Stoichiometry: Gram to Gram Calculations

1.   Write a _____ chemical equation.
2.   List the given information below the compounds.
3.   Use a question mark to indicate _____.
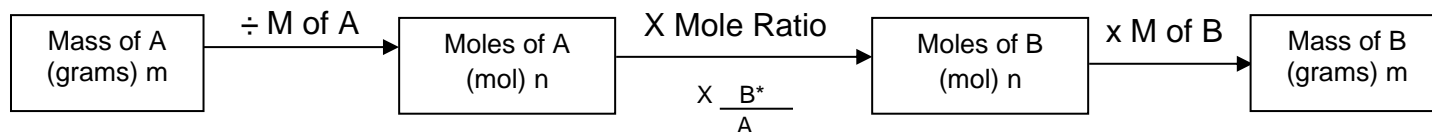4.   Calculate the _____ for the given compound and the unknown.

Example 1:
 If 2.56 g of chlorine, Cl_2, are used to prepare dichlorine heptoxide, Cl_2O_7, how many moles and how many grams of oxygen are needed?

Example 2:
 Propane, C_3H_8, is a gas used in BBQs. It burns in oxygen to produce carbon dioxide and water. Calculate the mass of propane that is needed to produce 12.1 g of water.

Stoichiometric Problems

| Mass of A (grams) m | ÷ M of A → | Moles of A (mol) n | X Mole Ratio
X $\frac{B^*}{A}$ → | Moles of B (mol) n | x M of B → | Mass of B (grams) m |

*Where B is unknown and A is known

1. Write a balanced equation for the reaction between nitrogen dioxide gas and water to produce nitric acid and nitrogen monoxide gas. State all the mole ratios.

2. Consider the following reaction: $Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$
   a) Write the all the mole ratios
   b) How many moles of HCl are required to react with 2.0 moles of Mg?
   c) How many moles of hydrogen are formed when 3.5 moles of Mg react?
   d) How many moles of HCl are required to react completely with 8.6 moles of Mg?

3. How many moles of hydrogen gas are produced from the decomposition of 12.0 g of water into its elements?

4. $Fe_2O_{3(s)} + 6HCl_{(aq)} \rightarrow 2FeCl_{3(aq)} + 3H_2O_{(l)}$
   What mass of hydrochloric acid is required to react with 234 g of rust (Fe_2O_3)?

5. $2N_2O_{5(s)} \rightarrow 4NO_{2(g)} + O_{2(g)}$
   How many grams of oxygen will be produced in this reaction when 1.76 g of nitrogen dioxide are made?

6. $8Zn_{(s)} + S_{8(s)} \rightarrow 8ZnS_{(s)}$
   What mass of zinc sulfide is expected when 54.0 g of S_8 reacts?

7. Potassium metal reacts with hydrochloric acid to produce aqueous potassium chloride and hydrogen gas. How many grams of potassium are required to produce 5.00 g of hydrogen gas.

8. $2NaN_{3(s)} \rightarrow 3 N_{2(g)} + 2Na_{(s)}$
   What mass of sodium azide (NaN_3) is required to produce 1.72×10^{24} molecules of nitrogen gas? (Hint: how do you convert molecules to moles?)

   Answers: 2b) 4.0mol   c) 3.5mol   d) 17mol   3.   0.666mol   4. 3.20×10^2g   5.   0.306g
   6. 164g   7. 194g   8. 124g