

Making Ionic Compounds

Elements combine to form compounds. If energy is released as the compound is formed, the resulting product is more stable than the reacting elements. In this investigation, you will react elements to form two compounds. You will test the compounds to determine several of their properties. Ionic compounds have properties that are different from those of other compounds. You will decide if the products you formed are ionic compounds.

Problem

What are the formulas and names of the products that are formed? Do the properties of these compounds classify them as having ionic bonds?

Objectives

- **Observe** evidence of a chemical reaction.
- **Acquire** and **analyze** information that will enable you to decide if a compound has an ionic bond.
- **Classify** the products as ionic or not ionic.

Materials

magnesium ribbon

crucible

ring stand and ring

clay triangle

laboratory burner

stirring rod

crucible tongs

centigram balance

100-mL beaker

distilled water

conductivity tester

Safety Precautions



- Always wear safety glasses and a lab apron.
- **Do not** look directly at the burning magnesium. The intensity of the light can damage your eyes.
- Avoid handling heated materials until they have cooled.

Pre-Lab

1. Read the entire **CHEMLAB**. Identify the variable. List any conditions that must be kept constant.
2. Write the electron configuration of the magnesium atom.
 - a. Based on this configuration, will magnesium lose or gain electrons to become a magnesium ion?
 - b. Write the electron configuration of the magnesium ion.
 - c. The magnesium ion has an electron configuration like that of which noble gas?
3. Repeat question 2 for oxygen and nitrogen.
4. Use the data table in the next column.
5. In your data table, which mass values will be measured directly? Which mass values will be calculated?
6. Explain what must be done to calculate each mass value that is not measured directly.

Procedure

1. Arrange the ring on the ring stand so that it is about 7 cm above the top of the Bunsen burner. Place the clay triangle on the ring.
2. Measure the mass of the clean, dry crucible, and record the mass in the data table.
3. Roll 25 cm of magnesium ribbon into a loose ball. Place it in the crucible. Measure the mass of the magnesium and crucible and record this mass in the data table.
4. Place the crucible on the clay ring. Heat the crucible with a hot flame, being careful to position the crucible near the top of the flame.
5. When the magnesium metal ignites and begins to burn with a bright white light, immediately turn off the laboratory burner. **CAUTION: Do not look directly at the burning magnesium.** After the magnesium product and crucible have cooled, measure their mass and record it in the data table.
6. Place the dry solid product in a small beaker for further testing.
7. Add 10 mL of distilled water to the dry magnesium product in the beaker and stir. Check the mixture with a conductivity checker, and record your results.

Sample Data

Mass Data	
Material(s)	Mass (g)
Empty crucible	
Crucible and Mg ribbon before heating	
Magnesium ribbon	
Crucible and magnesium products after heating	
Magnesium products	

Cleanup and Disposal

1. Wash out the crucible with water.
2. Dispose of the product as directed by your teacher.
3. Return all lab equipment to its proper place.

Analyze and Conclude

1. **Analyzing Data** Use the masses in the table to calculate the mass of the magnesium ribbon and the mass of the magnesium product. Record these masses in the table.
2. **Classifying** What kind of energy was released by the reaction? What can you conclude about the product of this reaction?
3. **Using Numbers** How do you know that the magnesium metal reacts with certain components of the air?
4. **Predicting** Magnesium reacts with both oxygen and nitrogen from the air at the high temperature of the crucible. Predict the binary formulas for both products. Write the names of these two compounds.
5. **Analyzing and Concluding** The product formed from magnesium and oxygen is white, and the product formed from magnesium and nitrogen is yellow. From your observations, which compound makes up most of the product?
6. **Analyzing and Concluding** Did the magnesium compounds and water conduct an electric current? Do the results indicate whether or not the compounds are ionic?
7. **Error Analysis** If the magnesium lost mass instead of gaining mass, what do you think was a possible source of the error?