

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

CHEMISTRY

9701/03

Paper 3 Practical Test

October/November 2003

CONFIDENTIAL INSTRUCTIONS

Great care should be taken to ensure 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 additional tests. 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', 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 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 Bunsen burner
- a test-tube holder
- a 100 cm^3 beaker
- a 250 cm^3 graduated (volumetric) flask
- a 50 cm^3 burette
- a glass (stirring) rod
- a titration flask
- a white tile
- a 25 cm^3 pipette
- a boiling tube (labelled **X**)
- a heat proof mat

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 (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 For Questions 1 and 2

(a) Solid **FA 1**: approximately 7 g

For Question 2

(b) Solution **FA 2** 150 cm³

(c) Distilled water 300 cm³

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***Questions 1 and 2**

FA 1 is “washing soda crystals” – sodium carbonate-10-water, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$. Approximately 7.0 g of the crystals should be provided in a stoppered boiling-tube that has been labelled **Y**.

In Centres with large numbers of candidates, it may save time to place 7 g of crystals in a boiling tube then fill the remaining tubes to the same level.

The sample should be fairly fresh but a small loss of water of crystallisation (due to efflorescence) is acceptable.

*Liquids***Question 2**

- [H] **FA 2** is **exactly** $0.100 \text{ mol dm}^{-3}$ hydrochloric acid.

Prepare a solution of hydrochloric acid that is approximately 0.11 mol dm^{-3} by diluting 10 cm^3 of concentrated hydrochloric to 1 dm^3 of solution.

This solution should be standardised against standard $0.050 \text{ mol dm}^{-3}$ sodium carbonate. (1.325 g of anhydrous sodium carbonate, that has been heated and allowed to cool in a desiccator, dissolved in 250 cm^3 of solution in a volumetric flask).

The standardised acid is diluted with a calculated volume of water to give a $0.100 \text{ mol dm}^{-3}$ solution whose concentration should be double checked by further titration against the $0.050 \text{ mol dm}^{-3}$ sodium carbonate.

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.

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, OCTOBER/NOVEMBER 2003

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 UCLES 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.