**Homework #5: Chemistry 1013 Spring 2015**

**Due Friday March 13**

**\_\_\_\_\_/25**

**Your name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Show work for all problems or you will receive no credit**

**5.1.** A sample of octane, C8H18 has a molecular weight=114 g/mol. A combustion scientist has

burned 19 μg of octane in a micro-reactor along with excess oxygen. How many molecules of octane did the scientist react ? Assume 1 mol count=6\*1023

19 ug=19\*10-6 g octane

Mol octane = 19\*10-6/114 =1.666\*10-7mol (divide up)

Molecules octane =1.666\*10-7 \*6\*1023 =1\*1017 (multiply down)

\_\_\_\_\_1\*1017\_\_\_\_\_\_\_\_octane molecules 3 pts

**5,2**. Circle the just legitimate empiric formulas among the compositions listed below: (2 pts)

a)H2O2 b)C3H9O c) P3H12Cl5 b) C8H18O2 c)N2O6

**5.3.** A sample of a mysterious green compound extracted from a sea slug is found to contain

0.279 g C, 0.168 g N and 0.0581 g H.

a) what is the empiric formula for the green compound ?

**0.279/12= mol C=0.0235 => 0.235/0.012~2**

**0.168/14=mol N=0.012=> 0.012/0.012=1**

**0.0581/1=mol H=0.058 0.058/0.012=4.8~5**

C2H5N

\_\_\_\_\_\_\_\_\_\_\_\_\_\_green compound’s empiric formula (3 pts)

b) The molecular weight of the green compound is later found to be 215 g/mol. What is the

actual molecular formula for the green compound ?

MW of empiric compound = 43

214/43=5=> C10H25N5

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ green compound’s molecular formula (2 pts)

**5.4.** A large sample of hydrocarbon CxHy is burned in excess oxygen to produce 176 grams of

CO2 and 36 grams of H2O . Given the molecular weights of CO2 and H2O, 44 and 18 g/mol

respectively, what is the empiric formula for the hydrocarbon ?

mol CO2= 176/44=4mol C

moles H2O=36/18=2 =1/2 mol H=> mol H = 2\*2=4

mole C=4, mol H=4 =>

\_\_\_\_CH\_\_\_\_\_\_\_\_\_\_\_\_\_ empiric formula for CxHy  (3 pts)

5.5 The molecular formula for the hallucinogenic compound LSD (lysergice diethylamide) is

C20H25N3O, molecular mass 323 g/mol. (10 pts total/2 pts per problem)

a) how many moles of LSD do you have in a sample containing 24 g C ?

24 g C/12=2 mol C

Mol LSD/mol C=1/20 =x/2=> x=0.1

\_\_\_\_\_0.1\_\_\_\_\_mol LSD

b) how many grams of O are in 0.5 moles of LSD ?

mol O/mol LSD= 1/1=> 0.5 mol LSD=> 0.5 mol O

0.5 mol O\*16= 8 g

\_\_\_8\_\_\_\_\_ g O

c) how many molecules of LSD do you have in a sample containing 0.0070 g N ?

(Assume 1 mol count =6\*1023. The atomic mass of N=14 g/mol)

0.007 g N/14 = mol N=0.0005

Mol LSD/mol N = 1/3= x/0.0005 => x= mol LSD = 1.6666\*10-4

Molecules LSD =1.666\*10-4 \*6\*1023 =1\*1020 \_\_\_1\*1020\_\_\_\_\_\_\_\_\_ molecules LSD

d) How many moles of H are combined with 0.15 g C in LSD ?

0.15 g C/12 = mol C=0.0125

Mol H/mol C= 25/20= x/0.0125

X=mol H=0.0156

\_\_0.0156\_\_\_\_\_\_\_\_\_\_\_\_ mol H

e) How many grams of H are in 12.92 g of LSD ?

12.92/323= mol LSD=0.04

Mol H/mol LSD=25/1=x/0.04

X=mol H=25\*0.04=1 mol = 1 g

\_\_\_\_\_1 g\_\_\_\_\_\_\_ g H