Stoichiometry Review Sheet

I. Part 1 – Multiple Choice

1. This section will account for 20 points on the test and will be OPEN NOTES.
2. Have the following notes and quizzes organized, highlighted, and reviewed.
   - ***Measuring Matter***
   - ***Empirical & Molecular Formulas***
   - ***Stoichiometry***

II. Part 2 – Performance Assessment

This section will account for 30 points on the test and will be CLOSED NOTES.

#1 – Number Of Atoms

1. Determine the number of Zn (zinc) atoms in 2.50 mol of Zn.

$$2.50 \text{ mol Zn} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol Zn}} = 1.51 \times 10^{24} \text{ atoms Zn}$$

#2 - Molar Mass

1. Calculate the molar mass of ethanol (C_2H_5OH).

$$2 \text{ mol C} \times \frac{12.01 \text{ g C}}{1 \text{ mol C}} = 24.02 \text{ g C}$$

$$6 \text{ mol H} \times \frac{1.01 \text{ g H}}{1 \text{ mol H}} = 6.048 \text{ g H}$$

$$1 \text{ mol O} \times \frac{16.00 \text{ g O}}{1 \text{ mol O}} = 16.00 \text{ g O}$$

$$24.02 + 6.048 + 16.00 = 46.07 \text{ g/mol } C_2H_5OH$$

#3 - Mole-To-Grams

1. What is the mass of 3.25 mol of H_2SO_4?

(1) $2 \text{ mol H} \times \frac{1.01 \text{ g H}}{1 \text{ mol H}} = 2.016 \text{ g H}$ (+)

(2) $1 \text{ mol S} \times \frac{32.07 \text{ g S}}{1 \text{ mol S}} = 32.07 \text{ g S}$ (+)

(3) $4 \text{ mol O} \times \frac{16.00 \text{ g O}}{1 \text{ mol O}} = 64.00 \text{ g O}$

$98.09 \text{ g/mol } H_2SO_4$

$$3.25 \text{ mol } H_2SO_4 \times \frac{98.09 \text{ g } H_2SO_4}{1 \text{ mol } H_2SO_4} = 319 \text{ g } H_2SO_4$$

#4 - Grams-To-Moles

1. Determine the number of moles present in 22.6 g of $AgNO_3$.

(1) $1 \text{ mol Ag} \times \frac{107.87 \text{ g Ag}}{1 \text{ mol Ag}} = 107.87 \text{ g Ag}$ (+)

(2) $1 \text{ mol N} \times \frac{14.01 \text{ g N}}{1 \text{ mol N}} = 14.01 \text{ g N}$ (+)

(3) $3 \text{ mol O} \times \frac{16.00 \text{ g O}}{1 \text{ mol O}} = 48.00 \text{ g O}$

$169.88 \text{ g/mol } AgNO_3$

$$22.6 \text{ g } AgNO_3 \times \frac{1 \text{ mol } AgNO_3}{169.88 \text{ g } AgNO_3} = 0.133 \text{ mol } AgNO_3$$

#5 - Stoichiometry

1. How much chlorine gas, in grams, is obtained fro the equation : $2NaCl \longrightarrow 2\,Na + Cl_2$, if 2.50 mol of NaCl are used?

$$2.50 \text{ mol NaCl} \times \frac{1 \text{ mol } Cl_2}{2 \text{ mol NaCl}} = 1.25 \text{ mol } Cl_2$$

$$1.25 \text{ mol } Cl_2 \times \frac{70.9 \text{ g } Cl_2}{1 \text{ mol } Cl_2} = 88.6 \text{ g } Cl_2$$

2. How many moles of CS_2 and H_2S are produced when 1.50 mol of S_8 is used in the following equation : $2CH_4 + S_8 \longrightarrow 2CS_2 + 4H_2S$?

(1.) $1.50 \text{ mol } S_8 \times \frac{2 \text{ mol } CS_2}{1 \text{ mol } S_8} = 3.00 \text{ mol } CS_2$

(2.) $1.50 \text{ mol } S_8 \times \frac{4 \text{ mol } H_2S}{1 \text{ mol } S_8} = 6.00 \text{ mol } H_2S$

3. Determine the mass of N_2 produced from the decomposition of 100 g of NaN_3 in the equation : $2NaN_3 \longrightarrow 2Na + 3N_2$.

