



## DPP –2 [Concentration terms ]

### Chapter:Some Basic Concepts of Chemistry

*“The difference between average and confident students is assignment completion”*

#### Concentration Terms

Topics: Basics · % · ppm · Molarity · Molality · Mole Fraction · Dilution · Mixing · Cross-Concentration · Normality

#### TYPE 1 : Solution Basics

**Q.1 The example of a solid solution is**

- (1) Glucose in water      (2) Copper in gold      (3) Camphor in nitrogen      (4) Oxygen in nitrogen

**Q.2 In a binary solution**

- (1) Solvent may be liquid      (3) Solute may be gas  
(2) Solvent may be solid      (4) Any of these

**Q.3 Which statement best explains the meaning of the phrase “like dissolves like”?**

- (1) A solute will easily dissolve a solute of similar mass  
(2) A solvent and solute with similar intermolecular forces will readily form a solution  
(3) The only true solutions are formed when water dissolves a non-polar solute  
(4) The only true solutions are formed when water dissolves a polar solute

**Q.4 An ionic compound that attracts atmospheric water so strongly that a hydrate is formed is said to be**

- (1) Dilute      (2) Hygroscopic      (3) Immiscible      (4) Miscible

#### TYPE 2 : Percentage (%)

**Q.5 A solution is prepared by adding 5 g of a substance (x) to 18 g of water. The mass percent of the solute is**

- (1) 21.74%      (2) 27.77%      (3) 18.50%      (4) 15.25%

**Q.6 A solution is prepared by adding 4 g of substance ‘A’ and 6 g of substance ‘B’ to 30 g of water. What is the mass percentage of ‘B’ in the solution?**

- (1) 10%                      (2) 20%                      (3) 15%                      (4) 13.33%

**Q.7** When 400 g of a 20% solution by weight was cooled, 50 g of solute precipitated. The percentage concentration of the remaining solution is

- (1) 8.57%                      (2) 15%                      (3) 12.25%                      (4) 9.5%

**Q.8** An aqueous solution of glucose is 10% in strength. The volume in which 2 mol of it is dissolved will be

- (1) 18 litre                      (2) 3.6 litre                      (3) 0.9 litre                      (4) 1.8 litre

**Q.9** Ammonia gas is passed into water, yielding a solution of density  $0.93 \text{ g/cm}^3$  and containing 18.6%  $\text{NH}_3$  by weight. The mass of  $\text{NH}_3$  per cc of the solution is

- (1)  $0.17 \text{ g/cm}^3$                       (2)  $0.34 \text{ g/cm}^3$                       (3)  $0.51 \text{ g/cm}^3$                       (4)  $0.68 \text{ g/cm}^3$

### TYPE 3 : Parts Per Million (ppm)

**Q.10** A 500 g toothpaste sample has 0.02 g fluoride concentration. What is the concentration of fluoride in terms of ppm?

- (1) 250                      (2) 40                      (3) 400                      (4) 1000

**Q.11** 1000 g aqueous solution of  $\text{CaCO}_3$  contains 10 g of calcium carbonate. The concentration of the solution is

- (1) 10 ppm                      (2) 100 ppm                      (3) 1000 ppm                      (4) 10,000 ppm

**Q.12** A sample of toothpaste weighing 500 g, on analysis was found to contain 0.2 g of fluorine. The concentration of fluorine in ppm is

- (1)  $4 \times 10^3$                       (2)  $4 \times 10^2$                       (3)  $4 \times 10$                       (4)  $2 \times 10^2$

**Q.13** A given sample contains 30 mg of Hg in 500 mL of solution. The ppm of mercury in water is

- (1) 60 ppm                      (2) 30 ppm                      (3) 6 ppm                      (4) 600 ppm

**Q.14** Persons are medically considered to have lead poisoning if they have a concentration greater than 10 micrograms of lead per decilitre of blood. Concentration in parts per billion is

- (1) 1000                      (2) 100                      (3) 10                      (4) 1

**TYPE 4 : Molarity****TYPE 4(i) : Molarity nikalni**

**Q.15** A molar solution is one that contains one mole of solute in

- (1) 1000 g of the solvent  
(2) one litre of the solution  
(3) 1000 g of the solution  
(4) 22.4 litres of the solution

