**CHEM 1114**

**Challenge problem 3a,3b**

**Due Friday 19 October 2012 in class**

**(6 pts/3 pts each)**

**Challenge 3a: text Problem 110, page 143**

***When M2S3 is heated in air it converts entirely to MO2. A 4.000 gram sample of***

***M2 S3 loses 0.277 grams when heated. What is the average atomic mass in g/mol of M ?***

**The implied reaction is:**

2O2+ M2S3🡪 2MO2 + 3 S

 **4.000 g 4.000-0.277=**

 **3.723 g**

* **2\*Mol M2S3 = moles MO2**

**Recall that: moles = mass/MW so:**

**2\* 4 g = 3.723 g**

 **MW M2S3 MW MO2**

**MW M2S3 = 2M + 3S, where M and S are the atomic masses of M and S**

 **=2M + 3\*32 = 2M + 96**

**MW MO2 = M + 2O , where M and O are the atomic masses of M and O**

 **= M + 2\*16 = M +32**

 **Plug into ratios above:**

**2\*4 \_\_ = 3.723**

**2M + 96 M + 32**

**Simplify algebraically:**

**8(M+32) = 3.723(2M +96)**

**8M + 256 = 7.446M +357.408**

**8M-7.446M = 0.554M = 357.408-256=101.408=> M=101.408/0.554=183.05 g/mol**

**(tungsten, W )**

**Challenge 3b:**

**If we burn 1.0 g AsX5 in O2 the arsenic (As) releases all the X and forms a pure arsenic oxide, As2O3 by consuming 0.09516 g O and expelling 0.7028 g X**

**as X2. Given that X is a halogen, use the data provided to identify it. (Show work !)**

**0.09516 g O = 0.09516 g/16 g mol-1 =0.005947 mol O in As2O3 sample formed**

**Since there are 2 As for every 3 O in As2O3, there are:**

 **2/3 (0.005947) mol As = 0.003965 mol As in the same sample**

**Since these As are also present in the original AsX5, it means 5\*0.003965 moles = 0.019825 mol of X are present and combined in the 1.0 g sample.**

**We know this sample of X weighs 0.7028 g.**

 **Atomic weight = mass/moles**

**∴ atomic weight of X = 0.7028/0.019825= 35.45 g/mol => Chlorine**