ASSIGNMENT 6 — Concentration-3 — Some Basic Concepts of Chemistry

1. 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 solution respectively are **(2019 Main, 12 Jan II)**
(a) 0.2, 11.11 (b) 0.167, 22.20
(c) 0.2, 22.20 (d) 0.167, 11.11

2. The amount of sugar ($C_{12}H_{22}O_{11}$) required to prepare 2 L of its 0.1 M aqueous solution is **(2019 Main, 10 Jan II)**
(a) 17.1 g (b) 68.4 g (c) 136.8 g (d) 34.2 g

3. A solution of sodium sulphate contains 92 g of Na^+ ions per kilogram of water. The molality of Na^+ ions in that solution in mol kg^{-1} is **(2019 Main, 9 Jan I)**
(a) 16 (b) 4 (c) 132 (d) 8

4. The molarity of a solution obtained by mixing 750 mL of 0.5 M HCl with 250 mL of 2 M HCl will be **(2013 Main)**
(a) 0.875 M (b) 1.00 M (c) 1.75 M (d) 0.0975M

5. The mole fraction of a solvent in aqueous solution of a solute is 0.8. The molality (in mol kg^{-1}) of the aqueous solution is **(2019 Main, 12 April I)**
(a) 13.88×10^{-2} (b) 13.88×10^{-1}
(c) 13.88 (d) 13.88×10^{-3}

6. What would be the molality of 20% (mass/mass) aqueous solution of KI? (Molar mass of KI = 166 g mol^{-1}) **(2019 Main, 9 April I)**
(a) 1.48 (b) 1.51
(c) 1.35 (d) 1.08

7. Dissolving 120 g of urea (mol. wt. 60) in 1000 g of water gave a solution of density 1.15 g/mL. The molarity of the solution is **(2011)**
(a) 1.78 M (b) 2.00 M (c) 2.05 M (d) 2.22 M

8. In which mode of expression, the concentration of a solution remains independent of temperature? **(1988, 1M)**
(a) Molarity (b) Normality (c) Formality (d) Molality

9. A molal solution is one that contains one mole of solute in **(1986, 1M)**
(a) 1000 g of solvent (b) 1.0 L of solvent
(c) 1.0 L of solution (d) 22.4 L of solution

10. A sugar syrup of weight 214.2 g contains 34.2 g of sugar ($C_{12}H_{22}O_{11}$). Calculate (i) molal concentration and (ii) mole fraction of sugar in syrup. (i) 0.55 (ii) 9.9×10^{-3} **(1988, 2M)**

11. Calculate the molality of 1.0 L solution of 93% H_2SO_4, (weight/volume). The density of the solution is 1.84 g/mL. 10.42 **(1990, 1M)**

12. 8.0575×10^{-2} kg of Glauber's salt ($Na_2SO_4 \cdot 10H_2O$) is dissolved in water to obtain 1 dm^3 of solution of density 1077.2 kg m^{-3}. Calculate the molality, molarity and mole fraction of Na_2SO_4 in solution. 0.24m, 0.25M, 4.3×10^{-3} **(1994, 3M)**

13. The density of a 3 M sodium thiosulphate solution ($Na_2S_2O_3$) is 1.25 g per mL. Calculate (i) the percentage by weight of sodium thiosulphate (ii) the mole fraction of sodium thiosulphate and (iii) the molalities of Na^+ and $S_2O_3^{2-}$ ions. (i) 37.92 (ii) 0.065 (iii) 7.73m **(1983, 5M)**

14. In a solution of 100 mL 0.5 M acetic acid, one gram of active charcoal is added, which adsorbs acetic acid. It is found that the concentration of acetic acid becomes 0.49 M. If surface area of charcoal is 3.01×10^2 m^2, calculate the area occupied by single acetic acid molecule on surface of charcoal. 5×10^{-19} m^2 **(2003)**
Find the molarity of water. Given: $\rho = 1000$ kg/m^3 55.56 **(2003)**

15. The mole fraction of a solute in a solution is 0.1. At 298 K, molarity of this solution is the same as its molality. Density of this solution at 298 K is 2.0 g cm^{-3}. The ratio of the molecular weights of the solute and solvent, $\left(\frac{m_{solute}}{m_{solvent}}\right)$ is ... 9
. **(2016 Adv.)**

16. A compound H_2X with molar weight of 80 g is dissolved in a solvent having density of 0.4 g mL^{-1}. Assuming no change in volume upon dissolution, the molality of a 3.2 molar solution is 8 **(2014 Adv.)**

17. 29.2% (*w*/*W*) HCl stock solution has density of 1.25g mL^{-1}. The molecular weight of HCl is 36.5 g mol^{-1}. The volume (mL) of stock solution required to prepare a 200 mL solution 0.4 M HCl is 8 mL. **(2012)**