UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary and Advanced Level

MARK SCHEME for the November 2004 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*.

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

CIE is publishing the mark schemes for the November 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.

Grade thresholds taken for Syllabus 9701 (Chemistry) in the November 2004 examination.

	maximum mark available	minimum mark required for grade:		
		A	B	E
Component 3	25	22	20	14

The thresholds (minimum marks) for Grades C and D are normally set by dividing the mark range between the B and the E thresholds into three. For example, if the difference between the B and the E threshold is 24 marks, the C threshold is set 8 marks below the B threshold and the D threshold is set another 8 marks down. If dividing the interval by three results in a fraction of a mark, then the threshold is normally rounded down.

November 2004

GCE A AND AS LEVEL

MARK SCHEME

MAXIMUM MARK:

SYLLABUS/COMPONENT: 9701/03

CHEMISTRY
Paper 3 (Practical Test)

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

Question 1

Supervisor's results

Check all subtractions in the titration Table 1.1.

Select the titre average. Use the rules in Standing Instructions, Section **(f)**

Record this value on the front of the Supervisor's script and as a ringed value by the titration Table 1.1 on each candidate script.

(b) Candidate's results

Check all subtractions in the titration Table 1.1. The subtraction of titration results labelled as rough need not be checked unless the candidate has included in the volume used to calculate the average.

Check the candidate's average using the rules in (g) and (h).
See (i) for details of spread penalties and possible spread penalty if only one titre has been selected.
See (h) for penalty if only one accurate titration has been performed.

Tick (if accepting the candidate's value) or correct this value, recording it by titration Table 1.1 on the script. Calculate the difference to the Supervisor's ratio.

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

Accuracy mark	
Mark	Difference to Supervisor/cm^3
8	Up to 0.10
7	0.10+ to 0.15
6	0.15+ to 0.20
5	0.20+ to 0.25
4	0.25+ to 0.30
3	0.30+ to 0.40
2	0.40+ to 0.60
1	0.60+ to 0.80
0	Greater than 0.80

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
0.40+ to 0.50	5
0.50+ to 0.60	6
0.60+ to 0.80	7
Greater than 0.80	8

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

(i) Any Initial and Final Burette reading transposed or 50 used as initial burette reading.

(ii) Final burette readings in Table 1.1 (except for any titration recorded as Rough) not recorded to 2 decimal places

or "impossible" burette readings (e.g. 23.47 cm^3) recorded at any point in the tables.

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

(iv) An incorrect average calculated

or

No selection of at least two titres for the calculation of the average shown (selected titres may be ticked or used in a calculation of the average.) **or** Error in subtraction in any accurate titre (any rough titre if included in selection of titres to calculate the average)

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

In all calculations, ignore evaluation errors if working is shown

(b) Give **one mark** for calculating the correct concentration in mol dm^{-3}

$\frac{\mathbf{23.72}}{\mathbf{158.2}}$ **or 0.15**

Do not give this mark if S = 32.0 has been used.

Give **one mark** for $\frac{\textbf{titre}}{\textbf{1000}}$ **x concentration in mol dm^{-3} calculated by candidate**

or

Give **one mark** for $\frac{\mathbf{23.72}}{\mathbf{1000}}$ **x titre** and **one mark** for this expression x $\frac{\mathbf{1}}{\mathbf{158.2}}$

(one) **(one)** **2**

(c) Give **one mark** for answer **(b)** x $\frac{1}{2}$ **1**

(d) Give **one mark** for answer **(c)** x $\frac{1}{3}$ **1**

(e) Give **one mark** for answer **(d)** x $\frac{1000}{25}$ **1**

(f) Give **one mark** for $\frac{\textbf{5.15}}{\textbf{answer to (e)}}$ or $\frac{\textbf{5.15 x 0.025}}{\textbf{answer to (d)}}$

and

Give **one mark** for a fully correct answer within 1% of the value calculated by the examiner.

Do not give this mark if there are 'chemical' errors in **(b)** to **(f)** even if these errors are self-cancelling.

The mark may be given if 158 rather than 158.2 has been used for M_r of sodium thiosulphate, providing the final answer is within 1% of the examiner calculated value

The correct answer is given by the expression: $\frac{\textbf{5150}}{\textbf{titre}}$

Record the examiner calculated value (ringed) as close as possible to the candidate value. Where the candidate has rounded a final answer, work with the more 'accurate' calculation. **2**

Total for Question 1 15

2 **FA 5** is a solution of iron(II) ammonium sulphate.

