**Exam 2 General Chemistry 1114 Alfred State College Monday 21 October 2013 A**

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

* 1. **English-metric conversions (2 pts each/4 pts total)**

Conversion factors 1 meter = 1.094 yards= 3.281 feet 1 inch=2.54 cm=25.4 mm

1 kilometer= 0.622 miles 1 liter=1000 mL = 0.275 gallons

1 mile=5280 feet =1760 yards 1 lb =454 g = 0.454 kg =16 oz

12 in = 1 foot

1. How many ft are in 1.220 meters ? \_\_4\_\_\_\_\_ ft in 1.220 meters ( report to nearest 1 ft)  
   1.220 m\*3.281 ft/m=4 ft
2. How many liters in 5.50 gallons? \_\_20\_\_\_ liters in 5.50 gallons (report to nearest 1 L)

**5.50 gal \* 1 L/0.275 gallons =20 L**

**2.2. Metric-metric symbols and conversions (14 pts)**

1) fill in the missing symbols, magnitudes and names (2 pt/line; 8 pts total)

|  |  |  |
| --- | --- | --- |
| **Prefix name** | **Symbol(letter)** | **Magnitude (10x)** |
| **nano** | **n** | **10-9** |
| **micro** | **μ** | **10‑6** |
| **Tera** | **T** | **1012** |

2) convert the metric units below to the indicated, alternative Metric measure (2 pts each/ 6 pts total)

1. 1.0\*10-8 kg = \_\_\_\_\_10\_\_\_\_\_\_\_\_\_\_µg
2. 0.009 Gs = \_\_\_\_\_9\_\_\_\_\_\_\_\_\_\_ Ms
3. 80 cm = \_\_\_\_\_\_8\_\_\_\_\_\_\_\_\_ dm

**2.3. unknown metal density determination (4 pts)**

A flask pycnometer has a volume of 10.000 mL. After taring, metal is placed in the flask. The metal is found to weigh 25.00 grams. The flask and metal are then re-tared and the flask containing metal is filled with water. The added water is found to weigh 7.500 g. Given that the density of water is 1.000 g/mL, what is the metal’s density in g/mL?  **(show work or no credit !!!)**

Volume of metal = 10-7.5 = 2.5 mL (since d=1 for water and water mass filling space not filled by metal = 2.5 g)

Dmetal = 25 g/2.5 mL = 10 g/mL

Unknown metal density=\_\_10\_\_g/mL \_\_\_/22

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**2.4 egg arithmetic (2 pt each/8 pts total))**

A dozen monstrously large eggs from Aldi’s weighs 4000 g. Assuming 1 dozen =12 count:

1. If you have 12,000 grams of eggs, how many dozen eggs do you have ? \_\_\_3\_\_\_\_\_\_\_\_ dozen eggs

12.000/4000=3 dozen

1. If you have 0.2 dozen eggs, what is the total mass of eggs you have ? \_\_800\_\_\_\_\_\_\_\_ grams eggs

0.2 doz\*4000=800 g

1. If you have 30 eggs, what do they weigh? \_10,000\_\_\_\_\_\_ grams eggs

30/12=2.5 dozen => 2.5 doz \* 4000 g/doz=10,000 g

1. If you have 50,000 grams of eggs, how many eggs do you have ? \_\_150\_\_\_\_\_\_\_\_ egg count

50,000/4000 dozen =12.5 dozen \*12 eggs=150 egg

**2.5. Simple mole-weight-count conversions (3 pts each/18 pts total) SHOW WORK !!!**

Assuming that a mole count= 6\*1023 and the gram atomic masses: C=12 g/mol N=14 g/mol H= 1 g/mol

1. What is the molecular weight (g/mol) of nicotine[**C**](http://en.wikipedia.org/wiki/Carbon)**10**[**H**](http://en.wikipedia.org/wiki/Hydrogen)**14**[**N**](http://en.wikipedia.org/wiki/Nitrogen)**2 ? \_162\_\_ MW nicotine (g/mol)**

10\*12+14\*1+2\*14=162

1. What does 0.06178 moles of nicotine weigh ? \_\_\_10\_\_\_\_ g nicotine

0.06178 mol\*162 g/mol=10 g

1. How many moles of nicotine in 1296 g of nicotine ? \_\_\_8\_\_\_\_\_\_ mol nicotine

1296 g/162 g mol-1 = 8 mol

1. How many moles of nicotine in 3.6\*1024 molecules of nicotine ? \_\_\_\_6\_\_\_\_ mol nicotine

3.6\*1024 =6

**6\*1023**

1. How many grams of nicotine are found in 1.4815\*1022 molecules of nicotine ? \_\_4\_\_\_\_grams nicotine

1.4815\*1022/6\*1023=2.469\*10-2 mol =>2.469\*10-2 mol\*162 g/mol=4 g

1. How many molecules are in 5.4 g of nicotine ? \_\_2\*1022\_\_\_molecules nicotine

5.4/162 mol = 0.03333 mol

0.0333\*6\*1023=2\*1022

\_\_\_\_/26

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**2.6. Stoichiometry Problems (`Body Parts’): SHOW WORK !!!! (5 pts each/25 pts total)**

The molecular mass of dynamite=TNT (C7H5N3O6) is 227 g/mol.