**Q.16** 8 g NaOH is dissolved in one litre of solution. Its molarity is

- (1) 0.8 M                      (2) 0.4 M                      (3) 0.2 M                      (4) 0.1 M

**Q.17** A given solution of NaOH contains 4.00 g of NaOH per litre of solution. The molarity of this solution is

- (1) 0.1 M                      (2) 0.4 M                      (3) 1.0 M                      (4) 4.0 M

**Q.18** Water is added to 10 g CaCO<sub>3</sub> to make 100 mL of solution. The molarity of the solution is

- (1) 1.0 M                      (2) 0.1 M                      (3) 10 M                      (4) 0.01 M

**Q.19** If 18 g of glucose is present in 1000 g of solvent, the solution is said to be

- (1) 1 molar                      (2) 0.1 molar                      (3) 0.5 molar                      (4) 0.1 molal

**Q.20** What is the molarity of NaOH solution if 250 mL of it contains 1 mg of NaOH?

- (1) 10<sup>-1</sup> M                      (2) 10<sup>-2</sup> M                      (3) 10<sup>-4</sup> M                      (4) 10<sup>-3</sup> M

**Q.21** Concentration of glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) in normal blood is approximately 90 mg per 100 mL. What is the molarity of the glucose solution in blood?

- (1) 5 M                      (2) 0.005 M                      (3) 0.05 M                      (4) 1 M

**Q.22** The concentration of glucose in blood is 0.8 g L<sup>-1</sup>. The molarity of glucose in the blood should be

- (1) 5.5 × 10<sup>-3</sup> M                      (3) 5.5 × 10<sup>-5</sup> M  
(2) 4.4 × 10<sup>-5</sup> M                      (4) 4.4 × 10<sup>-3</sup> M

**Q.23** The molarity of a solution of sodium chloride (mol. wt. = 58.5) in water containing 5.85 g of sodium chloride in 500 mL of solution is

- (1) 0.25                      (2) 2.0                      (3) 1.0                      (4) 0.2

**Q.24** 20.6 g NaBr is dissolved in 500 mL solution. What is the molarity of the resulting solution?

- (1) 0.6 (2) 0.4 (3) 1 (4) None

**Q.25**  $6.025 \times 10^{20}$  molecules of acetic acid are present in 500 mL of its solution. The concentration of solution is

- (1) 0.002 M (2) 10.2 M (3) 0.012 M (4) 0.001 M

**Q.26**  $6.02 \times 10^{21}$  molecules of urea are present in 100 mL of its solution. The concentration of urea solution is [AIIEE-2004]

- (1) 0.001 M (2) 0.01 M (3) 0.02 M (4) 0.1 M

**Q.27** The molarity of pure water is

- (1) 100 M (2) 55.5 M (3) 50 M (4) 18 M

**Q.28** Molarity of 720 g of pure water is

- (1) 40 M (2) 4 M (3) 55.5 M (4) Can't be determined

**Q.29** Equal weight of NaCl and KCl are dissolved separately in equal volumes of solutions. The molarity of the two solutions will be

- (1) Equal  
(2) That of NaCl will be less than that of KCl  
(3) That of NaCl will be more than that of KCl Solution  
(4) That of NaCl will be half that of the KCl solution

**Q.30** The total number of ions present in 1 ml of 0.1 M barium nitrate solution is

- (1)  $6.02 \times 10^8$  (2)  $6.02 \times 10^{10}$  (3)  $3.0 \times 6.02 \times 10^{19}$  (4)  $3.0 \times 6.02 \times 10^8$

**Q.31** 25.3 g of sodium carbonate,  $\text{Na}_2\text{CO}_3$  is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ion  $\text{Na}^+$  and carbonate ions  $\text{CO}_3^{2-}$  are respectively (Molar mass of  $\text{Na}_2\text{CO}_3 = 106 \text{ g mol}^{-1}$ ) [AIPMT (Prelims)-2010]

- (1) 0.955 M and 1.910 M (2) 1.910 M and 0.955 M (3) 1.90 M and 1.910 M (4) 0.477 M and 0.477 M

**Q.32** A solution of sodium sulfate contains 92 g of  $\text{Na}^+$  ions per kilogram of water. The molality of  $\text{Na}^+$  ions in that solution in  $\text{mol kg}^{-1}$  is [JEE-Main(Jan.)-2019]

- (1) 16 (2) 8 (3) 4 (4) 12

**Q.33** A 20.0 mL sample of  $\text{CuSO}_4$  solution was evaporated to dryness, leaving 0.967 g of residue. What was the molarity of the original solution? ( $\text{Cu} = 63.5$ )

- (1) 48.4 M                      (2) 0.0207 M                      (3) 0.0484 M                      (4) 0.303 M

**Q.34** Molarity of NaOH in 200 mL of an aqueous solution of it is 1 M. Find the change in molarity if 2 g of NaOH is added to it.

