



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

CHEMISTRY

9701/31

Advanced Practical Skills 1

October/November 2011

CONFIDENTIAL INSTRUCTIONS

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



The Supervisor's attention is drawn to the form on page 7 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.

This document consists of **8** printed 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 'Apparatus' on the use of pipette fillers, safety goggles and plastic gloves.

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	N	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.

Before 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 to 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 be noted that descriptions of solutions given in the question paper may not correspond exactly with the specifications 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 × 50 cm³ burette
1 × stand and burette clamp
1 × funnel (for filling burette)
1 × 25 cm³ measuring cylinder
1 × 50 cm³ measuring cylinder
1 × 100 cm³ beaker
1 × 250 cm³ beaker
1 × foamed plastic (expanded polystyrene) cup
1 × thermometer (−10 °C to +110 °C at 1 °C)
1 × Bunsen burner
1 × heat-proof mat
1 × test-tube rack
1 × test-tube holder
8 × test-tubes*
1 × hard glass test-tube, labelled **FA 6**, containing Pb(NO₃)₂ solid – see part 2
1 × teat/dropping pipette
1 × spatula
1 × glass rod
1 × wash bottle containing distilled water
paper towels

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

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)
[C]	FA 1	250 cm ³	2.5 mol dm ⁻³ sodium hydroxide	Dissolve 100 g NaOH [C] in each dm ³ of solution. Care – the process of solution is exothermic and any concentrated solution is very corrosive.
[H]	FA 2	250 cm ³	2.0 mol dm ⁻³ hydrochloric acid	See preparation instructions on page 65 of the 2011 syllabus.
	distilled water	250 cm ³		
FA 1, FA 2 and distilled water should be allowed to stand in the laboratory overnight to ensure uniform temperatures.				
[H]	FA 3	0.5 g	sodium metabisulfite	Na ₂ S ₂ O ₅ supplied in a stoppered tube
[H]	FA 4	1 g	sodium carbonate	Hydrated or anhydrous Na ₂ CO ₃ supplied in a stoppered tube
	FA 5	1 g	sodium sulfate	Hydrated or anhydrous Na ₂ SO ₄ supplied in a stoppered tube
[T] [O] [N]	FA 6	0.1 g	lead(II) nitrate	Pb(NO ₃) ₂ supplied in a labelled, stoppered hard-glass test-tube to each candidate
[T] [N]	FA 6	10 cm ³	0.1 mol dm ⁻³ lead(II) nitrate	Dissolve 33.1 g of Pb(NO ₃) ₂ [T] [O] [N] in each dm ³ of solution.

NOTE: the laboratory must be well ventilated.

3 The reagents below should also be available. 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 (hazards given in this column refer to the raw materials)
[T] [N]	0.10 mol dm⁻³ potassium chromate(VI)	Dissolve 19.4 g of K ₂ CrO ₄ [T] [N] in each dm ³ of solution.
	0.10 mol dm⁻³ potassium iodide	Dissolve 16.6 g of KI in each dm ³ of solution.
[H]	dilute hydrochloric acid	See identity details and preparation instructions on page 65 and 66 of the 2011 syllabus.
[C]	dilute nitric acid	
[H]	dilute sulfuric acid	
[H]	aqueous ammonia	
[C]	aqueous sodium hydroxide	
[H]	limewater	
[T] [N]	acidified aqueous potassium dichromate(VI)	

4 The following materials and apparatus should be available.

red and blue litmus paper, plain filter paper strips, 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 sight of the candidates, carry out the experiments in Question 1** 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 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.

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.

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 7 and 8).
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- 5 **A Seating Plan for each session/laboratory.**

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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.

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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 appropriate session/laboratory number.**

2 The candidate numbers of candidates attending each session were:

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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;
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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.



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CHEMISTRY

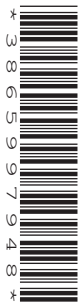
9701/34

Advanced Practical Skills 2

October/November 2011

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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 **FB** code number should be so labelled **without** the identities being included on the label. Where appropriate the identity of an **FB** coded chemical is given in the question paper itself.

4 Identity of materials

It should be noted that descriptions of solutions given in the question paper may not correspond exactly with the specifications 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.

