# CHEMISTRY

JEE MAINS & ADVANCED

**CLASS - XII**

## MODULE – 01

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# EXERCISE-I

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### Concentration terms (Revision of mole)

**Q.1** The amount of anhydrous $Na_2CO_3$ present in 250 *ml* of 0.25 *M* solution is
(1) 225 *g* (2) 66.25 *g*
(3) 6.0 *g* (4) 6.625 *g*

**Q.2** 2.0 molar solution is obtained , when 0.5 *mole* solute is dissolved in
(1) 250 *ml* solvent (2) 250 *g* solvent
(3) 250 *ml* solution (4) 1000 *ml* solvent

**Q.3** 36*g* water and 828*g* ethyl alcohol form an ideal solution. The mole fraction of water in it, is
(1) 1.0 (2) 0.7
(3) 0.4 (4) 0.1

**Q.4** With 63 *gm* of oxalic acid how many *litres* of $\frac{N}{10}$ solution can be prepared
(1) 100 *litre* (2) 10 *litre*
(3) 1 *litre* (4) 1000 *litre*

**Q.5** Mole fraction $(X)$ of constituent in solution is equal to

(1) $\frac{\text{No. of moles of solute}}{\text{Volume of solution in litre}}$

(2) $\frac{\text{No. of gram equivalent of solute}}{\text{Volume of solution in litre}}$

(3) $\frac{\text{No. of moles of solute}}{\text{Mass of solvent in kg}}$

(4) $\frac{\text{No. of moles of any constituent}}{\text{Total no. of moles of all constituents}}$

**Q.6** An $X$ molal solution of a compound in benzene has mole fraction of solute equal to 0.2. The value of $X$ is
(1) 14 (2) 3.2
(3) 4 (4) 2

**Q.7** The molarity of pure water is
(1) 55.6 (2) 5.56
(3) 100 (4) 18

**Q.8** 4.0 *gm* of $NaOH$ are contained in one decilitre of solution. Its molarity would be
(1) 4 *M* (2) 2 *M*
(3) 1 *M* (4) 1.5 *M*

**Q.9** The number of moles of KCl in 1000 ml of 3 molar solution is
(1) 1 (2) 2
(3) 3 (4) 1.5

### General Introduction & types of solution

**Q.10** For a solution of two liquids A and B. it was proved that $P = X_A(P_A^0 - P_B^0) + P_B^0$. The solution is :
(1) Ideal (2) Non ideal
(3) Semiideal (4) None of these

### Vapour Pressure

**Q.11** 1 mole of heptane (V.P. = 92 mm of Hg) was mixed with 4 moles of octane (V.P. = 31 mm of Hg) The vapour pressure of resulting ideal solution is :
(1) 46.2 mm of Hg (2) 40.0 mm of Hg
(3) 43.2 mm of Hg (4) 38.4 mm of Hg

### Immiscible Liquids

### Completely miscible liquids : Raoult's law

**Q.12** If Raoult's law is obeyed, the vapour pressure of the solvent in a solution is directly proportional to
(1) Mole fraction of the solvent
(2) Mole fraction of the solute
(3) Mole fraction of the solvent and solute
(4) The volume of the solution

**Q.13** The vapour pressure of pure benzene and toluene are 160 and 60 torr respectively. The mole fraction of toluene in vapour phase in contact with equimolar solution of benzene and toluene is :
(1) 0.50 (2) 0.6
(3) 0.27 (4) 0.73

### Non-ideal Solutions

**Q.14** Which pair from the following will not form an ideal solution
(1) $CCl_4 + SiCl_4$ (2) $H_2O + C_4H_9OH$
(3) $C_2H_5Br + C_2H_5I$ (4) $C_6H_{14} + C_7H_{16}$

**Q.15** 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.16** Which property is shown by an ideal solution

(1) It follows Raoult's law (2) $\Delta H_{mix} = 0$

(3) $\Delta V_{mix} = 0$ (4) All of these

**Q.17** When two liquid A and B are mixed then their boiling points becomes greater than both of them. What is the nature of this solution