- (1) 1.25 M                      (2) 0.25 M                      (3) 0.50 M                      (4) 0.75 M

**TYPE 4(ii) : Solute weight find karna**

**Q.35** How many moles of sodium chloride are present in 250 mL of a 0.50 M NaCl solution?

- (1) 0.125 mol                      (2) 0.150 mol                      (3) 0.075 mol                      (4) 0.02 mol

**Q.36** How many grams of  $\text{H}_2\text{SO}_4$  are present in 500 mL of 0.2 M  $\text{H}_2\text{SO}_4$  solution?

- (1) 9.8 g                      (2) 4.9 g                      (3) 19.6 g                      (4) 1.96 g

**Q.37** How many grams of  $\text{HNO}_3$  is required to prepare 400 mL solution of 0.2 M  $\text{HNO}_3$ ?

- (1) 5.04 g                      (2) 5040 g                      (3) 25.2 g                      (4) 2.52 g

**Q.38** The amount of sugar ( $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ ) required to prepare 2 L of its 0.1 M aqueous solution is [JEE-Main(Jan.)-2019]

- (1) 68.4 g                      (2) 17.1 g                      (3) 34.2 g                      (4) 136.8 g

**Q.39** For preparing 0.1 M solution of  $\text{H}_2\text{SO}_4$  in one litre, we need  $\text{H}_2\text{SO}_4$

- (1) 0.98 g                      (2) 4.9 g                      (3) 49.0 g                      (4) 9.8 g

**Q.40** What is the mass of sodium acetate ( $\text{CH}_3\text{COONa}$ ) required to make 200 mL of 0.245 molar aqueous solution? (Molar mass of  $\text{CH}_3\text{COONa} = 82 \text{ g mol}^{-1}$ ) [NCERT Pg. 23]

- (1) 3 g                      (2) 4 g                      (3) 5 g                      (4) 6 g

**Q.41** How many grams of  $\text{CH}_3\text{OH}$  should be added to water to prepare 150 mL solution of 2 M  $\text{CH}_3\text{OH}$ ?

- (1)  $9.6 \times 10^3$                       (2)  $2.4 \times 10^3$                       (3) 9.6                      (4) 2.4

**Q.42** If the density of methanol is  $0.8 \text{ kgL}^{-1}$ , what is the volume needed for making 2.5 L of its 0.4 M solution?

- (1) 0.4 L                      (2) 4.0 L                      (3) 0.04 L                      (4) 40 L

**Q.43** 5 g of an unknown solute is dissolved in 295 g solvent. If molarity and density of solution are 0.05 M and  $1.5 \text{ g cc}^{-1}$  respectively, the molecular weight of unknown solute is

- (1) 375                      (2) 425                      (3) 400                      (4) 500

**Q.44** All of the water in a 0.20 M solution of NaCl was evaporated and 0.150 mol of NaCl was obtained. What was the original volume of the sample?

- (1) 30 mL                      (2) 333 mL                      (3) 750 mL                      (4) 1000 mL

**Q.45** Which of the following methods of expressing concentration varies with temperature?

- (1) Molality                      (3) Molarity  
(2) Weight percent                      (4) Mole fraction

### TYPE 5 : Molality

**Q.46** A molal solution is one that contains one mole of a solute in

- (1) 1000 g of the solvent                      (3) one litre of the solvent  
(2) one litre of the solution                      (4) 22.4 litres of the solution

**Q.47** A solution contains 10 moles of sucrose in 1 kg of solvent. The molality of the solution is

- (1) 10 mol kg<sup>-1</sup>                      (2) 1 mol kg<sup>-1</sup>                      (3) 0.1 mol kg<sup>-1</sup>                      (4) 100 mol kg<sup>-1</sup>

**Q.48** The molality of a solution containing 5.3 g of anhydrous Na<sub>2</sub>CO<sub>3</sub> in 400 g of water is

- (1) 0.125 m                      (2) 1.25 m                      (3) 0.0125 m                      (4) 0.25 m

**Q.49** The molality of a solution containing 3 g CH<sub>3</sub>COOH in 50 g benzene is

- (1) 0.1 m                      (2) 0.5 m                      (3) 0.2 m                      (4) 1 m

**Q.50** Calculate molality of the solution obtained by dissolving 11.7 g NaCl in 500 g water

- (1) 0.1 m                      (2) 0.3 m                      (3) 0.2 m                      (4) 0.4 m

**Q.51** The molality of a urea solution in which 0.0100 g of urea [(NH<sub>2</sub>)<sub>2</sub>CO] is added to 0.3000 dm<sup>3</sup> of water at STP is

