CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 2003

GCE A AND AS LEVEL

MARK SCHEME

MAXIMUM MARK: 30

SYLLABUS/COMPONENT: 9701/05

CHEMISTRY
Practical 2

Question 1

(a) Titration Tables 1.1 and 1.2

Give **one mark** if

all final burette readings in both tables are to 2 decimal places, in the correct places in both tables and the subtraction in Table 1.1 is correct. titrations in Table 1.2 that are labelled Rough do **not** need to be to 2 d.p. and subtraction need not be checked **unless** the value has been included in calculating the average.

Titration Table 1.1

Give **one mark** if

A **candidate recorded** volume between 45.00 cm^3 and 45.50 cm^3 has been diluted.

Titration Table 1.2

Give **one mark** if

Two (uncorrected) titres are within 0.10 cm^3

Give **one mark** if

a suitable average has been selected. (Do not give this mark if there is an error in subtraction in Table 1.2)

4

Accuracy

From the Supervisor's results calculate, **to 2 decimal places**,

$$\frac{\text{Volume of FB 1 diluted}}{45.00} \times \text{Titre}$$

Record this value as a ringed total below Table 1.2.

Calculate the same ratio for each candidate and compare with the Supervisor's value.

Award accuracy marks as shown in the table below.

The spread penalty may have to be applied using the table below.

Accuracy Marks	
Mark	**Difference from Supervisor**
8	Up to 0.10
7	0.10+ to 0.15
6	0.15+ to 0.20
5	0.20+ to 0.30
4	0.30+ to 0.40
3	0.40+ to 0.60
2	0.60+ to 0.80
1	0.80+ 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
0.40+ to 0.50	5
0.50+ to 0.60	6
0.60+ to 0.80	7
Greater than 0.80	8

8

In all calculations, ignore evaluation errors if working is shown

(c) Give **one mark** for

$$\frac{\mathbf{100.0}}{\mathbf{248.2}} \quad \textbf{or} \quad \mathbf{0.403} \quad \textbf{or} \quad \mathbf{0.4029}$$

1

Do not give this mark if 32 is seen to be used instead of 32.1 for A_r of sulphur
0.403 without working gains this mark

(d) Give **one mark** for **Answer to (c) x** $\frac{\textbf{volume of FB 1 diluted}}{\textbf{250}}$

1

(e) Give **two marks** for **Answer to (d) x** $\frac{\textbf{titre}}{\textbf{1000}}$ **(1) x ½ (1)**

2

(f) Give **one mark** for $\frac{\mathbf{25}}{\mathbf{1000}}$ **x 0.023 or 0.000575**

1

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

1

(h) Give **one mark** for correctly calculating the oxidation numbers of

Chromium in CrO_4^{2-} (+)6
Iodine in I^- -1
Iodine in 1_2 0

Give **one mark** for **using the reacting quantities** in **(g)** to show that

$CrO_4^{2-} \equiv 1½\ I_2 \equiv 3e^-$.

And that the oxidation number of +6 is reduced to +3.

2

Total for Question 1 20

Question 2

ASSESSMENT OF PLANNING SKILLS

Plan

Give **one mark** for each of the following points.

Identify the method below that gives the best match - there may be cross-over.

(Record the letter of the point awarded in the text where given and tick the appropriate box in the margin)

Method	A Heat/Mass	B Heat/ Volume	C Acid/ Volume	D Acid/ Mass	E $CuCO_3$ Back-Titre	F CO_2 Back-Titre	G CuO Back-Titre	H Residue method	I $CuCO_3$/ CuO Titration
a	Weighs sample	Weighs sample	Weighs sample	Weighs sample and acid	Weighs sample	Weighs sample	Weighs sample	Weighs sample	Weighs sample
b	Heat	Heat	Placed in acid	Placed in acid	Known moles of acid measured	CO_2 produced in suitable way	CO_2 produced	Adds excess acid	Makes solution in a volumetric flask
c	Reweigh	CO_2 collected	CO_2 collected	Reweigh	$CuCO_3$ dissolved in excess acid	CO_2 dissolved in excess alkali	CuO dissolved in excess acid	Filter/dry residue	Titrates with standard acid
d	Heat to constant mass	Volume of gas measured	Volume of gas measured	Mass of CO_2 calculated	Excess of acid titrated	Excess of alkali titrated	Excess of acid titrated	Weighs residue	

4

Table of Results

Give three **marks** if table(s) show all measurements necessary

Deduct one mark for each measurement missing. (No negative marks)

The candidate must give **all** necessary readings: each relevant unit must be seen at least once.

Examiners must be satisfied that all practical readings needed for the candidate's method have been recorded.

Weighings must include:
- Mass of empty container
- Mass of container + solid
- (Mass of container + residual solid) where appropriate etc.

Collection of gas must include:
- An initial volume of gas
- A final volume of gas

Titration results must include:
- Initial burette readings
- Final burette readings
- Titre volume

3

Processing of Results

Give **one mark** for each of the following points. (Tick the appropriate box in the margin)

Mathematical expressions (using algebra or specimen values) must be included in the processing of results. Use must be made of the A_r values given in the paper and the GMV where appropriate.

Method	Mass/Volume methods	Back-Titre methods	Residue methods	$CuCO_3$/CuO titre
e	Volume of mass of CO_2 converted to moles	Initial moles of acid/alkali – excess moles of acid/alkali gives moles of CO_2/CuO/$CuCO_3$	Find mass of $CuCO_3$ by subtraction	Moles of acid converted to moles of $CuCO_3$
f	Moles of CO_2 converted to moles and mass of $CuCO_3$	Moles converted to mass of $CuCO_3$	% of $CuCO_3$ calculated	Moles of $CuCO_3$ converted to mass of $CuCO_3$
g	% of $CuCO_3$ calculated	% of $CuCO_3$ calculated		% of $CuCO_3$ calculated

3

Plan Marks

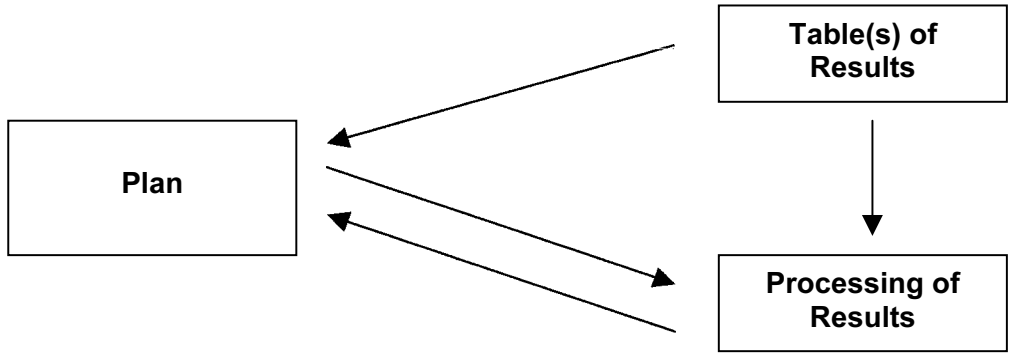
Marks for the Plan (a-d) may be awarded from the Table(s) of Results or from the Processing of Results

Processing of Results Marks

Marks in the final section (e-g) may be found in and awarded from the Planning Section

Marks for the Table of Results

The three marks in this section **can <u>only</u> be awarded** in the Table of Results Section



Total for Question 2 **10**

Total for Paper **30**