Group 2 metals and their compounds

OCR A Chemistry (H032 / H432) · AS and A level

Answer on your own paper. Show your working where needed.

1. Calcium atoms and ions

Write the outer-shell electron configuration of calcium and an ionic half-equation for its oxidation to a calcium ion.

2. Strontium and water

Strontium is placed in cold water. Write a balanced equation. Describe a test for the gas and identify the dissolved ion that gives a reading above pH 7.

3. Compare cold-water reactions

A student compares equal exposed areas of freshly cleaned magnesium and calcium in cold water at the same temperature. Predict which gives a higher initial gas production rate and describe a visual observation that supports your prediction.

4. Calcium and strontium

Which atom requires less energy to lose both outer electrons, calcium or strontium? Explain why the difference in nuclear charge alone gives the wrong prediction.

5. Compare two oxide-water reactions

Write equations for MgO and BaO reacting with water. Identify which gives the higher pH when the oxides are stirred with water in excess.

6. An antacid calculation

A sample contains 0.438 g of $Mg(OH)_2$. Calculate the maximum volume of 0.200 mol dm^{-3} HCl that it could neutralise. Use $M_r(Mg(OH)_2) = 58.3$. Give your answer in cm^3.

7. Barium ions and an unknown

An unknown may contain sulfate or carbonate. After adding dilute acid, aqueous barium ions produce a white solid. Identify the solid, write its ionic equation and explain the purpose of adding the acid first.

8. Heating metals in oxygen

Write equations for magnesium and calcium reacting with oxygen. Compare their usual reactivities using first and second ionisation energies.

9. Extra challenge · Identify a metal oxide from two results

0.622 g of an oxide MO of Mg, Ca or Sr is neutralised by 30.0 cm^3 of 0.400 mol dm^{-3} hydrochloric acid. A_r values are Mg 24.3, Ca 40.1, Sr 87.6 and O 16.0.

Identify the oxide, write its equation with water and predict how the resulting pH compares with that from MgO.

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