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

Your name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 pt)

* 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 m are in 16.405 ft ? \_\_\_5\_\_\_\_ m in 16.405 ft ( to nearest m)
16.405 ft\*1 m/3.281 ft=5 m
2. How many gallons in 18.1818 liters \_\_\_5\_\_\_\_ gallons in 18.1818 L ( to nearest gallon)

18.1818 L\*0.275 gal/L=5 gal

**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)** |
|  | **n** |  |
| **Giga** | **G** | **109** |
| **Tera** | **T** | **1012** |
| **Micro** | **μ** | **10-6** |

2) convert the metric units below to the indicated, alternative Metric measure (2 pts each/ 8 pts total)

1. 5.0\*10-8 kg = \_\_\_\_\_\_\_50\_\_\_\_\_\_\_µg
2. 0.040 Gs = \_\_\_\_\_\_\_40\_\_\_\_\_\_ Ms
3. 300 cm = \_\_\_\_\_\_30\_\_\_\_\_\_\_ 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 50.00 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 3.7500 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 !!!)**

Mass of metal = 10-3.75=6.25 mL (since mw=Vw at d= 1.000)

D=50 g/6.25=8 g

 Unknown metal density=\_\_8\_\_\_g/mL \_\_\_/22 pts

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

A dozen large eggs from Aldi’s weighs 500 g. Assuming 1 dozen =12 count:

1. If you have 10,000 grams of eggs, how many dozen eggs do you have ? \_\_\_20\_\_\_\_\_\_ dozen eggs

10,000 g/500 g doz-1 =20 doz

1. If you have 0.2 dozen eggs, what is the total mass of eggs you have ? \_\_\_100\_\_\_\_\_\_ grams eggs

0.2 doz\*500 g/doz= 100 g

1. If you have 30 eggs, what do they weigh ? \_\_1250\_\_\_\_\_ grams eggs

30/12 \* 500 g =1250g

Doz g/Doz

1. If you have 50,000 grams of eggs, how many eggs do you have ? \_1200\_\_\_\_\_\_\_\_ egg count

50,000g/500 g doz-1 = 100 doz => 100 doz \*12= 1200 eggs

**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 0.03704 moles of nicotine weigh ? \_\_\_6\_\_\_\_\_\_ g nicotine

0.03704\*162=6 g

1. How many moles of nicotine in 1620 g of nicotine ? \_\_\_10\_\_\_\_\_ mol nicotine

1620/162 =10 moles

1. How many moles of nicotine in 1.8\*1024 molecules of nicotine ? \_\_\_\_3\_\_\_\_ mol nicotine
2. How many grams of nicotine are found in 3.7037\*1022 molecules of nicotine ? \_\_10\_\_grams nicotine

**3.7037\*1022/6.0\*1023 = mol nicotine=0.06173 mol nicotine=> 0.06173\*162=10 g**

1. How many molecules are in 27 g of nicotine ? \_\_1023\_\_\_\_molecules nicotine

27/162= mol nicotine=0.1666 mol=> 0.1666\*6\*1023 =1023

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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 4.666 moles C in TNT ? \_\_\_4\_\_\_\_ mol O

4.666 mol C \* 6 mol O/7 mol C=4 mol O

1. How many grams of N are in a sample of TNT containing 0.714 mol H ? \_\_\_6\_\_\_\_ g N

0.714 mol H\*3 mol N/5 mol H =0.4284 mol N=>0.4284 mol N\*14 g/mol N=6

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 mol C

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

1. A sample of TNT contains 3.0\*1025 atoms of H. How many moles of N are present? \_\_30\_\_\_mol N

3\*1025 atom H/6.0\*1023 atoms H mol-1 =50 mol H

Mol N/mol H= 3/5=x/50 => x= 30

1. 1.75 g of C are in a sample of TNT. How many grams of O are combined with it ? \_\_\_2\_\_\_\_ g C

1.75/12 = mol C=0.1458 mol C

Mol O/mol C=6/7=x/0.1458 => mol O=6/7 \* 0.1458=0.125 mol O=> 0.125 \*16 g/mol=2

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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 0.022 g CO2 and 0.0045 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 ?

Mol CO2 =0.022/44=0.0005 mol C

Mol H2O=0.0045/18=0.00025 mol H2O=> 2\*0.00025 mol H =0.0005 mol H

C0.0005H0.0005 =>

**CxHy = \_\_\_\_CH\_\_\_\_\_\_\_\_\_\_**

**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

**2.8 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\_\_\_\_\_\_\_\_\_\_\_

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