

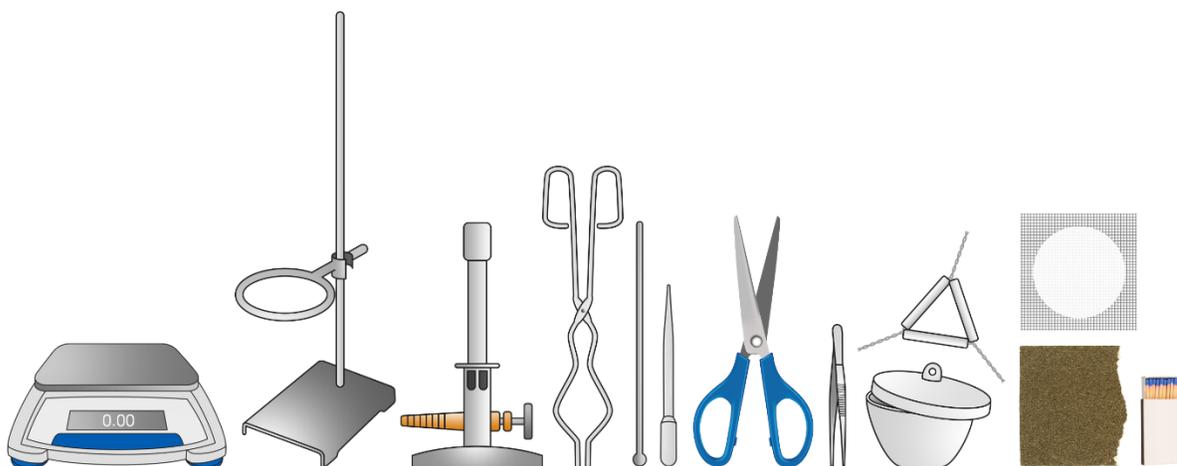
6D – EMPIRICAL FORMULA OF MAGNESIUM OXIDE

INQUIRY

How can you determine the simplest ratio formula of elements in a compound?

MATERIALS

- Balance (readability: 0.01 g)
- Stirring rod
- Bunsen burner
- Clay triangle
- Ring stand
- Iron ring
- Crucible and cover
- Crucible tongs
- Wire gauze
- Forceps
- Magnesium ribbon, 0.50 g
- Small piece of sandpaper
- Pipet with distilled water
- Flint striker or matches
- Scissors



BACKGROUND

Many elements will react when heated in the presence of air. Heat makes the elements more readily react with oxygen in the air. The elements react with oxygen in a specific ratio to form products. All elements combine in definite ratios to form compounds when they react. Chemical formulas indicate the true composition of compounds. The empirical formula gives only the simplest ratio of the relative number of atoms in a compound. The simplest ratio usually consists of small whole numbers. That is why the empirical formula is also called the "simplest formula."

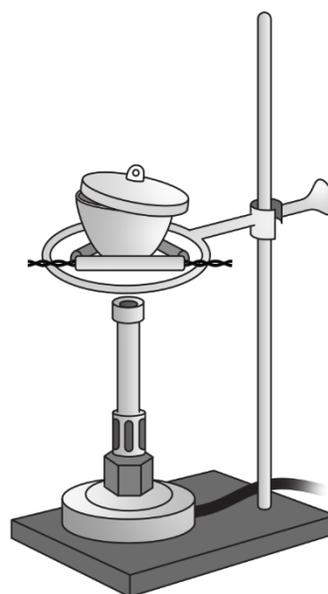
SAFETY

Follow these important safety precautions in addition to your regular classroom procedures.

- Wear safety goggles at all times.
- Do not look directly into the crucible when the magnesium ignites.
- Do not point the sample toward yourself or anyone else.
- Inspect the crucible for cracks. Request a new crucible if necessary.
- If the crucible tips over, just let it fall. Do not try to grab it with your hands while it is hot.
- If using matches, light the match before turning on the gas.
- If using a flint striker, make sure you know how to produce a spark before turning on the gas.

PROCEDURE

1. Clean and dry the crucible and cover thoroughly. Once clean, handle the crucible and cover with crucible tongs only for the remainder of this experiment.
2. Measure and record the mass of the crucible and cover in Table 1 on your answer sheet.
3. Obtain approximately 0.50 g of magnesium. Handle the magnesium only with forceps. Sand both sides of the magnesium until it becomes uniformly shiny. Wipe the magnesium with a paper towel.
4. Loosely curl the magnesium just enough to fit in the crucible. Add all magnesium to the crucible and cover it. Record the mass of magnesium, crucible and cover in Table 1.
5. Determine the mass of magnesium present. Record the value in the Table 1.
6. Record your observations of the sample before heating in Table 1.
7. Place the crucible in the clay triangle as shown. Use the crucible tongs to practice picking up the crucible cover with tongs and gently replacing it so the cover is slightly open as shown. Do not continue until you are comfortable using the tongs.
8. Gently heat the crucible with low heat for 1-2 minutes, cover slightly open.
9. Adjust the flame to heat the magnesium strongly for ten minutes. Aim the hottest part of the flame towards the bottom of the crucible.
10. After 10 minutes have passed, open the cover to inspect the magnesium. Do not look directly at burning magnesium. Continue heating the Mg for an additional 10 minutes or until the reaction is complete. The reaction is complete when the magnesium glows hot but shows no flashes of light.
11. When the reaction is done, heat the crucible with cover slightly open to a glowing red for 1-2 minutes.
12. Turn off the Bunsen burner. Place the cover on the wire gauze. Allow the crucible to cool to the touch.
13. Use the stirring rod to gently crush the contents of the crucible. Mix in a few drops of distilled water, and stir. Wipe as much product on the inside of the crucible as possible and rinse the stirring rod into the crucible with a few drops of distilled water. You will now have a thick paste.
14. Replace the cover, slightly open. Light the Bunsen burner and aim the hottest part of the flame under the crucible. Allow the crucible to heat for another few minutes, until the product is dry.
15. Turn off the Bunsen burner. Place the cover on the wire gauze and allow the crucible to cool to the touch. When cool, measure and record the first mass of the crucible, cover and contents in Table 1.
16. Record your observations of the sample after heating in Table 1.
17. Reheat the crucible and cover for 1 to 2 minutes.



PROCEDURE

18. Allow the crucible and cover to cool. Measure and record the second mass in Table 1.
19. If the mass has changed by less than 0.02 g you are finished. If it has changed more, continue heating, cooling, and measuring mass until the mass stabilizes. Record your final mass in Table 1.

ANALYSIS

Complete the analysis on your answer sheet.

QUESTIONS

Answer the questions on your answer sheet.