

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**NOVEMBER 2002**

**GCE Advanced Subsidiary Level**

**MARK SCHEME**

**MAXIMUM MARK : 25**

**SYLLABUS/COMPONENT :9701 /3**

**CHEMISTRY  
(PRACTICAL (AS))**



UNIVERSITY of CAMBRIDGE  
Local Examinations Syndicate

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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  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  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:

Mark	Difference in Ratio
6	Up to 0.03
5	0.03+ to 0.04
4	0.04+ to 0.05
3	0.05+ to 0.07
2	0.07+ to 0.10
1	0.10+ to 0.15
0	Greater than 0.15

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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  $\text{moles of water} = \frac{\text{mass of water}}{18}$

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

1

- (f) Give one mark for  $\text{moles of XSO}_4 = \frac{\text{Answer to (e)}}{7}$

1

- (g) Give one mark for  $M_r \text{ of XSO}_4 = \frac{\text{Answer to (d)(i)}}{\text{Answer to (f)}}$  No Units

1

- (h) Give one mark for answer to (g) - 96 No Units  
(Do not penalise twice)

1

Total for Question 1 15

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2

FA 2 is a solution containing  $\text{Mn}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$

Test	Observations	Deductions	
<p>(a) To 3 cm depth of FA 2 in a boiling-tube, add an equal depth of dilute aqueous sodium hydroxide.</p> <p>Cautiously warm the tube.</p>	<p>Off-white, buff or light brown precipitate. (Not dirty brown, brown or any yellow or red in the colour) [1]</p> <p>No ammonia, no alkaline gas, no gas turning litmus or UI paper blue.....</p>	<p>Manganese or <math>\text{Mn}^{2+}</math> [1]</p> <p>No ammonium salt, no <math>\text{NH}_4^+</math> [1] for observation and deduction</p>	3
<p>(b) Filter the mixture from (a) and collect the filtrate.</p> <p>Leave the residue in the filter paper and observe again after several minutes.</p>	<p>Allow precipitate colour here if not given in (a). Deduction in (a) can be given from observation here.</p> <p>Precipitate turns brown or darkens (No red or yellow in colour) [1]</p>	<p>Manganese or <math>\text{Mn}^{2+}</math> (one mark if not already given in (a))</p>	1
<p>(c) 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.</p>	<p>White precipitate forms and re-dissolves .....</p>	<p><math>\text{Pb}^{2+}</math>, <math>\text{Al}^{3+}</math> or <math>\text{Zn}^{2+}</math> (any one) [1] for observation and deduction</p>	1
<p>(d) Place the remainder of the filtrate from (b) in a boiling-tube. Add a piece of aluminium foil.</p> <p>Cautiously warm the tube.</p>	<p>Gas turns red litmus blue or gives white smoke with HCl or Ammonia gas [1]</p>	<p>Nitrate or nitrite <math>\text{NO}_3^-</math> or <math>\text{NO}_2^-</math> [1]</p>	2
<p>(e) To 3 cm depth of FA 2 in a test-tube, add an equal depth of dilute aqueous ammonia.</p> <p>Filter the mixture and add dilute nitric acid, drop by drop, until no further change is seen.</p>	<p>The observation marks from (a) or (b) can be given here.</p> <p>White precipitate forms and re-dissolves.....</p>	<p>Manganese or <math>\text{Mn}^{2+}</math> (one mark if not already given in (a) or (b))</p> <p><math>\text{Zn}^{2+}</math> [1] for observation and deduction Take care that deduction mark is not given for a ppt formed on adding ammonia</p>	1
<p>(f) To 2 cm depth of FA 2 in a test-tube, add dilute hydrochloric acid</p> <p>followed by aqueous barium chloride.</p>	<p>No brown gas.....</p> <p>White precipitate.....</p>	<p>No nitrite [1] for observation and deduction</p> <p>Sulphate [1] for observation and deduction</p>	2
<p>(g) To 2 cm depth of FA 2 in a test-tube, add dilute nitric acid</p> <p>followed by aqueous silver nitrate.</p>	<p>No brown gas .....</p> <p>No precipitate, no reaction, no change .....</p>	<p>No nitrite [1] for observation and deduction if not already given in (f)</p> <p>No halide or No chloride, bromide, iodide (any one) [1] for observation and deduction</p>	1

**Summary** (Only award these marks if there is supporting evidence in the individual tests)

FA 3 contains the cations  $\text{Mn}^{2+}$  and  $\text{Zn}^{2+}$   
and the anions  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$

1

**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.**