	Test	***Observations***	
(a)	To 2 cm depth of **FA 5** in a test-tube add 1 cm depth of aqueous silver nitrate. Leave the mixture to stand and continue with tests **(b)** to **(e)**.		
(b)	To 2 cm depth of FA 5 in a boiling-tube, add 4 cm depth of aqueous sodium hydroxide. Stir thoroughly with the glass rod provided. Filter the mixture and retain the filtrate for tests **(c), (d)** and **(e).**	Give **one mark** for a green precipitate. *Do **not** allow grey-green or green qualified by any other colour* *Allow muddy green or dirty green*	**1**
	<u>Observe the residue</u> in the filter paper after it has been exposed to the air for a few minutes.	Give **one mark** for orange, rusty, orange/brown, red/brown or brown colour (on precipitate standing in the filter paper) *Do **not allow** red or brick-red.*	**1**

	Test	*Observations*	
(c)	To 1 cm depth of the filtrate from **(b)** in a test-tube, add 2 cm depth of dilute nitric acid followed by aqueous silver nitrate.	Give **one mark** for no reaction **or** no precipitate **or** colourless solution. (Ignore any slight white colouration of the solution) *Do **not** allow if there is any reference to a precipitate.*	**1**
(d)	To 1 cm depth of the filtrate from **(b)** in a test-tube, add 2 cm depth of dilute hydrochloric acid followed by aqueous barium chloride.	Give **one mark** for white precipitate on addition of barium chloride **or** if the white precipitate is called barium sulphate. *This mark may be given if a white ppt, not related to $BaCl_2$ in the answer is given in a second line of the observation. (Assume the first line refers to addition of HCl)*	**1**
(e)	Place 1 cm depth of the filtrate from **(b)** in a boiling-tube and warm the tube gently. **Take care as a solution containing sodium hydroxide may 'bump' on heating and eject hot corrosive sodium hydroxide.**	Give **one mark** for a **chemical test on the gas** that shows ammonia is evolved. *Accept alkaline colour change with specified indicator paper or white smoke (fumes) with concentrated hydrochloric acid.* *An answer that describes red litmus turning blue and mentions ammonia is acceptable.*	**1**
(f)	Observe the mixture left to stand in test **(a)**.	Give **one mark** for a white/off-white /cream/grey precipitate *Do **not allow** silver or brown* **and** Give **one mark** for the solution turning yellow or orange. *Do **not allow** brown solution.*	**2**

Test	*Observations*	
(f) Use a teat pipette to remove the solution from the precipitate formed, then wash the precipitate with distilled water. Remove and discard the 'wash' water then dissolve the solid in dilute aqueous nitric acid. You may need to cautiously warm the mixture. Use this solution in the test below.		
Add dilute hydrochloric acid to the solid dissolved in nitric acid.	Give **one mark** for a white precipitate	**1**

Where a candidate has not earned a mark for a particular test because of an incomplete observation the mark may be awarded retrospectively if the observation is completed in the "Evidence" section of page 4.

e.g. A white precipitate is recorded in **(d)**.

On page 4 the candidate says sulphate because white ppt formed with $BaCl_2$

Candidate records red litmus turning blue in **(e)**.

On page 4 the candidate says ammonium salt as (ammonia) gas turns red litmus blue

Give **one mark** for identifying the correct ions present: NH_4^+, Fe^{2+}, SO_4^{2-}

(Examiners must see appropriate if incomplete observations for these ions) **1**

Give **one mark** for evidence (from the candidate's tests) that supports each of the ions **chosen by the candidate**. **1**

(This mark can be given for correct evidence supporting incorrect ions)

The minimum evidence: for NH_4^+ is reference to ammonia **or** any reference to red litmus turning blue in **(e)**

for SO_4^{2-} is a white precipitate in **(d)**

Give **one mark** for identifying the solid formed in **(e)** as silver.

Do not give this mark if there is no appropriate justification **1**

There are 11 marking points for **Question 2**.

If a candidate scores all 11 points:

Record the 11 marks in a circle, then cross out and replace with [10] MAX:

Total for Question 2 [10]

Total for Paper [25]