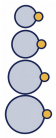
Group 2 Map

AQA A-level Chemistry · 3.2.2 Group 2, the alkaline earth metals

1 Trends down the group

3.2.2 i-ii

- Atomic radius **increases**: more shells
- **IE falls**: more shielding
- Melting point: generally **falls** from Ca
- Larger ions: weaker metallic bonding



2 Reactions with water

3.2.2 iii

- $M + 2H_2O \rightarrow M(OH)_2 + H_2$
- **Faster** down the group
- Mg + cold water: very slow
- Mg + steam: **MgO** + H_2

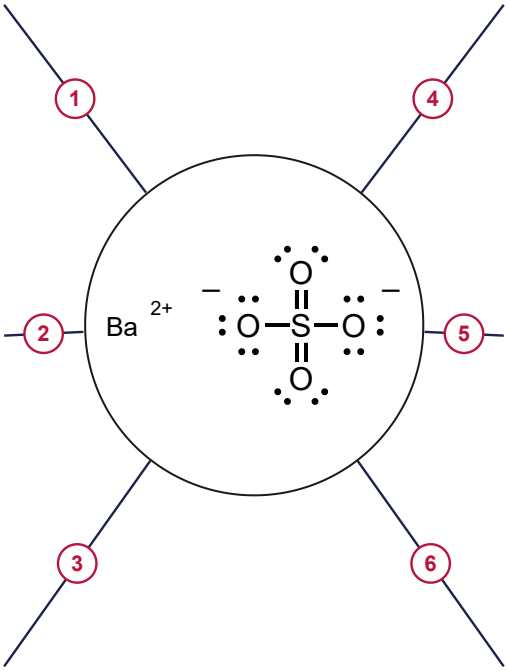


3 Extracting titanium

3.2.2 iv

- $TiO_2 \rightarrow TiCl_4$ first
- $TiCl_4 + 2Mg \rightarrow Ti + 2MgCl_2$
- Argon stops oxidation
- Mg is the **reducing agent**





4 Hydroxides and their uses

3.2.2 v-vi

- Hydroxides: **more soluble** down
- $Mg(OH)_2$ sparingly soluble
- $Mg(OH)_2$: **antacid**
- $Ca(OH)_2$: **acid soils**



5 Cleaning flue gases

3.2.2 vii

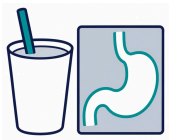
- SO_2: acidic, causes **acid rain**
- $CaO + SO_2 \rightarrow CaSO_3$
- $CaCO_3 + SO_2 \rightarrow CaSO_3 + CO_2$
- Wet scrubbing in power stations



6 Sulfates and the test

3.2.2 viii-x

- Sulfates: **less soluble** down
- Acidified **$BaCl_2$**: white $BaSO_4$
- Acid removes CO_3^{2-} first
- $BaSO_4$: the **barium meal**



Down Group 2: Mg → Ba

one larger atom or ion explains most of the rows

Property	Trend	Why
Atomic radius	increases	one more shell each period
First ionisation energy	decreases	outer electron further out and more shielded
Reaction with water	faster	electrons lost more easily
Hydroxide solubility	increases	$Mg(OH)_2$ sparingly soluble; $Ba(OH)_2$ soluble
Sulfate solubility	decreases	$BaSO_4$ insoluble: the sulfate test
Melting point	generally decreases	larger ions, same 2+ charge: weaker metallic bonding (Mg is lower than Ca)

Worked examples

Titanium

- $TiCl_4 + 2Mg \rightarrow Ti + 2MgCl_2$
- Ti +4 → 0: **reduced**
- Mg is the **reducing agent**

Which pH is higher?

- saturated $Ba(OH)_2$ or $Mg(OH)_2$
- $Ba(OH)_2$ more soluble
- **$Ba(OH)_2$**: more OH^-

Sulfate test

- acidify with HCl
- add $BaCl_2(aq)$
- white **$BaSO_4$**

Group 2 returns in periodicity (3.2.1), the halide tests (3.2.3) and lattice enthalpy (3.1.8).

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