that

π = 2.5 atm, T = 24 + 273 = 297Aº, S = 0.0821 lit. atm. deg^{-1} mol^{-1}, C = ?

We know that π = CST or C = $\frac{\pi}{ST}$ = $\frac{2.5}{0.0821 \times 297}$ = 0.1025 moles/litre

Ex.9 Twenty grams of a substance were dissolved in 500 ml. of water and the osmotic pressure of the solution was found to be 600 mm of mercury at 15ºC. Determine the molecular weight of the substance.

[1] 1120 [2] 1198 [3] 1200 [4] None of these

Sol. Here it is given that

w = 20 gm ; V = 500 ml. = $\frac{500}{1000}$ = 0.5 litre

π = 600 mm = $\frac{600}{760}$ atm ; T = 15 + 273 = 288ºA m = ?

According to Van't Hoff equation,

$\pi V = nST$ $\pi V = \frac{w}{m} ST$

$\therefore$ m = $\frac{wST}{\pi V}$ = $\frac{20 \times 0.0821 \times 288 \times 760}{600 \times 0.5}$ = 1198

Ex.10 0.15g of a substance dissolved in 15g of solvent boiled at a temperature higher by 0.216ºC than that of the pure solvent. Calculate the molecular weight of the substance. Molal elevation constant for the solvent is 2.16ºC.

[1] 216 [2] 100 [3] 178 [4] None of these

Sol. Here it is given that

w = 0.15 g, ΔT_b = 0.216ºC

W = 15 g K_b = 2.16ºC m?

Substituting values in the expression, m = $\frac{1000 \times K_b \times w}{\Delta T_b \times W}$ m = $\frac{1000 \times 2.16 \times 0.15}{0.216 \times 15}$ = 100

Exercise # 1

Q.1 100 mL each of 0.5 N NaOH, N/5 HCI and N/1 0 H_2SO_4 are mixed together. The resulting solution will be

[1] Acidic [2] Neutral [3] Alkaline [4] None ofthese

Q.2 25 mL of 3.0 M HNO_3 are mixed with 75 mL of4.0M HNO_3 Ifthe volumes are additive, the molarity of the final mixture would be

[1] 3.25M. [2]4.0M [3] 3.75M [4]3.50M

Q.3 To neutralise 20 mL of M/1 0 NaOH, the volume of M/20 HCI needed is

[1] 10 mL [2] 30 mL [3] 40 mL [4] 20 mL

Q.4 H_3PO_4 is a tribasic acid and one of its salts is NaH_2PO_4. What volume of 1 M NaOH should be added to 12 g NaH_2PO_4 (mol. wt. 120) to exactly convert it into Na_3PO_4

[1] 100 mL [2] 300 mL [3] 200 mL [4] 80 mL

Q.5 The amount of $KMnO_4$ required to prepare 100 mL of 0.1 N solution in alkaline medium

[1]1.58g [2]0.52g [3]3.16g [4] 0.31g

Q.6 Density of water is 1 g/m L. The concentration of water in mol/litre is

[1] 1000 [2]18 [3] 0.018 [4] 55.5

Q.7 How many grams of NaOH will be needed to prepare 250 mL of 0.1 M solution

[1]1g [2]10g [3]4g [4]6g

Q.8 How many grams of glucose be dissolved to make one litre solution of 10% glucose

[1]10g [2]180g [3]100g [4]1.8g

Q.9 The normality of 0.3 M phosphorus acid (H_3PO_3) is

[1] 0.1 [2] 0.9 [3] 0.3 [4] 0.6

Q.10 The molarity of a glucose solution containing 36 g of glucose per 400 mL of the solution is

[1] 1.0 [2] 0.5 [3] 2.0 [4] 0.05

Q.11 The maximum amount of $BaSO_4$ precipitated on mixing 20 mL of 0.5 M $BaCI_2$ with 20 mL of 1 M H_2SO_4 is

[1] 0.25 mole [2] 0.5 mole [3] 1 mole [4] 0.01 mole

Q.12 H_2O_2 solution used for hair bleaching is sold as a solution of approximately 5.0 g H_2O_2 per 100 mL of the solution. The molecular weight of H_2O_2 is 34. The molarity of this solution is approximately

[1] 3.0 [2]1.5 [3] 0.15 [4] 4.0

Q.13 What weight of sodium hydroxide is required to neutralise 100 mL of 0.1 N HCI

[1] 4.0 g [2] 0.04 g [3] 0.4 g [4] 2.0 9

Q.14 1 kg of NaOH solution contains 4g of NaOH. The approximate concentration of the solution is

[1] 0.1 molar [2] 0.1 molal [3] Decinormal [4] About 0.1 N

Q.15 5.85 g of NaCl dissolved in H_2O and solution is made upto 500 mL. The molarity is

[1] 0.1 [2] 0.2 [3] 1.0 [4] 0.117

Q.16 5.85 g of NaCl are dissolved in 90 g of water. The mole fraction of NaCI is

[1] 0.1 [2] 0.01 [3] 0.2 [4] 0.0196

Q.17 To prepare 0.1 M $KMnO_4$ solution in 250 mL flask, the weight of $KMnO_4$ required is

[1] 4.80g [2] 3.95g [3] 39.5g [4] 0.48 g

Q.18 The normality of 4% (wt./vol.) NaOH is

[1] 0.1 [2]1.0 [3] 0.05 [4] 0.01

Q.19 The molarity of a solution containing 23 g ethyl alcohol in one litre is

[1] 0.5 [2] 1.0 [3] 2.0 [4] 3.0

Q.20 The density of NH_4OH solution is 0.6 g/mL. It contains 34% by weight of NH_4OH. Calculate the normality of the solution

[1] 4.8 N [2] 10 N [3] 0.5 N [4] 5.8 N

Q.21 The volume of 0.1 M H_2SO_4 required to neutralise 30 mL of 2.0 M NaOH is

[1] 100 mL [2] 300 mL [3] 400 mL [4] 200 mL

Q.22 On dissolving 1 mole each of the following acids in 1 litre water, the acid which do not give a solution of 1 N strength is

[1] HCI [2] $HClO_4$ [3] HNO_3 [4] H_3PO_4

Q.23 100 mL of 0.3 N HCI solution were mixed with 200 mL of 0.6 N H_2SO_4 solution. The final acidic normality is

[1] 0.9 N [2] 0.6 N . [3] 0.5 N [4] 0.4 N

Q.24 How much water is to be added to dilute 10 mL of 10 N HCI to make it decinormal

[1] 990 mL [2] 1010 mL [3] 100 mL [4] 1000 mL

Q.25 The molality of 15% (wt.lvol.) solution of H_2SO_4 of density 1.1 g/cm^3 is approximately

[1] 1.2 [2] 1.4 [3] 1.8 [4] 1.6

Q.26 1.5 litre of a solution of normality Nand 2.5 litres of 2M HCI are mixed together. The resultant solution had a normality 5. The value of N is

[1] 6 [2]10 [3] 8 [4] 4

Q.27 45g of acid of mol. wt. 90 neutralised by 200 mL of 5N caustic potash. The basicity of the acid is

[1] 1 [2] 2 [3] 3 [4] 4

Q.28 10 mL of concentrated H_2SO_4 (18M) is diluted to one litre. The approximate strength of the dilute acid is

[1]18M [2] 180M [3]O.18M [4]1.8M

Q.29 Equal volumes of 0.1 M $AgNO_3$ and 0.2 M NaCI are mixed. The concentration of NO_3^- ions in the mixture will be