(1) Ideal solution

(2) Positive deviation with non ideal solution

(3) Negative deviation with non ideal solution

(4) Normal solution

**Q.18** All form ideal solution except

(1) $C_2H_5Br$ and $C_2H_5I$

(2) $C_2H_5Cl$ and $C_6H_5Br$

(3) $C_6H_6$ and $C_6H_5CH_3$

(4) $C_2H_5I$ and $C_2H_5OH$

**Q.19** Which of the following is true when components forming an ideal solution are mixed

(1) $\Delta H_m = \Delta V_m = 0$ (2) $\Delta H_m > \Delta V_m$

(3) $\Delta H_m < \Delta V_m$ (4) $\Delta H_m = \Delta V_m = 1$

**Q.20** An azeotropic solution of two liquids has boiling point lower than either 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

## Degree of Ionisation/Dissociation for Weak Electrolytes & Vant's Hoff factor

**Q.21** Which of the following salt has the same value of Van't Hoff factor $i$ as that of $K_4[Fe(CN)_6]$

(1) $Al_2(SO_4)_3$ (2) NaCl

(3) $Na_2SO_4$ (4) $Al(NO_3)_3$

**Q.22** Van't Hoff factor of $Ca(NO_3)_2$ is

(1) 1 (2) 2

(3) 3 (4) 4

**Q.23** One mole of a solute $A$ is dissolved in a given volume of a solvent. The association of the solute take place according to $nA \rightleftharpoons A_n$.

If x is the degree of association of A, then Van't Hoff factor $i$ is expressed as

(1) $i = 1 - x$ (2) $i = 1 + \frac{x}{n}$

(3) $i = \frac{1 - x + \frac{x}{n}}{1}$ (4) $i = 1$

**Q.24** The molecular weight of benzoic acid in benzene as determined by depression in freezing point method corresponds to

(1) Ionization of benzoic acid

(2) Dimerization of benzoic acid

(3) Trimerization of benzoic acid

(4) Solvation of benzoic acid

## Relative lowering of vapour pressure

**Q.25** For a solution of volatile liquids the partial vapour pressure of each component in solution is directly proportional to

(1) Molarity (2) Mole fraction

(3) Molality (4) Normality

**Q.26** When a substance is dissolved in a solvent the vapour pressure of the solvent is decreased. This results in

(1) An increase in the b.p. of the solution

(2) A decrease in the b.p. of the solvent

(3) The solution having a higher freezing point than the solvent

(4) The solution having a lower osmotic pressure than the solvent

**Q.27** If $P^o$ and $P$ are the vapour pressure of a solvent and its solution respectively and $N_1$ and $N_2$ are the mole fractions of the solvent and solute respectively, then correct relation is

(1) $P = P^o N_1$ (2) $P = P^o N_2$

(3) $P^o = P N_2$ (4) $P = P^o (N_1 / N_2)$

**Q.28** The relative lowering of the vapour pressure is equal to the ratio between the number of

(1) Solute moleules and solvent molecules

(2) Solute molecules and the total molecules in the solution

(3) Solvent molecules and the total molecules in the solution

(4) Solvent molecules and the total number of ions of the solute

**Q.29** 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 $25^oC$ is 23.8 *mm Hg*

(1) 1.25 *mm Hg* (2) 0.125 *mm Hg*

(3) 1.15 *mm Hg* (4) 00.12 *mm Hg*

**Q.30** According to Raoult's law the relative lowering of vapour pressure of a solution of volatile substance is equal to

(1) Mole fraction of the solvent

(2) Mole fraction of the solute

(3) Weight percentage of a solute

(4) Weight percentage of a solvent

**Q.31** The vapour pressure of water at $20^oC$ is 17.54 *mm*. When 20*g* of a non-ionic, substance is dissolved in 100*g* of water, the vapour pressure is lowered by 0.30 *mm*. What is the molecular weight of the substances

