Ms. Randall
Regents Chemistry
Lab activity: Would you like S'more Stoichiometry? (modified from Carole Henry)

Background: A chemical equation like $2\ H_2 + O_2 \rightarrow 2\ H_2O$ is balanced when both the reactant side and the product side of the equation show exactly the same number of each type of atom. A balanced reaction shows the molar relationship between the amounts of each reactant used and the amount of each product produced. The use of the coefficients in a balanced chemical equation as a ratio to predict how much reactant is consumed (used) or how much product is formed (created) is called Stoichiometry. 'Stoichio' means element and 'metry' means the process of measuring.

I love S'mores! I'll buy a package of graham crackers, chocolate bars, and marshmallows expecting to make a whole ton of S'mores but I always seem to run out of one of the food items. I'm left with all this extra food! The purpose of this lab activity is to help you understand that you may not always be able to make the entire product you want given the amount of reactants supplied. Please note, for the purpose of this activity, we will assume that 1 piece of food will represent 1 mole of that food.

A S'more generally consists of a slightly browned marshmallow, two graham cracker halves (half on top, half on bottom. Each half is considered 1 piece), and three pieces of chocolate from a standard Hershey type chocolate bar.

Objective: To recognize and perform simple Stoichiometry problems.

Materials: Bunsen burner, wooden splints, graham crackers, marshmallows, chocolate bars

Safety: Goggles must be worn when using Bunsen burner. Do not eat any food that has fallen onto the table or touched the burner itself!

Pre-lab:

1. **A 1.0-gram strip of zinc is reacted with hydrochloric acid in a test tube. The unbalanced equation below represents the reaction.**

   ____ Zn(s) + ____HCl(aq) ____H_2(g) + ____ $ZnCl_2$(aq)

   Balance the equation for the reaction of zinc and hydrochloric acid, using the smallest whole-number coefficients.

2. **What is the gram formula mass for $C_6H_{12}O_6$?**

3. **How many moles of $C_6H_{12}O_6$ are there in 200g?**

Procedure: Complete the mole problems and you will get to make a S'more!!!

Part I

1. Write a **balanced** chemical equation for the synthesis of 1 S'more using the following symbols:

Substance	***Symbol***
Graham Cracker	S
Marshmallow	Mm
Chocolate Pieces	Or
S'more	S_2MmOr_3

2. Calculate the gram formula mass of the S'more (S_2MmOr_3)in the table below:

Symbol	***gfm***
S	7.00 g
Mm	7.10 g
Or	3.30 g
S_2MmOr_3	_____ g/mol

3. ***Calculate the number of moles.*** Determine the number of moles of marshmallows that are available in the bag. If there are 454 g marshmallows in one bag, how many moles of marshmallows do you have?

4. ***Finding the moles of other substances in the reaction*.** Now, determine how many moles of graham crackers and chocolate segments are needed to make the maximum number of s'mores available using the mole ratios from your balanced equation.

5. ***Convert your number of graham crackers and chocolate segments into their respective mass (gram) values.*** (Hint: Use table T)

Part II

Now we will transfer the process you just completed into the language of chemical reactions. When you complete this problem, get it checked by your teacher and you will be rewarded with the necessary items to make your s'more!

If we were to add a piece of solid Cu to an aqueous solution of silver nitrate, the Silver would be replaced in a single replacement reaction forming aqueous copper (II) nitrate and solid silver. How many grams of silver is produced if 15.00 grams of Cu is added to the solution of excess silver nitrate? Show all work and don't forget to use significant figures!!!

1. Write and balance the chemical equation for the reaction:

2. Convert g Cu(s) to moles Cu(s):

3. Convert moles of Cu(s) to moles of Ag(s) produced:

3. Convert moles Ag(s) to grams of Ag(s) produced:

Approved:_____ Enjoy!!!!

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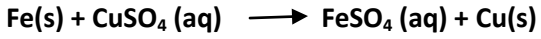
Lab conclusion: Would you like S'more Stoichiometry?

1. **Write a paragraph summarizing what you have learned about the scientific concept of the lab from doing the lab. Back up your statement with details from your lab experience.**

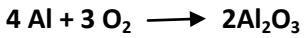
2. **Given the balanced equation:**



What total mass of iron is necessary to produce 1.00 mole of copper?

A) 26.0 g B) 55.8 g C) 112 g D) 192 g

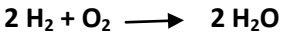
3. **Given the reaction:**



How many moles of Al_2O_3 will be formed when 27 grams of Al reacts completely with O_2?

A) 1.0 B) 2.0 C) 0.50 D) 4.0

4. **Given the reaction:**



The total number of grams of O2 needed to produce 54grams of water is

A) 36 B) 48 C) 61 D) 75

5. **Given the reaction:**

What is the total number of moles of NaCl formed when 2 moles of Na_2CrO_4 react completely?

A) 1 mole B) 2 moles
C) 3 moles D) 4 moles