**Moles Assignments**

**Directions: On a separate sheet of paper, solve each problem using dimensional analysis. Show your work, make sure your answers are in the correct number of significant figures. Please pay attention to the dates assigned and dates due for each section. Please email me a picture of work before 11:59pm on the due date.**

**Assignment 1: Moles – Particles Relationship**

**Date Assigned: Monday, 3.16.20 Date Due: Tuesday, 3.17.20**

1. How many atoms of gadolinium are in 2.00 moles?
2. How many moles are in 6.50 x 1024 molecules of dihydrogen monoxide?
3. How many formula units are in 0.7808 moles of sodium oxalate?
4. How many moles are in 7.20 x 1023 formula units of sulfuric acid?
5. How many molecules are in 0.450 moles of dinitrogen monoxide?

**Moles – Volume of a Gas Relationship**

**Date Assigned: Monday, 3.16.20 Due: Tuesday, 3.17.20**

1. What is the volume, in L, of 3.06 mol of O3 gas at STP?
2. How many moles are in 9.999 L of CO gas at STP?
3. What is the volume, in L, of 0.567 mol of NO2 gas at STP?
4. How many moles are in 237.66 mL of H2O gas at STP?
5. What is the volume, in L, of 0.2323 moles of O3 (ozone) gas at STP?

**Assignment 2: Moles – Mass Relationship**

**Date Assigned: Tuesday, 3.17.20 Due: Wednesday, 3.18.20**

1. How many moles are in 300. g of sodium chloride?
2. What is the mass, in g, of 0.146 moles of dihydrogen monoxide?
3. How many moles are in 316.95g of iron (III) sulfate?
4. What is the mass, in g, of 0.511 moles of calcium cyanide?
5. How many moles are in 0.34234 g of sugar, C12H22O11?

**Assignment 3: Combined Mole Problems**

**Date Assigned: Wednesday, 3.18.20 Due: Thursday, 3.19.20**

1. What is the mass, in grams, of 7.33 × 1022 water molecules?
2. How many carbon monoxide molecules are in 16.60 L of gas at STP?
3. What is the volume, in liters, of 929 g of ozone (O3) gas at STP?
4. What is the mass, in grams, of 8.84 × 1024 formula units of ammonium sulfate?
5. How many molecules are in 49.9 g of vanillin (C8H8O3), the compound responsible for the smell of vanilla?

**Assignment 4: Percent Composition**

**Date Assigned: Thursday, 3.19.20 Due: Friday, 3.20.20**

1. Calculate the percent of each element in copper (II) bromide.
2. Calculate the percent each element in sodium cyanide
3. Calculate the percent of each element in potassium chromate
4. Calculate the percent of each element in manganese (II) nitrate.
5. Calculate the percent of each element in aluminum sulfate.

**Assignment 5: Empirical Formulas and Molecular Formulas**

**Date Assigned: Friday, 3.20.20 Due: Monday, 3.23.20**

Empirical Formulas - Determine the empirical formulas from the information provided.

1. Rubbing alcohol, or isopropyl alcohol, contains 60.0% carbon, 13.4% hydrogen and the remaining amount is oxygen. Determine the empirical formula for isopropyl alcohol.
2. A sample of indium chloride contains 0.2596g of indium and 0.2404g chlorine. What is the empirical formula for indium chloride? (Hint, step 1 has already been done for you.)
3. Phosphoric acid is found in some soft drinks. A sample of this acid contains 0.3086g of hydrogen, 3.161g of phosphorous, and 6.531g of oxygen. What is the empirical formula for phosphoric acid?
4. A compound consists of 72.2% magnesium and the rest nitrogen by mass. What is the empirical formula for this compound?
5. Aspirin is the world’s most often used medication. The chemical analysis of aspirin indicates that the molecule is 60.00% carbon, 4.44% hydrogen, and 35.56% oxygen. Determine the empirical formula for aspirin.

Molecular Formulas – Determine the molecular formulas from the information provided.

1. A compound has an empirical formula of NO2 and a molecular mass of 92.02g/mol. Determine the molecular formula.
2. Nicotine is 74.1% carbon, 8.6% hydrogen, and 17.3% nitrogen by mass/ Its molecular mass is about 160 g/mol. Determine its molecular formula.
3. Epinephrine (adrenaline) is a hormone secreted into the bloodstream in times of danger and stress. It is 59.0% carbon, 7.1% hydrogen, 26.2% oxygen, and 7.7% nitrogen by mass. Its molecular mass is about 180 g/mol. Determine its molecular formula.
4. A certain carbohydrate is 40.0% carbon, 6.72% hydrogen, and 53.3% oxygen by mass. The experimentally determine molecular mass is approximately 180 g/mol. What is the molecular formula?
5. The compound, methyl butanoate, smells like apples. Its composition by mass is 58.8% carbon, 9.8% hydrogen, and 31.4% oxygen. If its molecular mass is approximately 102 g/mol, what is its molecular formula?