11 Qualitative Analysis

Set B **Answer key**

A Multiple choice

5 MARKS

1 **D** KNO_3, NaOH, Na_2SO_4 [1]

A gives a red-brown precipitate of iron(III) hydroxide, B gives a white precipitate of barium sulfate, and C is blue because of the copper(II) ions.

2 **B** Ammonia gas is produced. [1]

The acid reacts with the carbonate to give carbon dioxide, which is acidic. Ammonia is given off by ammonium salts with an alkali, not with an acid.

3 **A** barium nitrate solution [1]

Barium nitrate gives a white precipitate of barium sulfate with sulfuric acid only. The other reagents give the same result with both acids.

4 **D** sodium nitrate [1]

Warming with sodium hydroxide drives off the ammonium ions as ammonia. Barium sulfate is filtered off, leaving sodium and nitrate ions in the filtrate.

5 **C** zinc carbonate [1]

The gas is carbon dioxide, so the solid is a carbonate. The hydroxide dissolves in excess aqueous ammonia, so the cation is zinc. The chloride in test 1 comes from the hydrochloric acid.

B Structured questions

15 MARKS

6 **(a)**

A: calcium carbonate, $CaCO_3$ [1]

C: calcium chloride, $CaCl_2$ [1]

D: carbon dioxide, CO_2 [1]

E: calcium hydroxide, $Ca(OH)_2$ [1]

(b) $Ca^{2+}(aq) + 2OH^-(aq) \rightarrow Ca(OH)_2(s)$ [1]

(c)

Aqueous barium nitrate: no observable change. [1]

Aqueous silver nitrate: a white precipitate forms. [1]

7 **(a)**

T: iron(II) chloride [1]

U: carbon dioxide [1]

V: iron(II) hydroxide [1]

W: silver chloride [1]

(b)

Iron(II), carbonate and nitrate ions (all three needed). Chloride is not accepted, as it could have come from the hydrochloric acid. [1]

(c)

Any one, e.g. $CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$ *or* $Fe^{2+}(aq) + 2OH^-(aq) \rightarrow Fe(OH)_2(s)$ [1]

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Calcium hydroxide reacts with ammonium-based fertilisers to form ammonia gas, which escapes into the atmosphere. [1]

This results in the loss of nitrogen from the fertiliser, which plants need for growth. [1]