

IGCSE Coordinated Science: Identification of Ion and Gases

Identification of Ion and Gases

1. Use the following tests to identify:

Aqueous cations:

- Ammonium, copper(II), iron(II), iron(III) and zinc by means of aqueous sodium hydroxide and aqueous ammonia as appropriate.

Cation	Test	What happens if cation is present?
Ammonium (NH ₄ ⁺)	Add dilute sodium hydroxide, and then heat gently.	Damp red litmus paper turns blue and ammonia gas is released.
Copper (II)	Add dilute sodium hydroxide OR ammonia solution	Pale blue precipitate forms. However, as you add more ammonia, the solution dissolves, leading to a deep blue solution.
Iron (II)	Add dilute sodium hydroxide OR ammonia solution.	Pale green precipitate forms.
Iron (III)	Add dilute sodium hydroxide OR ammonia solution.	Red-brown precipitate forms.
Zinc	Add dilute sodium hydroxide OR ammonia solution	White precipitate forms.

Anions:

- Carbonate by means of dilute acid and then limewater,
- Chloride by means of aqueous silver nitrate under acidic conditions,
- Nitrate by reduction with aluminium,
- Sulfate by means of aqueous barium ions under acidic conditions,

Anion	Test	What happens is
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		anion is present?
Carbonate	Add dilute hydrochloric acid	Anion is present if bubbles give off gas that turns limewater milky
Chloride	<ol style="list-style-type: none"> 1. Add same amount of nitric acid as the chloride 2. Add silver nitrate solution 	Chloride ions will form a white precipitate.
Nitrate	Add sodium hydroxide. Afterwards, add some pieces of aluminum	Nitrate ions are present if ammonia gas is given off.
Sulfate	Add same amount of dilute hydrochloric acid. Next, add Barium Nitrate solution.	White precipitate will form if Sulfate ions are present.

Gases:

- Ammonia by means of damp red litmus paper,
- Carbon dioxide by means of limewater,
- Chlorine by means of damp litmus paper,
- Hydrogen by means of a lighted splint,
- Oxygen by means of a glowing splint.

Gas	Test	What happens if gas is present?
Ammonia, NH ₃	Use damp red litmus paper	Indicator turns blue
Carbon Dioxide, CO ₂	Bubble the suspected Carbon Dioxide sample through limewater.	Limewater becomes cloudy or milky.
Chlorine, Cl ₂	Hold damp litmus paper in the gas.	Paper turns white.
Hydrogen, H ₂	Put the gas in the tube and hold a lighted splint into the tube.	Gas burns with a squeaky pop

Oxygen, O₂

Collect the gas in a test tube and hold a glowing splint next to it.

Splint relights.