ASSIGNMENT-1

NUMERICAL QUESTIONS:

Q.1 A flask contains 1.2 gram of Helium at 1 atm. Pressure and 25ºC. Argon (at wt = 40) is now added to the flask keeping the volume constant till the combined weight of the two gases at the temperature is equal to the weight of air (Mean mol. wt = 29) of the same volume at one atm. pressure and 25ºC. How much of argon is added? What is the mean molecular wt of the He-Ar mixture.

Q.2 A sample of Pure $KHC_2O_4.H_2C_2O_4.2H_2O$ (three replaceable hydrogen) requires 4.62 mol of NaOH for titration. How many milli moles of $KMnO_4$ will the same sample react with.

Q.3 You are to produce 0.4(M) H_2SO_4 solution. With 500ml of 0.9 (M) H_2SO_4 how many ml of 0.1(M) H_2SO_4 should be mixed in nearest possible integers in order to obtain 0.4 (M) H_2SO_4 solution ?

Q.4 To Produce 0.56 Kg polyethylene, $(C_2H_4)_n$ how many gm of CaC_2 is required in nearest possible integers ?

At.wt. : Ca – 40 ; C – 12 ; H – 1

Q.5 In 100 ml sample of hard water, 100 ml of $\left(\dfrac{N}{50}\right)$ Na_2CO_3 solution was added and the mixture was boiled and filtered. The filtrate was neutralised with 60 ml of (N/50) HCl. If the density of hard water sample was 1 gm/ml, determine the permanent hardness of given hard water sample in ppm of $CaCO_3$ in nearest possible integers.

Q.6 The reaction $Cl_2 (g) + S_2O_3^{2-} \longrightarrow SO_4^{2-} + Cl^-$ is to be carried out in basic medium. Starting with 0.15 mole of Cl_2 , 0.010 moles of $S_2O_3^{2-}$ and 0.30 moles of OH^- , how many milli moles of OH^- will be left in solution after the reaction is complete ? Assume no other reaction occurs.

Q.7 Reducing sugars are sometimes characterised by a number Rcu, which is defined as the number of mg of copper reduced by 1 gm of sugar, in which the half reaction of copper is

$$Cu^2 + 2OH^- \longrightarrow Cu_2O + H_2O$$

It is sometimes more convenient to determine the reducing power of a carbohydrate by indirect method. In this method 50 mg of the carbohydrate was oxidised by an excess of $K_3[Fe(CN)_6]$. The $Fe(CN)_6^{4-}$ formed in this reaction required 10 ml of 0.05 (N) Ce^{4+} for reoxidation of $Fe(CN)_6^{4-}$ to $Fe(CN)_6^{3-}$. In this reaction Ce^{4+} is reduced to Ce^{3+}. The atomic weight of Cu is 63.5. Determine the R_{cu} value of the carbohydrate in nearest possible integers.

Q.8 What is the molarity of F^- ions in a saturated solution of BaF_2 ? ($Ksp = 1.0 \times 10^{-6}$) Give answer in the 10^{-5} order .

Q.9 A solution contain 8 g of carbohydrate in 100 g of water has density 1.025 $g/m\ell$ and an osmotic pressure of 5 atm at 27ºC the molar mass of carbohydrate is ………. (in g/mol).

Q.10 Calculate no. of mole in following –
(a) 5.6 g CO_2 (b) 74 g $Ca(OH)_2$
(c) 16 g CH_3OH (d) 30 g CH_3COOH

Q.11 Calculate no. of oxygen atom in following -
(a) $(NH_4)_2 Cr_2O_7$ (2 mole)
(b) H_3PO_4 (6.023×10^3 molecule)
(c) $H_2S_2O_8$(6.023×10^{22} molecule)
(d) COOH (45 g)
      |
   COOH

Q.12 Calculate total no. of atoms in following -
(a) 0.3 mole $(NH_4)_2Cr_2O_7$ (b) 0.1 mole $H_2S_2O_8$
(c) 0.9 mole H_2SO_5 (d) 90 g $C_6H_{12}O_6$

Q.13 If the components of air are N_2, 78%; O_2, 21% ; Ar, 0.9% and CO_2, 0.1% by volume, what would be the molecular weight of air ?

Q.14 Oxygen is present in a 1-litre flask at a pressure of 7.6×10^{-10} mm of Hg at 0ºC. Calculate the number of oxygen molecules in the flask.

Q.15 A polystyrene, having the formula $Br_3C_6H_3(C_3H_8)_n$, was prepared by heating styrene with tribromobenzoyl peroxide in the absence of air. If it was found to contain 10.46% bromine by weight, find the value of n.

Q.16 0.75 mole of solid 'A_4' and 2 moles of gaseous O_2 are heated in a sealed vessel, completely using up the reactants and producing only one compound. It is found that when the temperature is reduced to the initial temperature, the contents of the vessel exhibit a pressure equal to half the original pressure. What conclusions can be drawn from these data about the product of the reaction ?

Q.17 A compound which contains one atom of X and two atoms of Y for each three atoms of Z is made by mixing 5.0 g of X, 1.15×10^{23} atoms of Y and 0.03 mole of Z atoms. Given that only 4.40 g of the compound is formed. Calculate the atomic weight of Y if the atomic weights of X and Z are 60 and 80 amu respectively.

Q.18 Two elements A (at. wt. = 75) and B(at. wt. = 16) combine to give a compound having 75.8% of A. What is the formula of the compound ?

Q.19 116 g of Fe_3O_4 has 1.5 moles of Fe. Calculate the molecular weight of Fe_3O_4 without using atomic weights of Fe and O.

Q.20 In a Victor Meyer apparatus 0.168 g of a volatile compound displaced 49.4 mL of air measured over water at 20ºC and 740 mm of pressure. Calculate the molecular weight of the compound. (Aqueous tension at 20ºC = 18 mm)