**Exam 3: Chem 1013 INTRODUCTORY CHEMISTRY ALFRED STATE 30 April 2012**

\_\_\_/100 pts

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

**3.1. Scientific notation and prefixes (10 pts)**

1. Scientific notation < ---- > decimal (1 pt each/5 pts total)
2. Express 4,321 in scientific notation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Express 6.02\*101 decimal notation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Express 0.0001234 in scientific notation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Express 5.00\*10-3 in decimal notation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Express 310 in scientific notation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Re-write the quantities below in terms of their most reasonable, prefixed equivalents.

*Example: 0.0015 g= 1.5 mg 1 pt each/5 pts total*

1. 2,000 m = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_
2. 0.0000030 s= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. 40,000,000 g = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. 0.000000005 J=\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. 60,000,000 bytes= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.2 Molecular Weight (MW) 5 pts**

Calculate the molecular weights (g/mol) for the compounds below to the nearest gram/mol

 (You should use these in problem 3.3 below)

1. H2O \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g/mol
2. KOH\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g/mol
3. NaF \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g/mol
4. C8H18 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g/mol
5. Ca3 P2O8 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g/mol

**3.3. Basic Weight-Mole-molecule count conversions** (**Show work** *or* **no credit** will be given !!)

Note: Avogodro’s number = 6.022 \*1023 = the `chemist’s’ dozen 5 pts each/30 pts total

1. How many grams of H2O are in 0.1111 moles of H2O ? \_\_\_\_g H2O
2. How many molecules of KOH are in 37.197 grams of KOH? \_\_\_\_\_ molecules KOH
3. How many moles of NaF are in 252 grams of NaF? \_\_\_\_\_ moles NaF
4. How many grams in 4.226 \*1022 molecules of C8H18 ? \_\_\_\_\_ g C8H18

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**3.3. Basic Weight-Mole-molecule count conversions** (**continued)**

Note: Avogodro’s number = 6.022 \*1023 = the `chemist’s’ dozen

1. How many molecules of C8H18 in 0.16606 mol C8H18 ? \_\_\_\_\_\_\_\_ molecules C8H18
2. How many moles of Ca3P2O8 in 7.2264\*1024 molecules of Ca3P2O8? \_\_\_\_\_\_\_moles Ca3 P2O8
	1. **% Composition Problems (12 pts/ 4 pts each)**
3. A sample of compound composed of C,H and O contains 0.720 g C, 0.120 g H and 0.640 g O, determine the empiric formula of the compound:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element | Weight, g | AW g/mol |  |  |  |
| C | 0.72 | 12 |  |  |  |
| H | 0.12 |  1 |  |  |  |
| O | 0.64 | 16 |  |  |  |

 \_\_\_\_\_\_\_\_\_\_ empiric formula

1. A mystery liquid has a molecular weight of 320 g/mol . A sample of it contains 30.0% C, 2.50% % H, 17.5 % N and 50.00 % O. What is the molecular formula of the liquid ?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element | Weight, g | AW g/mol |  |  |  |
| C | 30 | 12 |  |  |  |
| H | 2.5 |  1 |  |  |  |
| N | 17.5 | 14 |  |  |  |
| O | 50.0 | 16 |  |  |  |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecular formula (MW= 320 g/mol)

1. 40 grams of iron powder (=Fe. Atomic mass=55.8 g/mol) is heated in air for several days. A black oxide powder containing both Fe and O results. The black powder weighs 51.459 g. What is the

formula for the black FeOx compound . (The atomic mass of O = 16 g/mol)

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**3.5 Balancing (9 pts) [Show work for each problem or no credit]**

**Balance these reactions: (3 pts each/9 pts total)**

**\_\_AgNO3 + \_\_H2SO4 \_\_\_\_\_Ag2SO4 + \_\_\_HNO3**

**\_\_\_CH4 + \_\_\_\_H2S \_\_\_\_\_CS2 + \_\_\_S2H6­­ + \_\_\_\_ H2**

**\_\_\_\_C4H10 + \_\_\_O2  \_\_\_\_\_CO + \_\_\_\_H2O**

**3.6. Stoichiometry Problems (15 points/ 5 pts per problem) Must show work for credit**

 **(Assume 1 mole count = 6.022\*1023)**

**C3H8 + 5O2 --------🡪 3CO2 + 4H2O**

**MW(g/mol) 44 32 44 18 g/mol**

1. **Compute the number of grams of H2O created by burning 0.13889 moles O2 ? \_\_\_\_\_\_\_\_g H2O**
2. **Compute the number of molecules of H2O created by burning 3.654 g C3H8\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ MOLECULES**
3. **Compute the number of moles of CO2 created by consuming 29.333 g C3H8? \_\_\_\_\_\_mol C3H8**

**3.7. Limiting Reagent Problems (10 points/5 points per problem)**

**Given: 2Al + 6HCl 🡪 2AlCl3 + 3H2**

**MW(g/mol) 27 36 133 2 g/mol**

1. **How many moles of H2 can form if 1.3333 moles of Al and 8 moles of HCl are combined ?**

**\_\_\_\_mol H2**

1. **How many grams of AlCl3 can form if 0.406 grams of Al and 9.0 grams of HCl are combined?**

**\_\_/34 \_\_\_\_\_ grams AlCl3**

**3.8. Chemical True/False (9 pts/ 1 pt per answer)**

1. **The mole concept and dozen concept are essentially the same. T F**
2. **Stoichiometry and Souffle recipe calculations are essentially the same. T F**
3. **There’s nothing special about Avogodro’s number. T F**
4. **Avogodro measured Avogodro’s number. T F**
5. **Molecular weights are in units of grams/mol. T F**
6. **The empiric formula is the same as molecular formula. T F**
7. **The atomic masses listed on the Periodic Table are relative masses in amu. T F**
8. **To find mass from moles, multiply down T F**
9. **Any day doing chemistry is a good day. T T**

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