# OCR (A) Chemistry GCSE

## Topic 4 - Predicting and Identifying Reactions and Products

Flashcards

# Why do elements in the same group have similar chemical properties?

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They have a similar electron configuration (same number of outer shell electrons).

What group of the periodic table are the alkali metals? Why are they called the alkali metals?

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Group 1

They react with water to form alkaline solutions with a very high pH.

# What are the general properties of the alkali metals?

# What are the general properties of the alkali metals?

- Low melting points
- Very reactive
- Soft
- Low density

What gas is produced when an alkali metal reacts with water?

What gas is produced when an alkali metal reacts with water?

Hydrogen

What are the products of the reaction between lithium and water?

What are the products of the reaction between lithium and water?

Lithium Hydroxide

Hydrogen

What is the chemical equation for the reaction between sodium and water?

What is the chemical equation for the reaction between sodium and water?

$$2Na + 2H_2O \rightarrow 2NaOH + H_2$$

What is formed when an alkali metal reacts with oxygen?

What is formed when an alkali metal reacts with oxygen?

Metal oxide

What is the chemical equation for the reaction between lithium and oxygen?

What is the chemical equation for the reaction between lithium and oxygen?

$$4Li + O_2 \rightarrow 2Li_2O$$

# What is formed when alkali metals react with chlorine?

What is formed when alkali metals react with chlorine?

Metal chloride (white precipitates).

# Why are alkali metals often stored in oil?

# Why are alkali metals often stored in oil?

To prevent them reacting with oxygen and water vapour in the air.

# Why are the alkali metals very reactive?

# Why are the alkali metals very reactive?

They have one electron in their outer shell which they need to lose to obtain a stable electron configuration.

# Explain the trend of reactivity down group 1

# Explain the trend of reactivity down group 1

Reactivity increases down the group as the atomic radius and electron shielding increase so there is weaker attraction between the nucleus and the outer shell electron. This means the outer electron is lost more easily further down the group.

What is the name used to describe the elements in group 0 of the periodic table?

What is the name used to describe the elements in group 0 of the periodic table?

Noble gases

# What are the properties of the noble gases?

# What are the properties of the noble gases?

- Low boiling points
- Low density
- Inert

# What does chemically inert mean?

# What does chemically inert mean?

Very unreactive

# Why are the noble gases chemically inert?

Why are the noble gases chemically inert?

They have full outer electron shells so are very stable.

# Describe the trend in boiling points down group 0

# Describe the trend in boiling points down group 0

Boiling point increases

What are the elements in group 7 of the periodic table called?

What are the elements in group 7 of the periodic table called?

Halogens

What is the colour and state of chlorine at room temperature?

What is the colour and state of chlorine at room temperature?

Pale green gas

What is the colour and state of bromine at room temperature?

What is the colour and state of bromine at room temperature?

Red-brown liquid

What is the colour and state of iodine at room temperature?

What is the colour and state of iodine at room temperature?

Black solid

# Why are the halogens different states at room temperature?

Why are the halogens at different states at room temperature?

Because they have different melting and boiling points.

As you go down group 7, melting and boiling point increases.

# What are the properties of halogens?

# What are the properties of halogens?

- Increasing melting and boiling points
- Diatomic
- Reactive

Halogens are diatomic. What does this mean?

Halogens are diatomic. What does this mean?

They form molecules containing two atoms.

E.g. $Cl_2$, $Br_2$ ...

What charge does a halide ion carry? Why?

What charge does a halide ion carry? Why?

-1

e.g. $Cl^-$, $Br^-$...

They gain one electron to obtain a full outer shell and a stable electron configuration.

What is the chemical equation for the reaction between bromine and sodium?

What is the chemical equation for the reaction between bromine and sodium?

$Br_2 + 2Na \rightarrow 2NaBr$

Describe the trend in reactivity of the halogens. How does this affect the rate of reaction?

Describe the trend in reactivity of the halogens. How does this affect the rate of reaction?

Reactivity decreases down the group.

Rate of reaction also decreases down the group.

# What is formed when hydrogen reacts with a halogen?

What is formed when hydrogen reacts with a halogen?

Hydrogen halide

e.g. HCl, HBr...

Chlorine reacts with hydrogen in the presence of sunlight but bromine requires a flame. Why?