[1] 0.1 M [2] 0.05 M [3] 0.2 M [4] 0.15 M

Q.30 A 5M solution of H_2SO_4 is diluted from one litre to a volume of 10 litre. The normality ofthis solution is

[1] 1N [2] 2N [3] 0.5N [4] 5N

Q.31 2.3 g of C_2H_5OH (mol. wt. 46) are dissolved in 500 mL of water. The molarity of the solution is

[1] 0.01 [2] 0.1 [3] 0.05 [4] 2.0

Q.32 Molecular weight of oxalic acid is 126. The weight of oxalic acid required to neutralise 1000 mL of normal solution of NaOH is

[1] 126g [2] 63g [3] 6.3g [4] 12.6g

Q.33 The number of moles present in 2 litre of 0.5 M NaOH is

[1] 2 [2] 1 [3] 0.1 [4] 0.5

Q.34 The weight of solute present in 200 mL of 0.1 M H_2SO_4

[1] 2.45g [2] 4.9g [3] 1.96g [4] 3.92 g

Q.35 The volume of 0.25 M H_3PO_4 required to neutralise 25 mL of 0.03 M Ca(OH) is

[1] 1.32 mL [2] 13.2 mL [3] 26.4 mL [4] 2.0 mL

Q.36 The nature of mixture obtained by mixing 50 mL of 0.1 MH_2SO_4 and 50 mL of 0.1 M NaOH is

[1] Acidic [2] Basic [3] Neutral [4] Amphoteric

Q.37 The solution A and Bare 0.1 and 0.2 molar in a substance. If 100 mL of A are mixed with 25 ml of B and there is no change in volume, then the final molarity of the solution is

[1] 0.15M [2] 0.18M [3] 0.12M [4] 0.30M

Q.38 The number of milli equivalents contained in 0.5 litre of 0.2 N solution is

[1] 0.1 [2]100 [3]0.01 (4}1.0

Q.39 If 250 mL of a solution contains 24.5g H_2SO_4 the molarity and normality respectively are

[1] 1M, 2N [2] 1M,0.5M [3] 0.5M, 1N [4] 2M,1N

Q.40 The normality of 1 % (wt.lvol.) H_2SO_4 is nearly

(1} 0.02 [2] 0.2 [3] 0.1 [4] 1

Q.41 The concentration of solution containing 0.5 mole H_3PO_4 dissolved in 500 g water

[1] 1m [2]1M [3] 1N [4] 0.5M

Q.42 In a flask at a certain temperature there are 2 g H_2 and 8g O_2. The mole fraction of O_2 in the given mixture is -.

[1] 0.2 [2] 1 [3] 2 [4] 0.1

Q.43 3.0 molal NaOH solution has a density of 1.110 g/ml. The molarity of the solution is

[1] 2.9732 [2] 3.05 [3] 3.64 [4] 3.0504

Q.44 The solution having lowest molar concentration is

[1] 1.0 N HCl [2] 0.4 N H_2SO_4 [3] 0.1 N Na_2CO_3 [4] None

Q.45 An aqueous solution of urea containing 18 g urea in 1500 cm^3 of solution has a density of 1.052 g/cm^3. If the molecular weight of urea is 60, then the molality of solution is

[1] 0.2 [2] 0.192 [3] 0.064 [4] 1.2

Q.46 A solution contains one mole of alcohol and four moles of water. What are the mole fractions of water and alcohol

[1] 1/4, 4/1 [2] 4/1,1/4 [3] 4/5,1/5 [4] 1/5, 4/5

Q.47 The amount of anhydrous Na_2CO_3 present in 250 mL of 0.25 M solution is

[1] 6.625 g [2] 6.0 g [3] 66.25 g [4] 6.225 g

Q.48 The mole fraction of NaCl in a solution containing 1 mole of NaCl in 1000 g of water is

[1] 0.0177 [2] 0.001 [3] 0.5 [4] 0.244

Q.49 In the aqueous solution of sulphuric acid the mole fraction of water is 0.85. The molality ofthe solution is

[1] 8.9m [2] 0.19m [3] 9.8m [4] 15m

Q.50 An example of colligative property is

[1] Freezing point [2] Boiling point [3] Vapour pressure [4] Osmotic pressure

Q.51 Which of the following is not a colligative properties

[1] ΔT_f [2] π [3] ΔT_b [4] K_b

Q.52 If P_0 and P are the vapour pressures ofthe solvent and solution respectively and n_1 and n_2 are the mole fractions of the solvent and solute respectively, then

[1] $P_s = P_0 n_1$ [2] $P_s = P_0 n_2$ [3] $P_0 = P_s n_2$ [4] $P_s = P_0 (n_1/n_2)$

Q.53 If P_0 and P_s, are the vapour pressure of solvent and its solution respectively. N_1 and N_2 are the mole fraction of solvent and solute respectively then

[1] $P_s = P_0/N_2$ [2] $P_0 - P_s = P_0N_2$

[3] $P_s = P_0N_2$ [4] $(P_0 - P_s) / P_s = N_1 / (N_1 + N_2)$

Q.54 Vapour pressure of a solvent containing nonvolatile solute is

[1] More than the vapour pressure of a solvent [2] Less than the vapour pressure of solvent

[3] Equal to the vapour pressure of solvent [4] None

Q.55 A substance will be deliquescent if its vapour pressure is

[1] Equal to the atmospheric pressure. [2] Equal to that of water vapour in the air

[3] Greater than that of water vapour in the air [4] Lesser than that of water vapours in the air

Q.56 The relative lowering in vapour pressure is

[1] $\propto X_{solute}$ [3] $\propto \frac{1}{X_{solute}}$ [3] $= X_{solute}$ [4] $\propto m$

Q.57 The boiling point of C_6H_6, CH_3OH, $C_6H_5NH_2$ and $C_6H_5NO_2$ are 80°C, 65°C, 184°C and 212°C respectively. Which will show highest vapour pressure at room temperature

[1] C_6H_6 [2] CH_3OH [3] $C_6H_5NH_2$ [4] $C_6H_5NO_2$

Q.58 The vapour pressure of a dilute solution of a solute is not influenced by

[1] Temperature of solution [2] Melting point of solute

[3] Mole fraction of solute [4] Degree of dissociation of solute

Q.59 The lowering of vapour pressure of a solvent by the addition .of a non-volatile solute to it, is directly proportional to
[1] The strength of the solution [2] The nature of the solute in the solution
[3] The atmospheric pressure [4] All

Q.60 An aqueous solution of methanol in water has vapour pressure
[1] Equal to that of water [2] Equal to that of methanol
[3] More than that of water [4] Less than that of water

Q.61 When a substance is dissolved in a solvent, the vapour pressure of solvent decreases. This brings
[1] An increase in b.pt. of the solution [2] A decrease in b.pt of a solution
[3] An increase in f.pt of the solvent [4] none

Q.62 Boiling point of water is defined as the temperature at which
[1] Vapour pressure of water equal to that of atmospheric pressure
[2] Bubbles are formed
[3] Steam comes out [4] None of the above

Q.63 A solution of sulphuric acid in water exhibits
[1] Negative deviations from Raoult's law [2] Positive deviations from Raoult's law
[3] Ideal properties [4] The applicability of Henry's law

Q.64 Binary liquid mixtures which exhibit positive deviations from Raoult's law boil at temperature than the expected b.pt –
[1] Lower [2] Higher [3] Same [4] Can't be said

Q.65 Which of the follwing is not correct for ideal solution
[1] Raoults law is obeyed for entire concentration range and temperatures
[2] $\Delta S_{mix} = 0$ [3] $\Delta V_{mix} = 0$
[4] $\Delta H_{mix} = 0$

