



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

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**CHEMISTRY**

**9701/35**

Advanced Practical Skills

**May/June 2011**

**CONFIDENTIAL INSTRUCTIONS**

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

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**The Supervisor's attention is drawn to the form on page 9 which must be completed and returned with the scripts.**

If you have any problems or queries regarding these instructions, please contact CIE

by e-mail: international@cie.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.

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This document consists of **9** printed pages and **3** blank pages.



## Safety

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. 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.

<b>C</b> corrosive substance	<b>F</b> highly flammable substance
<b>H</b> harmful or irritating substance	<b>O</b> oxidising substance
<b>T</b> toxic substance	<b>N</b> dangerous for the environment

The attention of Supervisors is drawn to any local regulations relating to safety and first-aid.

'Hazard Data Sheets', relating to materials used in this examination, should be available from your chemical supplier.

### Preparing the Examination

**1 Access to the question paper is NOT permitted in advance of the examination.**

**2 Preparation of materials**

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.

All solutions should 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.

**Supervisors are asked to carry out any confirmatory tests given on page 4 to ensure the materials supplied are appropriate.**

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

**3 Labelling of materials**

Materials must be labelled as specified in these instructions. Materials with an **FA** code number should be so labelled, **without** the identities being included on the label – where appropriate, the identity of an **FA** coded chemical is given in the question paper itself.

**4 Identity of materials**

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.**

**5 Size of group**

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.

**Apparatus**

- 1 In addition to the fittings ordinarily contained in a chemical laboratory, the apparatus and materials specified below will be necessary.
- 2 Pipette fillers (or equivalent safety devices), safety goggles and disposable plastic gloves should be used where necessary.

**3** *For each candidate*

- 1 × 25 cm<sup>3</sup> bulb form pipette
- 1 × pipette filler
- 1 × 250 cm<sup>3</sup> graduated (volumetric) flask labelled **FA 3**
- 2 × 250 cm<sup>3</sup> conical flask
- 2 × 50 cm<sup>3</sup> burette
- 2 × stand and burette clamp
- 2 × funnel (for filling burette)
- 1 × white tile
- 1 × 250 cm<sup>3</sup> beaker
- 1 × clean, dry, weighing bottle or tube
- 1 × expanded polystyrene or other foamed plastic cup
- 1 × thermometer, −10 °C to 110 °C by 1 °C
- 1 × 50 cm<sup>3</sup> measuring cylinder
- 1 × test-tube holder
- 2 × boiling tubes\*
- 12 × test-tubes\*
- 1 × test-tube rack
- 3 × teat/squeeze/dropping pipettes
- 1 × wash bottle containing distilled water
- 1 × marker pen (for labelling test-tubes)
- 1 × spatula
- paper towels
- access to a balance weighing to 0.1 g or better

\*Candidates are expected to rinse and re-use test-tubes and boiling tubes where possible. Additional tubes should be available.

**Where access to a balance is limited candidates should be directed to start the practical examination on different questions. (See p 62 of the 2011 Syllabus for balance:candidate ratio)**

### 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 Particular requirements

hazard	label	per candidate	identity	notes (hazards given in this column refer to the raw materials)
	<b>FA 1</b>	150 cm <sup>3</sup>	0.10 mol dm <sup>-3</sup> "borax", disodium tetraborate	Dissolve 38.10 g of Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> ·10H <sub>2</sub> O in each dm <sup>3</sup> of solution. <i>The solid needs grinding to a fine powder before adding to water and warming to dissolve. The solution should be filtered if necessary.</i>
	<b>FA 2</b>	60 cm <sup>3</sup>	1.0 mol dm <sup>-3</sup> hydrochloric acid	Dilute 85 cm <sup>3</sup> of concentrated (35–37%; approximately 11 mol dm <sup>-3</sup> ) acid <b>[C]</b> to 1 dm <sup>3</sup> .
	<b>Indicator, labelled with its identity</b>	10 cm <sup>3</sup>	Indicator, normally used in the Centre for a strong acid/weak base titration	Methyl orange or bromophenol blue are suitable indicators. See p 66 of the 2011 Syllabus for preparation instructions.
<b>Check on suitability of reagents.</b>				
<i>Check, and adjust where necessary, the concentration of FA 2 by titrating 50.0 cm<sup>3</sup> of FA 1 with FA 2 using methyl orange or bromophenol blue as indicator. Adjust the concentration of FA 2 to give a titration reading of 10.00 ± 0.20 cm<sup>3</sup>.</i>				
<b>[H]</b>	<b>FA 4</b>	6 g	anhydrous sodium carbonate	Each candidate should be provided with a stoppered tube, <b>labelled FA 4, and containing 6.0 ± 0.1 g of Na<sub>2</sub>CO<sub>3</sub> [H]</b> . <i>The sodium carbonate should be heated in an oven at 100 °C for one hour to remove any absorbed water. It should then be cooled in a desiccator or other closed container.</i>
	<b>FA 5</b>	9 g	sodium hydrogencarbonate	Each candidate should be provided with a stoppered tube, <b>labelled FA 5, and containing 9.0 ± 0.1 g of NaHCO<sub>3</sub></b> .
<b>[H]</b>	<b>FA 6</b>	10 g	a mixture of sodium carbonate and sodium hydrogencarbonate	An intimate mixture of 1 part anhydrous sodium carbonate <b>[H]</b> by mass to 2 parts sodium hydrogencarbonate by mass. <i>The sodium carbonate should be dried as for FA 4. Ensure the mixture is as uniform as possible.</i>
<b>[H]</b>	<b>FA 7</b>	200 cm <sup>3</sup>	3.0 mol dm <sup>-3</sup> hydrochloric acid	Dilute 255 cm <sup>3</sup> of concentrated (35–37%; approximately 11 mol dm <sup>-3</sup> ) acid <b>[C]</b> to 1 dm <sup>3</sup>

