CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 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 **Table 1.1**

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

Give **one mark** if the mass of **FA 1** in each experiment is between 3.20g and 3.50 g.
(**Do not give this mark** if there is any error in subtraction or weighings are in the wrong place in the table)
If the Candidate weighs to 3 decimal places the subtraction must also be correct to 3 decimal places.

Table 1.2

Give **one mark** if all initial and final temperatures are recorded to 1 decimal place or better.
(**Do not give this mark** if there is an error in subtraction or temperatures are in the wrong place in the table).
If the Candidate records temperatures to 2 decimal places the subtraction must also be correct to 2 decimal places.

Accuracy

Supervisor's Script

Check and correct any errors in subtraction in Tables 1.1 and 1.2.
Calculate the average mass and average temperature rise for the Supervisor's results (**Do not round these averages**).

Use the non-rounded values to calculate $\frac{\textbf{Temperature rise}}{\textbf{mass of FA 1}}$ **(Work to 2 d.p.)**

Record this as a ringed total on the front of the Supervisor's script.

Candidate Scripts

Check and correct any errors in subtraction.

Calculate $\frac{\textbf{Temperature rise}}{\textbf{mass of FA 1}}$ for *Experiment 1* and for *Experiment 2*.

Record each ratio, correct to 2 decimal places, above the appropriate column of Table 1.2.

Question 1 contd

Accuracy continued

Precision of working between the Candidate's Experiments.

Select the appropriate column for the "average" temperature rise obtained by the Candidate.

Compare the ratios for the two experiments conducted by the candidate. Accuracy marks are awarded for differences between the ratios as follows:

Average Temperature Rise is Closest to	5 °C (or higher)	4 °C	3 °C	2 °C	1 °C (or lower)
Mark	Difference in Ratio				
4	Up to 0.05	Up to 0.04	Up to 0.03	Up to 0.02	Up to 0.01
3	0.05+ to 0.10	0.04+ to 0.08	0.03+ to 0.06	0.02+ to 0.04	0.01+ to 0.02
2	0.10+ to 0.15	0.08+ to 0.12	0.06+ to 0.09	0.04+ to 0.06	0.02+ to 0.03
1	0.15+ to 0.20	0.12+ to 0.16	0.09+ to 0.12	0.06+ to 0.08	0.03+ to 0.04
0	> 0.20	> 0.16	> 0.12	> 0.08	> 0.04

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Precision of working between the Candidate and Supervisor.

Select the appropriate column for the "average" temperature rise obtained by the Candidate.

Record, as a ringed total, the calculated $\frac{\text{Temperature rise}}{\text{mass of FA 1}}$ for the **Supervisor** under Table 1.2

Compare this average ratio with the closer of the two ratios for the experiments conducted by the candidate.
Accuracy marks are awarded for differences between the ratios as follows:

Average Temperature Rise is Closest to	5 °C (or higher)	4 °C	3 °C	2 °C	1 °C (or lower)
Mark	Difference in Ratio				
4	Up to 0.05	Up to 0.04	Up to 0.03	Up to 0.02	Up to 0.01
3	0.05+ to 0.10	0.04+ to 0.08	0.03+ to 0.06	0.02+ to 0.04	0.01+ to 0.02
2	0.10+ to 0.15	0.08+ to 0.12	0.06+ to 0.09	0.04+ to 0.06	0.02+ to 0.03
1	0.15+ to 0.20	0.12+ to 0.16	0.09+ to 0.12	0.06+ to 0.08	0.03+ to 0.04
0	> 0.20	> 0.16	> 0.12	> 0.08	> 0.04

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Question 1 continued

In all calculations, ignore evaluation errors if working is shown

(f) Give **one mark** for **50 x 4.3 x (average temperature rise calculated in (e))** **1**

The **final answer** must show the correct units - J or kJ (ignore mol^{-1})

(g) Give **one mark** for $\frac{\textbf{answer to (f) in kJ}}{\textbf{59.5}}$ or $\frac{\textbf{answer to (f) in J}}{\textbf{59 500}}$

Do not award this mark if (J / kJ) units are inconsistent

Ignore any unit given in the final answer (e.g. g) **1**

(h) Give **one mark** for $\frac{\textbf{average mass from (d)}}{\textbf{answer to (g)}}$ (need not be evaluated)

Give **one mark** for **calculated M_r - 60** (60 must be used, the answer evaluated and there must be no units in the final answer)

2

Total for Question 1 15

2 **FA 3** is a solution containing Al^{3+}, (Na^+), SO_4^{2-}, Br^-

	Test	*Observations*	*Deductions*	
(a)	To 4 cm depth of **FA 3** in a boiling-tube, add the contents of the tube marked sodium carbonate	Gas turns lime water milky **[1]**	Solution is acidic/an acid/ H^+ present **[1]** (allow from CO_2, effervescence, fizzing or test for CO_2) (**not** from bubbles or gas)	**2**
(b)	Place 1 cm depth of **FA 3** in a test tube and add an equal depth of dilute nitric acid. Add aqueous barium nitrate.	(Permanent) White precipitate **[1]**	Sulphate **[1]**	**2**
(c)	Place 1 cm depth of **FA 3** in a test tube and add an equal depth of dilute nitric acid. Add aqueous silver nitrate. followed by dilute aqueous ammonia.	Cream or cream/white precipitate **No yellow** Ppt. is partially soluble or insoluble (both obs needed) **[1]** (Ignore colour change of the ppt on adding ammonia)	Bromide (from both obs) **[1]**	**2**
(d)	To 2 cm depth of **FA 3** in a test-tube, add dilute sodium hydroxide.	White precipitate, soluble in excess / additional sodium hydroxide (both observations needed) **[1]**	Pb^{2+}, Al^{3+}, Zn^{2+} **All three needed** **[1]**	**2**
(e)	To 2 cm depth of **FA 3** in a test-tube, add dilute aqueous ammonia.	White precipitate, insoluble in excess / additional ammonia (both observations needed) **[1]**	**Both** Pb^{2+} and Al^{3+} *(Ignore Mg^{2+})* **or** Zn^{2+} absent (if deduction mark given in **(d)**) **or** Al^{3+} present (if mentioned in **(a)**) **[1]**	**2**
(f)	To 2 cm depth of **FA 3** in a test-tube, add dilute hydrochloric acid.	No reaction /nNo precipitate / no change / remains colourless / remains clear ..... **Do not allow if ppt appears and then disappears**	**Not** Pb^{2+} or Al^{3+} **present** **[1]** *(Ignore anions)* **Both observation and deduction required**	**1**

Summary **FA 3** contains the cation Al^{3+}
and the anions SO_4^{2-} and Br^- 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.