CAMBRIDGE
INTERNATIONAL EXAMINATIONS

November 2003

GCE A AND AS LEVEL

MARK SCHEME

MAXIMUM MARK: 25

SYLLABUS/COMPONENT: 9701/03

CHEMISTRY
Practical 1

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

N.B. Boxed references within this marking scheme relate to the accompanying booklet of Standing Instructions.

Question 1

Table 1.1

Give **one mark** if all weightings (1st 4 lines of Table 1.1) ar to 2 d.p. or better (1)

Accuracy

From the Supervisor's script calculate $\frac{\textbf{mass of water droven off}}{\textbf{mass of anhydrous sodium carbonate}}$

Work to 2 decimal places. Use the lowest mass after heating. Record the Supervisor's value as a ringed value to the side of Table 1.1.

Calculate the same ratio for each candidate, recorded alongside the |Supervisor's value and calculate the difference between Supervisor and candidate. Award marks as follows:

Mark	Difference to Supervisor				
	S ⩾ 1.6	**S ≅ 1.3**	**S ≅ 1.0**	**S ≅ 0.6**	**S ≅ 0.3**
5	0.00 to 0.10	0.00 to 0.08	0.00 to 0.06	0.00 to 0.04	0.00 to 0.02
4	0.10+ to 0.20	0.08+ to 0.16	0.06+ to 0.12	0.04+ to 0.08	0.02+ to 0.04
3	0.20+ to 0.30	0.16+ to 0.24	0.12+ to 0.18	0.08+ to 0.12	0.04+ to 0.06
2	0.30+ to 0.40	0.24+ to 0.32	0.18+ to 0.24	0.12+ to 0.16	0.06+ to 0.08
1	0.40+ to 0.60	0.32+ to 0.48	0.24+ to 0.36	0.16+ to 0.24	0.08+ to 0.12
0	Greater than 0.60	Greater than 0.48	Greater than 0.36	Greater than 0.24	Greater than 0.12

(5)

If more than half the candidates in a Centre score less than 2 marks for accuracy, try 1.70 as a standard value.

If this produces no improvement, examine the candidates' values to see if there is a suitable average.

(a) Give one **mark** for a **statement** referring to heating to constant mass or words to that effect (Accept ±0.02 g as constant mass.
N.B. This mark is for understanding the concept – not a reflection of the numbers in Table 1.1 (1)

(b) Give **one mark** for correctly calculating the mas of crystals used.
(Line 2 – Line 1 of Table) (1)

(c) Give **one mark** for correctly calculating the mass of water driven from the crystals
(Line 2 – lower value from Lines 3 or 4 of Table) (1)

(d) Give **one mark** for calculating the water driven from the crystals as a % by mass. (1)

$$\frac{\textbf{answer (c)}}{\textbf{answer (b)}} \times \textbf{100}$$ (Ignore evaluation unless no working is shown)

Total for Question 1 = 10

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Question 2

Table 2.1

Give **one mark** if both weighings (1st two lines of Table 2.1) are to 2 dp or better and there is no error in subtraction (1)

Titration Table 2.2

Give **one mark** if all final burette readings (except any labelled Rough) are to 2 dp and the readings are in the correct places in the table. Do **not** give this mark if "impossible" initial or final burette readings (e.g. 23.47 cm^3) are given

Give one mark if there are two titres within 0.10 cm^3 and a "correct" average has been calculated.

See section (f) for acceptable averages

The subtraction of a Rough value need only be checked when the Rough value has been included in the selection of titres for calculating the average.

Do not give this mark if there is an error in subtraction. (2)

Accuracy

See section (g). Adopt procedure (ii) in (h) for any suspect Supervisor's result

From the Supervisor's titre calculate to 2 decimal places)

$$\frac{\mathbf{3.50}}{\mathbf{mass\ of\ crystals\ dissolved}} \times \mathbf{titre}$$

Record this value as a ringed total below Table 2.2

Calculate the same ration to 2 dp for each candidate and compare with that calculated for the Supervisor.

The spread penalty referred to in (g) of Standing Instructions may have to be applied using the table below

Accuracy Marks	
Mark	**Difference to Supervisor**
6	Up to 0.20
5	0.20+ to 0.25
4	0.25+ to 0.30
3	0.30+ to 0.50
2	0.50+ to 1.00
1	1.00+ to 2.00
0	Greater than 2.00

Spread Penalty	
Range used/cm^3	**Deduction**
0.20+ to 0.25	**1**
0.25+ to 0.30	**2**
0.30+ to 0.40	**3**
0.40+ to 0.50	**4**
0.50+ to 0.70	**5**
Greater than 0.70	**6**

If the Supervisor provided no titration details – see two possible approaches to assigning accuracy marks described at the top of page 3

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Action to be taken when no Titre results are provided by the Supervisor

(i) If the majority of candidates have similar "calculated titres" work with a suitable mean derived from the candidates' results.

(ii) If the Supervisor obtained a "good" ratio when heating in expt 1 (1.5 – 1.7)
Use the ratio/derived % of Na_2CO_3 to calculate the expected titre if 3.50 g of crystals were dissolved into 250 cm^3 of solution

In all calculations, ignore evaluation errors if working is shown

(a) Give **one mark** for $\frac{\textbf{titre}}{\textbf{1000}} \times \textbf{0.1000}$ (1)

(b) Give **two marks** for answer to (a) x $\underset{\textbf{(one)}}{\frac{\textbf{1}}{\textbf{2}}} \times \underset{\textbf{(one)}}{\frac{\textbf{250}}{\textbf{25}}}$

answer to (a) x 5 scores both marks (2)

(c) Give **one mark** for **answer to (b) x 106**

If $\frac{\textbf{250}}{\textbf{25}}$ is missing from an otherwise correct answer in **(b)** but introduced in **(c)** allow the mark for **(c)** (1)

(d) Give **one mark** for **mass of crystals weighed – answer to (c)** (1)

(e) Give **one mark** for $\frac{\textbf{answer to (d)}}{\textbf{mass of crystals weighed}} \times \textbf{100}$ (1)

Total for Question 2 = 15

Total for Paper = 25

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