Name:_____

Period:_____

Moles and Sandwiches

Introduction:

When we bake/cook something, we use a specific amount of each ingredient. In chemistry, reactions proceed with very specific recipes. The study of these recipes is *stoichiometry*. When the reactants are present in the correct amounts, the reaction will produce products. What happens if there are more or less of some of the reactants present?

Procedure: Go to **tinyurl.com/MHSsandwiches**.

Part 1: Making Sandviches: Select "Sandwiches"

1. The *sandwich* is a simulation of a two-reactant *synthesis* reaction. In this case, one reactant will be *limiting*, while the other will be in excess. Take some time and familiarize yourself with the simulation.
2. Set the reaction to a simple mole ratio of 2:1:1 

3. Complete the table below while making tasty cheese sandwiches:

Bread Used	Cheese Used	Sandwiches Made	Excess Bread	Excess Cheese
5 slices	5 slices			
4 slices	3slices			
		2 sandwiches	1 slice	0 slices
6 slices		3 sandwiches		4 slices

Part 2: Molecules: Select "Molecules"

4. Now let's work with real chemical reactions. Balance the following reaction: $\_\_H_2 + \_\_O_2 \rightarrow \_\_H_2O$
5. Complete the table below while making water H_2O from hydrogen H_2 and oxygen O_2:

Hydrogen Molecules H_2	Oxygen Molecules O_2	Water Molecules H_2O	Excess H_2	Excess O_2
4 molecules	4 molecules			
7 molecules	6 molecules			
		4 molecules	0 molecules	0 molecules
9 moles	8 moles			
		4 moles	1 moles	0 moles
4.0 moles	2.5 moles			
1.5 moles		1.5 moles	0 moles	0 moles

6. Notice that the labels changed from **molecules** to **moles**. This does not change the mole ratio, as a mole is simply a large number of molecules. How many molecules is a mole? _____
7. Now try producing **ammonia**, a very important chemical in industry and farming. Balance the following reaction: $\_\_N_2 + \_\_H_2 \rightarrow \_\_NH_3$
8. Complete the table below:

Moles N_2	Moles H_2	Moles NH_3	Excess N_2	Excess H_2
3 moles	6 moles			
6 moles	3 moles			
		4 moles	2 moles	0 moles
1.5 moles	4.0 moles			

9. Combustion of **hydrocarbons** like methane CH_4 produces two products, water and carbon dioxide CO_2.

   Balance the following reaction: $\_\_CH_4 + \_\_O_2 \rightarrow \_\_CO_2 + \_\_H_2O$

10. Complete the table below: **WATCH FOR FRACTIONS**

mol CH_4	mol O_2	mol CO_2	mol H_2O	Excess mol CH_4	Excess mol O_2
4 mol	4 mol				
3 mol	6 mol				
		2 mol	4 mol		
		3 mol			

11. **Game: Level 1:** *Fill in the chart and include the correct formulas, no leftovers. When you get a perfect score, bring the iPad and your sheet to the instructor for a stamp.*

	Reactants	→	Products	Best time
#1				
#2				
#3				
#4				
#5				

12. **Game: Level 2:** *Fill in the chart and include the correct formulas, no leftovers. When you get a perfect score, bring the iPad and your sheet to the instructor for a stamp.*

	Reactants	→	Products	Best time
#1				
#2				
#3				
#4				
#5				

13. **Game: Level 3** *Fill in the chart and include the correct formulas, no leftovers. When you get a perfect score, bring the iPad and your sheet to the instructor for a stamp.*

	Reactants	→	Products	Best time
#1				
#2				
#3				
#4				
#5				