
 **Mustansiriyah University – Collage of Science**

**Department of Chemistry – First Grade – First Term (2018 – 2019)**

**Subject: - Analytical Chemistry Examiner: - Dr: KHITAM JABER NABHAN**

**(B) (25 Degrees for each Question)**

 **Q1 – Define Five of the following terms: -**

1. **Mole Fraction (X), 2- Gram Formula weight, 3-Density, 4- Quantitative Analysis, 5-Volumetric Analysis, 6- Super Saturated Solution.**

**Q2 – Answer the questions:-**

1. **Calculate a pure of Copper containing 30.25** $×$**1023 atoms of Copper?**

**A. wt of Copper = 63.5** $\left(\frac{gm}{mol.}\right).$

1. **The Density of a 2M solution of a Hydrochloric Acid in water is 1.02 Kg\L, Calculate the Mole Fraction of Hydrochloric Acid**

**Q3 – Answer Two only:-**

1. **Calculate the number of mole of Ca (HCO3)2 required to prepare 1.5 mol. of CO2 according to the equation :**

 **Ca (HCO3)2 + 2HCl CaCl2 + 2CO2 + 2H2O**

1. **Calculate Five only the equivalent weight of the following compounds:**

 **1- NaCl, 2- Al(OH)3, 3- NiBr2, 4- H3PO4, 5- CH3COOH, 6- H2S**

1. **How many milliliters of concentrated of Nitric Acid, 70.5 %(** $\frac{wt}{wt}) $**and specific gravity 1.42, are required to prepare 0.5 L of a 0.1 M solution of Nitric Acid?**

**Q4 – Answer the questions:-**

**A. A solution was prepared by dissolving 120 mg Aluminium Phosphate in sufficient water to give 400 mL. Calculate**

 **(a) The Molar concentration of Aluminium Phosphate.**

 **(b) The Molar concentration of Aluminium.**

 **(c) The weight/volume percentage of Aluminium Phosphate.**

 **(d) The number of millimoles of Aluminium ion in 50.0 mL of this solution.**

 **B. How many grams of water must be used to dissolve 100 gm of Sucrose (C12H22O11) to prepare 0.02 Mole Fraction of a Sucrose in the solution?**

**A. wt: - O =16, Al =26, Na = 23, Fe = 56, P = 31, Cu = 63, Zn= 65, Ca = 40, N = 14, Cl = 35.5, K = 39, H = 1, C = 12, and S = 32.**

**(WITH MY BEST WISHES)**

**B : The Density of a 2M solution of a Hydrochloric Acid in water is 1.02 Kg\L, Calculate the Mole Fraction of Hydrochloric Acid?**

**Solve:**

Per litter of solution:

$$M=\frac{wt (gm)}{M.wt (\frac{gm}{mol.})} × \frac{1000}{ V (mL)}$$

$$2.0= \frac{wt (g)}{36.5 (\frac{g}{mol})} × \frac{1000}{1000 (mL)}=73 gm Hydrochloric Acid \left(Solute\right).$$

**Weight = (Volume × Density) = 1.000 L × 1.02 kg/ L = 1.02kg = 1020 gm of Solution.**

**Weight of water = 1020 – 73 = 947 gm water (Solvent).**

**Mol. water =wt / M.wt 947 / 18.0 = 52.62 mol.**

**Mol. HCl =wt / M.wt 73 / 36.5 = 2.0 mol.**

 **Sum of mole = 52.62+ 2.0 = 54.62 mole**

$$Mole fraction for Hydrochloric Acid (X) =\frac{2.0 mole}{54.62 mole} =0.037 $$