Q.66 Which one of the following liquid..,pairs shows a positive deviation from Raoult's law
[1] Acetone-chloroform [2] Benzene-methanol
[3] Water-Hydrochloric acid [4] Water-nitric acid

Q.67 Which of the following conditions is not correct for ideal solution
[1] no change in volume on mixing [2] no change in enthalpy on mixing
[3] it obey's Raoult's law
[4] lonisation of solute should occurs to a small extent

Q.68 When a crystal of the solute is introduced into a super saturated solution of the solute
[1] The solute dissolves [2] The excess solute crystallises out
[3] The solution becomes unsaturated [4] The solution remains super saturated

Q.69 An ideal solution is that which
[1] Shows positive deviation from Raoult's law [2] Shows negative deviation from Raoult's law
[3] Has no connection with Raoult's law [4] Obeys Raoult's law

Q.70 1000 gram aqueous solution of $CaCO_3$ contains 10 gram of carbonate. Concentration of solution is
[1] 10ppm [2] 100ppm [3] 1000ppm [4] 10,000 ppm

Q.71 Solute when dissolved in water
[1] Increases the vapour pressure of water [2] Decreases the boiling point of water
[3] Decreases the freezing point of water [4] All of the above

Q.72 Solutions distilled without change in composition at a temperature are called
[1] Amorphous [2] Azeotropic mixture
[3] Ideal solution [4] Super saturated solution

Q.73 Which pair shows a contraction in volume on mixing along with evolution of heat

[1] $CHCl_3 + C_6H_6$ [2] $H_2O + HCl$ [3] $H_2O + HNO_3$ [4] All

Q.74 Azeotropic mixture of water and HCl boils at 381.5 K. By distilling the mixture it is possible to obtain

[1] Pure HCl only [2] Pure water only

[3] Neither HCl nor water [4] Both water and HC! in pure state

Q.75 Which does not influence the solubility of a solid in a liquid solvent

[1] Nature of solute [2] Nature of solvent [3] Temperature [4] Pressure

Q.76 Which solution will show maximum elevation in b.pt

[1] 0.1 M KCl [2] 0.1 M $BaCl_2$ [3] 0.1 M $FeCl_3$ [4] 0.1 M $Fe_2(SO_4)_3$

Q.77 The elevation of boiling point method is used for the determination of molecular weight of

[1] Non-volatile and soluble solute [2] Non-volatile and insoluble solute

[3] Volatile and soluble solute [4] Volatile and insoluble solute

Q.78 Which statement is correct for the boiling point of solvent containing a dissolved solid substance

[1] Boiling point of the liquid is depressed [2] Boiling point of the liquid is elevated

[3] There is no effect on the boiling point [4] The change depends upon the polarity of the liquid

Q.79 In cold countries, ethylene glycol is added to water in the radiators of cars during winters. It results in

[1] Lowering in boiling point [2] Reducing viscosity

[3] Reducing specific heat [4] Lowering in freezing point

Q.80 Which of the following 0.1 M aqueous solutions will have the lowest freezing point

[1] Potassium sulphate [2] Sodium chloride [3] Urea [4] Glucose

Q.81 Beckmann thermometers are used to measure

[1] Boiling point of solution [2] Freezing point of solution

[3] Elevation in boiling point or depression in freezing point

[4] Any temperature

Q.82 The use of common salts, e.g., NaCl or $CaCl_2$ anhydrous is made to clear snow on the roads. This causes

[1] A lowering in f. pt of water [2] A lowering in m.pt of ice

[3] Ice melts at the temperature of atmosphere present at that time

[4] All

Q.83 The molal elevation/depression constant depends upon

[1] Nature of solvent [2] Nature of solute [3] Temperature [4] ΔH solution

Q.84 The correct relation ship between the boiling points of very dilute solutions of $AlCl_3$ (t_1) and $CaCl_2$(t_2) having the same molar concentration is - .

[1] $t_1 = t_2$ [2] $t_1 > t_2$ [3] $t_2 > t_1$ [4] $t_2 \geq t_1$

Q.85 The passing of particles through semipermeable membrane is called

[1] Osmosis [2] Electrodialysis [3] Electrophrosis [4] Electroplating

Q.86 From the colligative properties of solution which one is the best method for the determination of mol. wt of proteins & polymers

[1] Osmotic pressure [2] Lowering in V.P.

[3] Lowering in freezing point [4] Elevation in B.Pt

Q.87 In the case of osmosis, solvent molecules move from

[1] Higher vapour pressure to lower vapour pressure

[2] Higher concentration to lower concentration

[3] Lower vapour pressure to higher vapour pressure

[4] Higher osmotic pressure to lower osmotic pressure

Q.88 Osmotic pressure of non aqueous solution is measured by

[1] Berkeley and Hartley method [2] Pfeffer's method

[3] Morse and Frazer method [4] Townend's method

Q.89 As a result of osmosis, thevolume of the concentrated solution

[1] Gradually decreases [2] Gradually increases

[3] Suddenly increases [4] none

Q.90 The osmotic pressure of a solution of benzoic acid dissolved in benzene is less than expected because

[1] Benzoic acid is an organic solute [2] Benzene is a non-polar solvent

[3] Benzoic acid dissociates in benzene [4] Benzoic acid gets associated in benzene

Q.91 The spontaneous movement of solute particles from a more concentrated solution to less concentrated solution is called

[1] Osmosis [2] Diffusion [3] Plasmolysis [4] Fusion

Q.92 If mole fraction of the solvent in a solution decreases then

[1] Vapour pressure of solution increases [2] b.pt decreases

[3] Osmotic pressure increases [4] All are correct

Q.93 Assuming each salt to be 90% dissociated which of the following will have highest osmotic pressure-

[1] Decinormal $Al_2(SO_4)_3$ [2] Decinormal $BaCl_2$

[3] Decinormal Na_2SO_4

[4] A solution obtained by mixing equal volumes of [2] and [3] and filtering

Q.94 Two solutions have different osmotic pressures. The solution of higher osmotic pressure is called

[1] Isotonic solution [2] Hypotonic solution

[3] Isotopic solution [4] Hypertonic solution

Q.95 Blood is isotonic with

[1] 0.16 M NaCl [2] Conc.NaCl [3] 30% NaCl [4] 50% NaCl

Q.96 Which one of the following pairs of solution can we expect to be isotonic at the same temperature

[1] 0.1 M urea and 0.1 M NaCl [2] 0.1 M urea and 0.2 M $MgCl_2$

[3] 0.1 M NaCl and 0.1 M Na_2SO_4 [4] 0.1 M $Ca(NO_3)_2$ and 0.1 M Na_2SO_4

Q.97 0.5 M solution of urea is isotonic with

[1] 0.5 M NaCl solution [2] 0.5 M sugar solution

[3] 0.5 M $BaCl_2$ solution [4] 0.5 M solution benzoic acid in benzene

Q.98 Which salt may show the same value of vant Hoff factor (i) as that of $K_4Fe(CN)_6$ in very dilute solution state

[1] $Al_2(SO_4)_3$ [2] NaCl [3] $Al(NO_3)_3$ [4] Na_2SO_4

Q.99 Which compound corresponds vant Hoff factor (i)to be equal to 2 in dilute solution

