IB Chemistry Summer Assignment (for a grade) – For Rising Juniors 2019-2020 School Year

You are required to turn in this assignment on the first week of the school. First week of the school we will review these topics in class. You take a formative assessment over these concepts during second week of school for a grade.

1. Dimensional Analysis, Significant Figures & Uncertainty in measurement:

- 1. Which has greater mass, 3.0 cm^3 of iron (d=7.9 g/cm³) or 2.0 cm^3 of gold (d=19.3g/cm³)?
- 2. Perform the following mathematical operations, and express each result to the correct significant figures.
 - a) 97.381 + 4.2502 + 0.99195
 - b) 827 (4.987 4.962)
- 3. You measure the mass of a graduated cylinder to be 101.34 ± 0.05 g. You then add some water and measure the mass of the water *and* graduated cylinder ot be 156.58 ± 0.05 g. What is the mass of the water, with uncertainty and to the correct number of decimal places?
- 4. You measure the mass of a piece of unknown metal to be 14.56 ± 0.05 g and its volume to be 5.6 ± 0.5 cm³. What is its density, in g cm⁻³, and the percent uncertainty for your answer?

2. Nomenclature:

I. Write chemical formulas for the following compounds:

- a. Diphosphorus pentoxide
- b. Calcium Sulfate
- c. Iron (II) Nitrite
- d. Potassium Selenide
- e. Tetra carbon octahydride

II. Write names for the following compounds:

- a. K_2SO_4
- b. $Sr(ClO)_2$
- c. HI
- d. $Na_2(CO_3)$
- e. $Cu(Cr_2O_7)$

3. Atomic Structure & Periodic Table:

A. Rank the following elements by increasing atomic radius: carbon, aluminum, oxygen, potassium.

B. Rank the following elements by increasing electronegativity: sulfur, oxygen, neon, aluminum.

C. Why does fluorine have a higher ionization energy than iodine?

- D. Why do elements in the same family generally have similar properties?
- E. What trend in atomic radius occurs across the periodic table? What causes this trend?

IB Chemistry Summer Assignment (for a grade) – For Rising Juniors 2019-2020 School Year

F. What trend in ionization energy occurs across a period on the periodic table? What causes this trend?

G. Write electron configuration for Zn2+ ion, Cu +1 ion.

4. Matter & Energy:

- 1. Draw a reaction coordinate diagram for an exothermic reaction both with and without a catalyst. Label the axes, change in enthalpy, and activation energies
- 2. Draw a reaction coordinate diagram for an endothermic reaction both with and without a catalyst. Label the axes, change in enthalpy, and activation energies.
- 3. How much energy must be absorbed by 20.0 g of water to increase its temperature from 283.0 °C to 303.0 °C?

5. Mole Concept & Stoichiometry:

- 1. How many atoms of Oxygen are in
 - a) 25 molecules of CO_2
 - b) 25 grams of CO₂

2. Balance the equation: $C_2H_6 + O_2 \rightarrow CO_2 + H_2O$

3. Chlorine is used by textile manufacturers to bleach cloth. Excess chlorine is destroyed by its reaction with sodium thiosulfate, $Na_2S_2O_3$:

 $Na_2S_2O_{3(aq)} + 4Cl_{2(g)} + 5H_2O_{(aq)} \rightarrow 2NaHSO_{4(aq)} + 8HCl_{(aq)}$

- a. How many moles of $Na_2S_2O_3$ are needed to react with 0.12mol of Cl_2 ?
- b. How many moles of HCl can form from 0.12mol of Cl₂?
- c. How many grams of H_2O are required for the reaction of 0.12mol of Cl_2 ?
- d. How many moles of H_2O react if 0.24mol HCl is formed?
- 4. The reaction of powdered aluminum and iron(II)oxide,

 $\underline{2}\text{Al}_{(s)} + \underline{1} \text{Fe}_2\text{O}_{3(s)} \rightarrow \text{Al}_2\text{O}_{3(s)} + \underline{2}\text{Fe}_{(l)}$

produces so much heat the iron that forms is molten. Because of this, railroads use the reaction to provide molten steel to weld steel rails together when laying track. Suppose that in one batch of reactants 4.20mol Al was mixed with 1.75mol Fe_2O_3 .

- a. Which reactant, if either, was the limiting reactant?
- b. Calculate the mass of iron (in grams) that can be formed from this mixture of reactants.

5.
$$2 \operatorname{NaCl} + \operatorname{CaO} \rightarrow \operatorname{CaCl}_2 + \operatorname{Na}_2 O$$

What is my theoretical yield of sodium oxide if I start with 25.6 grams of calcium oxide?

6. Calculate the average atomic mass of sulfur if 95.00% of all sulfur atoms have a mass of 31.972 amu, 0.76% has a mass of 32.971amu and 4.22% have a mass of 33.967amu.