

Exercise walk-through

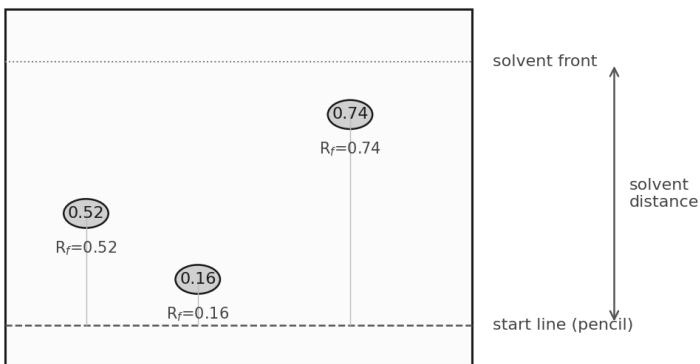
8.3

Identification of ions – chemistry only (4.8.3.1–4.8.3.2)

AQA · GCSE · Chemistry

Chromatography

$R_f = \text{spot distance (from start line)} / \text{solvent distance}$



- Stationary phase — the paper; mobile phase — the solvent.
- Separation by distribution between the two phases.
- $R_f = \text{spot distance over solvent distance}$.

Ion tests

reagent	ion	result
flame	Li / Na / K / Ca / Cu	crimson / yellow / lilac / orange-red / green
NaOH(aq)	Al ³⁺ / Ca ²⁺ / Mg ²⁺	white ppt; only Al dissolves in excess
NaOH(aq)	Cu ²⁺ / Fe ²⁺ / Fe ³⁺	blue / green / brown ppt
acid + AgNO ₃	Cl ⁻ / Br ⁻ / I ⁻	white / cream / yellow ppt
HCl + BaCl ₂	SO ₄ ²⁻	white ppt

- Identification of ions by chemical and spectroscopic means.
- Flame — Li crimson, Na yellow, K lilac, Ca orange-red, Cu green.
- NaOH — white for Al, Ca, Mg; only Al redissolves in excess.
- Halides with acidified silver nitrate; sulfate with acidified barium chloride.

Exercises 2.1·2.3

2.1 Give the flame colour of potassium. [1]

2.2 What reagent tests for sulfate ions? [2]

2.3 (*HT*) What does the intensity of spectral lines indicate? [1]

Exercises 2.1·2.3

2.1 Give the flame colour of potassium. [1]

2.1 Lilac.

2.2 What reagent tests for sulfate ions? [2]

2.2 Dilute hydrochloric acid, then barium chloride solution.

2.3 (*HT*) What does the intensity of spectral lines indicate? [1]

2.3 The concentration of the metal – more intense lines, more of it.

Exercises 3.1-3.3

3.1 Describe the test for iodide ions, giving reagents and the observation. [3]

3.2 An unknown solution gives a green flame and no precipitate with NaOH is recorded. Explain the limits of each test and suggest a confirmation. [4]

3.3 (*HT*) Explain two advantages of flame emission spectroscopy over a flame test. [4]

Exercises 3.1·3.3

3.1 Describe the test for iodide ions, giving reagents and the observation. [3]

3.1 Add dilute nitric acid to acidify; then silver nitrate solution; a yellow precipitate of silver iodide confirms iodide.

3.2 An unknown solution gives a green flame and no precipitate with NaOH is recorded. Explain the limits of each test and suggest a confirmation. [4]

3.2 A green flame suggests copper(II); but another metal's colour could mask or be masked in mixtures, so the flame test alone is not conclusive; copper(II) should give a blue precipitate with sodium hydroxide – the absence suggests a possible error, so repeat with fresh solution; confirm with flame emission spectroscopy, which separates the contributions of mixed metals.

3.3 (*HT*) Explain two advantages of flame emission spectroscopy over a flame test. [4]

3.3 Spectroscopy is far more sensitive – detects tiny concentrations a flame test misses; it works with mixtures, because each metal's lines sit at their own positions, whereas flame colours can mask each other. It is also rapid and gives concentration from line intensity.