**For Assignment**

**Book Examples problems (University Chemistry)-CHEM 101**

1. Calculate the weight of carbon dioxide which can be obtained from the combustion of 12.0 gm of carbon monoxide in excess of oxygen. Also calculate the weight of oxygen consumed.  **[18.9gm,6.85gm]**
2. A certain sulfide of iron contains 46.5% iron and 53.5% sulfur by weight. What is the empirical formula of the sulfide? (Given,at. Wt. of Fe=55.8 and S=32) **[FeS2]**
3. A certain sample of KClO3 when decomposed yielded 637 cubic centimeters of oxygen gas, measured at 273 K and one atmosphere pressure. Calculate the original weight of KClO3 and the weight of the KCl produced. **[2.32gm,1.41gm**]

1. A sample of pure calcium metal weighing 1.35gm was quantitatively converted to 1.88gm of pure CaO. If the atomic weight of oxygen is taken to be 16,what is the atomic weight of calcium? **[40.9]**
2. In the gravimetric determination of Phosphorus, an aqueous solution of Dihydrogenphosphate ion, H2PO4-, is treated with a mixture of ammonium and magnesium ions to precipitate Magnesium ammonium phosphate, MgNH4PO4.6H2O.This is heated and decomposed to Magnesium pyrophosphate, Mg2P2O7, which is weighed. A solution of H2PO4- yielded 1.054gm of Mg2P2O7.What weight of NaH2PO4 was present originally? The reactions are **[1.136gm]**

H2PO4- + Mg++ + NH4+ + 6H2O = MgNH4PO4. 6H2O + 2H+

2MgNH4PO4. H2O = Mg2P2O7 +2NH3 +13H2O

1. A sample of K2CO3 weighing 27.6 gm was treated by a series of reagents so as to convert all of its carbon to K2Zn3 [Fe(CN)6]2.How many grams of this product were obtained? **[11.6 gm]**
2. One gram of a gaseous compound of carbon and hydrogen gives upon combustion 3.3 gm of carbon and 0.899 gm of water. In a separate experiment, the density of a gaseous sample of this compound is found to be 1.78gm\liter under standard condition of temperature and pressure. What is the empirical and molecular formula of the compound? **[C3H4]**
3. One volume of a gaseous compound of Hydrogen, Carbon and Nitrogen gave upon combustion 2 volumes of CO2, 3.5 volumes of H2O and 0.5 volume of N2 , all measured at the same temperature and pressure. What is the empirical formula of the compound? Can the molecular formula be found from these data? [**C2H7N, ethyl amine**]
4. A 1 gm mixture of Cuprous oxide, Cu2O and Cupric oxide, CuO, was quantitatively reduced to 0.839 gm of metallic copper. What was the weight of CuO in the original sample? (Given At.wt of Cu=63.5) [**0.55 gm**]
5. A mixture of Aluminium and Zinc weighing 1.67 gm was completely dissolved in acid and evolved 1.69 litres of Hydrogen, measured at 273K and 1 atm pressure. What was the weight of Aluminium in the original mixture? The equations are,

Zn + 2H+ = Zn++ + H2 Al + 3H+ = Al3+ + 3/2 H2 (Given, At.wt. of Zn =65.4) [**1.24 gm**]

1. A carefully purified sample of Potassium chlorate,KClO3, weighing 4.008 gm, was quantitatively decomposed to 2.438 gm of Potassium chloride, KCl, and Oxygen.The potassium chloride was dissolved in water and treated with a silver nitrate solution. The result was a precipitate of Silver chloride, AgCl , weighing 4.687 gm. Under further treatment the silver chloride was found to contain 3.531 gm of silver. What are the atomic weights of *silver, chlorine and potassium* relative to O=15.999? [**107.9**, **35.4** and **39.1**]

