# EXPERIMENT NO. 5

**Qualitative Analysis**

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

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

- colour changes seen;
- the formation of any precipitate and its solubility in an excess of the reagent added;
- the formation of any gas and its identification by a suitable test.

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

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

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

**No additional tests for ions present should be attempted.**

**3 (a)** **FA 4** is an aqueous solution containing a single cation and a single anion.
The anion is either the sulfate ion, $SO_4^{2-}$, or the sulfite ion, $SO_3^{2-}$.

**(i)** To an approximately 1 cm depth of **FA 4** in a test-tube, add aqueous sodium carbonate.
Record your observations.

effervescence of a colourless gas which formed white ppt with lime water. [2]

**(ii)** Select reagents to identify the anion present in **FA 4**.
Carry out a test with these reagents and record your observations.

reagents aq. $BaCl_2$ and dilute HCl or $HNO_3$

observations white ppt with aq. $BaCl_2$ ppt remains insoluble in excess of dilute HCl. [2]

**(iii)** Identify **FA 4**.

The formula of **FA 4** is $H_2SO_4$ . [1]

**(b) (i)** **FA 5** contains one cation and two anions. Two of these ions are listed in the Qualitative Analysis Notes.
Carry out the following tests and record your observations.

| *test* | *observations* |
|---|---|
| Add a small spatula measure of **FA 5** to a hard-glass test-tube.<br><br>Heat the sample gently at first and then more strongly. | *Condensation of water<br>* green solid turned black |
| Pour a 4 cm depth of dilute sulfuric acid into a boiling tube. Carefully add the remaining **FA 5**. Leave to stand until the reaction is complete. The solution produced is **FA 6**.<br><br>Keep **FA 6** for use in the following tests. | effervescence of a colourless gas which formed white ppt with lime water.<br>solid dissolved gives a blue solution |
| To a 1 cm depth of **FA 6** in a test-tube add aqueous sodium hydroxide. | blue ppt<br><br>ppt insoluble in excess |
| To a 1 cm depth of **FA 6** in a test-tube add aqueous ammonia. | blue ppt<br><br>ppt soluble in excess giving a dark blue solution. |

[5]

**(ii)** State the type of reaction observed when **FA 5** was heated.

Thermal decomposition ..... [1]

**(iii)** Give the formula of the cation and one of the anions present in **FA 5**.

cation: $Cu^{2+}$ anion: $CO_3^{2-}$ [1]

[Total: 12]