(1) 210.2 (2) 206.88

(3) 215.2 (4) 200.8

**Q.32** For a dilute solution, Raoult's law states that

(1) The lowering of vapour pressure is equal to mole fraction of solute

(2) The relative lowering of vapour pressure is equal to mole fraction of 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 solvent

## Elevation of Boiling Point & Depression of Freezing Point

**Q.33** The latent heat of vapourisation of water is $9700\ Cal/mole$ and if the *b.p.* is $100^oC$, ebullioscopic constant of water is

(1) 0.513ºC (2) 1.026ºC

(3) 10.26ºC (4) 1.832ºC

**Q.34** If $0.15\ g$ of a solute dissolved in $15\ g$ of solvent is boiled at a temperature higher by $0.216^oC$ than that of the pure solvent. The molecular weight of the substance (molal elevation constant for the solvent is $2.16^oC$) is

(1) 1.01 (2) 10

(3) 10.1 (4) 100

**Q.35** The temperature, at which the vapour pressure of a liquid becomes equal to the atmospheric pressure is known as

(1) Freezing point (2) Boiling point

(3) Absolute temperature (4) None of these

**Q.36** At higher altitudes the boiling point of water lowers because

(1) Atmospheric pressure is low

(2) Temperature is low

(3) Atmospheric pressure is high

(4) None of these

**Q.37** Mark the correct relationship between the boiling points of very dilute solutions of $BaCl_2(t_1)$ and $KCl(t_2)$, having the same molarity

(1) $t_1 = t_2$

(2) $t_1 > t_2$

(3) $t_2 > t_1$

(4) $t_2$ is approximately equal to $t_1$

**Q.38** What is the freezing point of a solution containing $8.1\ g\ HBr$ in $100\ g$ water assuming the acid to be 90% ionised ($K_f$ for water $= 1.86\ K\ mole^{-1}$)

(1) $0.85^oC$ (2) $-3.53^oC$

(3) $0^oC$ (4) $-0.35^oC$

**Q.39** The molar freezing point constant for water is $1.86^oC\ mole^{-1}$. If 342 gm of canesugar $(C_{12}H_{22}O_{11})$ are dissolved in 1000 *gm* of water, the solution will freeze at

(1) $-1.86^oC$ (2) $1.86^oC$

(3) $-3.92^oC$ (4) $2.42^oC$

**Q.40** The freezing point of one molal $NaCl$ solution assuming $NaCl$ to be 100% dissociated in water is (molal depression constant = 1.86)

(1) $-1.86^oC$ (2) $-3.72^oC$

(3) $+1.86^oC$ (4) $+3.72^oC$

**Q.41** 1.00 *gm* of a non-electrolyte solute dissolved in 50 *gm* of benzene lowered the freezing point of benzene by 0.40 *K*. $K_f$ for benzene is 5.12 *kg mol*$^{-1}$. Molecular mass of the solute will be

(1) $256\ g\ mol^{-1}$ (2) $2.56\ g\ mol^{-1}$

(3) $512 \times 10^3\ g\ mol^{-1}$ (4) $2.56 \times 10^4\ g\ mol^{-1}$

## Osmotic Pressure

**Q.42** The concentration in *gms* per *litre* of a solution of cane sugar $(M = 342)$ which is isotonic with a solution containing $6\ gms$ of urea $(M = 60)$ per *litre* is

(1) 3.42 (2) 34.2

(3) 5.7 (4) 19

**Q.43** Osmotic pressure is 0.0821 *atm* at temperature of $300\ K$. Find concentration in *mole/litre*

(1) 0.033 (2) 0.066

(3) $0.33 \times 10^{-2}$ (4) 3

**Q.44** A 5% solution of canesugar (mol. wt. =342) is isotonic with 1% solution of a substance $X$. The molecular weight of $X$ is

