

Cambridge IGCSE Chemistry

Topic 8: Acids, bases and salts

Identification of ions and gases

Notes



Describe the following tests to identify:

aqueous cations: aluminium, ammonium, calcium, chromium(III), copper(II), iron(II), iron(III) and zinc (using aqueous sodium hydroxide and aqueous ammonia as appropriate) (Formulae of complex ions are **not** required)

in dilute NaOH

ions	few drops NaOH	excess NaOH
aluminium	white precipitate forms	precipitate re dissolves
ammonium	ammonia gas given off (how to test is further below)	no change
calcium	White precipitate forms	No change
chromium (III)	grey-green precipitate forms	dark green solution forms
copper (II)	blue precipitate forms	no change
iron (II)	green precipitate forms	no change
iron (III)	orange-brown precipitate forms	no change
zinc	White precipitate forms	Precipitate re dissolves

in ammonia (not needed to identify the other ions)

ions	few drops ammonia	excess ammonia
aluminium	White precipitate forms	No change
calcium	No precipitate formed	No precipitate formed
zinc	White precipitate forms	Precipitate re dissolves

cations: use of the flame test to identify lithium, sodium, potassium and copper(II)

Lithium	Crimson
Sodium	Yellow
Potassium	Lilac
Copper(II)	Green





anions: carbonate (by reaction with dilute acid and then limewater), chloride, bromide and iodide (by reaction under acidic conditions with aqueous silver nitrate), nitrate (by reduction with aluminium), sulfate (by reaction under acidic conditions with aqueous barium ions) and sulfite (by reaction with dilute acids and then aqueous potassium manganate(VII))

- Carbonates
 - Carbonates react with dilute acids to create carbon dioxide.
 - This gas can be bubbled through limewater, if the limewater goes cloudy, the gas is CO_2
- Halides
 - First add dilute nitric acid, followed by silver nitrate solution
 - Chloride gives a white precipitate
 - Bromide gives a cream precipitate
 - Iodide gives a yellow precipitate
- Nitrates
 - React copper/aluminium/zinc alloy with nitrate in sodium hydroxide solution then add aluminium and ammonia is released
 - Turns damp red litmus paper blue
- Sulfates
 - First add dilute hydrochloric acid, followed by barium chloride solution
 - A white precipitate will form when sulfate ions are in this solution
- Sulfites
 - React with dilute acids
 - Sulfur dioxide gas is given off
 - Use aqueous potassium manganate(VII) and there will be a colour change from purple to colourless

gases: ammonia (using damp red litmus paper), carbon dioxide (using limewater), chlorine (using damp litmus paper), hydrogen (using lighted splint), oxygen (using a glowing splint), and sulfur dioxide (using aqueous potassium manganate(VII))

- Ammonia
 - Turns damp red litmus paper blue
- Carbon dioxide
 - bubble the gas through the limewater (calcium hydroxide) and it will turn milky (cloudy)
- Chlorine
 - When damp litmus paper is put into chlorine gas the litmus paper is bleached and turns white



- Hydrogen
 - o Use a burning splint held at the open end of a test tube of the gas
 - Creates a 'squeaky pop' sound
- Oxygen
 - o Uses a glowing splint inserted into a test tube of the gas
 - Splint relights in oxygen
- Sulfur dioxide
 - o Use aqueous potassium manganate(VII) and there will be a colour change from purple to colourless

