

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

**CHEMISTRY**

**9701/03**

Paper 3 Practical Test

May/June 2003

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 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'.

### 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 ( $2 \text{ mol dm}^{-3}$  concentration,  $1 \text{ mol dm}^{-3}$  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  $250 \text{ cm}^3$  beaker  
a  $50 \text{ cm}^3$  measuring cylinder  
a small ( $10$  or  $25 \text{ cm}^3$ ) measuring cylinder  
a stop-clock (or sight of a clock with seconds sweep hand)  
test-tube holder  
test-tubes and boiling-tubes for question 2  
a bung/cork to fit a boiling-tube  
a filter funnel and paper  
a spatula  
a teat pipette

### 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 4.

**4 For Question 1**

- |                            |                     |
|----------------------------|---------------------|
| (a) Solution <b>FA 1</b> : | 300 cm <sup>3</sup> |
| (b) Solution <b>FA 2</b> : | 50 cm <sup>3</sup>  |
| (c) Distilled water        | 200 cm <sup>3</sup> |

**For Question 2**

- |                       |           |
|-----------------------|-----------|
| (b) Solid <b>FA 3</b> | about 3 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 2**

**FA 3** is a mixture of basic magnesium carbonate and “ammonium iodide”.

Prepare this mixture by grinding together in a pestle and mortar:

[O]  
[H]

Magnesium carbonate, $3\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 3\text{H}_2\text{O}$ ,	– 4 parts by mass
Ammonium nitrate, $\text{NH}_4\text{NO}_3$ ,	– 2 parts by mass
Potassium iodide, KI,	– 1 part by mass

*Liquids***Question 1**

**FA 1** is aqueous sodium thiosulphate containing  $37.0 \text{ g dm}^{-3} \text{ Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ .

*Dissolved carbon dioxide, present in stored distilled water, is often able to precipitate sulphur from a solution of sodium thiosulphate or at least cause turbidity in the solution.*

*It is recommended that this solution is prepared as late as possible before the examination and if possible made up using distilled water that has been boiled to remove dissolved gases and allowed to cool while covered e.g. with “clingfilm” or “gladwrap”.*

*The use of de-ionised water is a suitable alternative.*

[H] **FA 2** is  $2 \text{ mol dm}^{-3}$  hydrochloric acid, HCl.

*When  $5 \text{ cm}^3$  of **FA 2** is added to  $50 \text{ cm}^3$  of **FA 1** in a  $250 \text{ cm}^3$  beaker, a pencil cross placed under the beaker should be obscured in 15 – 35 seconds. Adjust the concentration of **FA 2** to give a time within this range (under temperature conditions as close as possible to those that will be experienced during the examination)*

- 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:

[T] aqueous lead nitrate,  $\text{Pb}(\text{NO}_3)_2$ , approximately  $15.0 \text{ g dm}^{-3}$

[H] [O] aqueous hydrogen peroxide,  $\text{H}_2\text{O}_2$ , approximately 10 or 20 volume solution.

**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.**

**Report on any difficulties experienced by candidates.**