

# Moles & Stoichiometry Review

## A. I know all of the vocabulary terms associated with the unit.

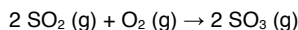
stoichiometry  
coefficient  
mole ratio

limiting reagent  
excess reagent

actual yield  
theoretical yield  
percent yield

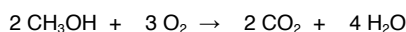
## B. I can interpret a balanced chemical equation and identify the quantities that are conserved in a chemical reaction.

1. Determine if each of the following interpretations is true or false for the following equation. If false, explain why it is false.



- Two molecules of sulfur dioxide react with one molecule of oxygen to produce two molecules of sulfur trioxide.
- Two moles of sulfur dioxide react with one mole of oxygen to produce two moles of sulfur trioxide.
- Two grams of sulfur dioxide react with one gram of oxygen to produce two grams of sulfur trioxide.
- At STP two liters of sulfur dioxide react with one liter of oxygen to produce two liters of sulfur trioxide.
- Mass is conserved in this reaction.
- The number of atoms is conserved in this reaction.
- The number of molecules is conserved in this reaction.
- The number of moles is conserved in this reaction.
- The volume is conserved in this reaction.

## C. I can construct the correct mole ratio from a balanced chemical equation.



2. Use the reaction above to write the correct MOLE RATIO (**nothing more**) that would be used in the solution to the following problems:
- How many liters of carbon dioxide will be formed from 6 moles of oxygen?
  - If I begin with 3.2 moles of methanol, how many grams of water will be produced?
  - Calculate the mass of carbon dioxide created from the addition of  $3.2 \times 10^{24}$  molecules of oxygen gas.
  - A reaction of 53g of oxygen will require how many grams of oxygen?

## D. I can solve all types of reaction stoichiometric problems including moles, mass, representative particles & volumes of gases at STP.

3. Complete the following mole conversions.
- the number of moles in 25 g of sodium hydroxide
  - the number of atoms in 17.2 moles of helium gas
  - the mass of 129 L of carbon dioxide gas at STP
  - the mass of  $1.25 \times 10^{22}$  molecules of ethane
4. Write out the steps for the following:
- mass A  $\rightarrow$  mass B
  - particles A  $\rightarrow$  volume B (at STP or use density)
  - mass A  $\rightarrow$  particles B
5. How many moles of carbon dioxide will be formed from the reaction of 4.2 moles of oxygen gas?  $2 \text{CH}_3\text{OH} + 3 \text{O}_2 \rightarrow 2 \text{CO}_2 + 4 \text{H}_2\text{O}$
6. Using the same reaction in #5 above, if 64g of water was produced, how many moles of oxygen gas was reacted?
7. Determine the number of moles of oxygen required for the combustion of  $2.5 \times 10^{26}$  atoms of magnesium.  $2 \text{Mg}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{MgO}(\text{s})$
8. Determine the mass of phosphorus produced when 15.00 g of calcium phosphate is heated in an electric furnace according to the equation:  
 $\text{Ca}_3(\text{PO}_4)_2(\text{s}) + 3 \text{SiO}_2(\text{s}) + 5 \text{C}(\text{s}) \rightarrow 3 \text{CaSiO}_3(\text{s}) + 5 \text{CO}(\text{g}) + 2 \text{P}(\text{s})$
9. How many liters of carbon dioxide are produced from the heating of 122 g of sodium carbonate,  $\text{Na}_2\text{CO}_3$ ? ( $\text{Na}_2\text{O}$  is also produced, density of oxygen is 1.33 g/L)
10. What mass of sodium nitride must be included in an air-bag to generate 68.0 L of nitrogen? Use 0.916 g/L as the density of nitrogen gas.  
 $2 \text{NaN}_3(\text{s}) \rightarrow 2 \text{Na}(\text{s}) + 3 \text{N}_2(\text{g})$

## E. I can identify limiting and excess reagents in a problem and solve stoichiometric problems involving limiting reagents.

11. What are the steps for finding the limiting reactant?
12. Determine the mass of silver nitrate produced when 154 g of silver reacted with 189 g of nitric acid according to the following equation?  
 $3 \text{Ag}(\text{s}) + 4 \text{HNO}_3(\text{aq}) \rightarrow 3 \text{AgNO}_3(\text{aq}) + \text{NO}(\text{g}) + 2 \text{H}_2\text{O}(\text{l})$
13. Which element is in excess when 3.00 g of magnesium is ignited in 2.20 g of pure oxygen? What mass of magnesium oxide is formed?

## F. I can calculate the theoretical yield, actual yield and percent yield given the appropriate information.

14. List the steps for finding the percent yield.
15. A student used 1.34 g of silver to produce silver nitrate. The actual yield was 1.85 g. Determine the percent yield.
16. Determine the actual yield of iron(III) oxide,  $\text{Fe}_2\text{O}_3$ , when 10.0 g of iron(II) sulfide is burned in air. The percent yield of the reaction is 88.10%.  
 $4 \text{FeS}(\text{s}) + 7 \text{O}_2(\text{g}) \rightarrow 2 \text{Fe}_2\text{O}_3(\text{s}) + 4 \text{SO}_2(\text{g})$