

EXPERIMENT NO. 3

3 Qualitative Analysis

At each stage of any test you are to record details of the following.

- colour changes seen
- the formation of any precipitate
- the solubility of such precipitates in an excess of the reagent added

Where gases are released they should be identified by a test, **described in the appropriate place in your observations.**

You should indicate clearly at what stage in a test a change occurs.

Marks are **not** given for chemical equations.

No additional tests for ions present should be attempted.

If any solution is warmed, a boiling tube MUST be used.

Rinse and reuse test-tubes and boiling tubes where possible.

Where reagents are selected for use in a test, the name or correct formula of the element or compound must be given.

- (a) **FB 4** and **FB 5** are solutions of salts each containing one cation and one anion from those listed in the Qualitative Analysis Notes. Carry out the following tests and record your observations in the table below.

test	observations	
	FB 4	FB 5
(i) To a 1 cm depth of solution in a test-tube, add aqueous ammonia.	off-white ppt, turns brown on contact with air. ppt insoluble in excess	white ppt ppt insoluble in excess
(ii) To a 1 cm depth of solution in a test-tube, add a few drops of aqueous silver nitrate.	white ppt	no change
(iii) To a 1 cm depth of solution in a test-tube add a few drops of aqueous barium chloride or barium nitrate.	no change	white ppt

(iv) Identify both ions in **FB 4**.

cation Mn^{2+} (aq) anion Cl^- (aq)

(v) Suggest the ions which may be present in **FB 5**.

cations Mg^{2+} / Al^{3+} (aq) anions SO_4^{2-} / SO_3^{2-} (aq)

(vi) Select a reagent which could be used in a further test on **FB 5** to identify the cation present. Carry out your test and record your observations.

test	observations
To a 1 cm depth of FB 5 in a test-tube, add $aq. NaOH$	white ppt ppt insoluble in excess

The cation in **FB 5** is Mg^{2+} (aq)

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(b) **FB 6** is a pale green salt containing two cations.

(i) What does this suggest about the identity of one of the cations in **FB 6**?

It contains a transition metal ion.

Carry out the following tests and complete the table below.

test	observations
(ii) Place a spatula measure of FB 6 in a hard-glass test-tube. Heat gently.	* solid dissolves to form a liquid * vapours * solid turns brown
(iii) Dissolve a small spatula measure of FB 6 in a 2cm depth of distilled water in a test-tube. Use this solution for tests (iv) and (v).	solid dissolves gives a yellow solution
(iv) Pour about half the solution prepared in (iii) into a boiling tube and add aqueous sodium hydroxide, then	brown/red-brown ppt ppt insoluble in excess
gently warm the mixture.	a colourless gas evolved which turns damp red litmus paper blue.
(v) To the remainder of the solution prepared in (iii), add a few drops of aqueous potassium iodide, then	solution darkens/ solution turns yellow-brown
add a few drops of starch solution.	turns blue-black

(vi) Identify the cations present in **FB 6**.

FB 6 contains Fe^{3+} and NH_4^+

(vii) What type of reaction occurred when potassium iodide was added to **FB 6** in (v)?

redox reaction

[7]

[Total: 14]