**Homework #9: Chemistry 1013 Spring 2014**

**Due Wed 23 April in class 24 pts**

Your name: \_\_\_\_answers\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**9.0** A compound composed of N, O and H has the following weight percent composition:

22.22 % N, 76.19% NO 1.58 % H. The molecular weight of the compound is 252 g/mol.

**a) what is the empiric formula for the compound ? HNO3 (63.0 g/mol)**

**element grams AW (g/mol) n=moles n/nmin**

**N 22.22 14 1.587 1**

**O 76.19 16 4.762 4.762/1.587=3**

**H 1.58 1 1.58 1**

**b) what is the molecular formula for the compound? (2 pts total)**

**252/63 = 4=> H4N4O12**

**9.1**. A 1.00 gram sample of N is burned in oxygen to form a nitrogen oxide weighing 3.2857 g.

**What is the empiric formula of the nitrogen oxide compound ? (1 pt)**

**Gram N =1.00 gram O = 3.2857-1=2.2857 g**

**Mol N=/14=0.0714 mole O= 2.2857/16=0.1428**

**Mol O/mol N= 0.1428/0.0714=2.0**

**N1O2**

**9..2 Balance these equations with whole-numbered coefficients. (2 pts per correct line)**

\_2\_Cu + \_2\_H2S + \_5\_O2 🡪 \_2\_CuSO4 + \_2\_H2O

\_2\_ C4H10 + 13\_\_O2 🡪 \_8\_\_CO2 + \_10\_\_H2O

**9.3 Stoichiometry calculations (show work or no credit) 3 pts each/18 pts total**

Given the balanced equation:

6HCl + 2Al -----🡪 2AlCl3 + 3H2

36 27 132 2 g/mol

a) **moles to moles:** How many moles of Al must be added to produce 15 moles of H2 ? \_10\_\_mol Al

mol Al/mol H2 = 2/3 = x/15=> x=(2/3)\* 15=10

b)**moles to weight:** How many grams of H2 are created by reacting 10 moles of HCl ? \_\_10\_\_ g H2

mol H2/mol HCl = 3/6= x/10=> x mol H2= 5 mol H2.

5 mol H2 \* 2 g H2/mol = 10 g

c) **weight to moles:** How many moles of HCl can combine with 90 g of Al ? 10\_\_\_mol HCl

mol Al= 90/27=3.3333

mol HCl/Mol Al =6/2= x/3.333 => x= 3.3333\*6/2=9.9999~10 mol HCl

**d) weight to weight:** How many grams of Al must react to form 1.1111 grams of H2 ? \_\_10\_\_ g Al

1.111 g /2 g mol-1 =0.5555 mol H2

Mol Al/mol H2= 2/3 = x/0.555 => x = mol Al= 2\*0.5555/3=0.3703 mol Al

0.3703 mol \*27 g/mol=10 g

e**) weight to count:** How many molecules of HCl are needed to make 73.065 g AlCl3 10\*1023 molecules HCl

73.065 g AlCl3/132 g mol-1 =0.554 mol AlCl3

Mol HCl/mol AlCl3 = 6/2= x/0.554=> x= 6\*0.554/2=1.6605 mol HCl =1.6605\*6.02\*1023 molecules HCl=10\*1023

**f) count to weight:** how many grams of Al produce 3.333 \*1023 molecules of H2 ? \_10\_\_\_ g Al

3.333\*1023 molecules H2/6.02\*1023 =0.5536 mol H2.

Mol Al/mol H2 = 2/3 = x/0.5536=> x= mol Al= 2\*0.5536/3=0.3691 mol Al

0.3691 mol\*27 g/mol=9.97 g ~10 g