CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 2002

GCE Advanced Level

MARK SCHEME

MAXIMUM MARK : 30

SYLLABUS/COMPONENT :9701 /5

CHEMISTRY
(PRACTICAL)

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

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

1 (a) ***Experiment 1***

Titration table Standing Instructions (f)

Check the Candidate's subtraction of each titration unless labelled Rough. The subtraction of a Rough titration should be checked if the Candidate has ticked the value and used it in calculating the average titre.

Give **one mark** if all burette readings are in the correct spaces in the table, the volume has been filled in, and all final burette readings are to at least 2 d.p. Ignore any titre which has been labelled **Rough**.

Give **one mark** for a sufficient number of titrations (any two titres differing by 0.10 cm^3 or less). Award this mark on uncorrected titres – **Rough** values may be included in assessing sufficient number of titrations.

Give **one mark** for a value of volume used from the burette and **quoted in the Summary**, which is clearly justified by the Candidate's indication of the results used. **Do not give this mark if no value is quoted in the Summary, no Values are ticked in the titration table or no calculation of the average is shown.** This will usually be the value of two identical titres or any other average provided it is correct to at least 2 d.p. or to the nearest 0.05 cm^3 (first and second d.p.s may be omitted here if they are 0)

3

Accuracy

See section (g).

As soon as the candidate's average titre has been checked or corrected, the titre value transferred to page 4 should be confirmed and corrected as necessary.

Assign accuracy marks by comparing the candidate's average titre (corrected as necessary) with the Supervisor's value.

The Supervisor's Titre, corrected if necessary, should be recorded on the front of the script.

Apply spread penalty as shown below

Accuracy marks	
Mark	Difference from Supervisor / cm^3
5	up to 0.20
4	0.20+ to 0.25
3	0.25+ to 0.30
2	0.30+ to 0.50
1	0.50+ to 1.00
0	Greater than 1.00

Spread Penalty	
Range used / cm^3	Deduction
0.20+ to 0.25	1
0.25+ to 0.30	2
0.30+ to 0.35	3
0.35+ to 0.40	4
greater than 0.40	5

5

Suspect Supervisor Values

Adopt procedure (ii) in (h) for any suspect Supervisor results

If there is not an obvious value from the Candidates' results, use 24.20 as the Standard Value. Report your action to Team Leader on the Centre Accuracy Return.

Calculations

In all calculations, ignore evaluation errors if working is shown

(b) Give **one mark** for $\frac{\text{titre}}{1000} \times 0.02$ **1**

(c) Give **two marks** for **ans (a) x 5 x** $\frac{1000}{25}$ **2**

(one) (one)

(d) *Experiment 2*

Check and correct, if necessary, all subtractions in Table 1.2.

MARK THE GRAPH BEFORE ASSESSING MARKS FOR ACCURACY

Graph

(e) **(i)** Give **one mark** if **FB 1** is plotted on *y-axis* and **FB 3** is plotted on *x-axis.*

(ii) Give **one mark** if both axes are correctly labelled and have the correct units.
[**FB 1** / cm^3 or **FB 1** (cm^3)] is sufficient for this mark.

(iii) Give **one mark** if linear scales have been used.
(Points should be plotted over more than half the length of the **FB 1** axis)

(iv) Check and re-plot **(with a red dot)** any incorrectly plotted values or values where the Candidate made an error in subtraction.
Give **two marks** for correct plotting (Candidate's values) of all four points.
A point is correctly plotted if the centre of the cross or the point is within ½ square on each axis of the point selected by the Examiner.
Give **one mark** if three points, only, are correctly plotted.
Do not give these marks if the scale(s) chosen is difficult to use. In this case the Examiner is to re-plot the correct values using suitable scales to assess the practical performed for accuracy marks.

Record the mark given in the boxes (i) – (iv) alongside the graph to indicate these marking points have been considered.

5

(f) Give **one mark** for a best-fit straight line drawn through the points.
Accept a line passing through three points but missing the fourth point as a line of best fit.
Accept a line that leaves two points evenly distributed on either side of the line.
Do not award this mark if either scale is non-linear.

1

(g) Give **one mark** for reading from the graph, to the nearest ½ square, the volume of **FB 3** where **the line intersects the FB 3 axis**.
Do not give this mark if a curve has been drawn.

1

ACCURACY MARKS

Lay a transparent ruler or straight line drawn on acetate on the plotted/re-plotted points. Adjust the position of the ruler/acetate to give the best-fit straight line (using the criteria above). Award accuracy marks as follows:

	Mark
All four plotted points are within 1 horizontal or vertical square on either side of the line.	3
Three of the plotted points are within 1 horizontal or vertical square on either side of the line and the fourth point is within 2 horizontal squares.	2
Three of the plotted points are within 2 horizontal or vertical squares on either side of the line.	1

3

Total for Question 1 21

2 Assessment of Planning Skills

(a) Give **one mark** for a diagram showing apparatus suitable for heating caesium nitrate, collecting and measuring the volume of gas given off.

Heating		*Collection*	
test-tube	✓	(gas)-syringe	✓
boiling-tube	✓	inverted measuring cylinder full of water	✓
combustion-tube	✓	inverted burette full of water	✓
round-bottomed flask**	✓	eudiometer	✓
beaker**	✗	uncalibrated gas jar	✗
		uncalibrated test-tube/boiling-tube	✗

** **Do not accept any apparatus that has sharp corners**

Do not give this mark if the collection apparatus is inverted and full of water but shows no graduations **unless** it has been correctly labelled. **No mark** should be given if solution or solid + water is heated.

Give **one mark** for correctly labelling the apparatus **and** indicating the volume of apparatus used **to collect the gas**, e.g. 100 cm^3 gas syringe, 250 cm^3 measuring cylinder.

2

(b) Give **one mark** for nitrogen dioxide and oxygen if gas is not collected over water or for oxygen alone if the gas is collected over water.

1

(c) Give **one mark** for a calculated M_r of caesium nitrate = 195.0

If the Candidate has chosen NO_2 and O_2 as the gas collected.
Give **one mark** for stating or showing by calculation that the greater volume of gas will be given by the first equation.
Give **one mark** if the mass of $CsNO_3$ is shown by calculation to be ≤ 0.65 g / 100 cm^3 gas and the mass used will not give more gas than can be collected in the apparatus selected.

If the Candidate has chosen O_2 as the only gas collected.
Give **one mark** for stating or showing by calculation that the greater volume of gas will be given by the second equation.
Give **one mark** if the mass of $CsNO_3$ is shown by calculation to be ≤ 1.625 g / 100 cm^3 gas and the mass used will not give more gas than can be collected in the apparatus selected.

3

(d) Give **one mark** for **stating** that moles of gas and moles of $CsNO_3$ need to be calculated.

Give **one mark** for reference to numerical mole ratios from equations (if first mark has been given)

2

(e) Give **one mark** for a suitable safety feature with associated reason, e.g.
use of fume cupboard as NO_2 is toxic.

1

Total for Question 2 is 9

Total for Paper 30.