CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education Advanced Level

CHEMISTRY 9701/3

PAPER 3 Practical Test

INSTRUCTIONS

MAY/JUNE SESSION 2002

1 hour 15 minutes

Great care should be taken that any confidential information given does not reach the candidates either directly or indirectly.

GENERAL

1 Advanced access to the question paper is **not** allowed. The Chemistry teacher responsible should ensure that the chemicals required give the results specified on Page 4.

The 'General Apparatus' requirements and the 'Particular Requirements' are printed separately. It is *especially important* that the details of page 4 are kept secure.

2 Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Only those tests described in the question paper should be attempted. Candidates must not attempt confirmatory tests (a statement advising candidates that such additional tests gain no credit being given in the question paper). Please also see under 'General Apparatus' on the use of pipette fillers and safety goggles.

In accordance with COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

Attention is drawn, in particular, to certain materials used in the examination. The following codes are used where relevant.

C = corrosive substance

F = highly flammable substance

H = harmful or irritating substance

O = oxidising substance

T = toxic substance

If you have any problems or queries regarding these Instructions, please contact CIE
by e-mail: International@ucles.org.uk,
by phone: +44 1223 553554,
by fax: +44 1223 553558,
stating the Centre number, the nature of the query and the syllabus number quoted above.

These instructions consist of 8 printed pages.

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

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In this context, the attention of Supervisors is drawn to the following publications relating to safety and first-aid:

(a) 'Hazcards', as published by CLEAPSS Development Group, Brunel University, Uxbridge, UB8 3PH (01895-251496)

(b) 'Hazards in the Chemical Laboratory', as published by the Royal Society of Chemistry (4th edition, 1986, edited by L. Bretherick, ISBN 0-85186-489-9)

(c) 'Hazard Data Sheets', published by BDH Laboratory Supplies.

General Apparatus

1 In addition to the fittings and reagents ordinarily contained in a chemical laboratory, the apparatus and materials specified below will be necessary.

2 It as assumed that bench solutions (2 mol dm^{-3} concentration, 1 mol dm^{-3} for sulphuric acid) of the common acids and alkalis are available.

3 Pipette fillers and safety goggles should be used where necessary.

For each candidate

1 250 cm^3 beaker
2 foamed plastic cups (e.g. expanded polystyrene) to fit inside 250 cm^3 beaker
a 50 cm^3 measuring cylinder
a weighing bottle
a –5 °C to 50 °C by 0.2 °C thermometer
access to a balance weighing to 2 decimal places or better
[Where balance provision is limited within a Centre, some candidates should be instructed to start on question 2]

test-tubes and boiling tubes for question 2
a spatula
a teat pipette
test-tube holder

Particular requirements

1 As a possible aid to maintaining security, the descriptions of the particular chemicals required are given under two headings:

(a) overall specifications are given on page 3;

(b) the actual identities are given on page 4.

2 Materials with an **FA** code number should be so labelled for the candidates' benefit, **without** the identities being included on the label - where appropriate, the identity of an **FA** coded chemical is given in the question paper itself.

Chemicals Required

1 The chemicals required per question are described in general terms below.

2 Where quantities are specified for each candidate (shown after a colon against each listed item), they are meant as guides only and are quantities greater than candidates will normally need to use. It is suggested that about 80% of the specified quantities should be distributed to candidates with the remainder kept as a central reserve. More material may be supplied if requested by candidates, without penalty.

Where relevant, spare material should be available to cover accidental loss.

3 The specific qualitative analysis reagents needed for Question 2 are identified on page 5.

4 For Question 1

(a)	Solid **FA 1:**	about 12 g
(b)	Solution **FA 2:**	150 cm^3

For Question 2

(c)	Solution **FA 3**	about 40 cm^3
(d)	Solid anhydrous sodium carbonate	about 1 g

Detailed Identities of Chemicals Required

1 It is *especially important* that great care is taken that the confidential information given below does not reach the candidates either directly or indirectly.

2 The identities of the chemicals with an **FA** code number are as follows.

Solids

Question 1

FA 1 is anhydrous sodium carbonate, Na_2CO_3.

It is advisable to heat the solid before the examination to remove any absorbed water. Cool and store the solid in a desiccator and provide to each candidate in a stoppered container such as a test-tube with bung.

NB. The description of FA 1 in the question paper differs to that in the preparation instructions. Candidates may be disadvantaged if the actual identity of the solid FA 1 is disclosed.