- (1) 0.555 m                      (3) 33.3 m  
(2) 5.55 × 10<sup>-4</sup> m                      (4) 3.33 × 10<sup>-2</sup> m

**Q.52** How many grams of KCl must be added to 75.0 grams of water to produce a solution that is 2.25 molal (m)? [Molecular weight of KCl = 74.5]

- (1) 126 g                      (2) 63 g                      (3) 45 g                      (4) 12.57 g

**TYPE 6 : Mole Fraction**

**Q.53** 23 g ethanol is dissolved in 36 g water. Find mole fraction of ethanol.

- (1) 2                                      (2) 0.5                                      (3) 0.2                                      (4) 0.8

**Q.54** Mole fraction of glycerine ( $C_3H_8O_3$ ) in a solution of 36 g of water and 46 g of glycerine is

- (1) 0.46                                      (2) 0.36                                      (3) 0.20                                      (4) 0.40

**Q.55** The mole fraction of oxygen in a mixture of 7 g of nitrogen and 8 g of oxygen is

- (1)  $\frac{8}{15}$                                       (2) 0.5                                      (3) 0.25                                      (4) 1.0

**Q.56** In a solution of 7.8 g benzene ( $C_6H_6$ ) and 46.0 g toluene ( $C_6H_5CH_3$ ) the mole fraction of benzene is

- (1)  $\frac{1}{6}$                                       (2)  $\frac{1}{5}$                                       (3)  $\frac{1}{2}$                                       (4)  $\frac{1}{3}$

**Q.57** A solution is prepared by adding 360 g of glucose to 864 g of water. The mole fraction of glucose (molar mass = 180) is

- (1) 0.04                                      (2) 0.40                                      (3) 0.02                                      (4) 0.96

**Q.58** The mole fraction of carbon in diamond is

- (1) 0.4                                      (2) 0.3                                      (3) 0.2                                      (4) 1

**Q.59** Which of the following is correct?

- (1) The sum of mole fractions of all the components in a solution is always unity  
(2) Mole fraction depends upon temperature  
(3) Mole fraction is always negative  
(4) Mole fraction is independent of content of solute in solution

**Q.60** 8 g of NaOH is dissolved in 18 g of  $H_2O$ . Mole fraction of NaOH in solution and molality (in  $mol\ kg^{-1}$ ) of the solutions respectively are [JEE-Main(Jan.)-2019]

- (1) 0.167, 11.11                                      (2) 0.2, 22.20                                      (3) 0.2, 11.11                                      (4) 0.167, 22.20

**TYPE 7 : Dilution**

**Q.61** Which of the following is correct for a concentrated and diluted solution of the same substance?

- (1)  $M_1V_1 + M_2V_2 = M(V_1 + V_2)$   
(2)  $M_1V_1 = M_2V_2$   
(3)  $2M_1V_1 = (V_1 + V_2)M$   
(4)  $M_1V_1 - M_2V_2 = M(V_1 + V_2)$

**Q.62** What volume of water is to be added to  $100\ cm^3$  of 0.5 M NaOH solution to make it 0.1 M solution?

- (1) 200 cm<sup>3</sup>                      (2) 400 cm<sup>3</sup>                      (3) 500 cm<sup>3</sup>                      (4) 100 cm<sup>3</sup>

**Q.63** How much water should be added to 2 M HCl solution to form 1 litre of 0.5 M HCl?

- (1) 0.75 L                      (2) 0.25 L                      (3) 0.50 L                      (4) 1.00 L

**Q.64** What volumes of 1 M and 2 M H<sub>2</sub>SO<sub>4</sub> solution are required to produce 2 L of 1.75 M H<sub>2</sub>SO<sub>4</sub> solution?

- (1) 0.5 L of 1 M and 1.5 L of 2 M      (2) 1.5 L of 1 M and 0.5 L of 2 M      (3) 1.0 L of 1 M and 1.0 L of 2 M      (4) 0.75 L of 1 M and 1.25 L of 2 M

### TYPE 8 : Mixing of Solutions

**Q.65** 50 mL of 0.2 M H<sub>2</sub>SO<sub>4</sub> is mixed with 50 mL of 0.3 M H<sub>2</sub>SO<sub>4</sub>. The molarity of the final solution is

- (1) 0.25 M                      (2) 0.50 M                      (3) 0.30 M                      (4) 0.10 M

**Q.66** 500 mL of 0.1 M HCl is mixed with 500 mL of 0.2 M HCl. The molarity of the final solution is

- (1) 0.15 M                      (2) 0.20 M                      (3) 0.10 M                      (4) 0.30 M

**Q.67** 2.5 litre of 1 M NaOH solution is mixed with another 3 litre of 0.5 M NaOH solution. Find out the molarity of the resultant solution.

