

# EXPERIMENT NO. 15

## 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,  $\text{SO}_4^{2-}$ , or the sulfite ion,  $\text{SO}_3^{2-}$ .

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

effervescence of colourless gas which gives  
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.  $\text{BaCl}_2$  followed by dilute  $\text{HCl}$   
observations white ppt with aq.  $\text{BaCl}_2$   
and ppt remains insoluble in excess of  
dilute  $\text{HCl}$

[2]

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

The formula of **FA 4** is  $\text{H}^+$ ,  $\text{SO}_4^{2-}$   
 $\text{H}_2\text{SO}_4$

[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 <b>FA 5</b> to a hard-glass test-tube.  Heat the sample gently at first and then more strongly.	- moisture condensation  - pale green solid turns black
Pour a 4 cm depth of dilute sulfuric acid into a boiling tube. Carefully add the remaining <b>FA 5</b> . Leave to stand until the reaction is complete. The solution produced is <b>FA 6</b> .  Keep <b>FA 6</b> for use in the following tests.	effervescence of a colourless gas.  solid dissolves and forms a blue solution
To a 1 cm depth of <b>FA 6</b> in a test-tube add aqueous sodium hydroxide.	Blue ppt.  ppt remains insoluble in excess
To a 1 cm depth of <b>FA 6</b> in a test-tube add aqueous ammonia.	Blue ppt.  ppt soluble in excess gives 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:  $\text{Cu}^{2+}$  ..... anion:  $\text{CO}_3^{2-}$  ..... [1]

[Total: 12]