(1) 34.2 (2) 171.2

(3) 68.4 (4) 136.8

**Q.45** Which statement is wrong regarding osmotic pressure (P), volume (V) and temperature (T)

(1) $P \propto \frac{1}{V}$ if $T$ is constant

(2) $P \propto T$ if $V$ is constant

(3) $P \propto V$ if $T$ is constant

(4) $PV$ is constant if $T$ is constant

**Q.46** The value of osmotic pressure of a 0.2 $M$ aqueous solution at 293$K$ is

(1) 8.4 *atm* (2) 0.48*atm*

(3) 4.8 *atm* (4) 4.0 *atm*

**Q.47** If a $0.1M$ solution of glucose (mol. wt. 180) and $0.1\,\text{molar}$ solution of urea (mol. wt. 60) are placed on the two sides of a semipermeable membrane to equal heights, then it will be correct to say

(1) There will be no net movement across the membrane

(2) Glucose will flow across the membrane into urea solution

(3) Urea will flow across the membrane into glucose solution

(4) Water will flow from urea solution into glucose solution

**Q.48** If osmotic pressure of a solution is 2atm at $273\ K$, then at $546\ K$, the osmotic pressure is

(1) 0.5 *atm* (2) 1 *atm*

(3) 2 *atm* (4) 4 *atm*

**Q.49** A solution of urea contain 8.6 gm/litre (*mol. wt.* 60.0). It is isotonic with a 5% solution of a non-volatile solute. The molecular weight of the solute will be

(1) 348.9 (2) 34.89

(3) 3489 (4) 861.2

## Miscellaneous

**Q.50** Which of the following is not a colligative property

(1) Osmotic pressure

(2) Elevation in B.P.

(3) Vapour pressure

(4) Depression in freezing point

**Q.51** Colligative properties of a solution depends upon

(1) Nature of both solvent and solute

(2) The relative number of solute and solvent particles

(3) Nature of solute only

(4) Nature of solvent only

**Q.52** What does not change on changing temperature

(1) Mole fraction (2) Normality

(3) Both (1) and (2) (4) None of these

**Q.53** Osmotic pressure of 0.1 M solution of NaCl and $Na_2SO_4$ will be

(1) Same

(2) Osmotic pressure of NaCl solution will be more than $Na_2SO_4$ solution

(3) Osmotic pressure of $Na_2SO_4$ solution will be more than NaCl

(4) Osmotic pressure of $Na_2SO_4$ will be less than that of NaCl solution

**Q.54** In equimolar solution of glucose, $NaCl$ and $BaCl_2$, the order of osmotic pressure is as follow

(1) Glucose $> NaCl > BaCl_2$

(2) $NaCl > BaCl_2 >$ Glucose

(3) $BaCl_2 > NaCl >$ Glucose

(4) Glucose $> BaCl_2 > NaCl$

**Q.55** Which of the following will have the highest boiling point at 1 *atm* pressure

(1) $0.1\,M\ NaCl$ (2) $0.1M$ sucrose

(3) $0.1M\ BaCl_2$ (4) $0.1M$ glucose

**Q.56** Which of the following aqueous solutions containing 10 gm of solute in each case has highest B.P.

(1) $NaCl$ solution (2) $KCl$ solution

(3) Sugar solution (4) Glucose solution

**Q.57** The freezing points of equimolar solutions of glucose, $KNO_3$ and $AlCl_3$ are in the order of

(1) $AlCl_3 < KNO_3 <$ Glucose

(2) Glucose $< KNO_3 < AlCl_3$

(3) Glucose $< AlCl_3 < KNO_3$

(4) $AlCl_3 <$ Glucose $< KNO_3$

**Q.58** Which of the following has minimum freezing point

(1) $0.1M\ K_2Cr_2O_7$ (2) $0.1\,M\ NH_4Cl$

(3) $0.1\,M\ BaSO_4$ (4) $0.1\,M\ Al_2(SO_4)_3$

# ABOUT PHYSICS WALLAH

Alakh Pandey is one of the most renowned faculty in NEET & JEE domain's Physics. On his YouTube channel, Physics Wallah, he teaches the Science courses of 11th and 12th standard to the students aiming to appear for the engineering and medical entrance exams.

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