- (1) 0.80 M                      (2) 1.0 M                      (3) 0.73 M                      (4) 0.50 M

**Q.68** 10 mL of 2 M NaOH solution is added to 200 mL of 0.5 M NaOH solution. What is the final concentration? [JEE(Main-online)-2013]

- (1) 0.57 M                      (2) 5.7 M                      (3) 11.4 M                      (4) 1.14 M

**Q.69** 50 mL of 0.1 M HCl is mixed with 150 mL of 0.3 M HCl and 300 mL of water. The molarity of the final solution is

- (1) 0.10 M                      (2) 0.15 M                      (3) 0.20 M                      (4) 0.30 M

**Q.70** 4.9 g H<sub>2</sub>SO<sub>4</sub> is mixed with 250 mL H<sub>2</sub>O and 250 mL of 0.1 M H<sub>2</sub>SO<sub>4</sub>. The molarity of the final solution is

- (1) 0.15 M                      (2) 0.10 M                      (3) 0.25 M                      (4) 0.20 M

**Q.71** What is the [OH<sup>-</sup>] in the final solution prepared by mixing 20.0 mL of 0.050 M HCl with 30.0 mL of 0.10 M Ba(OH)<sub>2</sub>?

- (1) 0.12 M                      (2) 0.10 M                      (3) 0.40 M                      (4) 0.0050 M

**Q.72** 20 mL of 0.5 M Na<sub>2</sub>SO<sub>4</sub> is mixed with 50 mL of 0.2 M H<sub>2</sub>SO<sub>4</sub> and 30 mL of 0.4 M Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> solution. Assuming 100% dissociation, the concentration of SO<sub>4</sub><sup>2-</sup> in the final solution is

- (1) 0.56 M                      (2) 0.46 M                      (3) 0.36 M                      (4) 0.66 M

**Q.73** A solution is made by mixing 300 mL 1.5 M  $\text{Al}_2(\text{SO}_4)_3$  + 300 mL 2 M  $\text{CaSO}_4$  + 400 mL 3.5 M  $\text{CaCl}_2$ . Assuming complete dissociation, the final molarity of  $\text{SO}_4^{2-}$  is

- (1) 1.95 M                      (2) 1.50 M                      (3) 2.25 M                      (4) 1.35 M

**Q.74** A solution is made by mixing 300 mL 1.5 M  $\text{Al}_2(\text{SO}_4)_3$  + 300 mL 2 M  $\text{CaSO}_4$  + 400 mL 3.5 M  $\text{CaCl}_2$ . Assuming complete dissociation, the final molarity of  $\text{Ca}^{2+}$  is

- (1) 2.00 M                      (2) 1.75 M                      (3) 3.50 M                      (4) 2.50 M

**Q.75** A solution is made by mixing 300 mL 1.5 M  $\text{Al}_2(\text{SO}_4)_3$  + 300 mL 2 M  $\text{CaSO}_4$  + 400 mL 3.5 M  $\text{CaCl}_2$ . Assuming complete dissociation, the final molarity of  $\text{Cl}^-$  is

- (1) 2.80 M                      (2) 1.40 M                      (3) 3.50 M                      (4) 5.60 M

**Q.76** What is the mass of the precipitate formed when 50 mL of 16.9% (w/v) solution of  $\text{AgNO}_3$  is mixed with 50 mL of 5.8% (w/v)  $\text{NaCl}$  solution? ( $\text{Ag} = 107.8$ ,  $\text{N} = 14$ ,  $\text{O} = 16$ ,  $\text{Na} = 23$ ,  $\text{Cl} = 35.5$ ) [Re-AIPMT-2015]

- (1) 7 g                              (2) 14 g                              (3) 28 g                              (4) 3.5 g

**Q.77** Equal amounts of solutions of  $\text{NaOH}$  having concentration 10% (wt/wt) and 20% (wt/wt) are mixed. What will be the molality of  $\text{NaOH}$  in the resulting solution?

