

S'MORES AND LIMITING REACTANTS

Two atoms or molecules must come together in just the right way in order for them to react. As a result, it is virtually impossible to obtain 100% yield in a chemical reaction by combining the reactants in exact proportions. In order to increase the odds that at least one reactant will react completely, we often add more than is needed of another reactant. This reactant is said to be in **excess**. The reactant that is used up in the reaction is called the **limiting reactant** because it limits the amount of product formed.

In this activity, you will use a recipe for S'mores as an analogy for a chemical equation in which reactants and products are in set proportions to each other. You will be given varying amounts of each reactant. One of these reactants will limit the number of S'mores you can produce. The other reactants will be in excess. After working with this culinary "reaction," you will identify the limiting and excess reactants in *chemical* reactions and perform stoichiometric calculations based on the amount of the limiting reactant.

OBJECTIVES

- Investigate the concept of limiting reagents by constructing S'mores.

PROCEDURE

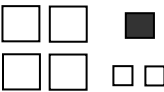


- Obtain a plastic bag of S'mores ingredients, a sheet of drawing paper, and markers or map pencils.
- Use the following recipe to construct as many S'mores as possible using your ingredients.

Recipe for 1 S'more

2 graham cracker halves
1 chocolate square
1 marshmallow

ANALYSIS & CONCLUSIONS

- Complete the analysis questions (1-3) on the back of this paper.
- On the sheet of drawing paper, draw a diagram that shows the following:
 - number of each reactant
 - number of *complete* S'mores
 - number of left over reactants (reactants in excess)
 - identity of the limiting reactant
- Label your drawings (4 graham cracker halves, 2 marshmallows, 1 S'more, etc.). Use markers and/or map pencils to make your drawings attractive. Be creative!! Your paper should look something like the following (with the addition of labels).

Names _____		Period ____	
		Group # ____	
reactants	→	products	
			
Limiting reactant: <u>chocolate bar</u>			

EXTENSION

Use fresh ingredients to make a S'more. Eat it and enjoy!!