TO MAKE THE PERFECT S’MORE WE NEED...

- 2 graham squares
- 1 large marshmallow
- .25 of a chocolate bar
HOW MUCH OF EACH DO WE NEED TO MAKE S’MORES FOR ALL OF US....

• Graham Squares......
• Marshmallows.....
• Chocolate bars......

• What is the ratio of Graham Crackers to s’mores?
• Marshmallows to s’mores?
• Chocolate bars to s’mores?
WHAT IF WE WANTED TO MAKE S’MORE FOR 37 PEOPLE?

We could use the ratios we came up with as conversion factors…..

37 s’mores $\times$ 2 graham squares = 74 graham squares needed
1 s’more

37 s’mores $\times$ 1 marshmallow = 37 marshmallows needed
1 s’more

37 s’mores $\times$ 0.25 candy bars = 9.25 candy bars needed
1 s’more
STOICHIOMETRY

Refers to the numerical relationships between the participants in a chemical reaction.
IN STOICHIOMETRY....

We use molar ratios to calculate how much of a reactant we need or how much a product we will produce.

Consider the following chemical reaction

$$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$$

If I want to make 1 mole of water….how many moles of hydrogen gas do I need?

How many moles of oxygen gas do I need?
WORKING IN MASS...

We can use stoichiometry to figure out the mass of reactants needed to create a certain amount of product.
CONSIDER THE EQUATION

\[4\text{Fe}(s) + 3\text{O}_2(g) \rightarrow 2\text{Fe}_2\text{O}_3(s)\]

• If I want to create 45 grams of Fe\(_2\)O\(_3\) how much iron do I need?

• 1 mole of Fe\(_2\)O\(_3\) is 159.687g so…..

\[
45\text{g Fe}_2\text{O}_3 \times \frac{1\text{ mole Fe}_2\text{O}_3}{159.687\text{g Fe}_2\text{O}_3} \times \frac{4\text{ mole Fe}}{2\text{ mole Fe}_2\text{O}_3} \times \frac{55.845\text{g Fe}}{1\text{ mole Fe}} = 31.474\text{g Fe needed}
\]
LIMITING REAGENT....

• Literally the reagent that limits how much product can be formed…..
• Calculate how much product can be formed with each amount of reagent available. The one that would produce the least amount of product is the limiting reagent.

\[ S_8 + 8O_2 \rightarrow 8SO_2 \]

There is .5mole of \( S_8 \) available and 2.0mole of \( O_2 \) available….which is limiting?

\[
\begin{align*}
\text{.5mole } S_8 \times 8 \text{ mole } SO_2 &= 4 \text{ mole } SO_2 \\
1 \text{ mole } S_8 \\
\text{2.0mole } O_2 \times 1 \text{ mole } SO_2 &= 2 \text{ mole } SO_2 \\
1 \text{ mole } O_2
\end{align*}
\]

\[ \text{SO…… } O_2 \text{ is limiting!!!} \]
WHEN WE RUN A REACTION WE OFTEN DISCUSS YIELDS....

• Theoretical Yield: The amount of product expected....calculated using stoichiometry....this assumes 100% of the limiting reagent is used.

• Actual Yield: Measured....how much product is made.

• Percent Yield = $\frac{\text{actual}}{\text{theoretical}} \times 100$