- (1) 1.5 m                              (2) 4.4 m                              (3) 3.0 m                              (4) 0.15 m

### TYPE 9 : Cross-Concentration (Interconversion of Concentration Terms)

#### TYPE 9(i) : Molarity and Molality (Interconversion )

**Q.78** The molality of 1.2 M  $\text{H}_2\text{SO}_4$  solution (density = 1.4 g/mL) is

- (1) 0.936 m                      (2) 9.36 m                      (3) 0.0936 m                      (4) 1.872 m

**Q.79** Density of a 2.05 M solution of acetic acid in water is 1.02 g mL<sup>-1</sup>. The molality of the solution is

- (1) 1.14 mol kg<sup>-1</sup>                      (3) 2.28 mol kg<sup>-1</sup>  
(2) 3.28 mol kg<sup>-1</sup>                      (4) 0.44 mol kg<sup>-1</sup>

**Q.80** The density of 2 M aqueous solution of  $\text{NaOH}$  is 1.28 g/cm<sup>3</sup>. The molality of the solution is [Given that molecular mass of  $\text{NaOH} = 40 \text{ g mol}^{-1}$ ] [NEET-2019 (Odisha)]

- (1) 1.32 m                              (2) 1.20 m                              (3) 1.56 m                              (4) 1.67 m

**Q.81** The density of 3 M solution of sodium chloride is 1.252 g mL<sup>-1</sup>. The molality of the solution will be (molar mass,  $\text{NaCl} = 58.5 \text{ g mol}^{-1}$ ) [JEE-Main-online-2013]

- (1) 2.18 m                      (2) 3.00 m                      (3) 2.60 m                      (4) 2.79 m

**TYPE 9(ii) : Mole fraction and Molality (Interconversion )**

**Q.82** If we have 10 molal urea solution (MW = 60), the mole fraction of urea is

- (1) 0.1526                      (2) 0.8474                      (3) 0.2526                      (4) 0.0526

**Q.83** Calculate molality of aqueous urea solution which has  $X_{\text{urea}} = 0.2$

- (1) 10.5 m                      (2) 12.5 m                      (3) 13.88 m                      (4) 15.0 m

**Q.84** 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) 1.4                              (4) 2

**Q.85** Mole fraction of the solute in a 1.00 molal aqueous solution is [AIPMT (Prelims)-2011]

- (1) 1.7700                      (2) 0.1770                      (3) 0.0177                      (4) 0.0344

**Q.86** The mole fraction of a solvent in aqueous solution of a solute is 0.8. The molality (in mol kg<sup>-1</sup>) of the aqueous solution is [JEE-Main(april)-2019]

- (1)  $13.88 \times 10^{-1}$                       (2)  $13.88 \times 10^{-2}$                       (3) 13.88                      (4)  $13.88 \times 10^{-3}$

**Q.87** A 5.2 molal aqueous solution of methyl alcohol, CH<sub>3</sub>OH, is supplied. What is the mole fraction of methyl alcohol in the solution? [AIEEE-2011]

- (1) 0.086                      (2) 0.050                      (3) 0.100                      (4) 0.190

**Q.88** Mole fraction of solvent in aqueous solution of NaOH having molality of 3 is

- (1) 0.3                              (2) 0.05                              (3) 0.7                              (4) 0.95

**TYPE 9(iii) : % and Molarity (Interconversion )**

**Q.89** A sample of H<sub>2</sub>SO<sub>4</sub> (density 1.8 g mL<sup>-1</sup>) is labelled as 74.66% by weight. What is the molarity of the acid? (Give answer in rounded digits)

- (1) 14 M                              (2) 13.71 M                              (3) 12 M                              (4) 10 M

**Q.90** The molarity of 93% (w/W) H<sub>2</sub>SO<sub>4</sub> solution (density = 1.84 g/mL) is

- (1) 17.46 M                      (2) 8.73 M                      (3) 1.746 M                      (4) 34.92 M

**Q.91** Molarity of 29%  $\left(\frac{W}{W}\right)$   $\text{H}_2\text{SO}_4$  solution whose density is  $1.22 \text{ g mL}^{-1}$  is [NCERT Pg. 23]

- (1) 1.8 M                      (2) 3.6 M                      (3) 2.4 M                      (4) 1.2 M

**Q.92** Concentrated aqueous sulphuric acid is 98%  $\text{H}_2\text{SO}_4$  (w/v) and has a density of  $1.80 \text{ g mL}^{-1}$ . Molarity of solution is

- (1) 1 M                      (2) 1.8 M                      (3) 10 M                      (4) 1.5 M

**Q.93** The concentrated sulphuric acid that is peddled commercially is 95%  $\text{H}_2\text{SO}_4$  by weight. If the density of this commercial acid is  $1.834 \text{ g cm}^{-3}$ , the molarity of this solution is [JEE-(Main)-2012]

- (1) 17.8 M                      (2) 15.7 M                      (3) 10.5 M                      (4) 12.0 M

**Q.94** How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2 M  $\text{HNO}_3$ ? The concentrated acid is 70% (w/w)  $\text{HNO}_3$ . [NEET-2013]

