

## Intro to Stoichiometry

Go to: [bit.ly/stoichsim](http://bit.ly/stoichsim)

Title: Interactive Mole-Mole and Mass-Mass Stoichiometry Tutorial

File name: stoichiometry.swf (Requires Flash Player Plugin)

Click on **Mole-Mole**. Read each slide and answer the questions as you go through this tutorial.

### 1. (Slide 2)

#### Stoichiometry: The Mole Ratio

According to the scrambled egg recipe, 2 tablespoons of milk are needed for every 6 eggs.

How many tablespoons of milk are needed for scrambling 18 eggs?



Scrambled Eggs for Two

Ingredients:  
6 eggs  
2 tbsp milk  
pinch salt & pepper  
1 tbsp butter

Preparation:  
Beat eggs with milk and seasoning. Preheat nonstick frying pan on medium heat. Melt butter in pan. Add eggs. Cook, with occasional stirring, until set.

2 tbsp

6 tbsp

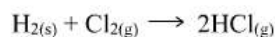


Answer the question on the slide. Hover over the green tabs to reveal the answer. Show the conversion below using dimensional analysis!

### 2. (Slide 3)

#### Stoichiometry: The Mole Ratio

The same thing can be done with the balanced equation. It says that one molecule of chlorine gas is needed for every molecule of hydrogen gas that reacts.



How many chlorine molecules ( $\text{Cl}_2$ ) are needed to react with 9 molecules of hydrogen ( $\text{H}_2$ )?

9 molecules  $\text{Cl}_2$

18 molecules  $\text{Cl}_2$



Answer the question on the slide. Hover over the green tabs to reveal the answer. Show the conversion using dimensional analysis!

3. (Slide 4).

**Stoichiometry: The Mole Ratio**

Let's look again at the scrambled eggs recipe. Notice that it gives the requirements for making scrambled eggs for 2 people.

Use the recipe to determine the number of eggs required to make scrambled eggs for only one person.



Scrambled Eggs for Two	
Ingredients:	
6 eggs	
2 tbsp milk	
pinch salt & pepper	
1 tbsp butter	
Preparation:	
Beat eggs with milk and seasoning. Preheat nonstick frying pan on medium heat. Melt butter in pan. Add eggs. Cook, with occasional stirring, until set.	

3 eggs

2 eggs

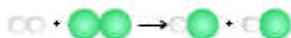


Answer the question on the slide. Hover over the green tabs to reveal the answer. Show the conversion below using dimensional analysis!

4. (Slide 5).

**Stoichiometry: The Mole Ratio**

Now look at the recipe for making hydrogen chloride gas. Note that it says that you need 1 molecule of H<sub>2</sub> to make 2 molecules of HCl.



How many molecules of Cl<sub>2</sub> are needed to make 12 molecules of HCl?

6 molecules Cl<sub>2</sub>

24 molecules Cl<sub>2</sub>



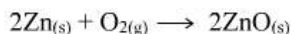
Answer the question on the slide. Hover over the green tabs to reveal the answer. Show the conversion below using dimensional analysis!

5. Read through the next five slides carefully. Pay attention to the set up and math that they do to calculate with mole ratios.

6. (Slide 10).

**Stoichiometry: The Mole Ratio**

We can write two mole ratios that express the idea that 2 formula units of ZnO are produced for every molecule of O<sub>2</sub> that reacts.



Which of these mole ratios can be used as a unit conversion factor to convert from moles of O<sub>2</sub> to moles of ZnO?

$\frac{2 \text{ mol ZnO}}{1 \text{ mol O}_2}$

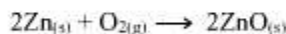
$\frac{1 \text{ mol O}_2}{2 \text{ mol ZnO}}$

Which of the provided answers would be useful to convert moles O<sub>2</sub> to moles of ZnO? Explain why this is the correct answer!

7. (Slide 11).

### Stoichiometry: The Mole Ratio

This is how we would use the unit analysis method to calculate the moles of ZnO produced by the reaction of 5.0 moles of O<sub>2</sub>:



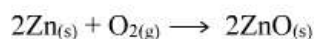
Click here when ready for solution

Answer the question on the slide. Show the conversion using dimensional analysis. Check your answer by holding your mouse over the corresponding green tab.

8. (Slide 12).

### Stoichiometry: The Mole Ratio

Now consider the relationship between Zn and O<sub>2</sub>.



Which of these relationships would be useful to convert from moles of Zn to moles of O<sub>2</sub>?

$$\frac{1 \text{ mol O}_2}{2 \text{ mol ZnO}}$$

$$\frac{2 \text{ mol ZnO}}{1 \text{ mol O}_2}$$

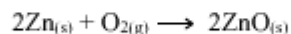
$$\frac{1 \text{ mol O}_2}{2 \text{ mol Zn}}$$

Which of the provided answers would be useful to convert moles of Zn to moles of O<sub>2</sub>? Explain why this is the correct answer!

9. (Slide 13).

### Stoichiometry: The Mole Ratio

Using the appropriate conversion factor and the unit analysis method for problem solving, calculate the moles of zinc needed to produce 10. moles of ZnO.



