**Exam 2 General Chemistry 1114 Alfred State College Monday 29 October 2012 A**

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

* 1. **English-metric conversions (2 pts each/6 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 98.43 feet ? \_\_**30**\_\_\_\_\_m in 98.43 ft
*98.43 ~~ft~~\*1 m/3.281 ~~ft~~ =30 m*
2. How many oz in 567.5 g ? \_\_\_**20**\_\_\_\_oz in 567.5 g

*567.5 ~~g~~\* 16 oz/454 ~~g~~=20 oz*

1. How many liters in 2.75 gallons? \_\_\_**10**\_\_\_\_ liters in 2.75 gallons

*2.75 ~~gallons~~ \*1 liter/0.275 ~~gallons~~ =10 liters*

**2.2. Metric-metric symbols and conversions (16 pts)**

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

|  |  |  |
| --- | --- | --- |
| **Prefix name** | **Symbol(letter)** | **Magnitude (10x)** |
| **pico** | **p** | **10-12** |
| **micro** | **μ** | **10-6** |
| **giga** | **G** | **109** |
| **centi** | **c** | **10-2** |

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

1. 1.0\*10-7 kg = \_\_\_\_\_\_**100**\_\_\_\_\_\_\_\_\_\_µg
2. 0.09 Gs = \_\_\_\_\_\_\_ **90\_\_\_\_\_\_\_\_\_** Ms
3. 80 cm = \_\_\_\_\_\_ **8**\_\_\_\_\_\_\_\_ dm
4. 0.07 ns = \_\_\_\_\_\_**70**\_\_\_\_\_\_\_\_ ps

**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 !!!)**

 ***Space occupied by water =7.500 mL so space occupied my 25.00 grams metal = 10-7.5=2.5 mL***

***D = mass metal/Vmetal = 25.000 g/2.5 mL = 10 g/mL***

 Unknown metal density=\_\_10\_\_\_g/mL \_\_\_/27 pts (includes name)

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

A dozen monstrously large eggs from Aldi’s weighs 2000 g. Assuming 1 dozen =12 count:

1. If you have 10,000 grams of eggs, how many dozen eggs do you have ? \_\_\_\_\_**5**\_\_\_\_\_\_ dozen eggs
2. If you have 0.2 dozen eggs, what is the total mass of eggs you have ? \_\_400\_\_\_\_\_\_\_\_\_ grams eggs
3. If you have 30 eggs, what do they weigh ? \_\_5000\_\_\_\_\_\_\_ grams eggs

30/12 = # dozen eggs=2.5 ~~dozen~~ \* 2000 g/~~dozen~~ =5000 g

1. If you have 50,000 grams of eggs, how many eggs do you have ? \_\_\_300\_\_\_\_\_\_\_ egg count

50,000 g/2000 g doz-1 = 25 doz => 25 doz\*12 egg/doz = 300 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 0.01852 moles of nicotine weigh ? \_\_\_\_**3**\_\_\_\_\_ g nicotine

0.01852 mol\*162 g/mol=3 g

1. How many moles of nicotine in 810 g of nicotine ? \_\_\_\_5\_\_\_\_\_\_ mol nicotine

810 g/162 g mol-1 =5 mol

1. How many moles of in 4.2\*1024 molecules of nicotine ? \_\_\_\_7\_\_\_\_ mol nicotine

**4.2\*1024/6\*1023 = 7 mol**

1. How many grams of nicotine are found in 3.7037\*1022 molecules of nicotine ? \_\_10\_\_\_\_grams nicotine

(3.7037\*1022/6.0\*1023) =0.0617 mol =0.0617 mol \*162 g/mol=10 g

1. How many molecules are in 13.5 g of nicotine ? \_**5E22**\_\_\_\_\_\_molecules nicotine

13.5 g/162 g mol-1 = 0.08333 mol = 0.08333 mol\*6\*1023 molecules/mol=

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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

**Mol O/mol C = 6/7= m/2.333 => m= 6\*2.333/7=2**

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

Mol N/mol H = 3/5=m/0.357 => m =3\*0.357/5=0.2142 mol N

Grams N = 14\*0.2142 =3 g

1. How many moles of TNT are present if a sample of it contains 42 g C ? \_0.5\_\_\_\_\_ mol TNT

42 g C = 42 g C/12 g mol-1 = 3.5 mol C

Mol TNT/mol C=1/7= m/3.5=> m= 0.5

1. A sample of TNT contains 1.5\*1025 atoms of H. How many moles of TNT are present? \_\_\_\_5\_\_\_mol TNT

Mol H=1.5\*1025/6\*1023 =25

Mol TNT/Mol H = 1/5= m/25=> m =5

1. 0.875 g of C are in a sample of TNT. How many grams of O are combined with it ? \_\_1\_\_\_\_\_\_ g C

0.875 g/12= 0.07129 mol C

Mol O/mol C= 6/7=m/0.07129=> m(O) = 6\*0.07129/7=0.0625 => 0.0625 mol\*16 g/g=1

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**2.7. % Composition problems ( 4 pts each/8 pts total)**

1. An alcohol sample contains C,H andO at the weight % below. What is the alcohol’s empiric formula?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | mass | AW (g/mol) | moles | Mol/min mol |
| C | **60.000** | 12 | 60/12=5 | 3 |
| O | **26.667** | 16 | 26.667/16=1.666 | 1 |
| H | **13.333** | 1 | 13.333 | 8 |

**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 empiric formula given that the molecular weight of the compound is 1192 g/mol?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element | mass | AW (g/mol) | N=mass/AW | N/Nmin | X2 |
| N | 9.58 | 14 | 0.684 | **1** | **2** |
| C | 16.44 | 12 | 1.37 | **2** | **4** |
| O | 21.92 | 16 | 1.37 | **2** | **4** |
| H | 3.075 | 1 | 3.075 | **4.5** | **9** |

**Empiric formula** = \_\_\_**\_\_\_\_C4H9O4N2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2.8 Reaction Balancing** (2 pt each/ 6 pts total)

Balance these reactions:

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

\_\_\_2H2O 🡪 \_2\_H2 + \_1\_O2

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

**2.9 Naming ( 1 pt/name; 4 pts total)**

Given: acetate = C2H3O2-1 phosphite = PO3-3 carbonate = CO3-2 nitrate = NO3-1

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

1. Nitrogen monoxide: formula= \_\_\_\_NO\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Ca3N2name= \_\_\_\_calcium nitride\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Lithium carbonate: formula = \_\_\_\_Li2CO3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Cu3PO3 name= \_\_\_\_\_\_Cu(I) phosphite\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2.9 Simple Reaction Stoichiometry Problem (3 pts)**

Given the balanced reaction:

 **2C8H18 + 25O2 🡪 16CO2 + 18H2O**

***MW 114 32 44 18 g/mol***

How many grams of water form when 0.061728 mol C8H18 are burned ? (show work or no credit)

0.061728 mol C8H18 \*18 mol H2O/2 mol C8H18 \*18 g /mol H2O =10.0

 \_\_**10.0\_\_\_\_** grams water from

 0.061728 mol C8H18

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