[1] K_2SO_4 [2] $NaHSO_4$ [3] Sugar [4] $MgSO_4$

Q.100 In which of the following, the vant Hoff factor (i) is equal to one

[1] NaCl [2] KNO_3 [3] Urea [4] All

Answer Key

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	3	3	3	3	1	4	1	3	4	2	4	2	3	2	2	4	2	2	1	4	2	4	3	1	4
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	2	2	3	2	1	2	2	2	3	4	1	3	2	1	2	1	1	1	3	2	3	1	1	3	4
Qus.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	4	1	2	2	4	3	2	2	1	3	1	1	1	1	2	2	4	2	4	4	3	2	4	3	4
Qus.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	4	1	2	4	1	3	4	1	2	1	1	1	4	2	4	2	3	1	4	1	4	2	1	4	3

Exercise # 2

Q.1 A molal solution is one that contains one mole of a solute in

[1] 1000 gm of the solution [2] 1000 c.c. of the solution

[3] 1000 c.c of the solvent [4] 1000 gm of the solvent

Q.2 In which mode of expression the conc. of a solution remains independent of temp

[1] Molarity [2] Normality [3] Formality [4] Molality

Q.3 The volume strength of .1.5N H_2O_2 solution is

[1] 4.8 [2] 8.4 [3] 3.0 [4] 8.0

Q.4 The volume strength of H_2O_2 solution is 10. What does it mean

[1] At S.T.P. 10gm solution of H_2O_2 gives 10ml. of O_2

[2] At S.T.P. 1gm equivalent of H_2O_2 gives 10ml. of O_2

[3] At ST.P. 10 litre solution of H_2O_2 gives 10ml . of O_2

[4] At S.T.P. 1ml solution of H_2O_2 gives 10ml . of O_2

Q.5 What is the volume of 0.5M HCI required to neutralize 25ml of 0.25M Na_2CO_3 solution

[1] 12.5ml [2] 25ml [3]37.5 ml [4] 50ml

Q.6 If 5.85 gm. of NaCI are dissolved in 90gms.of water the mole fraction of NaCI is

[1] 0.1 [2] 0.01 [3] 0.02 [4] 0.2

Q.7 Findtheweignt of H_2SO_4 in l200ml of a solution of 0.2N strength

[1] 7.76g [2] 9.76g [3] 11.76g [4] 13.76gm

Q.8 What weight of Na_2CO_3 of 95% purity would be required to neutralize 45.6 ml of 0.235N acid

[1] 0.3978 g [2] 0.4978 g [3] 0.5978 g [4] 0.6978 g

Q.9 What is the strength in g per litre of a solution of H_2SO_4 12 ml of which neutralized 15ml of N/10 NaOH solution

[1] 3.125 g/l [2] 4.125 g/l [3] 5.125 g/l [4] 6.125 g/l

Q.10 Calculate the normality of the resulting solution made by adding 2 drops (0.1 ml) of 0.1 N. H_2SO_4 in 1 litre of distilled water

[1] 10^{-2} [2] 10^{-3} [3] 10^{-4} [4] 10^{-5}

Q.11 Two litres of NH_3 at 30°C and 0.20 atmosphere is neutralized by 134ml of a solution of H_2SO_4 Calculate the normality of H_2SO_4

[1] 0.12 [2] 0.22 [3] 0.32 [4] 0.42

Q.12 What weight of HNO_3 is required to make 1 litre of 2N solution to be used as an oxidising agent in the. reaction: $3\,Cu + 8\,HNO_3 \rightarrow 3Cu(NO_3)_2 + 2NO + 4\,H_2O$

[1] 63gm [2] 21 gm [3] 42 gm [4] 84gm

Q.13 The amount of $KMnO_4$ required to prepare 1 00 ml of 0.1 N solution in alkaline medium is

[1] 1.58 gram [2] 3.16 gram [3] 0.52 gram [4] 0.31 gram

Q.14 If 18 gram of glucose ($C_6H_{12}O_6$) is present in 1000 gram of an aqueous solution of glucose it is said to be

[1] 39.2 gram [2] 1.1 molal [3] 0.5 molal [4] 0.1 molal

Q.15 What weight of ferrous ammonium sulphate is needed to prepare 100 ml of 0.1 normal solution (equivalent weight = 392)

[1] 39.2 gram [2] 3.92 gram [3] 1.96 gram [4] 19.6 gram

Q.16 The normality of 10% (weight/volume) acetic acid is

[1] 1N [2] 10N [3] 1.66N [4] 0.83 N

Q.17 How much water is needed to dilute 10 ml of 10 N HCI to make it exactly decinormal (0.1 N)

[1] 990 ml [2] 1000 ml [3] 1010 ml [4] 100 ml

Q.18 4.0 gram of caustic soda is dissolved in 100 c.c. of solution. The normality of solution is

[1] 1 [2] 0.1 [3] 0.5 [4] 4.0

Q.19 What is the molarity of H_2SO_4 solution that has a density of 1.84 gm/cc at 35°C and contains 98% by weight

[1] 4.18M [2] 8.14M [3] 18.4M [4] 18M

Q.20 In order to prepare 100 cm^3 of 0.250 M barium chloride solution the amount of $BaCl_2.2H_2O$ re quired will be - .

[1] 0.250 moles [2] 0.0025 moles [3] 2.5 moles [4] 6.1 gram of $BaCl_2.2H_2O$

Q.21 25 mL of 3 M HCI were added to 75 mL of 0.05 M HCl. The molarity of HCI in the resulting solution is approximately

[1] 0.055 M [2] 0.35 M [3] 0.787 M [4] 3.05 M

Q.22 0.2 moles of HCI and 0.1 moles of $CaCl_2$ were dissolved in water to have 500 ml of solution, the molarity of Cl^- ions is

[1] 0.04 M [2] 0.8 M [3] 0.4 M [4] 0.08 M

Q.23 When 5.0 gram of $BaCl_2$ is dissolved in water to have 10^6 gram of solution. The concentration of solution is

[1] 2.5 ppm [2] 5 ppm [3] 5M [4] 5 gm L^{-1}

Q.24 The number of iodine atoms present in 40 mL solution of its 0.1 M solution -

[1] 4.81×10^{21} [2] 24.08×10^{21} [3] 0.408×10^{23} [4] 6.02×10^{22}

Q.25 To a 4L of 0.2 M solution of NaOH, 2L of 0.5 M NaOH are added. The molarity of resulting solution is

[1] 0.9M [2] 0.3M [3] 1.8M [4] 0.18M

Q.26 A molal solution is one that contain one mole of a solute in

[1] 1000 gram of the solvent [2] One litre of the solvent

[3] One litre of the solution [4] 22.4litres ofthe solution

Q.27 10 gram of glucose are dissolved in 150 gram of water. The mass % of glucose is

[1] 5% [2] 6.25% [3] 93.75% [4]15%

Q.28 If 100 ml of 1.0 M NaOH solution is diluted to 1.0 L, the resulting solution contains

[1] 1 mole of NaOH [2] 0.1 mole of NaOH

[3] 10.0 mole of NaOH [4] 0.05 mole of NaOH

Q.29 An aqueous solution of non-electrolyte "A" with molecular mass 60 contains 6 g in 500 ml and has density equal to 1.05. The molality of solution is

[1] 1.25 [2] 0.19 [3] 0.25 [4] 0.30

Q.30 Out of molarity (M), molality (m), formality (F) and mole fraction (x) those independent of temperature are

[1] M,m [2] F, x [3] m,x [4] M,x

Q.31 One among the following is an incorrect statement

[1] Molality of a solution is dependent on the temperature

[2] Molarity of a solution is dependent on the temperature

[3] Normality of 0.5 M aqueous solution of $H_2C_2O_4.2H_2O$ is 1 N

[4] Molality of a,solution relates moles of solute and mass of solvent

Q.32 Molality of the solution is

[1] The number of moles ofthe dissolved per kilogram of solvent

[2] The number of gram mole of the solute dissolved per ml of the solution

[3] The nu'mber of grams of solute dissolved per kilogram of solvent

[4] The number of moles of solute dissolved per litre of the solution

Q.33 Molarity of a solutions relates the

[1] Moles of solute and solvent [2] Moles of solute and mass of solution

[3] VolumeOf solute and volume of solvent [4] Volume of solution and moles of solute

