UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary and Advanced Level

MARK SCHEME for the November 2005 question paper

9701 CHEMISTRY

9701/03 **Paper 3 (Practical Test), maximum raw mark 25**

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2005 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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Question 1

Supervisor's results

Check all subtractions in Tables 1.1 and 1.2.
Select the titre average.

Calculate, **correct to 2 decimal places**, the ratio: **Volume of FA2 x Titre**

Record this value on the front of the Supervisor's script and as a ringed value by Table 1.2 on each candidate script.

Candidate's results

Check all subtractions in Tables 1.1 and 1.2. The subtraction of titration results labelled as rough need not be checked unless the candidate has included them in the volumes used to calculate the average.

Calculate, **correct to 2 decimal places**, **Volume of FA 2 diluted x Titre**

Record this value by Table 1.2 on the script and calculate the difference to the Supervisor's ratio.

Award **accuracy marks** for differences as follows:

Accuracy mark	
Mark	Difference to Supervisor
6	Up to 4.50
5	4.50+ to 6.75
4	6.75+ to 9.00
3	9.00+ to 13.50
2	13.50+ to 18.00
1	18.00+ to 22.50
0	Greater than 22.50

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

6

Deduct from the accuracy mark **one mark** for **each** of the following errors:

(i) Final burette readings in Tables 1.1 and 1.2 not recorded to 2 decimal places or in the wrong place in a Table,
or "impossible" burette readings (e.g. 23.47 cm^3) recorded at any point in the tables.

(ii) No two recorded (uncorrected) titres within 0.1 cm^3.

(iii) An incorrect average calculated **or** no selection of at least two titres for the calculation of the average.
Selected titres may be ticked or used in a calculation of the average.

THERE IS A MAXIMUM DEDUCTION OF TWO MARKS FROM THE ACCURACY MARKS

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In all calculations, ignore evaluation errors if working is shown.
Where an answer is given with no working the Examiner is to check the appropriate working and the answer must be given correct for this working.

(c) Give **one mark** for $\frac{\textbf{Volume of FA 2 diluted}}{\textbf{250}}$ **x 1.00**

1

(d) Give **one mark** for **answer to (c) x** $\frac{\textbf{Titre}}{\textbf{1000}}$

1

(e) Give **two marks** for **answer to (d) x** $\underset{\textbf{(one)}}{\frac{\textbf{1}}{\textbf{2}}}$ **x** $\underset{\textbf{(one)}}{\frac{\textbf{1000}}{\textbf{25}}}$

No marks are to be awarded if the answer to (d) has not been used unless the answer has been started again from first principles.

2

(f) Give **one mark** for **answer to (e) x a clearly calculated** $\boldsymbol{M_r}$
(M_r does not have to be correct)

and

If full marks have been given in **(c)** to **(e)**, give **one mark** for an answer within 1% of the answer calculated by the examiner from the candidate's results.

The correct answer is given by: **Candidate's Accuracy "product" x 1.6096 x 10^{-2}**

2

(g) Give **one mark** for **38.10 - answer to (f)**

1

(h) Give **one mark** for $\frac{\textbf{answer to (g)}}{\textbf{18}}$

and

Give **one mark** for $\frac{\textbf{moles of water calculated in first part of (h)}}{\textbf{answer to (e)}}$

2

Total for Question 1 = 15

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Question 2 **FA 4** is red lead oxide, Pb_3O_4.

	Test	*Observations [6]*
(a)	Transfer half of the solid **FA 4** provided to a boiling-tube and add about 7 cm depth of dilute nitric acid. **Cautiously warm** the tube until the orange solid is no longer visible. Filter the mixture and retain both filtrate and residue for further tests. Wash the residue with water.	Give **one mark** for colourless filtrate and brown solid/precipitate/residue
(b)	Transfer the remaining **FA 4** to a hard glass test-tube and heat strongly. Identify, with a suitable test, the gas evolved.	Give **one mark** for identifying the gas as oxygen and giving an appropriate test, e.g. relights glowing splint/splint burns more brightly/splint glows more brightly

Tests on the filtrate

(c)	To 1 cm depth of the filtrate from **(a)** in a test-tube, add aqueous sodium hydroxide until there is no further change.	Give **one mark** for white precipitate soluble in excess sodium hydroxide
(d)	To 1 cm depth of the filtrate from **(a)** in a test-tube, add aqueous ammonia until there is no further change.	Give **one mark** for white precipitate insoluble in excess ammonia
(e)	To 1 cm depth of the filtrate from **(a)** in a test-tube, add aqueous potassium iodide.	Give **one mark** for yellow precipitate

Tests on residue

(f)	Cautiously place 1 cm depth of concentrated hydrochloric acid into a boiling-tube and add an equal amount of water. Add to the tube some of the residue from **(a)** and warm gently. Identify, with a suitable test, the gas evolved. **Immediately the gas is identified rinse the contents of the tube into the sink.**	Give **one mark** for identifying the gas as chlorine and giving an appropriate test, e.g. bleaches indicator paper

6

Give **one mark** for correctly identifying the cation as Pb^{2+} and giving **one** pieces of supporting evidence

Give **one further mark** for a second piece of supporting evidence

Give **one mark** for correctly identifying **FA 4** as an oxidising agent/oxidant

Give **one mark** for giving a correct piece of evidence to support this behaviour.

4

Total for Question 2 = 10
Total for Paper = 25

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