

Exercise walk-through

2.1

Groups and the air

Pearson Edexcel · International GCSE · Chemistry

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The method

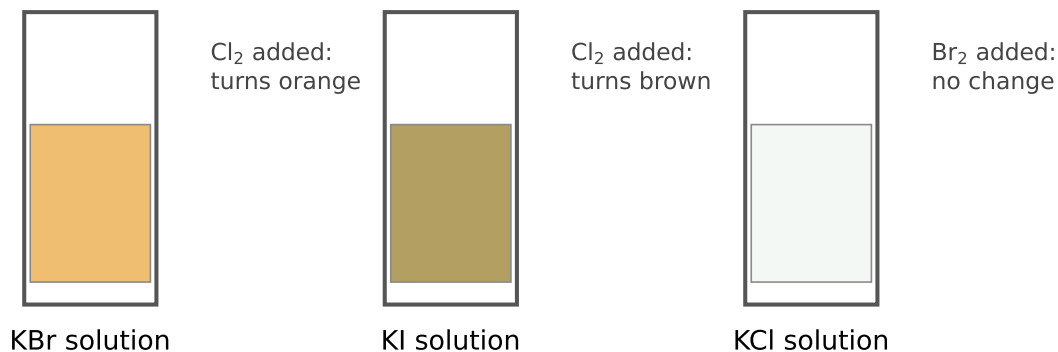
Method — Two families, two trends

Group 1 (Li, Na, K) with water: hydroxide + hydrogen, increasingly vigorous – lithium fizzes, sodium melts and darts, potassium ignites with a lilac flame. (C)
The outer electron is lost more easily further down. Group 7: Cl₂ pale green gas, Br₂ orange liquid, I₂ dark solid; a more reactive halogen displaces a less reactive one from its salt.

Method — Two families, two trends

Group 1 (Li, Na, K) with water: hydroxide + hydrogen, increasingly vigorous – lithium fizzes, sodium melts...

the more reactive halogen displaces the less reactive one



Exercises 2.1·2.3

2.1 Write the word equation for sodium reacting with water, and name the gas. [2]

2.2 Describe the trend in reactivity down Group 1, with the observations for potassium as evidence. [2]

2.3 State the colours and physical states of chlorine, bromine and iodine at room temperature. [3]

Exercises 2.1·2.3

2.1 Write the word equation for sodium reacting with water, and name the gas. [2]

2.1 sodium + water → sodium hydroxide + hydrogen; hydrogen.

2.2 Describe the trend in reactivity down Group 1, with the observations for potassium as evidence. [2]

2.2 Reactivity increases down the group; potassium ignites/melts with a lilac flame – more vigorous than sodium and lithium.

2.3 State the colours and physical states of chlorine, bromine and iodine at room temperature. [3]

2.3 Chlorine – pale green gas; bromine – orange-brown liquid; iodine – grey-black/dark solid.

Exercises 2.4·3.1

2.4 Give the percentages by volume of nitrogen and oxygen in dry air. [2]

2.5 Write the balanced equation for the thermal decomposition of copper(II) carbonate. [2]

3.1 Explain how damp iron wool in a measuring cylinder over water measures the percentage of oxygen in air, including the expected result. [3]

Exercises 2.4·3.1

2.4 Give the percentages by volume of nitrogen and oxygen in dry air. [2]

2.4 Nitrogen $\approx 78\%$, oxygen $\approx 21\%$.

2.5 Write the balanced equation for the thermal decomposition of copper(II) carbonate. [2]

2.5 $\text{CuCO}_3(\text{s}) \rightarrow \text{CuO}(\text{s}) + \text{CO}_2(\text{g})$.

3.1 Explain how damp iron wool in a measuring cylinder over water measures the percentage of oxygen in air, including the expected result. [3]

3.1 The iron reacts with the oxygen in the trapped air, forming rust; water rises to replace the used oxygen; the rise is about one-fifth ($\approx 21\%$) of the air's volume.

Exercises 3.2·3.4

3.2 Chlorine is bubbled into potassium bromide solution. State what is seen and explain it as a displacement reaction, writing the ionic equation. [4]

3.3 (C) Explain, in terms of electronic configuration, why reactivity decreases down Group 7. [2]

3.4 In an experiment, 100 cm^3 of air is passed over heated copper and the final gas volume is 79 cm^3 . Calculate the percentage of oxygen in the air sample, and state one reason the answer may be slightly low. [3]

Exercises 3.2·3.4

3.2 Chlorine is bubbled into potassium bromide solution. State what is seen and explain it as a displacement reaction, writing the ionic equation. [4]

3.2 The colourless solution turns orange: chlorine is more reactive than bromine, so it displaces bromine from the bromide; the bromine formed dissolves giving the orange colour; $\text{Cl}_2 + 2\text{Br}^- \rightarrow 2\text{Cl}^- + \text{Br}_2$.

3.3 (C) Explain, in terms of electronic configuration, why reactivity decreases down Group 7. [2]

3.3 (C) Down the group the outer shell is further from the nucleus, so an incoming electron is attracted less strongly and gained less easily – reactivity falls.

3.4 In an experiment, 100 cm^3 of air is passed over heated copper and the final gas volume is 79 cm^3 . Calculate the percentage of oxygen in the air sample, and state one reason the answer may be slightly low. [3]

3.4 Oxygen used = $100 - 79 = 21 \text{ cm}^3$, so oxygen = $21/100 \times 100 = 21\%$. Slightly low if not all the oxygen reacted (not enough copper / copper oxide already coating the copper).