Q.34 The number of moles of solute per kg'of solvent is called

[1] Mole fraction of solute [2] Normality

[3] Molarity [4] Molality

Q.35 The units of mole fraction of a compound in solution are - "

[1] mol kg^{-1} [2] mollitre^{-1} [3]g litre^{-1} [4] None ofthese

Q.36 The hardness of water is usually expressed in

(1) ppm [2] g/litre [3] Mol/litre [4] None

Q.37 The term standard solution is used for the solutions whose

[1] Normality is known [2] Molarity is known[3] Strength is known [4] All

Q.38 A molar solution represents a solution of molarity equal to

[1] 1 [2] 2 [3] 3 [4] None

Q.39 5 mL of N HCI, 20 mL of N/2 H_2SO_4 and 30 mL of N/3 HNO_3 are mixed together and volume made one litre. The normality of the resulting solution is -

[1] N/5 [2] N/10 [3] N/20 [4] N/40

Q.40 What will be the normality of a solution obtained by mixing 0.45 Nand 0.60 N NaOH in the ratio 2 : 1 by volume -

[1] 0.4N [2] 0.5N [3] 1.05N [4] 0.15N

Q.41 1000 g aqueous solution of $CaCO_3$ contains 10 g of calcium carbonate. Concentration of solution is

[1] 10 ppm [2] 100 ppm [3] 1000 ppm [4] 10000 ppm

Q.42 1.0 g of pure calcium carbonate was found to require 50 mL of dilute HCI for complete reactions. The strength of the HCI solution is given by

[1] 4N [2] 2N [3] 0.4N [4] 0.2 N

Q.43 The normality of 10% (weight/volume) acetic acid is

[1] 1N [2] 10N [3] 1.7N [4] 0.83N

Q.44 Cryoscopic constant of a liquid is

[1] Decrease in freezing point when 1 gram of solute is dissolved per kg of the solvent

[2] Decrease in the freezing point when 1 mole of solute is dissolved per kg of the solvent

[3] Is the elevation for 1 molar solution

[4] Is a factor used for calculation of elevation in boiling point

Q.45 If the vapour pressure of solutions of two liquids are less than those expected from ideal solution they are said to have

[1] Negative deviation from ideal behaviour

[2] Positive deviations from ideal behaviour

[3] Ideal behaviour

[4] Positive deviation for lower cone. and negative deviations for higher concentration

Q.46 The osmotic pressure ofthe solution having concentration 0.05 M

[1] Increases with increase in temperature

[2] Does not change with change in temperature

[3] Decreases with increase in temperature

[4] Initially decreases and then increases with rise in temperature

Q.47 Pure water freezes at 5.45ºC at a certain place but a 0.374 m solution of tetra chloroethane in benzene freezes at 3.55ºC. The K_f for benzene is

[1] 5.08 K. kg mol^{-1} [2] 508 K kg mol^{-1} [3] 0.508 K kg mol^{-1} [4] 50.8 °C kg mol^{-1}

Q.48 At certain Hill-station pure water boils at 99.725ºC. If K_b for water is 0.513ºC kg mol^{-1}. The boiling point of 0.69 m solution of urea will be

[1] 100.079ºC [2] 103ºC [3] 1 00. 359°C [4] Un predictable

Q.49 The freezing point of a 0.05 molal solution of a non-electrolyte in water is- (K_f = 1. 86ºC/mol)

[1] –1.86 °C [2] –0.93 °C [3] -0.093ºC [4] 0.93ºC

Q.50 The freezing point of 1 molal NaCI solution assuming NaCI to be 100% dissociated in water is

[1] -1.86ºC [2] -3.72ºC [3]+1.86ºC [4] +3.72ºC

Q.51 The molar freezing point constant for water is 1.86 °C/mole. if 342 gm of cane sugar ($C_{12}H_{22}O_{11}$) is dissolved in 1000 gram of water, the solution will freeze at-

[1] -1.86 °C [2] 1.86ºC [3] -3.92 °c [4] 2.42ºC

Q.52 The melting points of most of the solid substance increase with an increase of pressure acting on them. However, ice melts at a temperature lower than its usual melting point, when the pressure is increased. This is because

[1] ice is less dense than water [2] pressure generate heat

[3] the chemical bonds break under pressure [4] ice is not a true solid

Q.53 A binary solution of. ethanol and n-heptane is an example of

[1] Ideal solution. [2] Non ideal solution with +ve deviation

[3] Nonideal solution with –ve deviation [4] Un predictable behaviour

Q.54 At low concentrations, the statement that equimolal solutions under a given set of experimental conditions have equal osmotic pressures is true for

[1] All solutions [2] Solutions of non-electrolyte only

[3] Solution of electrolyte only [4] None of these

Q.55 A thermometer which can be used only for accurate measurement of small differences in temperature is known as a

[1] Beckmann thermometer [2] Contact thermometer

[3] Clinical thermometer [4] Platinum resistance thermometer

Q.56 10 gram of solute with molecular mass 100 gram mol^{-1} is dissolved in 100 gram solvent to show 0.3°C elevation in boiling point. The value of molal ebullioscopic constant will be

[1] 10 [2] 3 [3] 0.3 [4] Unpredictable

Q.57 If the observed and theoretical molecular mass of NaCI is found to be 31.80 and 58.50, then the degree of dissociation of NaCI is

[1] 83.96% [2] 8.39% [3] 90% [4] 100%

Q.58 When mango is placed in dilute aqueous solution of hydrochloride acid, it

[1] Shrinks [2] Swells [3] Bursts [4] Nothing happens

Q.59 In certain solvent, phenol dimerizes to the extent of 60%. Its observed molecular mass in that solvent should be

[1] > 94 [2] = 94 [3] < 94 [4] Unpredictable

Q.60 A 5.8% solution of NaCI has vapour pressure closest to

[1] 5.8 % solution of urea [2] 2 m solution of glucose

[3] 1 m solution of urea [4] 5.8 % solution of glucose

Q.61 Equal volume of 1 M urea and 1 M glucose are mixed. The mixture will have

[1] Same osmotic pressure [2] Lower osmotic pressure

[3] Higher osmotic pressure [4] None ofthese

Q.62 Depression in freezing point of solution of electrolytes are generally

[1] Lower [2] Higher than what should be normally

[3] Low or high depending upon nature of electrolyte [4] What it should be normally

Q.63 For dilute solution Raoult's law states that

[1] The lowering of vapour pressure is equal to the mole fraction of the solute

[2] The relative lowering of vapour pressure is equal to the mole fraction ofthe solute

[3] The relative lowering of vapour pressure is proportional to the amount of solute in solution

[4] The vapour pressure of the solution is equal to the mole fraction of the solvent

Q.64 An azeotropic solution of two liquids has boiling point lower than either of them when it

[1] Shows a negative deviation from Raoult's law

[2] Shows no deviation from Raoult's law

[3] Shows positive deviation from Raoult's law

[4] Is saturated

Q.65 The molal elevation constant is the ratio of the elevation in BP to

[1] Molarity [2] Molality

[3] Mole fraction of solute [4] Mole fraction of solvent

Q.66 The osmotic pressure of solution increases if

[1] Temperature is decreased [2] Solution constant is increased

[3] Number of solute molecules are increased [4] Volume is increased

Q.67 A 5% solution of cane sugar is isotonic with 0.877 % of X. The molecular weight of substance X is