Liquids

[H] **FA 2** is approximately 2 mol dm^{-3} hydrochloric acid, HC*l*.

*When 1.0 g of **FA 1** is added to 25.0 cm^3 of **FA 2** there should be a temperature rise between 4.5 °C and 5.5 °C.*

Question 2

FA 3 contains aluminium sulphate, and sodium bromide.
Dissolve:
60.0 g of aluminium sulphate, $Al_2(SO_4)_3.16H_2O$;
20.0 g of sodium bromide, NaBr **or** (24.0 g of potassium bromide, KBr)
in distilled water and make up to 1 dm^3.

[H] A tube, **labelled sodium carbonate,** containing 1.0 ± 0.1 g of anhydrous sodium carbonate, Na_2CO_3.

3 The qualitative analysis reagents specifically required are set out below. If necessary, they may be made available from a communal supply: however, the attention of the Invigilators should be drawn to the fact that such an arrangement may enhance the opportunity for malpractice between candidates.

The usual reagents and apparatus for qualitative analysis, including:

[C] aqueous silver nitrate, $AgNO_3$, approximately 8.5 g dm^{-3}

[T] aqueous barium nitrate, $Ba(NO_3)_2$, approximately 50.0 g dm^{-3}.

COLOUR BLINDNESS

With regard to colour-blindness – a minor handicap, relatively common in males – it is permissible to advise candidates who request assistance on colours of, for example, precipitates and solutions (especially titration end-points). Please include with the scripts a note of the index numbers of such candidates.

Experience suggests that candidates who are red/green colour-blind – the most common form – do not generally have significant difficulty. Reporting such cases with the scripts removes the need for a 'Special Consideration' application for this handicap.

Accuracy of Solutions

1 All the solutions are to be labelled as shown and they should each be bulked and mixed thoroughly before use to ensure uniformity.

Every effort should be made to keep the concentrations accurate within one part in two hundred of those specified.

If the concentrations differ slightly from those specified, the Examiners will make the necessary allowance. They should be informed of the exact concentrations.

2 It should also be noted that descriptions of solutions given in the question paper may not correspond exactly with the specification in these Instructions. **The candidates must assume the descriptions given in the question paper.**

3 In view of the difficulty of the preparation of large quantities of solution of uniform concentration, it is recommended that the maximum number of candidates per group be 30 and that separate supplies of solutions be prepared for each group.

Responsibilities of the Supervisor

(i) The Supervisor, or other competent chemist **must** carry out the experiments in question 1 and complete the tables of readings on a spare copy of the question paper which should be labelled 'Supervisor's Results'. This should be done for each session held and for each set of solutions supplied. It is essential that each packet of scripts contains a copy of the Supervisor's Results as the candidates' work cannot be assessed accurately without such information.

(ii) The Supervisor must complete the Report Form on page 7 to show which candidates attended each session. If all candidates took the examination in one session, please indicate this on the Report Form. A copy of the Report Form must accompany each copy of the Supervisor's Results in order for the candidates' work to be assessed accurately.

(iii) The Supervisor must give details on page 8 of any particular difficulties experienced by a candidate, especially if the Examiner would be unable to discover this from the written answers.

Each envelope returned to Cambridge must contain the following items.

1 The scripts of those candidates specified on the bar code label provided.

2 A copy of the Supervisor's Results relevant to the candidates in **1**.

3 A copy of the Report Form, including details of any difficulties experienced by candidates (see pages 7 and 8).

4 The Attendance Register.

Failure to provide appropriate documentation in each envelope may cause candidates to be penalised.

REPORT FORM

This form must be completed and sent to the Examiner in the envelope with the scripts.

Centre Number ..... Name of Centre .....

1 Supervisor's Results

Please submit details of the readings obtained in Question 1 on a spare copy of the question paper clearly marked 'Supervisor's Results' **and showing the Centre number**.

2 The index numbers of candidates attending each session were:

First Session	*Second Session*

3 The Supervisor is required to give details overleaf of any difficulties experienced by particular candidates, giving names and index numbers. These should include reference to:

(a) any general difficulties encountered in making preparation;

(b) difficulties due to faulty apparatus or materials;

(c) accidents to apparatus or materials;

(d) assistance with respect to colour blindness.

Other cases of hardship, e.g. illness, temporary disability, should be reported direct to CIE on the normal 'Application for Special Consideration' form.

4 A plan of work benches, giving details by index numbers of the places occupied by the candidates for each experiment for each session, **must** be enclosed with the scripts.

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Report on any difficulties experienced by candidates.