EXPERIMENT 3.1

COMPARING THE PROPERTIES OF A COMPOUND WITH THOSE OF ITS COMPONENT ELEMENTS

In this experiment, you will compare the properties of the elements with those of the resultant compound. The properties being compared experimentally are physical state, colour, odour, solubility in water, electrical conductivity and reaction with hydrochloric acid. You may also consult data tables to add melting point and density to the comparison table.

Aim

To compare the properties of the elements magnesium and oxygen with those of the compound magnesium oxide

Materials

- 2 strips of magnesium ribbon (20 cm and 1 cm)
- Steel wool
- Crucible tongs
- Pipe clay triangle
- Bunsen burner
- Tripod
- Test tubes, stoppers and test-tube rack
- 250 mL beaker
- Distilled water
- Crucible and lid
- Electrical conductivity apparatus
- Matches
- 1 mol L^{-1} hydrochloric acid (HCl)

What are the risks in doing this experiment?	How can you manage these risks to stay safe?
1 mol L^{-1} HCl is corrosive to skin and clothing.	Wear safety glasses and protective clothing. Take care when pouring and clean up spills immediately. If hydrochloric acid is spilt on the skin, wash the affected area with plenty of water and notify your teacher.
Magnesium burns with a very bright flame.	Do not look at the flame directly.
Magnesium oxide is an irritant.	Do not breath in the powder; work in a well-ventilated area.
A hot crucible retains heat, especially if contents have significant mass.	Use tongs to handle the crucible; place hot crucible on the heatproof mat. Do not touch the hot crucible. If you burn yourself, place the affected part under cold running water for 10 minutes and inform your teacher.
The Bunsen burner will get hot.	Do not use the Bunsen burner if the gas tube is damaged. Ensure long hair is tied back and the flame is away from flammable material. If you burn yourself, place the affected part under cold running water for 10 minutes and inform your teacher.

In your write-up, add any more risks you can think of, as well as ways to manage them.

Procedure

1. Thoroughly clean the surface of both strips of magnesium ribbon with steel wool. Record the appearance of the cleaned magnesium.
2. Coil the longer piece of magnesium ribbon so that it fits inside the crucible.
3. Place the crucible on a pipe clay triangle or a tripod over the Bunsen burner and carefully heat the crucible without the lid until the magnesium begins to glow.

   Warning: Do not look directly at the burning magnesium.
4. Place the lid on the crucible with tongs and heat strongly for about 10 minutes.
5. Remove the lid and heat for a further 5 minutes to ensure complete reaction.
6. Replace the lid and allow it to cool. This is the sample of magnesium oxide to be used for comparing properties.
7. Use the conductivity apparatus to test the electrical conductivity of magnesium metal, magnesium oxide and oxygen (air). Record the results.
8. Place 10 mL of distilled water in each of two test tubes. Add the 1 cm strip of magnesium to one and some of the magnesium oxide to the other. Stopper and shake. Record the results.
9. Consult data tables for the melting point and density of magnesium and magnesium oxide.
10. Add 10 mL of hydrochloric acid to each of three test tubes. To the first one add the strip of magnesium ribbon. To the second, add some magnesium oxide. Record your observations. Stopper the third test tube and shake it to aerate the water. Record your observations.

Results

Record your results in a table like the one below.

Properties	Magnesium	Oxygen	Magnesium oxide
Physical state			
Colour			
Electrical conductivity			
Solubility in water		0.0359 g O_2 per litre water at 25°C	
Reaction with HCl			
Melting point			
Density			

Analysis of results

What are the similarities and differences in the properties of the elements and compound?

Discussion

What other properties could be compared?

Conclusion

Summarise your findings about the comparison of properties of the elements and resultant compound.