[1] 58.98 [2] 119.96 [3] 95.58 [4] 126.98

Q.68 A 0.01 M solution of glucose in water freezes at –0.0186 °C. A 0.01 M solution of KCI in water is freezes at temperature

[1] higher than - 0.0186ºC [2] OºC

[3] 0.0186 °C [4] lower than –0.0186 °C

Q.69 The osmotic pressure of 0.2 molar solution of urea at 300 K (R = 0.082 litre atm mol^{-1} K^{-1}) is

[1] 4.92atm [2] 1atm [3] 0.25atm [4] 27atm

Q.70 A liquid is in equilibrium with its vapour at its boiling point. On the average the molecules in the two phase have equal

[1] Inter-molecular forces [2] Potential energy

[3] Total energy [4] Kinetic energy

Q.71 The hard shell of an egg is dissolved in acetic acid and then egg.was subsequently placed in saturated solutiol'Jof NaCl

[1] The egg will shrink [2] The egg will become harder

[3] The egg will swell [4] No change in the size of egg

Q.72 All form ideal solutions except

[1] C_2H_5Br and C_2H_5I [2] C_6H_5CI and C_6H_5Br

[3] C_6H_6 and $C_6H_5.CH_3$ [4] C_2H_5I and C_2H_5OH

Q.73 The substance A when dissolved in solvent B shows the molecular mass corresponding to A_3. The vant Hoffs factor will be

[1] 1 [2] 2 [3] 3 [4] 1/3

Q.74 Which statement is incorrect about osmotic pressure (π), volume (V) and temperature (T)

[1] $\pi \propto \frac{1}{V}$ if T is constant [2] $\pi \propto$ T if V is constant

[3] $\pi \propto$ V if T is the constant [4] π V is constant if T is constant

Q.75 Blood cells retain their normal shapes in solutions which are

[1] isotonic to blood [2] isomotic to blood

[3] hypertonic to blood [4] equinormal to blood

Q.76 The process of osmosis was first discovered by

[1] Nollet [2] Pfeffer [3] Traube [4] Dutrochet

Q.77 The osmotic pressure of a dilute solution is given by

[1] $P = P_0X$ [2] $\pi V = nRT$ [3] $\Delta P = P_0N_2$ [4] $\frac{\Delta P}{P_0} = \frac{P_0 - P}{P_0}$

Q.78 Osmotic pressure of a solution increased by

[1] Decreasing the temperature

[2] Increasing the volume

[3] Increasing the number of molecules of the solute

[4] None ofthe above

Q.79 The solution having same osmotic pressure are called

[1] Equivalent solutions [2] Ideal solutions

[3] Equimolar solutions [4] Isotonic solutions

Q.80 A property which depends primarily on the number of molecules of a system and not on their nature is known to be

[1] Constitutive [2] Additive [3] Colligative [4] None ofthe above

Q.81 Which of the following molecular diffuse through a cell membrane

[1] Fructose [2] Glycogen [3] Haemoglobin [4] Catalase

Q.82 The osmotic pressure of equimolar solutions of urea, $BaCl_2$ and $AlCl_3$ will be in the order

[1] $AlCl_3 > BaCl_2 >$ Urea [2] $BaCl_2 > AlCl_3 >$ Urea

[3] Urea> $BaCl_2 > AlCl_3$ [4] $BaCl_2 >$ Urea> $AlCl_3$

Q.83 Which of the following is a colligative property

[1] Change in free energy. [2] Dipole moment

[3] Heatofvapourisaiton [4] Osmotic pressure

Q.84 Which of the following statements is correct for the boiling point of solvent containing a dissolved solid substance-

[1] Boiling point of the liquid is depressed [2] Boiling point of the liquid is elevated

[3] There is no effect on the boiling point [4] The change depends upon the polarity ofthe liquid

Q.85 Which of the following condition is not satisfied by an ideal solution is

[1] $\Delta H_{mixing} = 0$ [2] $\Delta V_{mixing} = 0$

[3] Raoult's law is obeyed [4] Formation of an azeotropic mixture

Answer Key

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	4	4	2	4	2	3	3	3	4	4	1	3	3	4	2	3	1	1	3	4	3	2	2	1	2
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	1	2	2	2	3	1	1	4	4	4	1	4	1	4	2	4	3	3	2	1	1	1	1	3	2
Qus.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	1	4	2	2	1	3	1	1	1	2	1	3	2	3	2	3	1	4	1	4	1	4	4	3	1
Qus.	76	77	78	79	80	81	82	83	84	85															
Ans.	1	2	3	4	3	1	1	4	2	4															

Exercise # 3

Q.1 Blood has been found to be isotonic with **[CPMT 1994]**

[1] Normal saline solution [2] Saturated NaCl solution

[3] Saturated KCl solution [4] Saturated solution of a 1: 1 mixture of NaCl and KCl

Q.2 The number of moles of SO_2Cl_2 in 13.5 gm is **[CPMT 1994]**

[1] 0.1 [2] 0.2 [3] 0.3 [4] 0.4

Q.3 A 0.2 molal aqueous solution of a weak acid (HX) is 20% ionised. The freezing point of this solution is (Given $K_f = 1.86°C/m$ for water) **[IIT 1995]**

[1] - 0.31 °C [2] - 0.45°C [3] - 0.53°C [4] - 0.90°C

Q.4 Heavy- water freezes at **[CPMT 1993]**

[1] OºC [2] 3.8ºC [3] 38°C [4] - 0.38ºC

Q.5 The molecular weight of benzoic acid in benzene as determined by depression in freezing point method corresponds to **[IIT 1996]**

[1] Ionization of benzoic acid [2] Dimerization of benzoic acid

[3] Trimerization of benzoic acid [4] Solvation of benzoic acid

Q.6 If the solution boils at a temperature T_1 and the solvent at a temperature T_2 the elevation of boiling point is given by **[MP PET 1996]**

[1] $T_1 + T_2$ [2] $T_1 - T_2$ [3] $T_2 - T_1$ [4] $T_1 \div T_2$

Q.7 "The relative lowering of the vapour pressure is equal to the mole fraction of the 'solute". This law is called **[MP PET 1997, 2001]**

[1] Henry's law [2] Raoult's law [3] Ostwald's law [4] Arrhenius's law

Q.8 Molal depression constant for water is 1.86°C. The freezing point of a 0:05 molal solution of a non-electrolyte in water is **[MP PET 1997]**

[1] –1.86°C [2] –0.93°C [3] –0.093°C [4] 0.93°C

Q.9 One mole of a solute A is dissolved in a given volume of a solvent. The association of the solute take place according to $nA \rightarrow [A]_n$. The Van't Hoff factor i is expressed as **[MP PMT 1997]**

[1] $i = 1 - x$ [2] $i = 1 + \frac{x}{n}$ [3] $i = \frac{1 - x + \frac{x}{n}}{1}$ [4] $i = 1$

Q.10 The number of moles of a solute in its solution is 20 and total number of moles are 80. The mole fraction of solute is **[MP PMT 1997]**

[1] 2.5 [2] 0.25 [3] 1 [4] 0.75

Q.11 Which of the following will have the highest boiling point at 1 atm pressure? **[MP PET/PMT 1998]**

[1] 0.1 M NaCl [2] 0.1 M sucrose, [3] 0.1 M $BaCl_2$ [4] 0.1 M glucose

Q.12 An aqueous solution freezes at - 0.186°C (k_f= 1.86°; k_b = 0.512). What is the elevation in boiling point

