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

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.

4

Accuracy

Supervisor's Script

Check and correct any errors in subtraction

Calculate $\frac{\textbf{mass lost on heating}}{\textbf{mass of FA 1 after heating}}$ correct to 2 decimal places.

Record this as a ringed total on the front of the Supervisor's script. The value of this ratio ≃ 1.05

If there is a significant difference in the value obtained for the Supervisor it may suggest an impure sample of $MgSO_4.7H_2O$ has been used or the wrong salt distributed.

Candidate Scripts

Check and correct any errors in subtraction

Calculate $\frac{\textbf{mass lost on heating}}{\textbf{mass of FA 1 after heating}}$ 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

6

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 $\textbf{moles of water} = \dfrac{\textbf{mass of water}}{\textbf{18}}$

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

1

(f) Give **one mark** for $\textbf{moles of } XSO_4 = \dfrac{\textbf{Answer to (e)}}{\textbf{7}}$

1

(g) Give **one mark** for $\textbf{M}_r \textbf{ of } XSO_4 = \dfrac{\textbf{Answer to (d)(i)}}{\textbf{Answer to (f)}}$ **No Units**

1

(h) Give **one mark** for **answer to (g) - 96** **No Units**

(Do not penalise twice)

1

Total for Question 1 15

2

FA 2 is a solution containing Mn^{2+}, Zn^{2+}, SO_4^{2-}, NO_3^-

	Test	*Observations*	*Deductions*	
(a)	To 3 cm depth of **FA 2** in a boiling-tube, add an equal depth of dilute aqueous sodium hydroxide. **Cautiously** warm the tube.	Off-white, buff or light brown precipitate. (**Not** dirty brown, brown or any yellow or red in the colour) **[1]** No ammonia, no alkaline gas, no gas turning litmus or UI paper blue.....	Manganese or Mn^{2+} **[1]** No ammonium salt, no NH_4^+ **[1]** for observation and deduction	3
(b)	Filter the mixture from **(a)** and collect the filtrate. Leave the residue in the filter paper and observe again after several minutes.	*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]**	*Manganese or Mn^{2+}* *(**one mark** if not already given in **(a)**)*	1
(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.	White precipitate forms and re-dissolves	Pb^{2+}, Al^{3+} or Zn^{2+} (any one) **[1]** for observation and deduction	1
(d)	Place the remainder of the filtrate from **(b)** in a boiling-tube. Add a piece of aluminium foil. **Cautiously** warm the tube.	Gas turns red litmus blue or gives white smoke with HCl or Ammonia gas **[1]**	Nitrate or nitrite NO_3^- or NO_2^- **[1]**	2
(e)	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.	*The observation marks from **(a)** or **(b)** can be given here.* White precipitate forms and re-dissolves.....	*Manganese or Mn^{2+}* *(**one mark** if not already given in **(a)** or **(b)**)* Zn^{2+} **[1]** for observation and deduction *Take care that deduction mark is not given for a ppt formed on adding ammonia*	1
(f)	To 2 cm depth of **FA 2** in a test-tube, add dilute hydrochloric acid followed by aqueous barium chloride.	No brown gas..... White precipitate.....	No nitrite **[1]** for observation and deduction Sulphate **[1]** for observation and deduction	2
(g)	To 2 cm depth of **FA 2** in a test-tube, add dilute nitric acid followed by aqueous silver nitrate.	No brown gas ..... No precipitate, no reaction, no change	No nitrite *[1] for observation and deduction if not already given in (f)* No halide or No chloride, bromide, iodide (any one) **[1]** for observation and deduction	1

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^- **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.