



Lab -Stoichiometry of Magnesium Oxide

Goggles must be worn at all times

Introduction:

In this experiment, you will examine the reaction between magnesium metal and oxygen gas. When heated, magnesium reacts readily with oxygen in the air, to produce magnesium oxide. The chemical reaction is written as follows: $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

The magnesium will be heated strongly in an open crucible for several minutes. You may need to repeat this step several times in order to ensure that all the magnesium has reacted and turned into product.

You will use stoichiometry to determine how much product you should be able to make from the experiment and then in doing the lab, you will see if you are actually able to produce the desired amount of MgO.

Purpose: 1) You will measure the mass of the magnesium that reacts and predict the mass of magnesium oxide that should be produced using stoichiometry.

2) After the experiment you will calculate your % yield and % error of actual magnesium oxide produced.

Materials Provided:

-Crucible	-Magnesium ribbon	-Bunsen burner	-Clay triangle
-Crucible tongs	-Ring stand w/ ring	-Safety goggles	

Procedure:

- 1) Obtain a piece of magnesium ribbon from your teacher.
- 2) Obtain a clean, dry crucible. Find the mass of the crucible and record it on the Data Table.
- 3) Roll the magnesium in a loose coil, and place it in the crucible. Find the mass of the crucible, and magnesium. Record this mass on the Data Table.
- 4) Set up the ring stand, ring, Bunsen burner, and triangle. Place the crucible on the triangle.
- 5) Begin heating the crucible gradually. Heat slowly by moving the flame around underneath the crucible. Remove the heat temporarily if a large amount of smoke comes out of the crucible.
- 6) Heat the crucible to redness, for four minutes
- 7) Turn off the Bunsen burner and allow the crucible to cool to a temperature low enough so that you can touch the crucible.
- 8) Find the mass of the crucible & contents. Record this mass on the Data Table.
- 9) Reheat the crucible and contents for four minutes, cool, and find the mass again. Record this mass on the Data Table. Compare the masses found in steps 8 and 9. If the two masses are not the same, repeat this step again until the masses are the same.

Data and Observations:

Mass of crucible	
Mass of crucible & magnesium (before burning)	Class Set: _____
Using math, subtract to find mass of Mg	Do not write on _____
Mass of crucible and MgO product (Trial 1)	
Mass of crucible and MgO product (Trial 2)	
Mass of crucible and MgO product (Trial 3)...	

Calculations/ Analysis:

- 1) Write the chemical reaction you are performing and identify the type of chemical reaction.
- 2) Why did the product weigh more than the reactant (Mg) in this lab?
- 3) Determine your **theoretical yield of MgO** (aka the amount of product you "should" produce in this lab).
*How: Using stoichiometry and your balanced chemical equation, calculate the mass (g) of magnesium oxide that you should produce in this lab **given** the mass (g) of magnesium you began the experiment with. You Must Show Your Entire Calculation!*
- 4) Determine your **experimental yield of MgO**, (aka the amount of product you "actually" produced).
How: Using information from your data table, show which numbers you would subtract to arrive at this value. You Must Show Your Entire Calculation!
- 5) a. How does your **experimental yield** compare to your **theoretical yield of MgO**? Explain using data to support your answer.
b. Is it common to have the experimental yield that is less than the theoretical yield? Why/ why not?

Now we're going to see how profitable of a chemist you are. **SHOW YOUR WORK**

- 6) a. Calculate your **% error** using the formula:
$$\frac{\text{(theoretical yield - experimental yield)}}{\text{theoretical yield}} \times 100 = \% \text{ error}$$

b. In general, what does the % error tell you about your results in this lab? Do you think it's possible to have a 0% error? Explain.
- 7) Which reactant (Mg or O₂) limited the amount of product you were able to make?
- 8) a. Calculate your **% yield** using the formula:
$$\frac{\text{experimental yield}}{\text{theoretical yield}} \times 100 = \% \text{ yield}$$

b. In general, what does the % yield tell you about your results in this lab? Did you produce as much as you expected? Explain.

Conclusion: Read through the introduction and purpose of this lab. Write a 3 sentence summary that highlights what was accomplished during this activity and any errors that were made. It should be clear you understand why you did the lab.