[1] 0.186 [2] 0.512 [3] $\frac{0.512}{1.86}$ [4] 0.0512 **[MP PET/PMT 1998]**

Q.13 200 ml of a solution contains 5.85 g dissolved sodium chloride. The concentration of the solution will be (Na = 23; Cl = 35.5) **[MP PMT 1999]**

[1] 1 molar [2] 2 molar [3] 0.5 molar [4] 0.25 molar

Q.14 20 ml of HCl solution requires 19.85 ml of 0.01 M NaOH solution for complete neutralization. The molarity of HCl solution is **[MP PMT 1999]**

[1] 0.0099 [2] 0.099 [3] 0.99 [4] 9.9

Q.15 How many grams of NaOH will be required to neutralize 12.2 grams of benzoic acid **[MP PMT 1999]**

[1] 40 gms [2] 4 gms [3] 16 gms [4] 12.2 gms

Q.16 The normality of 0.3 M phosphorus acid (H_3PO_3) is **[IIT 1999; AIIMS 2000]**

[1] 0.1 [2] 0.9 [3] 0.3 [4] 0.6

Q.17 In the depression of freezing point experiment it is found that the **[IIT 1999]**

[1] Vapour pressure of the solution is less than that of pure solvent

[2] Vapour pressure of the solution is more than that of pure solvent

[3] Only solute molecules solidIfy at the freezing point

[4] Only solvent molecules solidify at the freezing point ,

Q.18 The rise in the boiling point of a solution containing 1.8 gram of glucose in 100 g of a solvent in 0.1°C. The molal elevation constant of the liquid is **[CPMT 1999]**

[1] 0.01 K/m [2] 0.1 K/m [3] 1 K/m [4] 10 K/m

Q.19 The osmotic pressure of 1 m solution at 27°C is **[CPMT 1999]**

[1] 2.46 atm [2] 24.6 atm [3] 1.21 atm [4] 12.1 atm

Q.20 If one mole of a substance is pr:esent in 1 kg of solvent. then **[CPMT 1996]**

[1] It shows molar concentration [2] It shows molal concentration

[3] It shows normality [4] It shows strength gm/ gm

Q.21 Van't Hoff factor of $Ca(NO_3)_2$ is **[CPMT 1997]**

[1] I [2] 2 [3] 3 [4] 4

Q.22 The boiling point of water (100°C) becomes 100.52°C. if 3 grams of a nonvolatile solute is dissolved in 200 ml of water. The molecular weight of solute is (K_b for water is 0.6 K-m) **[AIIMS 1998]**

[1] 12.2 g/mol [2] 15.4 g/mol [3] 17.3 g/mol [4] 20.4 g/mol

Q.23 With 63 gm of oxalic acid how many litres of $\frac{N}{10}$ solution can be prepared **[Rajasthan PET 1999]**

[1] 100 litre [2] 10 litre [3] 1 litre [4] 1000 litre

Q.24 How many gram of HCl will be present in 150ml of its 0.52 M solution, **[Rajasthan PET 1999]**

[1] 2.136 gm [2] 5.70 gm [3] 8.50 gm [4] 3.65 gm

Q.25 The vapour pressure lowering caused by the addition of 100 g of sucrose(molecular mass = 342) to 1000 g of water if the vapour pressure of pure water at 25°C is 23.8 mm Hg **[RPET 1999]**

[1] 1.25 mm Hg [2] 0.125 mm Hg [3] 1.15 mm Hg [4] 00.12 mm Hg

Q.26 Which of the following is a colligative property **[AIIMS 1999]**

[1] Viscosity [2] Surface tension [3] Refractive index [4] Osmotic pressure

Q.27 Which of the following does not show positive deviation from Raoult's law **[MP PMT 2000]**

[1] Benzene-Chloroform [2] Benzene-Acetone

[3] Benzene-Ethanol [4] Benzene-Carbon tetrachloride

Q.28 A mixture has 18g water and 414g ethanol. The mole fraction of water in mixture is (assume ideal behaviour of the mixture) **[MP PMT 2000]**

[1] 0.1 [2] 0.4 [3] 0.7 [4] 0.9

Q.29 The vapour pressure of a solvent A is 0.80 atm. When a non-volatile substance B is added to this solvent its vapour pressure drops to 0.6 atm. What is mole fraction of B in solution **[MP PMT 2000, 01]**

[1] 0.25 [2] 0.50 (e) 0.75 [4] 0.90

Q.30 A solution of 1 molal concentration of a solute will have maximum boiling point elevation when the solvent is

[1] Ethyl alcohol [2] Acetone [3] Benzene [4] Chloroform **[MP PMT 2000]**

Q.31 In an experiment, 1g of a non-volatile solute was dissolved in 100g of acetone (mol. mass = 58) at 298K. The vapour pressure of the solution was found to be 192.5 mm Hg. The molecular weight of the solute is (vapour pressure of acetone = 195 mm Hg) **[CPMT 2001; CBSE 2001]**

[1] 25.24 [2] 35.24 [3] 45.24 [4] 55.24

Q.32 What is molarity of a solution of HCl which contains 49% by weight of solute and whose specific gravity is 1.41

[1] 15.25 [2] 16.75 [3] 18.92 [4] 20.08 **[CPMT 2001; CBSE 2001]**

Q.33 Which of the following does not show negative deviation from Raoult's law **[MP PMT 2001]**

[1] Acetone-Chloroform [2] Acetone-Benzene

[3] Chloroform-Ether [4] Chloroform-Benzene

Q.34 171 g of cane sugar ($C_{12}H_{22}O_{11}$) is dissolved in 1 litre of water. The molarity of the solution is **[MP PMT 2001]**

[1] 2.0 M [2] 1.0 M [3] 0.5 M [4] 0.25 M

Q.35 What is the molarity of H_2SO_4 solution, that has a density 1.84 gm/cc at 35°C and contains solute 98% by weight

[1] 4.18 M [2] 8.14 M [3] 18.4 M [4] 18 M **[AIIMS 2001]**

Q.36 0.440 g of a substance dissolved in 22.2 g of benzene lowered the freezing point of benzene by 0.567°C. The molecular mass of the substance ($K_b = 5.12°C\ mol^{-1}$) **[BHU 2001; CPMT 2001]**

[1] 178.9 [2] 177.8 [3] 176.7 [4] 175.6

Q.37 A solution is obtained by dissolving 12 g of urea (mol. wt.60) in a litre of water. Another solution is obtained by dissolving 68.4 g of cane sugar (mol. wt. 342) in a litre of water at are the same temperature. The lowering of vapour pressure in the first solution is **[CPMT 2001]**

[1] Same as that of 2nd solution [2] Nearly one-fifth of the 2nd solution

[3] Double that of 2nd solution [4] Nearly five times that of 2nd solution

Q.38 Value of gas constant R is **[AIEEE 2002]**

[1] 0.082 litre atm [2] 0.987 cal $mol^{-1}K^{-1}$ [3] 8.3J$mol^{-1}K^{-1}$ [4] 83 erg $mol^{-1}K^{-1}$

Q.39 Freezing point of an aqueous solution is (-0.186)ºC. Elevation of boiling point of the same solution is $K_f = 1.86°C$. $K_b = 0.512°$ find the increase in boiling point **[AIEEE 2002]**

[1] 0.186°C [2] 0.0512°C [3] 0.092°C [4] 0.02372°C

Q.40 The boiling point of a solution of 0.11 gm of a substance in 15 gm of ether was found to be 0.1ºC higher than that of the pure ether. The molecular weight of the substance will be ($K_b = 2.16$) **[MP PET 2002]**

[1] 148 [2] 158 [3] 168 [4] 178

Q.41 With increase of temperature, which of these changes **[AIEEE 2002]**

[1] Molality [2] Weight fraction of solute

[3] Fraction of solute present in water [4] Mole fraction

Q.42 In mixture A and B components show –ve deviation as **[AIEEE 2002]**

[1] $\Delta V_{mix} > 0$ [2] $\Delta H_{mix} < 0$

[3] A–B interaction is weaker than A–A and B–B interaction

[4] A–B interaction is strong than A–A and B–B interaction

Q.43 The vapour pressure of pure liquid A is 0.80 atm. On mixing a non-volatile B to A, its vapour pressure becomes 0.6 atm. The mole fraction of B in the solution is **[MP PET 2002]**

[1] 0.150 [2] 0.25 [3] 0.50 [4] 0.75

Q.44 Which one of the statements given below concerning properties of solutions. describes a colligative effect.

