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SL HL Paper 3 Section A Experimental work (6)

A student performed an experiment to determine the empirical formula of magnesium oxide.

She placed 0.196 g of magnesium in a crucible and heated it strongly with a Bunsen burner lifting the lid occasionally to allow some air in. After the magnesium had reacted it was allowed to cool. The mass of the product was 0.299 g.

(a) Show that the student's results give Mg_5O_4 for the empirical formula of magnesium oxide. *[1]*

(b) The student knew that the correct result is MgO. She wondered whether all the magnesium had reacted.

Describe one simple chemical test that she could perform to determine whether the product still contained magnesium metal and state the equation for the reaction that would occur if the test is positive. *[2]*

(c) Suggest how she could ensure that all the magnesium does react when she repeats the experiment. *[1]*

(d) Other than the fact that not all the magnesium may have reacted, the student also realised that she had made at least four other assumptions. These were:

- None of the product escaped when the lid of the crucible was lifted.
- Other than oxygen, magnesium does not react with any of the other gases in the air.
- The magnesium was pure.
- The magnesium did not react with the crucible.

Suggest how the student could perform the experiment using apparatus available in a school laboratory to overcome the first two of these four assumptions. *[2]*

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