**Exam 2 General Chemistry 1114 Alfred State College Monday 17 October 2011 Section 2 (Fong)**

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

* 1. **English-metric conversions (2 pts each/8 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 8 pints = 1 gallon

1. How many cm are in 65.6167 feet ? \_\_\_\_2000\_\_\_\_\_\_\_\_ cm in 65.6167 ft
65.6167 ~~ft~~\*12 ~~in~~/~~ft~~ \*2.54 cm/~~in~~=2000 cm
2. How many oz in 28.375 kg ? \_\_\_\_1000\_\_\_\_\_\_\_\_ oz in 28.375 kg

28.365 ~~kg~~ \* (16 oz/0.454 ~~kg~~ )= 1000

1. How many mm in 0.5468 yards ? \_\_\_\_\_500\_\_\_\_\_\_\_\_ mm in 0.5468 yds

0.5468 ~~yd~~ \*(3 ft/~~yd)~~ \*(12 in/ft)\*(2.54 cm/in) \*(10 mm/cm)

1. How many gallons in 909.09 liters ? \_\_\_\_\_\_250\_\_\_\_\_\_\_ gallons in 909.09 liters

909.09 ~~L~~ \* (0.275 gal/L) =250 gal

**2.2. Metric-metric symbols and conversions (19 pts)**

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

|  |  |  |
| --- | --- | --- |
| **prefix** | **Symbol(letter)** | **Magnitude (10x)** |
| **nano** | **n** | **10-9** |
| **pico** | **p** | **10-12** |
| **giga** | **G** | **109** |
| **milli** | **m** | **10-3** |

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

1. 9.0\*10-9 kg = \_\_\_\_\_\_\_9\_\_\_\_\_\_\_\_\_µg 9.0\*10-9 kg/µg = 9\*10-9 \*103/10-6 = 9
2. 0.008 Gs = \_\_\_\_\_\_\_8\_\_\_\_\_\_\_\_ Ms 0.008 Gs/Ms= 0.008 \*109/Ms= 0.008\*109/106 = 8
3. 7\*1024 pm = \_\_\_\_\_\_\_7\_\_\_\_\_\_\_\_ Tm 7\*1024 pm/Tm = 7\*1024\*10-12/1012 =7
4. 0.006 ns = \_\_\_\_\_\_\_6\_\_\_\_\_\_\_\_ ps 0.006 ns/ps = 0.006\*10-9/10-12

3) convert 5 km/s to its equivalent value in mm/µs (3 pts)

5 km/mm =5\*103/10-3=5\*106

1 s/µs 1/10-6 = 106

=>5\*106 = 5 mm

 106 µs

5 km/s= \_5\_\_\_\_\_\_\_\_\_\_\_\_\_ mm/µs

**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 !!!)**

D= M/Vm = 25.5 g/(10-7.5) =10 g/mL

 Unknown metal density=\_\_10\_\_\_g/mL \_\_\_/32 pts (includes name)

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

A dozen large eggs from Aldi’s weighs 2500 g. Assuming 1 dozen =12 count:

1. If you have 10,000 grams of eggs, how many dozen eggs do you have ? \_\_\_\_\_\_4\_\_\_\_\_ dozen eggs

10,000/2500=4

1. If you have 0.2 dozen eggs, what is the total mass of eggs you have ? \_\_\_\_500\_\_\_\_\_\_ grams eggs

0.2\*2500=500 g

1. If you have 30 eggs, what do they weigh ? \_\_\_6250\_\_\_\_\_\_ grams eggs

30/12 doz \* 2500 g/doz = 6250 g

1. If you have 50,000 grams of eggs, how many eggs do you have ? \_\_\_\_\_240\_\_\_\_\_ egg count

50,000/2500 doz \* 12 eggs/doz =240

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

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 g/mol**

1. What does 0.01852 moles of nicotine weigh ? \_\_\_\_\_**3**\_\_\_\_\_ g nicotine

**0.01852\*162 =3 g**

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

**810/162=5**

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

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

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

3.7037\*1022 molecules/6\*1023=0.06173 mol => 0.06173 mol\*162 g/mol =10 g

1. How many molecules are in 13.5 g of nicotine ? \_\_\_5\*1022\_\_\_\_molecules nicotine

13.5 g\* 1 mol/162 g\* 6\*1023 molecules/mol=5\*1022

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**2.6. Stoichiometry Problems (`Body Parts’): Show work ! (5 pts each/30 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

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~~ \* 14 g N/~~mol N~~= 3 g N

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

42 g C\* 1 mol C/12 g C=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

**1.5\*1025 molecules H \* 1 mol H =25 mol H => mol TNT/mol H = 1/5 = m/25=> m=5**

**6.0\*1023 molecules H**

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 C\* 1 mol C/12 g C = mol C= 0.0729 mol C

Mol O/mol C= 6/7= m/0.0729=> m=0.0625 mol O

Mass O= 0.0625 \*16 g/mol= 1 g O

1. 2.8 grams of N are in a sample of TNT. How many molecules of TNT do we have ? \_\_4\*1022\_ molecules

TNT

2.8 g N\* 1 mol N/14 g N =0.2 mol N

Mol TNT/mol N= 1/3= m/0.2=> m= 0.2/3=0.0666 mol TNT => 6\*1023molecules/mol\*0.06666 mol

=4\*1022

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**2.7. % Composition problems ( 4 pts each/8 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 |
| O | **26.667** | 16 | 1.666 | 1 |
| H | **13.33** | 1 | 13.33 | 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 **molecular formula** given that the molecular weight of the compound is 1192 g/mol?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element | mass | AW (g/mol) | mol | Mol ratio(mol/min mol) | Mol ratio\* factor (2) |
| 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 N2C4O4H9**

**Molecular formula** = \_\_\_ **N2\*8C4\*8O4\*8H9\*8 =N16C32O32H72**\_\_ MW=149

1192/149= 8=> multiply empiric formula coefficients by 8

**2.8 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= \_\_\_\_\_copper(I) phosphite\_\_\_\_\_\_\_\_\_\_\_\_\_

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