Chlorine reacts with hydrogen in the presence of sunlight but bromine requires a flame. Why?

Reactivity decreases down the group so bromine requires more energy for the reaction to occur.

# When does a halogen displacement reaction occur?

# When does a halogen displacement reaction occur?

When a more reactive halogen displaces a less reactive halogen from an aqueous solution of its halide ions.

# Why will halogen A only displace halogen B if A is above B in group 7?

# Why will halogen A only displace halogen B if A is above B in group 7?

Reactivity decreases down the group. The less reactive halogen is displaced by the more reactive halogen. For displacement to occur, halogen A would have to be more reactive than B to displace it from the ionic compound so A has to be above B.

# Which halogens can chlorine displace?

# Which halogens can chlorine displace?

Any halogens below chlorine in group 7.

E.g. iodine and bromine

Which halogens cannot be displaced by bromine?

Which halogens cannot be displaced by bromine?

Chlorine and fluorine because they are above bromine in group 7 so are more reactive.

# Why can’t iodine displace chlorine or bromine from an aqueous ionic solution?

## Why can't iodine displace chlorine or bromine from an aqueous ionic solution?

Because iodine is below bromine and chlorine in group 7 and reactivity decreases down the group. Displacement will only occur if iodine is more reactive than the halogen in the ionic compound. Iodine could displace astatine.

Write the word equation for the reaction between chlorine and potassium bromide

# Write the word equation for the reaction between chlorine and potassium bromide

Chlorine + potassium bromide → potassium chloride + bromine

Write the word equation for the reaction between bromine and calcium chloride

Write the word equation for the reaction between bromine and calcium chloride

No reaction occurs because bromine can’t displace chlorine.

Write the chemical equation for the reaction between bromine and potassium iodide

Write the chemical equation for the reaction between bromine and potassium iodide

$$Br_2 + 2KI \rightarrow I_2 + 2KBr$$

# Why does reactivity decrease down group 7?

# Why does reactivity decrease down group 7?

Halogens need to gain one electron to obtain a stable electron configuration. As you go down group 7 atomic radius and electron shielding increase. Attraction between the nucleus and outer shell electrons decreases so it is harder for the atom to gain an electron meaning reactivity decreases.

What colour are solutions of chlorine, bromine and iodine?

What colour are solutions of chlorine, bromine and iodine?

Chlorine water - colourless

Bromine water - orange

Iodine solution - brown

What would you observe when chlorine is added to potassium bromide?

What would you observe when chlorine is added to potassium bromide?

$Cl_2 + 2KBr \rightarrow Br_2 + 2KCl$

Colour change from colourless (due to $Cl_2$) to orange (due to $Br_2$).

# What are the general properties of transition metals?

(Chemistry only)

# What are the general properties of transition metals? (Chemistry only)

- Hard.
- High density.
- High melting and boiling points.
- Less reactive than alkali metals.
- Form coloured compounds.
- Useful as catalysts.
- Form ions with different charges.

# Give an example of a transition metal (Chemistry only)

# Give an example of a transition metal (Chemistry only)

A few examples:

- Chromium
- Manganese
- Iron
- Copper
- Nickel
- Cobalt

What is the link between a metal's reactivity and the tendency to form a positive ion?

What is the link between a metal's reactivity and the tendency to form a positive ion?

A metal with a greater tendency to form a positive ion is more reactive.

# What is a displacement reaction?

# What is a displacement reaction?

A reaction where a more reactive element replaces a less reactive element in a compound.

# How can you deduce the order of reactivity of a series of metals?

# How can you deduce the order of reactivity of a series of metals?

React each metal with other metal salts.

If a reaction is observed, displacement has occurred. This shows the solid metal is more reactive than the metal in the salt.

Iron reacts with copper sulfate to form iron sulfate and copper. Which metal is more reactive?

Iron reacts with copper sulfate to form iron sulfate and copper. Which metal is more reactive?

Iron is more reactive than copper as it has displaced copper from the solution.

# Describe the test for oxygen gas

# Describe the test for oxygen gas

Insert a glowing splint into a test tube of gas. If oxygen is present, the splint will relight.

# Describe the test for hydrogen gas

# Describe the test for hydrogen gas

Insert a burning splint into a test tube of gas. If hydrogen is present, a squeaky pop will be heard.

