

S'Mores Lab: Chemical Reactions, Stoichiometry, and Limiting Reactants

- PURPOSE:**
1. To gain an understanding of reactants and products in a chemical reaction.
 2. To perform calculations similar to those that will be done in stoichiometry.
 3. To describe what a limiting reagent is and what it does in a chemical reaction.

MATERIALS:

- graham crackers
- marshmallows
- Chocolate bar
- Microwave oven
- paper towels
- scale or balance

PROCEDURE:

Step 1 Weigh each of the reactants separately (1/2 graham cracker, 1 marshmallow, and 1 chocolate squares) and record the masses to the appropriate number of significant figures. *Record these masses & the “molar masses” neatly in your lab notebook. (Note: your graham cracker is made of 4 sections. When you weigh 1/2 the cracker, this is twice your “molar mass.” Divide by 2 to get the molar mass of your graham cracker.)*

Step 2 Record the following symbols to be used for each reactant with the above data.

M = marshmallow

Gr = graham cracker (whole, not broken in half yet.)

Ch = chocolate square (broken into the pieces that you wish to use on each S'More.)

Step 3 Perform a mechanical **synthesis reaction (Make S'Mores!)** with your “reactants” until you cannot make any more full S'Mores. *Write out a balanced equation for this synthesis reaction in your lab notebook.*

Step 4 Cause this reaction to go to completion by making as many of the product as you possibly can. Weigh one of the representative products. *Record this mass to the appropriate number of significant figures.*

Step 5 Count and record how many products you were able to form.

DATA: Create a data table to record your data.

	Mass taken	Molar mass (mass per “atom”)
mass of graham cracker		
mass of marshmallow		
mass of chocolate square		
Actual Mass of S'More		XXXXXXXX
Number of S'Mores made: _____	XXXXXXXX	XXXXXXXX

ANALYSIS:

Answer the following questions in your lab notebook by comparing the masses involved in your reaction with the information supplied below.

1. The material responsible for your reaction reaching completion is called a limiting reactant. Define, in your own words, what a limiting reactant is. Identify your limiting reactant.
2. What, if anything, do you have left over? These are the “excess reactants.” How much of each reactant remains?
3. How many S'Mores could you make if you had started with 100.0 grams of each reactant?
4. What is the limiting reactant in the situation in question #3?
5. How much of each excess reactant would remain?
6. $3N_2 + H_2 \rightarrow 2NH_3$. If 73.5 g of nitrogen and 9.71 g of hydrogen react, how much ammonia is formed? What is the limiting reactant? What is the excess reactant? How much excess reactant remains when the reaction is complete?

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Actual Mass of S'More		xxxxxxx
Number of S'Mores made: _____	xxxxxxx	xxxxxxx

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Answer the following questions in your lab notebook by comparing the masses involved in your reaction with the information supplied below.

7. The material responsible for your reaction reaching completion is called a limiting reactant. Define, in your own words, what a limiting reactant is. Identify your limiting reactant.
8. What, if anything, do you have left over? These are the “excess reactants.” How much of each reactant remains?
9. How many S'Mores could you make if you had started with 100.0 grams of each reactant?
10. What is the limiting reactant in the situation in question #3?
11. How much of each excess reactant would remain?
12. $3N_2 + H_2 \rightarrow 2NH_3$. If 73.5 g of nitrogen and 9.71 g of hydrogen react, how much ammonia is formed? What is the limiting reactant? What is the excess reactant? How much excess reactant remains when the reaction is complete?