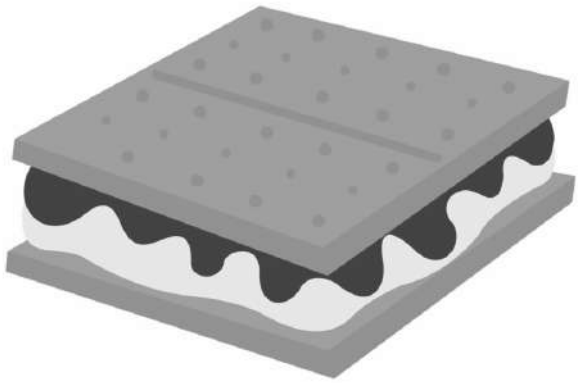
UNIT 7

ACTIVITY 4:
LIMITING REACTANT WITH S'MORES

OBJECTIVE: Construct as many mini s'mores as possible. Do not eat the finish s'mores until the end of the lab.



Recipe for a complete s'more:

- 2 Teddy Grahams (chemical symbol – Tg)
- 1 Mini Marshmallow (chemical symbol – Mm)
- 3 Chocolate Chips (chemical symbol – Cc)

PROCEDURE:

1. The unbalanced chemical equation for this reaction is:

$$Tg + Mm + Cc \rightarrow Tg_2MmCc_3$$

2. Balance the chemical equation above.
3. Using the contents in your bag, construct as many complete s'mores as possible.
4. How many complete s'mores were you able to construct?

    - How many Tg did you have left over?
    - How many Mm did you have left over?
    - How many Cc did you have left over?

ANALYSIS:

1. Which reactant limited the number of S'mores you could make?

2. Which reactants did you have an excess of?

3. Look up the term **limiting reactant.** Write a definition of a limiting reactant that would explain to a non-chemistry student doing this lab what a limiting reactant is.

4. Look up the term **excess reactant.** Write a definition of an excess reactant that would explain to a non-chemistry student doing this lab what an excess reactant is.

STOICHIOMETRY: LIMITING REACTANT

1. A S'more is made by combining 2 graham crackers, 1 marshmallow, and 1 bar of chocolate. If you have the following ingredients available, how many S'mores can you make?

   8 graham crackers, 5 marshmallows, and 12 bars of chocolate

Equation: 2 graham crackers + 1 marshmallow + 1 chocolate → 1 S'more

Which ingredient is used up first?

Identify any ingredients that are left over:

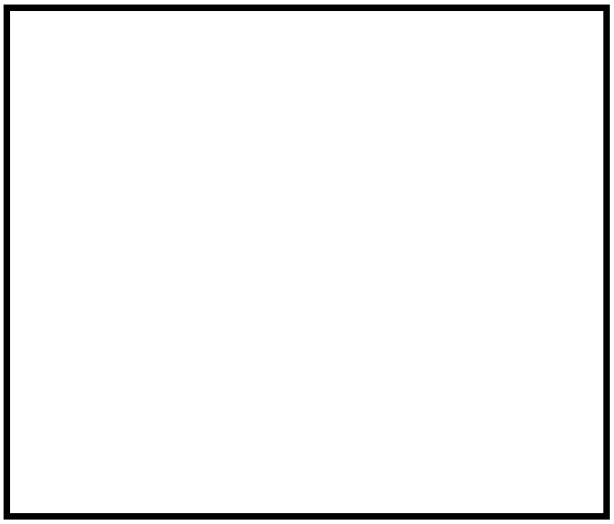
Limiting reactant:

Excess reactant:

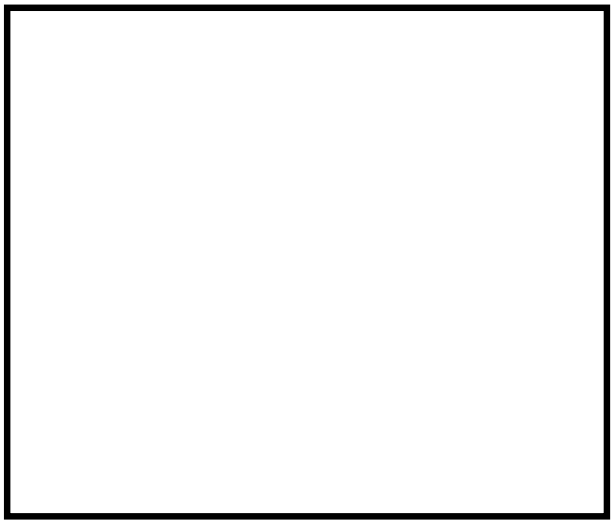
2. Hydrogen and oxygen to form water according to the equation below. **4 moles of hydrogen** and **4 moles of oxygen** are mixed together and allowed to react.

$$H_2 + O_2 \rightarrow H_2O$$

Draw a picture to represent the molecules for both reactants and products.



REACTANTS



PRODUCTS

How many moles of water are produced?

Which reactant is completely used up?

Which reactant is in excess?

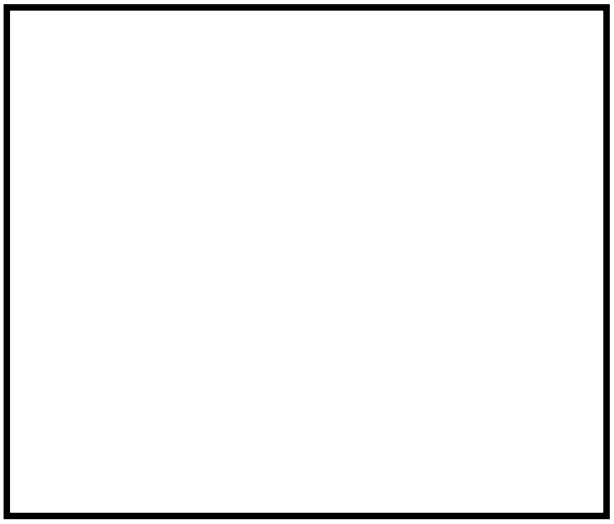
How many moles of excess reactant remain after the reaction?

Based on information above, what determines how much product is made from a particular reactant mixture?

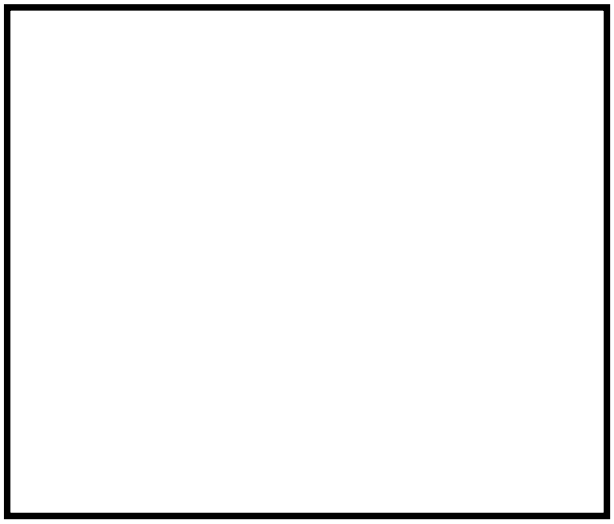
3. Nitrogen gas and hydrogen gas react to form ammonia gas according to the equation below. **3 moles of nitrogen** and **6 moles of hydrogen** are placed into a reaction vessel and allowed to react.

$$N_2 + H_2 \rightarrow 2\ NH_3$$

Draw a picture to represent the molecules for both reactants and products.



REACTANTS



PRODUCTS

How many moles of ammonia are produced?

What is the limiting reactant?

Which reactant is in excess?

How many moles of excess reactant remain?