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1 × heat proof mat
1 × test-tube rack
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8 × test-tubes*
1 × boiling tube*
2 × filter funnels and paper
1 × teat/dropping pipette
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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)
[C]	FB 1	250 cm ³	1.50 mol dm ⁻³ sodium hydroxide	Dissolve 60.0 g of NaOH [C] in each dm ³ of solution. Care: the process of solution is exothermic and any concentrated solution is very corrosive.
[H]	FB 2	250 cm ³	1.00 mol dm ⁻³ sulfuric acid	See preparation instructions on page 65 of the 2011 syllabus.
Check on suitability of reagents.				
FB 1 and FB 2 should be prepared in good time and kept in the same store so that they are at the same temperature on the day of the practical. The titration of 25.00 cm³ of FB 1 should require between 18.00 – 20.00 cm³ of FB 2.				
	FB 3	10 cm ³	0.5 mol dm ⁻³ sodium carbonate	Dissolve 53.0 g of Na ₂ CO ₃ [H] in each dm ³ of solution.
[T] [N]	FB 4	10 cm ³	0.1 mol dm ⁻³ potassium chromate(VI)	Dissolve 19.4 g of K ₂ CrO ₄ [T] [N] in each dm ³ of solution.
	FB 5	10 cm ³	0.2 mol dm ⁻³ potassium bromide	Dissolve 23.8 g of KBr in each dm ³ of solution.
[H]	FB 6	0.5 g	manganese(IV) oxide powder	Powdered MnO ₂ [H] supplied in a weighing bottle or stoppered tube

3 The reagents below should also be available. 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	identity	notes (hazards given in this column refer to the raw materials)
	aqueous hydrogen peroxide	'10 volume' hydrogen peroxide	Dilute 100 cm ³ '100 volume' hydrogen peroxide [C] [O] with distilled water to 1 dm ³ .
	aqueous iron(II) sulfate	0.2 mol dm ⁻³ iron(II) sulfate	Dissolve 56 g of FeSO ₄ ·7H ₂ O [H] in 500 cm ³ of distilled water and 50 cm ³ 1 mol dm ⁻³ sulfuric acid [H] and dilute the solution with distilled water to 1 dm ³ . This solution should be freshly prepared.
[H]	dilute hydrochloric acid		
[C]	dilute nitric acid		
[H]	dilute sulfuric acid		
[H]	aqueous ammonia		
[C]	aqueous sodium hydroxide		
[H] [N]	0.05 mol dm⁻³ silver nitrate		
[T] [N]	0.1 mol dm⁻³ lead(II) nitrate		
[H]	limewater		
[T] [N]	acidified aqueous potassium dichromate(VI)		
[N]	0.02 mol dm⁻³ potassium manganate (VII)		

See identity details and preparation instructions on pages 65 and 66 of the 2011 syllabus

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

[Turn over

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- (a)** any general difficulties encountered in making preparation;
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- (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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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CHEMISTRY

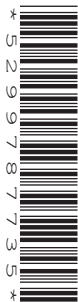
9701/35

Advanced Practical Skills 1

October/November 2011

CONFIDENTIAL INSTRUCTIONS

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



The Supervisor's attention is drawn to the form on page 7 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.

This document consists of **8** printed 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 'Apparatus' on the use of pipette fillers, safety goggles and plastic gloves.

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	N	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.

Before 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 to 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 be noted that descriptions of solutions given in the question paper may not correspond exactly with the specifications 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 × 50 cm³ burette, labelled **FA 1**
1 × 50 cm³ burette, labelled **FA 2**
2 × stands and burette clamps
2 × funnels (for filling burettes)
1 × 100 cm³ beaker
1 × 250 cm³ beaker
1 × stand with boss and clamp
1 × thermometer, −10° to +110 °C at 1 °C
1 × stop clock (stop watch) or sight of a clock with a seconds display
1 × Bunsen burner
1 × heat-proof mat
1 × tripod and gauze
1 × test-tube rack
1 × test-tube holder
8 × test-tubes*
6 × boiling tubes*
2 × teat/dropping pipettes
1 × glass rod
1 × wash bottle containing distilled water
paper towels

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

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)
	FA 1	100 cm ³	0.018 mol dm ⁻³ potassium peroxydisulfate	Dissolve 4.86 g of K ₂ S ₂ O ₈ [O][H] in each dm ³ of solution.
	FA 2	100 cm ³	Solution being 0.2% with respect to starch, 0.5 mol dm ⁻³ with respect to potassium iodide and 0.010 mol dm ⁻³ with respect to sodium thiosulfate	Dissolve 2 g of starch for each dm ³ of solution to be prepared in a small volume of hot distilled water and allow the solution to cool. Add 83 g of KI and 2.48 g of Na ₂ S ₂ O ₃ ·5H ₂ O for each dm ³ of solution.
Check on suitability of reagents. 10 cm ³ FA 1 + 10 cm ³ FA 2 should take between 15 s and 35 s to form the blue-black iodine-starch complex when mixed at 60 °C. Adjust the concentration of FA 1 if necessary.				
[T]	FA 3	15 cm ³	0.1 mol dm ⁻³ barium chloride	See preparation instructions on page 65 of the 2011 syllabus.
[H]			or 0.1 mol dm ⁻³ barium nitrate	
[H]			1.0 mol dm ⁻³ sulfuric acid	
	FA 4	15 cm ³	0.2 mol dm ⁻³ mixture of ammonium chloride and sodium sulfite	See preparation instructions on page 65 of the 2011 syllabus.
	FA 5	15 cm ³		
				Dissolve 10.7 g of freshly purchased NH ₄ Cl [H] and 25.2 g of freshly purchased Na ₂ SO ₃ [H] in each dm ³ of solution.

