CAIE Chemistry A-level

Topic 10 - Group 2

Flashcards

What is formed when Group 2 elements react with oxygen?

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Group 2 metal oxide.

This is a redox reaction.

What is observed when Group 2 elements react with oxygen?

What is observed when Group 2 elements react with oxygen?

- Beryllium only reacts in powdered form.
- Magnesium burns with an intense white flame.
- Calcium burns with a bright white flame (red at the top).
- Strontium is reluctant to start burning but burns intensely with a white flame.
- Barium burns with a white flame.

Write an equation for the reaction between calcium and oxygen

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$$Ca_{(s)} + \tfrac{1}{2}O_{2(g)} \rightarrow CaO_{(s)}$$

What is formed when Group 2 elements react with water?

What is formed when Group 2 elements react with water?

An alkaline hydroxide and hydrogen gas.

This is a redox reaction.

Describe the trend in the reactions with water as you go down Group 2

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As you go down the group, the reactions become more vigorous.

Write an equation for the reaction between strontium and water

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$$Sr + 2H_2O \rightarrow Sr(OH)_2 + H_2$$

Why does beryllium only react with steam at very high temperatures and not with cold water?

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Beryllium is the least reactive Group 2 metal.

Why does magnesium stop reacting with cold water after a short time?

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An insoluble coat of magnesium hydroxide forms on the surface, preventing further reaction.

What is formed when Group 2 elements react with dilute acids?

What is formed when Group 2 elements react with dilute acids?

A salt and hydrogen gas.

This is a redox reaction.

Write an equation for the reaction between magnesium and hydrochloric acid

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$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

Describe the trend in the reactivity of Group 2 metals with hydrochloric acid

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Reactivity increases and so the reactions become more vigorous as you go down the group.

Describe and explain the trend in the reactivity of Group 2 metals with sulfuric acid

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The reactions do not get more vigorous down the group due to the solubility of the sulfates produced.

- Beryllium and magnesium: soluble sulfates so similar reaction as with HCl
- Calcium: sparingly soluble sulfate
- Strontium and barium: insoluble sulfates

Calcium, strontium and barium only react with sulfuric acid for a short time as the formation of the insoluble sulfate on the metal stops the reaction.

Why might a precipitate be seen when a Group 2 oxide reacts with water?

Why might a precipitate be seen when a Group 2 oxide reacts with water?

Group 2 hydroxides are only slightly soluble in water so when the solution is saturated, the metal hydroxide doesn't dissolve.

Write an equation for the reaction between calcium oxide and water

Write an equation for the reaction between calcium oxide and water

$$CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_{2(aq)}$$

Describe the trend in the solubility of Group 2 hydroxides. Use this to explain the trend in pH.

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The solubility of Group 2 hydroxides increases down the group. As a result, more OH^- ions are release in solution, meaning pH increases down the group.

Which Group 2 oxide doesn't react with water?

Which Group 2 oxide doesn't react with water?

Beryllium oxide

What is formed when Group 2 oxides react with dilute acids?

What is formed when Group 2 oxides react with dilute acids?

A salt and water

Write an equation for the reaction between barium oxide and hydrochloric acid

Write an equation for the reaction between barium oxide and hydrochloric acid

$$BaO + 2HCl \rightarrow BaCl_2 + H_2O$$

How do Group 2 hydroxides behave in water? Use $Ca(OH)_2$ as an example.

How do Group 2 hydroxides behave in water? Use $Ca(OH)_2$ as an example.

Group 2 hydroxides dissociate in water to form their constituent ions:

$$Ca(OH)_{2(s)} \rightarrow Ca^{2+}_{(aq)} + 2OH^-_{(aq)}$$

What is formed when Group 2 hydroxides react with dilute acids?

What is formed when Group 2 hydroxides react with dilute acids?

A salt and water.

E.g. $Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + 2H_2O$

How do Group 2 carbonates behave in water?

How do Group 2 carbonates behave in water?

All Group 2 carbonates are sparingly soluble in water. They do not react with water.

What is formed when Group 2 carbonates react with dilute acids?

What is formed when Group 2 carbonates react with dilute acids?

A salt, water and carbon dioxide gas

Write an equation for the reaction between magnesium carbonate and nitric acid

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$$MgCO_3 + 2HNO_3 \rightarrow Mg(NO_3)_2 + CO_2 + H_2O$$

Describe the thermal decomposition of Group 2 nitrates

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Upon heating, Group 2 nitrates decompose to form a Group 2 metal oxide, nitrogen dioxide and oxygen gas.

Write an equation for the thermal decomposition of strontium nitrate

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$$Sr(NO_3)_2 \rightarrow SrO + 2NO_2 + \frac{1}{2}O_2$$

Describe the thermal decomposition of Group 2 carbonates

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Upon heating, Group 2 carbonates decompose to form a Group 2 oxide and carbon dioxide.

E.g. $CaCO_3 \rightarrow CaO + CO_2$