- (1) 90.0 g                      (2) 70.0 g                      (3) 54.0 g                      (4) 45.0 g

**Q.95** Concentrated aqueous sulphuric acid is 98%  $\text{H}_2\text{SO}_4$  by mass and has a density of  $1.80 \text{ g mL}^{-1}$ . Volume of acid required to make one litre of 0.1 M  $\text{H}_2\text{SO}_4$  solution is

- (1) 16.65 mL                      (2) 22.20 mL                      (3) 5.55 mL                      (4) 11.10 mL

**Q.96** What volume of 63%  $\text{HNO}_3$  (wt/wt) having density  $1.4 \text{ mL}^{-1}$  is required to prepare 200 mL of 0.7 M  $\text{HNO}_3$  solution?

- (1) 20 mL                      (2) 40 mL                      (3) 15 mL                      (4) 10 mL

**TYPE 9(iv) : % and Concentration terms (Interconversion)**

**Q.97** If we have 10 molal urea solution (MW = 60), the % w/w of urea is

- (1) 37.5%                      (2) 60.0%                      (3) 25.0%                      (4) 45.5%

**Q.98** Calculate the mole percentage of  $\text{CH}_3\text{OH}$  and  $\text{H}_2\text{O}$  respectively in 60% (by mass) aqueous solution of  $\text{CH}_3\text{OH}$ .

- (1) 45.8, 54.2                      (2) 54.2, 45.8                      (3) 50, 50                      (4) 60, 40

**Q.99** What will be the density (in  $\text{g mL}^{-1}$ ) of 3.60 molar sulphuric acid having 29% by mass? (Molar mass =  $98 \text{ g mol}^{-1}$ )

- (1) 1.88                      (2) 1.22                      (3) 1.45                      (4) 1.64

**Q.100** A 6.90 M solution of KOH in water has 30% by weight of KOH. The density of the solution is

- (1) 1.155 g/mL (3) 1.322 g/mL  
(2) 1.288 g/mL (4) 1.450 g/mL

**Q.101** What would be the molality of 20% (mass/mass) aqueous solution of KI? (molar mass of KI = 166 g mol<sup>-1</sup>) [JEE-Main(april)-2019]

- (1) 1.08 (2) 1.48 (3) 1.51 (4) 1.35

**Q.102** Mole fraction of ethanol in ethanol-water mixture is 0.25. Hence percentage concentration of ethanol by weight of mixture is

- (1) 25% (2) 75% (3) 46% (4) 54%

### TYPE 9(iii) :Miscellaneous (Interconversion )

**Q.103** The molarity of CaCO<sub>3</sub>(aq.) solution which has concentration of CaCO<sub>3</sub> = 200 ppm is

- (1)  $2 \times 10^{-3}$  M (2)  $2 \times 10^{-2}$  M (3)  $2 \times 10^{-4}$  M (4)  $2 \times 10^3$  M

**Q.104** The density of a solution prepared by dissolving 120 g of urea (mol. mass = 60 u) in 1000 g of water is 1.15 g/mL. The molarity of this solution is [JEE-(Main)-2012]

- (1) 2.05 M (2) 0.50 M (3) 1.78 M (4) 1.02 M

**Q.105** The density of 3 M solution of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> is 1.25 g mL<sup>-1</sup>. Calculate the % by weight of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> and mole fraction of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> respectively.

- (1) 37.92% and 0.065 (3) 37.92% and 0.045  
(2) 30.25% and 0.045 (4) 30.25% and 0.065

**Q.106** 10 mL of sulphuric acid solution (sp. gr. = 1.84) contains 98% by weight of pure acid. The volume of 2.5 M NaOH solution required to just neutralise the acid is

- (1) 147.2 mL (2) 73.6 mL (3) 294.4 mL (4) 184.0 mL

**Q.107** The concentration of a solution of H<sub>2</sub>O<sub>2</sub> is 6.8% (w/V). Then the volume concentration of the solution is

