EXPERIMENT NO. 4

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) In **Question 1** you used **FA 2**. This solution was prepared from hydrated ammonium iron(II) sulfate, $(NH_4)_2Fe(SO_4)_2.6H_2O$.
To a 1 cm depth of **FA 2** in a test-tube, add a small spatula measure of sodium carbonate.
Record your observations.

Test	Observation
To 1cm depth of FA2 in a test tube, add a small spatula measure of sodium carbonate	effervescence of a colorless gas produced which gave white ppt with Lime water.

Solutions containing Fe^{2+} ions can quickly be oxidised in air if they are prepared by dissolving the solid in distilled water.
Use your observations to suggest what other substance was added to solid $(NH_4)_2Fe(SO_4)_2.6H_2O$ to prepare **FA 2**.

an acid / H^+ ..... [2]

(b) **FA 6** is a mixture of two salts, each of which contains a single cation and a single anion from those listed in the Qualitative Analysis Notes. Do the following tests and record your observations in the table below.

	test	*observations*
(i)	Place a small spatula measure of **FA 6** in a hard-glass test-tube and heat strongly.	i) solid turned grey/black from green ii) Steamy fumes / water condensed. iii) Solid melts.
(ii)	Place a small spatula measure of **FA 6** in a test-tube and carefully add dilute sulfuric acid until the reaction is complete, then	effervescence of colorless gas, which gave white ppt with lime water. solid dissolved give a pale blue solution
	add aqueous sodium hydroxide.	Blue ppt. insoluble in excess
(iii)	To a 3 cm depth of distilled water in a boiling tube, add the remaining sample of **FA 6**. Stir and then filter the mixture into a clean boiling tube. You will use this solution for tests **(iv)**–**(vi)**.	
(iv)	To a 1 cm depth of the solution from **(iii)** in a test-tube, add aqueous sodium hydroxide.	white ppt. insoluble in excess
(v)	To a 1 cm depth of the solution from **(iii)** in a test-tube, add aqueous ammonia.	white ppt. insoluble in excess
(vi)	To a 1 cm depth of the solution from **(iii)** in a test-tube, add aqueous barium chloride or aqueous barium nitrate.	white ppt. formed

(vii) Suggest possible identities for the ions present in **FA 6**.

cations Cu^{2+} and Mg^{2+}

anions CO_3^{2-} and SO_4^{2-} / SO_3^{2-}

(viii) Describe a further test that would allow you to determine exactly which anions are present. Explain your choice. Do **not** do this test.

add any dilute strong acid other than H_2SO_4 in test (vi) after $BaCl_2(aq)$, ppt of $BaSO_4$ will be insoluble and ppt of $BaSO_3$ will be soluble.

[11]

[Total: 13]