[1] Boiling point of pure water decreases by the addition of ethanol **[AIIMS 2003]**

[2] Vapour pressure of pure water decreases by the addition of nitric acid

[3] Vapour pressure of pure benzene decreases by the addition of naphthalene

[4] Boiling point of pure benzene increases by the addition of toluene

Q.45 25ml of a solution of barium hydroxide on titration with a 0.1 molar solution of hydrochloric acid gave a litre value of 35 ml. The molarity of barium hydroxide solution was **[AIEEE 2003]**

[1] 0.07 [2] 0.14 [3] 0.28 [4] 0.35

Q.46 Liquids A and B form an ideal solution **[AIEEE 2003]**

[1] The enthalpy of mixing is zero [2] The entropy of mixing is zero

[3] The free energy of mixing is zero

[4] The free energy as well as the entropy of mixing are each zero

Q.47 Pressure cooker reduces cooking time for food because **[AIEEE 2003]**

[1] Heat is more evenly distributed in the cooking space

[2] Boiling point of water involved in cooking is increased

[3] The higher pressure inside the. cooker crushes the food material

[4] Cooking involves chemical changes helped by a rise in temperature

Q.48 To neutralise completely 20 mL of 0.1 M aqueous solution of phosphorous acid (H_3PO_3), the volume of 0.1 M aqueous KOH solution required is : **[AIEEE 2004]**

[1] 60 mL [2] 20 mL [3] 40 mL [4] 10 mL

Q.49 Which of the following liquid pairs shows a positive deviation from Raoult's law? **[AIEEE 2004]**

[1] Acetone – Chloroform [2] Benzene – methanol

[3] Water – Nitric acid [4] Water – hydrochloric acid

Q.50 Which one of the following statements is False ? **[AIEEE 2004]**

[1] Two sucrose solutions of same molality prepared in different solvents will have the same freezing point depression

[2] The osmotic pressure (π) of a solution is given by the equation $\pi = MRT$, where M is the molarity of the solution

[3] The correct order of osmotic pressure for 0.01 M aqueous solution of each compound is

$BaCl_2 > KCl > CH_3COOH >$ sucrose.

[4] Raoult's law states that the vapour pressure of a component over a solution is proportional to its mole fraction.'

Q.51 A solution of urea (mol. mass 56 g mol^{-1})boils at 100.18ºC at the atmospheric pressure. If K_f and K_b for water are 1.86 and 0.512 K kg mol^{-1} respectively, the above solution will freeze at **[CPMT-2005]**

[1] 0.654ºC [2] –0.654ºC [3] 6.54ºC [4] –6.54ºC

Q.52 A solution has a 1 : 4 mole ratio of pentane to hexane. The vapour pressures of the pure hydrocarbons at 20ºC are 440 mm Hg for pentane and 120 mm Hg for hexane.The mole fraction of pentane in the vapour phase would be

[1] 0.200 [2] 0.549 [3] 0.786 [4] 0.478 **[CPMT-2005]**

Q.53 If α is the degree of dissociation of Na_2SO_4, the vant Hoff's factor(i) used for calculating the molecular mass is-

[1] $1 + \alpha$ [2] $1 - \alpha$ [3] $1 + 2\alpha$ [4] $1 - 2\alpha$ **[AIEEE-2005]**

Q.54 Benzene and toluene form nearly ideal solutions. At 20ºC, the vapour pressure of benzene is 75 torr and that of toluene is 22 torr.The partial vapour pressure of benzene at 20ºC for a solution containing 78 g of benzene and 46 g of toluene in torr is **[AIEEE-2005]**

[1] 50 [2] 25 [3] 37.5 [4] 53.5

Q.55 Equimolar solutions in the same solvent have **[AIEEE-2005]**

[1] Same boiling point but different freezing point [2] Same freezing point but different boiling point

[3] Same boiling and same freezing points [4] Different boiling and different freezing points

Q.56 A solution containing 10g per dm^3 of urea (molecular mass = 60 g mol^{-1}) is isotonic with a 5% solution of a nonvolatile solute, The molecular mass of this nonvolatile solute is - **[CPMT-2006]**

[1] 350g mol^{-1} [2] 200g mol^{-1} [3] 250g mol^{-1} [4] 300g mol^{-1}

Q.57 1.00 g of a non-electrolyte solute (molar mass 250 g mol^{-1}) was dissolved in 51.2g of benzene. If the freezing point depression constant K_f of benzene is 5.12K kg mol^{-1}, the freezing point of benzene will be lowered by

[1] 0.5 K [2] 0.2 K [3] 0.4 K [4] 0.3 K **[CPMT-2006]**

Q.58 During osmosis flow of water through a semipermeable membrane is **[CPMT-2006]**

[1] From both sides of semipermeable membrane with unequal flow rates

[2] From solution having lower concentration only

[3] From solution having higher concentration only

[4] From both sides of semipermeable membrane with equal flow rates

Q.59 A solution of acetone in ethanol **[CPMT-2006]**

[1] Behave like a near ideal solution [2] Obeys Raoult's law

[3] Shows a negative deviation from Raoult's law [4] Shows a positive deviation from Raoult's law

Q.60 18 g of glucose ($C_6H_{12}O_6$) is added to 178.2g of water. The vapour pressure of water for this aqueous solution at 100ºC is **[AIEEE-2006]**

[1] 7.60 torr [2] 76.00 torr [3] 752.40 torr [4] 759.00 torr

Q.61 A 5.25% solution of a substance is isotonic with a 1.5% solution of urea (molar mass = 60 g mol^{-1}) in the same solvent. If the densities of both the solutions are assumed to be equal to 1.0 g cm^{-3}, molar mass of the substance will be **[AIEEE-2007]**

[1] 105.0 g mol^{-1} [2] 210.0 g mol^{-1} [3] 90.0 g mol^{-1} [4] 115.0 g mol^{-1}

Q.62 The density (in g mL^{-1}) of a 3.60 M sulphuric acid solution that is 29% H_2SO_4 (Molar mass = 98 g mol^{-1}) by mass will be **[AIEEE-2007]**

[1] 1.22 [2] 1.45 [3] 1.64 [4] 1.88

Answer Key

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	1	1	2	2	2	2	2	3	3	2	3	4	3	1	2	4	1	4	2	2	3	3	2	1	2
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	4	1	1	1	3	3	3	2	3	3	1	1	3	2	2	3	2	2	2	1	1	2	3	2	3
Qus.	51	52	53	54	55	56	57	58	59	60	61	62													
Ans.	2	4	3	1	3	4	3	1	4	3	2	1													