

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CHEMISTRY

9701/03

Paper 3 Practical Test

May/June 2004

Confidential Instructions

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

GENERAL

- 1 Access to the examination paper is not permitted before the examination.**

Supervisors may be asked to check concentrations of solutions prepared or purity of solids by specific instructions in the preparation instructions.

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

This document consists of **8** printed pages.



In this context, the attention of Supervisors is drawn to any local regulations relating to safety and first-aid. Supervisors should also consult any 'Hazard Data Sheets', which should be available from your chemical supplier.

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 is 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

a 250 cm^3 beaker
a 250 cm^3 graduated (volumetric) flask, labelled **FA 3**
a 50 cm^3 burette
a glass (stirring) rod
a titration flask
a white tile
a 25 cm^3 pipette
a pipette filler
a heat proof mat
a test-tube rack
a filter funnel and paper
6 test-tubes
3 boiling-tubes
a test-tube holder

access to a balance weighing to 0.01 g or better.

Where there is limited access to a balance, half of the candidates should be instructed to start the examination by setting up the apparatus for titration.

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, they are sufficient for the experiments described in the question paper to be completed.
In preparing materials, the bulk quantity for each substance should be increased by 25% as spare material should be available to cover accidental loss.

More material may be supplied if requested by candidates, without penalty.

- 3 The specific qualitative analysis reagents needed for Question 2 are identified on page 4.

4 For Question 1

(a) Solid **FA 1** between 1.70 g and 2.00 g
(supplied in a stoppered tube labelled **FA 1**)

(b) Solution **FA 2** 150 cm³

For Questions 1 and 2

(c) Distilled water 400 cm³

For Question 2

(d) Solid **FA 4** about 2 g
(supplied in a stoppered boiling-tube labelled **FA 4**)

To aid the preparation of tubes FA 1 and FA 4 in large Centres, it is suggested that the first tube is prepared by weighing the required quantity. Subsequent tubes should be filled to the same level.

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 .

*Between 1.70 g and 2.00 g of the solid should be provided in a stoppered tube that has been labelled **FA 1**.*

Question 2

FA 4 is a mixture containing equal masses of powdered calcium carbonate, CaCO_3 , and anhydrous sodium sulphite, Na_2SO_3 .

*Each candidate should be provided with approximately 2 g of the mixture in a stoppered tube that has been labelled **FA 4**.*

Liquids

Question 1

[H] **FA 2** is 0.15 mol dm^{-3} hydrochloric acid.

Prepare the solution of hydrochloric by diluting between 12.5 cm^3 and 13.0 cm^3 of concentrated hydrochloric acid to 1 dm^3 .

The indicator normally used at the Centre for the titration of a strong acid with a weak base, e.g. methyl orange or bromophenol blue, should be provided.

- 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:

barium chloride (or barium nitrate), labelled barium chloride.

[H] aqueous iodine, I_2 , approximately 2.5 g dm^{-3} .

Dissolve the 2.5 g of solid in water containing sufficient potassium iodide to dissolve the iodine, then make up the solution to 1 dm^3 with distilled water.

[O] [H] acidified aqueous potassium dichromate(VI), $\text{K}_2\text{Cr}_2\text{O}_7$, approximately 29.4 g dm^{-3} .

Dissolve the 29.4 g of solid in 500 cm^3 of water and make up to 1 dm^3 with 1 mol dm^{-3} sulphuric acid.

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 and session/laboratory details.

2 The index numbers of candidates attending each session were:

First Session

Second Session

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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.



Report on any difficulties experienced by candidates.