10.1 Group 2 metals, magnesium to barium

Name: _____ Class: _____ Date: _____ **Total: 12 marks**

KEY WORDS thermal stability • thermal decomposition • solubility • group • oxide

Objective

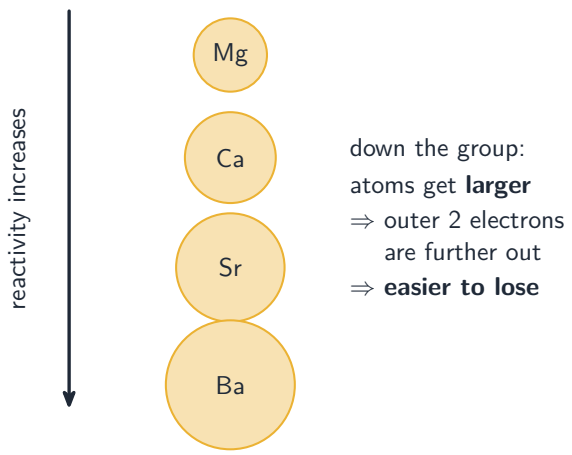
Build the skills to answer exam questions on the **Group 2 metals** – their reactions, **thermal decomposition** and **thermal stability**, and **solubility** trends.

You must be able to:

- write equations for the reactions with oxygen, water and dilute acids
- describe the thermal decomposition of the carbonates and nitrates and the stability trend
- state the solubility trends of the hydroxides and sulfates

1 Key knowledge and worked examples

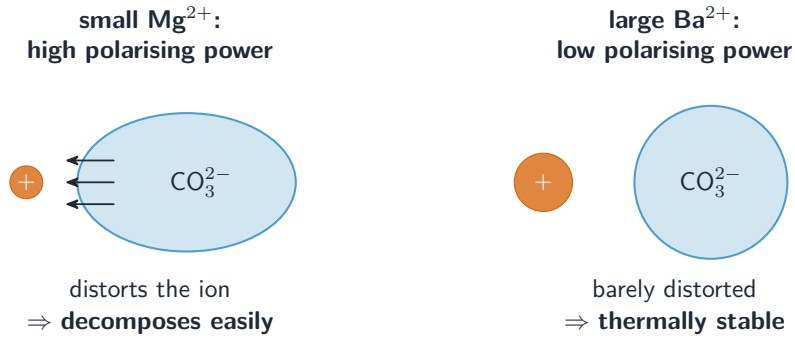
Reactivity and reactions



Reactivity increases down Group 2: larger atoms lose their two outer electrons more easily

- **oxygen:** $2Mg + O_2 \rightarrow 2MgO$.
- **water:** $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$ (faster down the group).
- **acid:** $Mg + 2HCl \rightarrow MgCl_2 + H_2$.

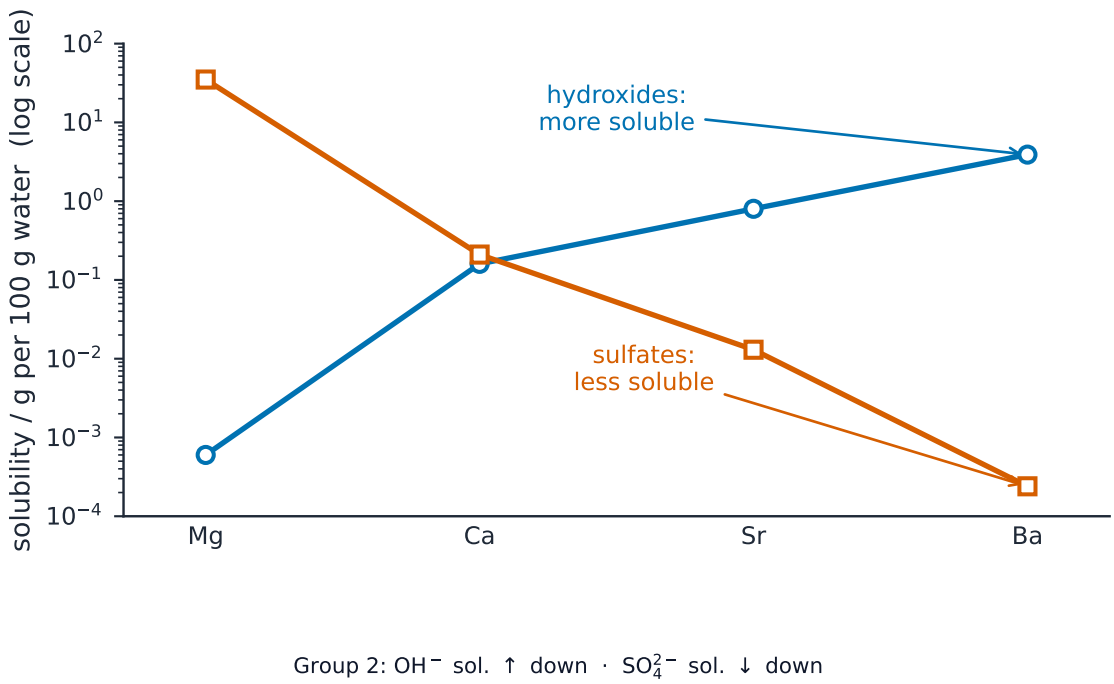
Thermal decomposition and stability



A small cation polarises the carbonate more, weakening it – so stability rises down the group

Carbonates → oxide + CO_2 ($CaCO_3 \rightarrow CaO + CO_2$); nitrates → oxide + NO_2 + O_2. **Thermal stability increases down the group** (a larger ion polarises less).

Solubility



Down Group 2: hydroxides become more soluble; sulfates become less soluble

2 Practice

2.1 Write the equation for the reaction of calcium with water. [1]

2.2 State the trend in reactivity down Group 2 and why. [2]

3 Exam-style questions

3.1 Which carbonate is the **most** thermally stable? [1]

- ☐ **A** $MgCO_3$
- **B** $CaCO_3$
- **C** $SrCO_3$
- **D** $BaCO_3$

3.2 Down Group 2, the solubility of the sulfates: [1]

- ☐ **A** increases
- **B** decreases
- **C** stays the same
- **D** first rises then falls

3.3 (a) Write the equation for the thermal decomposition of calcium nitrate. [2]

(b) Explain why barium carbonate is more thermally stable than magnesium carbonate. [3]

3.4 Describe and explain the trend in reactivity of the Group 2 metals with water. [2]