- (1) 22.4 (2) 11.2 (3) 20 (4) 5

### TYPE 10 : Normality

**Q.108** The normality of 1.5 M H<sub>3</sub>PO<sub>4</sub> is

- (1) 4.5 N (2) 1.5 N (3) 3.0 N (4) 0.5 N

**Q.109** What is the normality of 1 M H<sub>3</sub>PO<sub>4</sub> solution?

- (1) 0.5 N                      (2) 1.0 N                      (3) 2.0 N                      (4) 3.0 N

**Q.110** The molarity of 0.2 N  $\text{Na}_2\text{CO}_3$  solution will be

- (1) 0.05 M                      (2) 0.2 M                      (3) 0.1 M                      (4) 0.4 M

**Q.111** What is the molarity of 1 N  $\text{H}_2\text{SO}_4$  solution?

- (1) 1 M                      (2) 2 M                      (3) 0.5 M                      (4) 3 M

**Q.112** What is the normality of 2 M  $\text{H}_3\text{PO}_2$  solution?

- (1) 0.5 N                      (2) 1.0 N                      (3) 2.0 N                      (4) 3.0 N

**Q.113** Normality of 0.3 M phosphorous acid is

- (1) 0.15                      (2) 0.6                      (3) 0.9                      (4) 0.1

**Q.114** A  $100\text{ cm}^3$  solution is prepared by dissolving 2 g of NaOH in water. The normality of the solution is

- (1)  $\frac{N}{2}$                       (2)  $N$                       (3)  $2N$                       (4)  $\frac{N}{4}$

**Q.115** Which of the following solutions has the highest normality?

- (1) 8 g of KOH per litre  
(2) 1 N phosphoric acid  
(3) 6 g of NaOH per 100 mL  
(4) 0.5 M  $\text{H}_2\text{SO}_4$

**Q.116** How many gram equivalents of  $\text{H}_2\text{SO}_4$  are present in 200 mL of  $\frac{N}{10}$   $\text{H}_2\text{SO}_4$  solution?

- (1) 0.02                      (2) 0.20                      (3) 0.04                      (4) 0.01

**Q.117** The mass of  $\text{H}_2\text{SO}_4$  in 150 mL of  $\frac{N}{7}$   $\text{H}_2\text{SO}_4$  solution is

- (1) 1.05 g                      (2) 2.10 g                      (3) 0.525 g                      (4) 10.5 g

**Q.118** How many grams of dibasic acid (mol. weight 200) should be present in 100 mL of the aqueous solution to give strength of 0.1 N?

- (1) 10 g                      (2) 2 g                      (3) 1 g                      (4) 20 g

**Q.119** What volume of 0.1 N  $\text{HNO}_3$  solution can be prepared from 6.3 g of  $\text{HNO}_3$ ?

- (1) 1 litre                      (2) 2 litre                      (3) 0.5 litre                      (4) 5 litre

**Q.120** A 5 M solution of  $\text{H}_2\text{SO}_4$  is diluted from 1 litre to a volume of 100 litres, the normality of the solution will be

- (1) 1 N                      (2) 5 N                      (3) 0.1 N                      (4) 0.5 N

**Q.121** 10 mL of  $\frac{N}{2}$  HCl, 30 mL of  $\frac{N}{10}$  HNO<sub>3</sub> and 75 mL of  $\frac{N}{5}$  H<sub>2</sub>SO<sub>4</sub> are mixed together. The normality of the resulting solution is

- (1) 0.02 N                      (2) 0.5 N                      (3) 0.2 N                      (4) 0.025 N

**Q.122** 100 mL decinormal HCl is mixed with 100 mL seminormal H<sub>2</sub>SO<sub>4</sub> solution. The normality of the resulting mixture is

- (1) 0.30 N                      (2) 0.60 N                      (3) 0.15 N                      (4) 0.10 N

**Q.123** Calculate normality of 2.1% (w/V) H<sub>2</sub>SO<sub>4</sub> solution.

- (1) 2.14 N                      (2) 4.28 N                      (3) 0.428 N                      (4) 0.214 N

**Q.124** For 1% H<sub>2</sub>SO<sub>4</sub> solution find its normality (approx.)

- (1) 0.1                      (2) 0.2                      (3) 0.4                      (4) 0.02

**Q.125** Na<sub>2</sub>SO<sub>4</sub> is added in water to make 12% w/w solution having density 1.2 g/mL. Correct statement(s) is/are

- (1) Nearly 0.96 mole of Na<sub>2</sub>SO<sub>4</sub> dissolved per kg of H<sub>2</sub>O  
(2) Normality of Na<sup>+</sup> ion equals normality of SO<sub>4</sub><sup>2-</sup> ion  
(3) Molarity of solution is less than molality  
(4) Both (a) and (b)

**Q.126** One litre of N/2 HCl solution is heated in a beaker. It was observed that when the volume of the solution was reduced to 600 mL, 3.25 g of HCl was lost. Calculate the normality of the new solution.

- (1) 1.70                      (2) 0.685                      (3) 0.342                      (4) 0.171

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— End of DPP —

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