GCE Advanced Subsidiary Level

MARK SCHEME

MAXIMUM MARK : 25

SYLLABUS/COMPONENT : 9701 /3

CHEMISTRY (PRACTICAL (AS))
N.B. Boxed references within this marking scheme relate to the accompanying booklet of Standing Instructions

1

**Tables 1.1 and 1.2**

Give **one mark** if all weighings are to 2 decimal places or better.

Give **one mark** if the mass of FA 1 recorded in Table 1.1 is between 2.00g and 2.50g inclusive.

Give **one mark** if there is evidence of reheating and reweighing the tube.

Give **one mark** if two masses of tube + FA 1 after heating are within 0.05 g.

**Withhold one of these marks if**

- there is an error in subtraction
- the mass of empty tube differs between the two tables
- the smallest mass of tube + FA 1 after heating was not used in calculating the residual mass of FA 1.

**Accuracy**

**Supervisor’s Script**

Check and correct any errors in subtraction

Calculate \[ \frac{\text{mass lost on heating}}{\text{mass of FA 1 after heating}} \] correct to 2 decimal places.

Record this as a ringed total on the front of the Supervisor’s script. The value of this ratio \( \approx 1.05 \)

If there is a significant difference in the value obtained for the Supervisor it may suggest an impure sample of MgSO₄·7H₂O has been used or the wrong salt distributed.

**Candidate Scripts**

Check and correct any errors in subtraction

Calculate \[ \frac{\text{mass lost on heating}}{\text{mass of FA 1 after heating}} \] correct to 2 decimal places.

Record this ratio, correct to 2 decimal places, below Table 1.2.

**Compare the ratio obtained from the candidate’s results (corrected where necessary) with the theoretical value of 1.05.**

Accuracy marks are awarded for differences between the ratios as follows:

<table>
<thead>
<tr>
<th>Mark</th>
<th>Difference in Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Up to 0.03</td>
</tr>
<tr>
<td>5</td>
<td>0.03+ to 0.04</td>
</tr>
<tr>
<td>4</td>
<td>0.04+ to 0.05</td>
</tr>
<tr>
<td>3</td>
<td>0.05+ to 0.07</td>
</tr>
<tr>
<td>2</td>
<td>0.07+ to 0.10</td>
</tr>
<tr>
<td>1</td>
<td>0.10+ to 0.15</td>
</tr>
<tr>
<td>0</td>
<td>Greater than 0.15</td>
</tr>
</tbody>
</table>
In all calculations, ignore evaluation errors if working is shown

(d) Ignore

(i) Calculated mass of anhydrous magnesium sulphate

and

Give one mark for (ii) Correctly calculated mass of water

1

(e) Give one mark for

moles of water = \( \frac{\text{mass of water}}{18} \)

(If an incorrect \( M_r \) is used this mark is not awarded but subsequent marks may be given)

1

(f) Give one mark for

moles of \( \text{XSO}_4 \) = \( \frac{\text{Answer to (e)}}{7} \)

1

(g) Give one mark for

\( M_r \) of \( \text{XSO}_4 \) = \( \frac{\text{Answer to (d)(i)}}{\text{Answer to (f)}} \)

No Units

1

(h) Give one mark for

answer to (g) - 96

No Units

(Do not penalise twice)

1

Total for Question 1 15
FA 2 is a solution containing Mn\(^{2+}\), Zn\(^{2+}\), SO\(_4^{2-}\), NO\(_3^-\).

<table>
<thead>
<tr>
<th>Test</th>
<th>Observations</th>
<th>Deductions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>To 3 cm depth of FA 2 in a boiling-tube, add an equal depth of dilute aqueous sodium hydroxide. Cautiously warm the tube.</td>
<td>Off-white, buff or light brown precipitate. (Not dirty brown, brown or any yellow or red in the colour) [1]</td>
</tr>
<tr>
<td>(b)</td>
<td>Filter the mixture from (a) and collect the filtrate. Leave the residue in the filter paper and observe again after several minutes.</td>
<td>Allow precipitate colour here if not given in (a). Deduction in (a) can be given from observation here. Precipitate turns brown or darkens (No red or yellow in colour) [1]</td>
</tr>
<tr>
<td>(c)</td>
<td>Place 2 cm depth of the filtrate from (b) in a test-tube and add dilute nitric acid, drop by drop, until no further change is seen.</td>
<td>White precipitate forms and re-dissolves .................................</td>
</tr>
<tr>
<td>(d)</td>
<td>Place the remainder of the filtrate from (b) in a boiling-tube. Add a piece of aluminium foil. Cautiously warm the tube.</td>
<td>Gas turns red litmus blue or gives white smoke with HCl or Ammonia gas [1]</td>
</tr>
<tr>
<td>(e)</td>
<td>To 3 cm depth of FA 2 in a test-tube, add an equal depth of dilute aqueous ammonia. Filter the mixture and add dilute nitric acid, drop by drop, until no further change is seen.</td>
<td>The observation marks from (a) or (b) can be given here. White precipitate forms and re-dissolves .................................</td>
</tr>
<tr>
<td>(f)</td>
<td>To 2 cm depth of FA 2 in a test-tube, add dilute hydrochloric acid followed by aqueous barium chloride.</td>
<td>No brown gas.................................</td>
</tr>
<tr>
<td>(g)</td>
<td>To 2 cm depth of FA 2 in a test-tube, add dilute nitric acid followed by aqueous silver nitrate.</td>
<td>No brown gas .................................</td>
</tr>
</tbody>
</table>

Summary  (Only award these marks if there is supporting evidence in the individual tests)  
FA 3 contains the cations Mn\(^{2+}\) and Zn\(^{2+}\) and the anions SO\(_4^{2-}\) and NO\(_3^-\)  
Total of 12 scoring points  

If the mark is in excess of 10 cross through the mark and record 10 max.  
Total for Question 2 is 10 and for the Paper 25.