**Stoichiometry**

* 2Mg (s) + O2 (g) 🡪 2MgO (s) This reaction states that for every 2 moles of Magnesium that reacts 1 mole of oxygen is needed and 2 moles of magnesium oxide is produced.

The mole ratio is  **2 moles Mg : 1 mole O2 : 2 mole MgO**

* Since a **balanced** chemical reaction follows the law of conservation of matter, the coefficients (the moles) can be used to determine an unknown quantity.
* To determine the unknown quantity there are 3 stages:

1. **Before**: the amount in moles before the reaction starts
2. **Change**
3. **After-** the amount in moles at the end of the reaction
4. Recipe for a Newsham S'more is 1 bar of chocolate, 1 marshmallow, and 2 graham crackers.

How many S'mores can you make when you have 12 bars of chocolate, 5 marshmallows, and 8 graham crackers?

**Rxn:** 1 chocolate + 1 marshmallow + 2 graham crackers 🡪 1 S’more

# of S’mores produced:\_\_\_\_\_\_\_\_\_ Which ingredient is used up first?\_\_\_\_\_\_\_\_\_

Identify any ingredients that are left over.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Limiting Reactant (Reagent)** – is used up completely; none left at the end of the reaction

**Excess Reactant (Reagent)** – there is leftovers; some remains at the end of the reaction

Identify the limiting reactant.\_\_\_\_\_\_\_\_\_\_\_\_\_

Identify the excess reactants & how much of each remain\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Oxygen and hydrogen react to form water according to the equation below. 4.0 moles of oxygen and 4.0 moles of hydrogen are mixed together and allowed to react. **O2(g) +** **2 H2(g)** 🡪 **2 H2O(l)**

* 1. Draw a particulate representation of the particles in the reaction container.

How many moles of water are produced? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which reactant is completely used? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which reactant is in excess & how much is leftover? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Before After

* 1. Construct a Before-Change-After Table for the reaction mixture.

Rxn: **O2(g) +**  **2 H2(g) 🡪 2 H2O(l)**

How many moles of water are produced?\_\_\_\_\_\_\_\_\_ Which reactant is completely used?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which reactant is in excess?\_\_\_\_\_\_\_\_\_\_\_\_How many moles of excess reactant remain after the reaction?\_\_\_\_\_\_\_\_\_\_\_\_

* 1. In both methods above (particulate drawing &BCA table), 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. 3.0 moles of nitrogen and 6.0 moles of hydrogen are placed into a reaction vessel and allowed to react.

**N2(g) + 3 H2(g) 🡪 2 NH3(g)**

a) How many moles of ammonia are produced? b) What is the limiting reactant? c) What is the excess reactant and how many moles of excess reactant remains unchanged (unreacted/left over)?

On your own paper do the example below.

4. Methanol, CH3OH, is formed by the reaction of hydrogen and carbon monoxide.

**CO + 2 H2 🡪 CH3OH**

If 5.0 moles CO and 6.0 moles H2 are present, how many moles of CH3OH are formed? What is the limiting reactant? What is the excess reactant? How many moles of excess reactant remains unchanged (unreacted/left over)?