Name:_____ Per:___ Date:_____

Another Practice Exam on Balancing, Stoichiometry and Limiting Reactants:

1. When lithium reacts with water to produce lithium hydroxide and hydrogen gas, how many mole of hydrogen gas are produced from 2.12 mol lithium? $Li + H_2O \rightarrow LiOH + H_2$ (*unbalanced equation)*
NOTE: 1. First balance the equation. 2. Then note that this is a straight stoichiometry problem as only one quantity is given. 3. Notice too that the quantity was given in moles and the answer is to be in moles so no conversion of grams to moles is necessary. Complete the problem showing your work below:

2. Solid iron combines with oxygen gas to produce rust, iron(III) oxide. What mass of rust, Fe_2O_3, can be formed form a piece of iron with a mass of 10.5 g if oxygen is present in excess?

$$Fe_{(s)} + O_{2\,(g)} \rightarrow Fe_2O_{3\,(s)}$$ *(unbalanced equation)*

NOTE: 1. First balance the equation. 2. Note that this is a straight stoichiometry problem because you are told that oxygen was in excess thus there is no need to figure out which is the limiting reactant as it is obvious that it is iron that determines this. 3. Note that the quantity of iron is given in grams which means that since the equation is based on mole ratios you must convert from grams to moles. 4. Note that the question asks for the "mass of rust," which means you must convert moles to grams when you calculate the amount of Fe_2O_3 that is formed to answer the question. Complete the problem showing your work below:

3. Manganese(IV) oxide reacts with hydrochloric acid to produce chlorine gas, manganese(II) chloride and water. $MnO_2 + HCl \rightarrow Cl_2 + MnCl_2 + H_2O$

a) What is balanced equation for this reaction?
b) When 10.2 g MnO_2 react with 18.3 g HCl, which is the limiting reactant?
c) How many moles of chlorine gas can be produced?
d) How many grams of chlorine gas is this?
e) If you were able to produce 7.20 grams of Cl_2 in lab, what is your percent yield?

NOTE: (a) Balance the equation. b) Notice that you are given both quantities of the starting reactants in grams so you must convert to moles of each of the reactants then use the mole ratios to determine which of these starting materials will make the least amount of Cl_2. Note that I chose to compare them to Cl_2 only because you are asked further questions about Cl_2 in item c. Which ever of the reactants makes the LEAST amount of Cl_2 will determine which is the limiting reactant. The answer of the least amount of Cl_2 is the maximum amount of product possible and answers item c. d) Convert moles to grams utilizing the molar mass off the periodic table. Note that the formula is Cl_2 so it's 2 x 35.453g per 1 mole of Cl_2. Show you work below:

4. Aqueous sodium iodide reacts with aqueous lead(II) nitrate to produce the yellow precipitate lead(II) iodide and aqueous sodium nitrate. $NaI_{(aq)} + Pb(NO_3)_{2\,(aq)} \rightarrow PbI_{2\,(s)} + NaNO_{3\,(aq)}$

a. What is the theoretical yield of lead iodide, PbI_2, if 125.5 g of sodium iodide, NaI, react with 205.6 g lead nitrate, $Pb(NO_3)_2$?
b. If the actual yield from this reaction is 164.5 g lead iodide, PbI_2, what is the percent yield?

NOTE: 1. Balance the equation first 2) Note that both of the reactants are given and that they are in grams. This means that it is a limiting reactant problem and you must convert all grams to moles in order to utilizing the equation. 3) The least amount of product possible from these two starting materials is all that can be made before the limiting reactant runs out and this will be your theoretical yield. 4) Percent yield is calculated by the following: actual yield/theoretical yield x 100%.