# Describe the test for carbon dioxide gas

# Describe the test for carbon dioxide gas

Bubble the gas through limewater.

The limewater will turn cloudy if carbon dioxide is present.

# Describe the test for chlorine gas

# Describe the test for chlorine gas

Insert damp blue litmus paper into a test tube of gas. If chlorine is present, the litmus paper will turn red before being bleached white.

What colour precipitate forms when sodium hydroxide reacts with calcium ions?

(Chemistry only)

What colour precipitate forms when sodium hydroxide reacts with calcium ions? (Chemistry only)

White

What colour precipitate forms when sodium hydroxide reacts with copper(II) ions?

(Chemistry only)

What colour precipitate forms when sodium hydroxide reacts with copper(II) ions? (chemistry only)

Blue

What colour precipitate forms when sodium hydroxide reacts with iron(II) ions? (Chemistry only)

What colour precipitate forms when sodium hydroxide reacts with iron(II) ions? (Chemistry only)

Green

What colour precipitate forms when sodium hydroxide reacts with iron(III) ions? (Chemistry only)

What colour precipitate forms when sodium hydroxide reacts with iron(III) ions? (Chemistry only)

Brown

What colour precipitate forms when sodium hydroxide reacts with zinc ions?

(Chemistry only)

What colour precipitate forms when sodium hydroxide reacts with zinc ions? (Chemistry only)

- White precipitate at first.
- Re-dissolves with excess NaOH to form a colourless solution.

# Describe the test for sulfate ions

(Chemistry only)

# Describe the test for sulfate ions (Chemistry only)

- Add HCl to remove any $CO_3^{2-}$ ions which would obscure the results.
- Add a couple of drops of barium chloride.
- If sulfate ions are present, a white precipitate of barium sulfate will form.

# Describe the test for carbonate ions (Chemistry only)

# Describe the test for carbonate ions (Chemistry only)

- Add a few drops of HCl to the sample in a test tube.
- Connect this test tube to a test tube of limewater.
- If carbonate ions are present, carbon dioxide will be produced. Limewater will turn cloudy when $CO_2$ is bubbled through.

# Describe the test for halide ions

(Chemistry only)

# Describe the test for halide ions (Chemistry only)

- Add a couple of drops of nitric acid to react with any carbonate ions which would obscure the results.
- Add a couple of drops of silver nitrate.
- Observe the colour of the precipitate.

What colour precipitate is formed when silver nitrate is added to a chloride solution?

(Chemistry only)

What colour precipitate is formed when silver nitrate is added to a chloride solution? (Chemistry only)

White precipitate of silver chloride.

What colour precipitate is formed when silver nitrate is added to a bromide solution? (Chemistry only)

What colour precipitate is formed when silver nitrate is added to a bromide solution? (Chemistry only)

Cream precipitate of silver bromide.

What colour precipitate is formed when silver nitrate is added to an iodide solution? (Chemistry only)

What colour precipitate is formed when silver nitrate is added to an iodide solution? (Chemistry only)

Yellow precipitate of silver iodide.

# Describe how you would carry out a flame test to test for ions

(Chemistry only)

# Describe how you would carry out a flame test to test for ions (Chemistry only)

- Clean a nichrome wire using hydrochloric acid.
- Turn the Bunsen burner onto the blue flame.
- Dip the wire in the solid substance that you want to test.
- Place the wire in the flame. Record the colour of the flame.

What is the result of the flame test on lithium ions? (Chemistry only)

What is the result of the flame test on lithium ions? (Chemistry only)

Crimson flame

What is the result of the flame test on sodium ions?

(Chemistry only)

What is the result of the flame test on sodium ions? (Chemistry only)

Yellow flame

What is the result of the flame test on potassium ions?

(Chemistry only)

What is the result of the flame test on potassium ions? (Chemistry only)

Lilac flame

What is the result of the flame test on calcium ions?

(Chemistry only)

What is the result of the flame test on calcium ions? (Chemistry only)

Orange-red flame

What is the result of the flame test on copper ions?

(Chemistry only)

What is the result of the flame test on copper ions? (Chemistry only)

Blue-green flame

# What are the advantages of using instrumental methods of analysis? (Chemistry only)

What are the advantages of using instrumental methods of analysis? (Chemistry only)

- More sensitive
- More accurate
- Faster