Revised August 2011

HONORS LAB 4a: Empirical Formula

Aim To calculate the empirical formula of magnesium oxide

Apparatus Crucible & lid, tongs, retort stand & ring, scissors, ruler, Bunsen burner, clay triangle

Chemicals Magnesium ribbon, distilled water

Method

1. Measure the mass of a clean, dry, empty crucible AND its lid. Record the mass in the data table.

2. Measure a 25.0 cm length of magnesium ribbon and cut to this length. Clean the magnesium with the steel wool until it is shiny and any black residue has been removed. Wrap the magnesium metal into a loose coil/ball and place it in the bottom of the crucible.

3. Measure the mass of the crucible, lid and magnesium metal. Record the mass in the data table.

4. Place the crucible in the clay triangle with the lid slightly ajar, and heat the crucible and its contents gently (gentle heating can be achieved by brushing the blue flame against the bottom of the crucible) for approximately two minutes.

If the magnesium starts to burn during heating, do not look directly at the bright light emitted

5. Using the tongs fit the lid properly on to the crucible, and then heat strongly for another two minutes. After two minutes, use the tongs to carefully lift the lid a small amount to allow air to enter the crucible. Do not open the lid too far. Replace the lid and continue to heat the crucible. Replace the lid immediately if the metal begins to burn or the amount of smoke greatly increases.

6. Repeat step five (continually heating and allowing some air to enter the crucible) for about ten to fifteen minutes. At the end of the heating the magnesium metal should have all been converted to a grey/white ash.

The idea is to allow air into the crucible so that the magnesium CAN react, BUT to ensure that the contents of the crucible are NOT lost

7. Allow the crucible to cool for 5 minutes. Add about 2 ml (approx. 20 drops) of distilled water directly to the solid powder.

8. Gently heat the crucible and contents, with the lid slightly ajar, for approx. 30 seconds to allow the water to evaporate. Avoid splattering of the contents.

9. Allow the crucible to cool completely before reweighing the combined mass of the crucible, lid and product formed.

Results

Mass of empty crucible and lid in g	
Mass of crucible, lid and Mg ribbon in g	
Mass of crucible, lid and product after heating in g	

Conclusion/Calculation

1. Calculate the mass of magnesium metal, the mass of the product and hence the mass of oxygen added.

2. Calculate the percentage composition by mass of the magnesium oxide that you have produced.

3. Use the percentage data to calculate an empirical formula for magnesium oxide.

4. Write a balanced chemical equation for the reaction that takes place.

5. Discuss the possible sources of error in this experiment. **BE SPECIFIC**.

6. If the experiment had been carried out in such a way that *insufficient* oxygen had been allowed to enter the crucible during heating, what effect would this have on the calculated empirical formula?

7. Consider the following data. Use it to calculate the empirical formula of iron oxide.

A piece of iron that has a mass of 19.6995 g is heated in a crucible in the same manner as the magnesium in this experiment. At the end of the experiment the iron oxide product had a mass of 27.2251 g.