NOTE: The laboratory must be well ventilated.

- 3** The reagents below should also be available. 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	identity	notes (hazards given in this column refer to the raw materials)
[T] [N]	aqueous potassium chromate(VI)	0.10 mol dm ⁻³ K ₂ CrO ₄	Dissolve 19.4 g of K ₂ CrO ₄ [T] [N] in each dm ³ of solution.
	aqueous sodium carbonate	0.5 mol dm ⁻³ Na ₂ CO ₃	Dissolve 53.0 g of Na ₂ CO ₃ [H] in each dm ³ of solution.
[H]	dilute hydrochloric acid	See identity details and preparation instructions on pages 65 and 66 of the 2011 syllabus	
[C]	dilute nitric acid		
[H]	dilute sulfuric acid		
[H]	aqueous ammonia		
[C]	aqueous sodium hydroxide		
[T]	0.1 mol dm ⁻³ barium chloride or		
[H]	0.1 mol dm ⁻³ barium nitrate		
[H] [N]	0.05 mol dm ⁻³ silver nitrate		
[H]	limewater		
[T] [N]	acidified aqueous potassium dichromate(VI)		

- 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 sight of the candidates, carry out the experiments in Question 1** 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 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.

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.

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 7 and 8).
- 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** 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:

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- (c)** accidents to apparatus or materials;
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Other cases of hardship, e.g. illness, temporary disability, should be reported direct to CIE on the normal 'Application for Special Consideration' form.

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Report on any difficulties experienced by candidates.

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CHEMISTRY

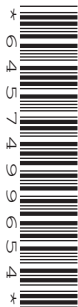
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Advanced Practical Skills 2

October/November 2011

CONFIDENTIAL INSTRUCTIONS

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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 'Apparatus' on the use of pipette fillers, safety goggles and plastic gloves.

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

N = dangerous for the environment

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

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

Before 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 concentrations accurate to within one part in two hundred of those specified.

3 Labelling of materials

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

4 Identity of materials

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

5 Size of group

In view of the difficulty in preparing 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 gloves should be used where necessary.

3 *For each candidate*

2 × 50 cm³ burette (one of these should be labelled **FB 1**)
2 × stand and burette clamp
2 × funnel for filling burette
1 × white tile
2 × 25 cm³ measuring cylinder
1 × 100 cm³ beaker
1 × stop clock or sight of a clock with seconds display
1 × Bunsen burner
1 × heat proof mat
1 × test-tube rack
1 × test-tube holder
8 × test-tubes*
2 × boiling tube*
3 × teat/dropping pipette
1 × glass rod
1 × wash bottle containing distilled water
paper towels

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

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)
[H] [F]	FB 1	120 cm ³	2 mol dm ⁻³ propanone	Make up 147 cm ³ of propanone [H] [F] to 1 dm ³ with distilled water. Keep in a stoppered bottle to avoid loss by evaporation.
[H]	FB 2	120 cm ³	3 mol dm ⁻³ hydrochloric acid	Dilute 255 cm ³ of concentrated (35% w/w; approximately 11 mol dm ⁻³) hydrochloric acid [C] to 1 dm ³ .
	FB 3	100 cm ³	0.005 mol dm ⁻³ iodine	To make 250 cm ³ of 0.1 mol dm ⁻³ iodine, dissolve 10 g of potassium iodide in 200 cm ³ of water and add 6.35 g of iodine [N] [H]. To check that the iodine has dissolved, pour the solution from one beaker to another. Once all the iodine has dissolved, make up the solution to 250 cm ³ with water. Dilute the mixture 20 fold to give a concentration of 0.005 mol dm ⁻³ .
[H]	FB 4	15 cm ³	1 mol dm ⁻³ sulfuric acid	See preparation instructions on page 65 of the 2011 syllabus.
[T] [N]	FB 5	15 cm ³	0.1 mol dm ⁻³ lead nitrate	See preparation instructions on page 65 of the 2011 syllabus.
	FB 6	15 cm ³	0.2 mol dm ⁻³ ammonium chloride and 0.3 mol dm ⁻³ sodium carbonate	Dissolve 10.7 g of freshly purchased NH ₄ Cl [H] and 85.8 g of Na ₂ CO ₃ ·10H ₂ O [H] in each dm ³ of solution.

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[H]	dilute sulfuric acid		
[H]	aqueous ammonia		
[C]	aqueous sodium hydroxide		
[T]	0.1 mol dm ⁻³ barium chloride		
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red and blue litmus papers, plain filter paper strips for use with dichromate(VI), aluminium foil for testing nitrate/nitrite, wooden splints and the apparatus normally used in the Centre for use with limewater in testing for carbon dioxide

Turn over

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