Given the atomic masses for C=12 g/mol, H = 1 g/mol, N = 14 g/mol O=16 g/mol

1. How many moles of O are combined with 2.333 moles C in TNT ? \_\_2\_\_\_\_ mol O

2.333 mol C \* 6 mol O/7 mol C=2 mol O

1. How many grams of N are in a sample of TNT containing 0.357 mol H ? \_\_3\_\_\_\_\_ g N

0.357 mol H \* 3 mol N/5 mol H =0.214 mol N=> 0.214 mol N\*14 g/mol N=3 g

1. How many moles of TNT are present if a sample of it contains 84 g C ? \_\_1\_\_\_\_ mol TNT

84 g C/12 g mol-1 = 7 mole C

Mol TNT/mol C = x/7 =1/7=> x= 1

1. A sample of TNT contains 1.428\*1023 atoms of H. How many g of N are also present? \_\_2\_\_\_\_\_g N

1.428\*1023 =0.238 mol H

6.0\*1023

Mol N/mol H=3/5=x/0.238=> mol N=3\*0.238/5=0.1428

mass N= 0.1428\*14=2

1. 2.625 g of C are in a sample of TNT. How many grams of O are combined with it ? \_\_3\_\_\_\_\_\_ g C

2.625 g/12 g mol-1 =0.21875 mol C

Mol O/mol C=6/7=x/0.21875=> x=0.1875

0.1875\*16=3 g

\_\_\_\_/25

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**2.7. % Composition problems ( 5 pts each/10 pts total)**

1. An alcohol sample contains 60 wt % C, 26.667 wt % O and 13.333 wt % H. What is the alcohol’s empiric formula?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | mass | AW (g/mol) | mol | Mol ratio (mol/min mol) |
| C | **60** | 12 | 5 | 3=5/1.666 |
| O | **26.667** | 16 | 1.666 | 1 =1.6666/1.666 |
| H | **13.333** | 1 | 13.333 | 8=13.333/1.666 |

**Empiric formula:** \_\_\_\_\_\_\_C3H8O\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. A small protein molecule contains the following masses of component elements: 9.58 g N, 16.44 g C 21.92 g O and 3.075 g H. What is the **molecular formula** given that the molecular weight of the compound is 447 g/mol?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element | mass | AW (g/mol) | mol | Mol ratio(mol/min mol) | Mol ratio\* factor (2) |
| N | 9.58 | 14 | 0.684 | 1=0.684/0.684 | **2** |
| C | 16.44 | 12 | 1.37 | 2=1.37/0.684 | **4** |
| O | 21.92 | 16 | 1.37 | 2=1.37/0.684 | **4** |
| H | 3.075 | 1 | 3.075 | 4.5=3.075/0.684 | **9** |

**Empiric MW=149 g/mol**

**Molecular formula** = \_\_N6C12O12H27\_**\_\_\_\_\_\_\_\_\_\_ 447/149=3**

**2.8 Combustion Problem (4 pts) show work or no credit**

A hydrocarbon sample, CxHy, is burned in pure O2 to form 0.480 g CO2 and 0.393 g H2O. Given that 1 mole CO2 weighs 44 g and 1 mole of H2O weighs 18 grams, what is the empiric formula of the hydrocarbon CxHy ?

0.48/44= mol CO2 = mol C=0.010909

0.393/18=mol H2O= ½ mol H=0.0218=> mol H=0.04366

C0.010909H0.04366 =>

**CxHy = \_\_\_\_CH4\_\_\_\_\_\_\_\_\_\_**

**2.9 Reaction Balancing** (1 pt each/ 11 pts total)

Balance these reactions:

\_\_1\_ CH4 + \_\_2\_O2 🡪 \_1\_\_CO2 + \_2\_H2O

\_\_2\_H2O 🡪 \_2\_H2 + \_1\_O2

\_\_2\_AgNO3 + \_\_1\_ CaCl2 🡪 \_\_2\_AgCl + \_1\_Ca(NO3)2

**2.10 Naming ( 1 pt/name; 2 pts total)**

phosphite = PO3-3 carbonate = CO3-2

Use the Periodic Table provided to name or determine the formula of the four compounds below:

1. Lithium carbonate: formula = \_\_\_\_Li2CO3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Cu3PO3 name= \_\_\_\_\_copper(I) phosphite\_\_\_\_\_\_\_\_\_\_\_

\_\_\_/27