**2 Particular requirements continued**

hazard	label	per candidate	identity	notes (hazards given in this column refer to the raw materials)
	<b>FA 8</b>	20 cm <sup>3</sup>	1.0 mol dm <sup>-3</sup> sodium chloride (or potassium chloride)	Dissolve 58.5 g of NaCl (or 74.6 g of KCl) in each dm <sup>3</sup> of solution
<b>[H] [N]</b>	<b>FA 9</b>	20 cm <sup>3</sup>	1.0 mol dm <sup>-3</sup> sodium nitrite	Dissolve 69.0 g of NaNO <sub>2</sub> <b>[T] [N] [O]</b> in each dm <sup>3</sup> of solution.
	<b>FA 10</b>	20 cm <sup>3</sup>	1.0 mol dm <sup>-3</sup> sodium bromide (or potassium bromide)	Dissolve 103 g of NaBr (or 119 g of KBr) in each dm <sup>3</sup> of solution.
<b>[N]</b>	<b>FA 11</b>	20 cm <sup>3</sup>	0.2 mol dm <sup>-3</sup> copper(II) sulfate	Dissolve 49.9 g of CuSO <sub>4</sub> .5H <sub>2</sub> O <b>[H] [N]</b> in each dm <sup>3</sup> of solution.
	<b>FA 12</b>	20 cm <sup>3</sup>	0.2 mol dm <sup>-3</sup> magnesium sulfate	Dissolve 49.3 g of MgSO <sub>4</sub> .7H <sub>2</sub> O in each dm <sup>3</sup> of solution.
	<b>aqueous sodium thiosulfate</b>	10 cm <sup>3</sup>	0.2 mol dm <sup>-3</sup> sodium thiosulfate	Dissolve 49.6 g of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> .5H <sub>2</sub> O in each dm <sup>3</sup> of solution. <i>The solid should be dissolved in boiled distilled water that has been cooled in a closed vessel – this prevents aerial oxidation of the thiosulfate by dissolved oxygen.</i>

**NOTE: The laboratory must be well ventilated**

**3** The reagents below should also be provided. 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 lead to the contamination of reagents and enhance the opportunity for malpractice between candidates.

hazard	label	notes
[H]	<b>dilute hydrochloric acid</b>	<b>See identity details and preparation instructions on page 65 and 66 of the 2011 syllabus.</b>
[C]	<b>dilute nitric acid</b>	
[H]	<b>dilute sulfuric acid</b>	
[H]	<b>aqueous ammonia</b>	
[C]	<b>aqueous sodium hydroxide</b>	
[T]	<b>0.1 mol dm<sup>-3</sup> barium chloride</b>	
[H]	<b>0.1 mol dm<sup>-3</sup> barium nitrate</b>	
[H] [N]	<b>0.05 mol dm<sup>-3</sup> silver nitrate</b>	
[T] [N]	<b>0.1 mol dm<sup>-3</sup> lead(II) nitrate</b>	
	<b>0.1 mol dm<sup>-3</sup> potassium iodide</b>	
	<b>starch solution</b>	<i>Starch indicator should be prepared but labelled as starch solution</i>

**4** The following materials and apparatus should be available.

red and blue litmus paper, plain filter paper strips for use with dichromate(VI), aluminium foil for testing for nitrate/nitrite, wooden splints and the apparatus normally used in the Centre for use with limewater in testing for carbon dioxide

### Responsibilities of the Supervisor during the Examination

- 1 The Supervisor, or other competent chemist **must, out of the sight of the candidates, carry out the experiments in Question 1 and Question 2** and complete 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 each laboratory used in that session, and each set of solutions supplied.**

**N.B. The question paper cover requests the candidate to fill in details of the examination session and the laboratory used for the examination.**

**It is essential that each packet of scripts contains a copy of the applicable Supervisor's Results as the candidates' work cannot be assessed accurately without such information.**

- 2 The Supervisor must complete the Report Form on page 9 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.

The Supervisor must give details on page 10 of any particular difficulties experienced by a candidate, especially if the Examiner would be unable to discover this from the written answers.

### After the Examination

**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 Report relevant to the candidates in 1.
- 3 A copy of the Report Form, including details of any difficulties experienced by candidates (see pages 9 and 10).
- 4 The Attendance Register.
- 5 **A Seating Plan for each session/laboratory.**

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

### 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 candidate 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.





## 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 and Question 2** on a spare copy of the question paper clearly marked 'Supervisor's Results' and **showing the Centre number and appropriate session/laboratory number.**

2 The candidate 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 candidate 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 candidate 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.





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