**Exercise Problems .**

1. An oxide of Antimony is found to contain 24.73% oxygen. What is its empirical formula?

(At.wt. of Sb=121.8 )  **[Sb2O5]**

1. When 0.210 gm of a compound containing only hydrogen and carbon was burned, 0.660 gm of CO2 was recovered.What is the empirical formula of the compound? A determination of the density of this hydrocarbon gave a value of 1.87gm/liter at 273K and 1 atm. What is the molecular formula of the compound? [**CH2, C3H6**]
2. A sample of Europium dichloride, EuCl2,weighing 1 gm is treated with excess aqueous Silver nitrate , and all the chloride is recovered as 1.29 gm of AgCl. What is the atomic weight of Europium?  **[151.47 gm]**
3. A sample of an oxide of iron weighing 1.6 gm was heated in a stream of hydrogen gas until it was completely converted to 1.12 gm of metallic iron.What is the empirical formula of the iron oxide? ( given At.wt.=55.8) **[Fe2O3]**
4. When Barium bromide , BaBr2, is heated in a stream of chloride gas , it is completely converted to Barium chloride, BaCl2.From 1.5 gm of BaBr2 just 1.05 gm of BaCl2 is obtained .Calculate the atomic weight of Barium from these data. (Given, At.wt. Br=79.9) **[136.5 gm]**
5. A 0.578 gm sample of pure tin is treated with gaseous fluorine until the weight of the resulting compound is constant at a value of 0.944 gm. What is the empirical formula of the tin fluoride formed? Write an equation for its synthesis. (At.wt. of Sn =118.7) **[SnF4]**
6. Equal weights of zinc metal and iodine are mixed together and the iodine is completely converted to ZnI2.What fraction by weight of the original zinc remains unreacted? (At.wt. of Zn =65.4, I = 126.9) **[0.74]**
7. A 4.22 gm sample of a mixture of CaCl2 and NaCl was treated to precipitate all the calcium as CaCO3, which was then heated and converted to pure CaO. The final weight of the CaO was 0.959gm.What was the percentage by weight of CaCl2 in the original mixture? **[45.02%]**
8. An alloy of Aluminium and Copper was treated with aqueous HCl. The aluminium dissolved according to the reaction the reaction Al + 3H+ → Al3+ +3/2H2, but the copper remained as the pure metal.A 0.35 gm sample of the alloy gave 415cc of H2 measured at 273K and 1 atm-pressure. What is the weight percentage of Al in the alloy? **[95.3%]**
9. A sample of pure lead weighing 2.07 gm is dissolved in nitric acid to give a solution of lead nitrate .This solution is treated with hydrochloric acid, chlorine gas, and ammonium chloride.The result is a precipitate of Ammonium hexachloroplumbate,(NH4)2PbCl6.(456.2) What is the maximum weight of this product that could be obtained from the lead sample? (At.wt. of Pb =207.2)  **[4.5576 gm]**
10. A 0.596 gm sample of a gaseous compound containing only Boron and Hydrogen occupies 484cc at 273 K and 1-atm pressure. When the compound was ignited in excess oxygen, all its hydrogen was recovered as 1.17 gm of H2O , and all the boron was present as B2O3.What is empirical formula , the molecular formula, and the molecular weight of the Boron-hydrogen compound ?What weight of B2O3 was produced by the combustion? (At.wt. of B =10.8**) [BH3, B2H6, 27.6, 1.51gm**]

1. A sample of an unknown oxide of barium gave upon exhaustive heating 5gm of pure BaO and 366cc of oxygen gas measured at 273 K and 1 atm-pressure. What is the empirical formula of the unknown oxide? What weight of oxide was present initially? (At.wt. of Ba =137.33) **[BaO2, 5.52 gm]**
2. A mixture of KBr and NaBr weighing 0.56 gm was treated with aqueous Ag+ and all the Bromide ion was recovered as 0.97 gm of pure AgBr. What was the fraction by weight of KBr in the original sample? (At.wt. of Ag =107.8**) [0.377]**