(1.) $100 \text{ g } NaN_3 \times \frac{1 \text{ mol } NaN_3}{65.02 \text{ g } NaN_3} = 1.538 \text{ mol } NaN_3$

(2.) $1.538 \text{ mol } NaN_3 \times \frac{3 \text{ mol } N_2}{2 \text{ mol } NaN_3} = 2.307 \text{ mol } N_2$

(3.) $2.307 \text{ mol } N_2 \times \frac{28.02 \text{ g } N_2}{1 \text{ mol } N_2} = 64.64 \text{ g } N_2$

#6 - Percent Composition

1. Calculate the percent by mass of each element in sodium sulfate (Na_2SO_4).

(1.) $2 \text{ mol Na} \times \frac{22.99 \text{ g Na}}{1 \text{ mol Na}} = 45.98 \text{ g Na}$

(2.) $1 \text{ mol S} \times \frac{32.07 \text{ g S}}{1 \text{ mol S}} = 32.07 \text{ g S}$

(3.) $4 \text{ mol O} \times \frac{16.00 \text{ g O}}{1 \text{ mol O}} = 64.00 \text{ g O}$

(+) $= 142.05 \text{ g/mol}$

(1.) $\frac{45.98 \text{ g}}{142.05 \text{ g}} \times 100 = 32.37\% \text{ Na}$

(2.) $\frac{32.07 \text{ g}}{142.05 \text{ g}} \times 100 = 22.58\% \text{ S}$

(3.) $\frac{64.00 \text{ g}}{142.05 \text{ g}} \times 100 = 45.05\% \text{ O}$

#7 - Empirical / Molecular Formulas

1. Determine the empirical formula for aspirin, which is 60.0% carbon, 4.44% hydrogen, and 35.56% oxygen. (assume 100 g)

(1.) $60.00 \text{ g C} \times \frac{1 \text{ mol C}}{12.01 \text{ g C}} = 5.00 \text{ mol C}$

(2.) $4.44 \text{ g H} \times \frac{1 \text{ mol H}}{1.01 \text{ g H}} = 4.40 \text{ mol H}$

(3.) $35.56 \text{ g O} \times \frac{1 \text{ mol O}}{16.00 \text{ g O}} = 2.22 \text{ mol O}$

(1.) $\frac{5.00 \text{ mol C}}{2.22 \text{ mol O}} = 2.25 \text{ mol C}^*$ (Multiply by 4 to get a whole #)

(2.) $\frac{4.40 \text{ mol H}}{2.22 \text{ mol O}} = 2 \text{ mol H}$

(3.) $\frac{2.22 \text{ mol O}}{2.22 \text{ mol O}} = 1 \text{ mol O}$

$2.25 \times 4 = 9$

$2 \times 4 = 8$

$1 \times 4 = 4$

$C_9H_8O_4$

2. A compound was found to contain 49.98 g of carbon and 10.47 g of hydrogen. The molar mass of the compound is 58.12 g/mol. Determine the molecular formula.

(1.) $49.98 \text{ g C} \times \frac{1 \text{ mol C}}{12.01 \text{ g C}} = 4.162 \text{ mol C}$

(2.) $10.47 \text{ g H} \times \frac{1 \text{ mol H}}{1.01 \text{ g H}} = 10.366 \text{ mol H}$

(1.) $\frac{4.162 \text{ mol C}}{4.162 \text{ mol C}} = 1.00 \text{ mol C}$

(2.) $\frac{10.366 \text{ mol H}}{4.162 \text{ mol C}} = 2.50 \text{ mol H}^*$ (Multiply by 2 to get a whole #)

$1 \times 2 = 2$

$2.5 \times 2 = 5$

C_2H_5

$n = \frac{\text{molar mass of compound}}{\text{molar mass of } C_2H_5} = \frac{58.12 \text{ g}}{29.07 \text{ g}} = 2.00 \times C_2H_5 = C_4H_{10}$