**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_**

**Mole Ratios and Stoichiometry**

**Show all of your work with conversion factors and include the proper number of sig figs, and units on answers.**

**Determining moles and grams in *compounds***.

1. Determine the ***moles of sulfur and moles of oxygen*** in 3.0 moles of CuSO4.
2. Determine the ***moles of lead, nitrogen and oxygen*** in 2.5 moles of Pb(NO3)4.
3. Determine the ***grams of oxygen*** in 1.78 moles of KClO3.
4. Determine the ***mass of carbon*** in 25.0 grams of C3H7OH.
5. Determine the ***mass of oxygen*** in 12.6 grams of Ba(OH)2.

**Stoichiometry:** For the following calculations write the answer on the line provided.

**Balance the following equation to answer questions 6-7.**

\_\_\_\_ H2 + \_\_\_\_ Cl2 → \_\_\_\_ HCl

1. If 10.0 moles of hydrogen (H2) react, how many…
   1. moles of chlorine also (Cl2) react? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. moles of hydrogen chloride (HCl) are produced? \_\_\_\_\_\_\_\_\_\_\_\_\_
2. If 345 moles of hydrogen chloride are formed, how many moles of hydrogen must react?

**Balance the following equation to answer question 8.**

\_\_\_\_ C8H18 + \_\_\_\_ O2 → \_\_\_\_ CO2 + \_\_\_\_ H2O

1. If you burn 4.0 moles of octane (C8H18)…
   1. how many moles of oxygen (O2) are required? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. how many moles of ***each product*** are produced?

mol CO2 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

mol H2O = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Mole-Mole Problems**

1. **N2 + 3 H2 → 2 NH3**

How many moles of hydrogen (H2) are needed to completely react with 0.998 moles of nitrogen (N2)?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **2 KClO3 → 2 KCl + 3 O2**

How many moles of oxygen (O2) are produced by the decomposition of 0.756 moles of potassium chlorate (KClO3)?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **K3PO4­ + Al(NO3)3 → 3 KNO3 + AlPO4**

How many moles of KNO3 are produced when 4.52 moles of K3PO4 react with Al(NO3)3?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Mole -Mass Problems**

1. \_\_\_\_\_ **K2SO4 →** \_\_\_\_\_ **K2S +** \_\_\_\_\_ **O2**
2. Balance the equation above
3. How many grams of potassium sulfide (K2S) are produced if 3.0 moles of potassium sulfate (K2SO4) decompose?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_ **N2 +** \_\_\_\_\_ **H2 →** \_\_\_\_\_ **NH3**
2. Balance the equation above
3. How many grams of hydrogen (H2) are necessary to react completely with 0.24 mol of nitrogen (N2)?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How many grams of ammonia (NH3) are produced in the reaction in part b above?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_ **AgNO3 +** \_\_\_\_\_ **BaCl2 →** \_\_\_\_\_ **AgCl +** \_\_\_\_\_ **Ba(NO3)2**
   1. Balance the equation above
   2. How many grams of AgCl are produced from 1.25 mol of AgNO3?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. How many grams BaCl2 is necessary to react with 1.25 mol of AgNO3?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Mass - Mass Problems**

1. \_\_\_\_\_ **KClO3 →** \_\_\_\_\_ **KCl +** \_\_\_\_\_ **O2**
   1. Balance the equation above
   2. If 5.0g of KClO3 decomposes, how many grams of oxygen (O2) are produced?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. What mass of KCl is produced in part b above?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_ **H2SO4 +** \_\_\_\_\_ **NaOH →** \_\_\_\_\_ **H2O +** \_\_\_\_\_ **Na2SO4**
   1. Balance the equation above
   2. How many grams of water are produced when 2.0g of Na2SO4 are produced?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_ **AlCl3 →** \_\_\_\_\_ **Al +** \_\_\_\_\_ **Cl2**
   1. Balance the equation above
   2. If 10.0g of AlCl3 are reacted, what mass of Cl2 is produced?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. What mass of aluminum is produced from 10.0g of AlCl3?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Acetylene gas (C2H2) is produced by adding water to calcium carbide (CaC2). The equation is:

\_\_\_\_\_ **CaC2 (s)  +** \_\_\_\_\_ **H2O (l) →** \_\_\_\_\_ **C2H2 (g) +** \_\_\_\_\_ **Ca(OH)2 (aq)**

* 1. Balance the equation above.
  2. How many grams of acetylene are produced by adding water to 5.00 g CaC2?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. How many grams of CaC2 are needed to react completely with 0.941g of H2O?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Aluminum reacts with sulfur in this reaction: 2 Al(s) + 3 S(s) **→**  Al2S3(s)
2. How many grams of Al2S3 are produced when 7.74g of S react?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How many ***atoms of aluminum*** are needed to react completely with 86.2 grams of sulfur?

Hint: “It’s my number – I’m Avogadro!”

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Use data from the reaction between HCl and Na2CO3 to answer the following questions.
   1. Balance the equation.

\_\_\_\_\_ HCl + \_\_\_\_\_ Na2CO3 **→** \_\_\_\_\_ H2O + \_\_\_\_\_ CO2 + \_\_\_\_\_ NaCl

* 1. Determine the mole ratio of Na2CO3 to NaCl.
  2. How many grams of NaCl will be produced when \_\_\_\_\_\_\_\_\_\_\_\_\_ grams of Na2CO3 react completely with hydrochloric acid (HCl)?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. How many molecules of carbon dioxide (CO2) gas will be produced?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. What mass of water will be produced?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

f. Compare the mass of NaCl formed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ grams to your answer for (c). Explain one reason that could cause the mass of NaCl formed to be different than the mass of NaCl that was calculated.