**Experiments to investigate the reactions of Group 2**

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| **Safety:*** Wear eye protection.
* Magnesium and calcium are highly flammable.
* Calcium hydroxide is an irritant.
* Barium hydroxide is corrosive.
* Calcium hydroxide solution is an irritant
* Barium compounds are toxic.
* Danger of suck-back – remove delivery tube from limewater *before* removing heat.
 | Highly flammableIrritant Toxic Corrosive |

**Method:**

**1) Reactions with oxygen:**

* Using crucible tongs burn a small piece of magnesium ribbon over a heat proof mat **(do not look directly at the flame).**
* Tap the oxide into a boiling tube for later.
* Record your observation.
1. Predict how barium would react with oxygen.
2. Write a balanced chemical equation and use oxidation numbers to show that magnesium is oxidised when it reacts with oxygen and that oxygen is reduced.
3. Write an equation for the reaction between magnesium and oxygen.

**2) Reactions with water:**

* 1/3 filled with a test tube with cold water.
* Put a 3-4 calcium granules into the test tube and place in a test tube rack placing an inverted boiling tube over the top.
* Carefully ignite any gas collected in the boiling tube.
* Test the resulting solution with universal indicator.
* Repeat the experiment using magnesium powder. You will need to use boiling water from a kettle instead of cold water.
* Record your observations.
1. State and explain the trend in reactivity down the group, you may wish to draw dot and cross diagrams for the metals.
2. Write an equation for the reaction between magnesium and water.

**3) Group 2 compounds in water:**

* Using your boiling tube saved from experiment 1, add 10 cm3 of deionised water and shake well.
* Add three drops of universal indicator, shake and record the pH.
* Place a similar quantity of Strontium hydroxide in a separate boiling tube.
* Add 10 cm3 of deionised water to each tube and shake well, add three drops of universal indicator, gently shake and record the pH.
* Record your observation.
1. This experiment appears not to be a fair test as magnesium oxide rather than magnesium hydroxide is used. Using your results to explain why this is not so.
2. What would you see if strontium oxide is added to water followed by three drops of universal indicator? Write an equation for the reactions.
3. Is there a relationship between the pH and the position of the metal hydroxide in Group 2? Explain your answer.

**4) Decomposition of the carbonates - DEMO:**

* Place calcium carbonate to a height of about 1 cm in a boiling tube.
* Attach the delivery tube. Place the other end of the delivery tube into a test tube which is one third full of limewater.
* Repeat the set up with strontium carbonate.
* Heat both tubes equally with the hottest flame possible.
* Note which limewater turns cloudy first
* **Remember to remove the delivery tube from the limewater before removing the flame from the boiling tube.**
1. Is there a relationship between the thermal stability of the metal carbonate and the position of the metal in Group 2?
2. Using the observation of the change in the limewater as evidence, write a balanced equation for each reaction.
3. Write a general equation for these reactions using M for the metal and include state symbols.

**Technicians list:**

* Calcium granules
* Magnesium ribbon
* Magnesium powder
* Universal indicator
* Magnesium oxide
* Calcium oxide
* Calcium hydroxide
* Barium hydroxide
* boiling tube stoppers
* Deionised/distilled water
* Limewater
* Group 2 metal carbonates
* Delivery tubes x 2