Answer

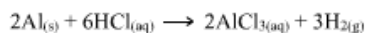
Answer the question on the slide. Show the conversion using dimensional analysis! Hover over the green tabs to check your answer.

10. Look through the next few problems and make sure you can solve them on your own.

11.

**Stoichiometry: The Mole Ratio**

Using the appropriate conversion factor, calculate the moles of hydrogen gas,  $H_2$ , produced by the reaction of 0.50 moles of aluminum metal with hydrochloric acid,  $HCl$ .



Answer the question on the slide. Show the conversion using dimensional analysis! Hover over the green tabs to check your answer.



Answer



12.

**Stoichiometry: The Mole Ratio**

*Now work this problem before looking at the answer.*

Calculate the moles of  $N_2$  needed to completely react with 1.50 moles of  $H_2$  according to the balanced equation:

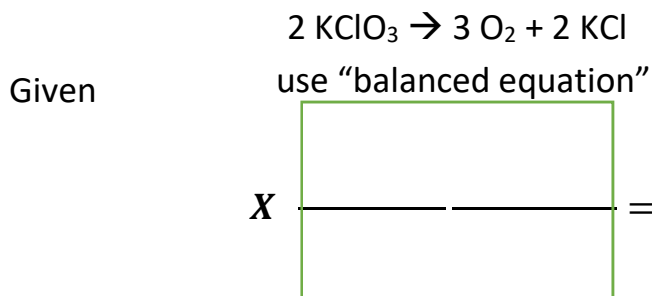


Answer the question on the slide. Show the conversion using dimensional analysis! Hover over the green tabs to reveal the answer

Answer

### Stoichiometry Mole-Mole Practice

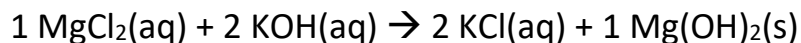
1. In the decomposition reaction below if you were given 0.400 mol of  $\text{KClO}_3$ , how many moles of  $\text{O}_2$  will form?



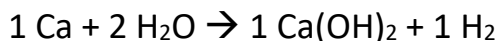
2. When ammonia ( $\text{NH}_3$ ) is burned in air, water and nitrogen gas are given off. What is the amount of nitrogen gas produced if 2.34 moles of ammonia are present?



3. Using the equation below, if there are 10.23 moles of  $\text{MgCl}_2$ , how many moles of  $\text{KCl}$  are produced?



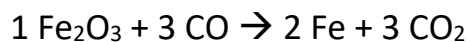
4. How many moles of  $\text{H}_2\text{O}$  are needed to react with 5.25 moles of  $\text{Ca}$ ?



5. How many moles of  $\text{HCl}$  would be required to produce 2.29 moles of  $\text{H}_2$ ?



6. What is the total number of moles of  $\text{CO}$  used to produce 3.75 moles of iron?



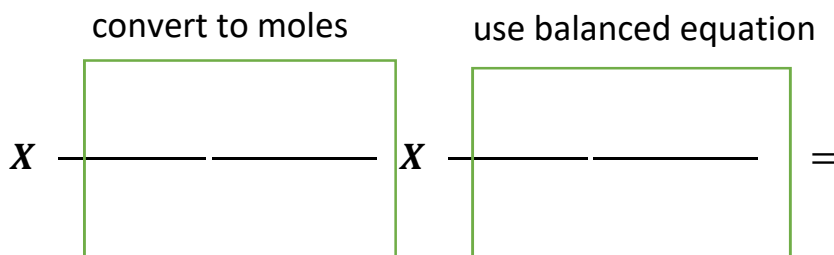
### Stoichiometry with Grams Practice:

1. The combustion of a sample of butane (C<sub>4</sub>H<sub>10</sub>) produced 2.46 g of water.



a) How many moles of CO<sub>2</sub> are formed?

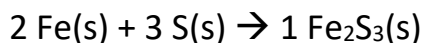
Given



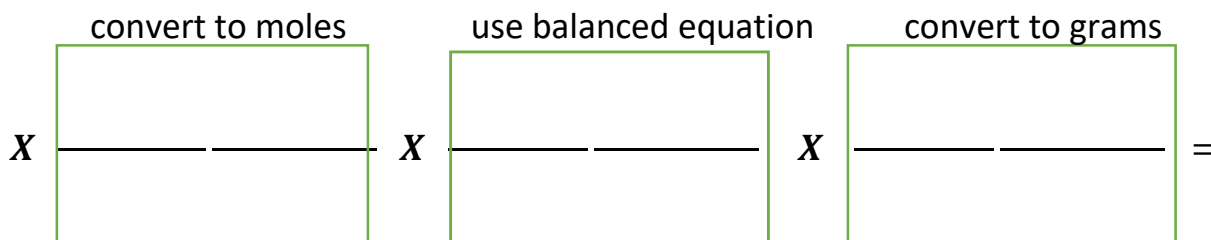
b) How many moles of butane burned?

c) How much oxygen was used up in moles?

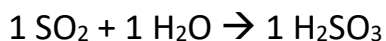
2. If 95g of iron are needed for the reaction below, how many grams of sulfur are involved in this reaction?



Given



2. What mass of H<sub>2</sub>SO<sub>3</sub> is produced when 245g of sulfur dioxide is reacted with water?



Given

