

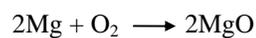
## EXERCISE 7

### Percent Composition of Magnesium Oxide

#### OBJECTIVES:

1. To become familiar with methods for determining the composition of simple compounds.
2. To develop skill in using an analytical balance.
3. To perform simple stoichiometric calculations.
4. To determine the formula of a compound from experimental data.
5. To determine the gram-atomic-weight, valence, and equivalent weight of a metal.

The composition of a compound such as magnesium oxide (MgO) can be determined by forming the compound from its elements; namely, magnesium and oxygen. The equation for this reaction is:



#### Equipment

1. Crucible and its lid
2. Iron stand
3. Burner
4. Stirring rod
5. Crucible tongs

## Procedure

1. Heat, cool, and weigh to the nearest .001 g a crucible and its lid.
2. Fold and roll approximately .5 g magnesium ribbon; place the magnesium in your crucible and weigh to the nearest .001 g.
3. Heat the crucible and its contents with cover on but allowing air (oxygen) to react with the magnesium by raising the crucible cover slightly. When the magnesium reacts with oxygen, it ignites. As soon as this happens, cover your crucible so that magnesium oxide will not be lost. After all the magnesium has reacted, open crucible lid slightly and heat intensely for about 5 minutes. Cool to room temperature; crush the product with the end of a stirring rod, being careful not to break the crucible. Add 8-10 drops of distilled water to the product. Reheat crucible and lid gently first, then intensely for 10 minutes. This converts magnesium nitride ( $\text{Mg}_3\text{N}_2$ ) to magnesium hydroxide ( $\text{Mg}(\text{OH})_2$ ) and finally to magnesium oxide ( $\text{MgO}$ ). Cool crucible and contents and weigh.
4. (a) Calculate the weight of Mg.  
(b) Calculate the mols of Mg (gram atomic weight).
5. (a) Calculate the weight of oxygen from your data.  
(b) Calculate the mols of oxygen atoms (gram atomic weight).
6. Calculate the percent of oxygen in your sample from your data.
7. Calculate the percent of oxygen from formula  $\text{MgO}$ .
8. Calculate the percent error.
9. Write and balance equations for each reaction in Procedure 3.
10. The gram atomic weight of magnesium can be calculated from your data. According to the formula  $\text{MgO}$ , one gram atomic weight of oxygen will combine with one gram atomic weight of magnesium. From item 4 and 5 and the accepted gram atomic weight of oxygen, calculate the gram atomic weight of magnesium.
11. The equivalent weight of a metal may be defined as the weight of metal that will react with 8.00 g of oxygen. Calculate the equivalent weight of magnesium using your data.
12. The valence of a metal may be defined as its gram-atomic-weight divided by its equivalent weight rounded to the nearest whole number. Calculate the valence of magnesium.
13. Calculate the formula for magnesium oxide by finding the simplest whole number ratio of the number of gram-atomic-weights of magnesium to the number of gram-atomic-weights of oxygen using data in items 4 and 5.
14. In view of your results from this experiment, how do you think values for gram-atomic-weights, valences, and formulas were determined by chemists in the 1800's.
15. Show all your calculations.

# ANSWER SHEET

## EXERCISE 7

NAME \_\_\_\_\_ SECTION \_\_\_\_\_ DATE \_\_\_\_\_

1. Weight of crucible and lid ..... \_\_\_\_\_

2. Weight of crucible lid and magnesium ..... \_\_\_\_\_

3. Weight of crucible, lid, and magnesium oxide ..... \_\_\_\_\_

4. a. Weight of magnesium..... \_\_\_\_\_

b. Number of mols of Mg ..... \_\_\_\_\_

5. a. Weight of oxygen..... \_\_\_\_\_

b. Number of moles of oxygen atoms..... \_\_\_\_\_

6. Percent of oxygen in samples from data..... \_\_\_\_\_

7. Percent of oxygen from formula MgO ..... \_\_\_\_\_

8. Percent error ..... \_\_\_\_\_

9. Balanced equations:

10. Atomic weight of magnesium from your data ..... \_\_\_\_\_

11. Equivalent weight of magnesium from your data ..... \_\_\_\_\_

12. Valence of magnesium ..... \_\_\_\_\_

13. Ratio of mols of magnesium to mols of  
oxygen atoms in MgO ..... \_\_\_\_\_

Formula ..... \_\_\_\_\_