
CHEMISTRY

9701/31

Paper 3 Advanced Practical Skills 1

May/June 2014

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 Cambridge

by e-mail: info@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 gloves should be used where necessary.

3 *For each candidate*

1 × 25 cm³ pipette
1 × 50 cm³ burette
1 × burette stand and clamp
1 × funnel (for filling burette)
1 × 250 cm³ conical flask
1 × white tile
1 × 25 cm³ measuring cylinder
2 × 100 cm³ beaker
1 × stop clock or sight of a clock with seconds display
6 × test-tubes*
2 × boiling tubes*
1 × test-tube rack
1 × test-tube holder
1 × glass rod
3 × teat/dropping pipette
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 are for the raw materials)
[N]	FA 1	150 cm ³	0.02 mol dm ⁻³ potassium manganate(VII)	See preparation instructions on page 60 of the 2014 syllabus.
	FA 2	200 cm ³	'0.5 vol' hydrogen peroxide	Dilute 25 cm ³ of '20 vol' hydrogen peroxide [H] to 1 dm ³ . Instructions for the preparation of '20 vol' hydrogen peroxide are given below. The solution can deteriorate quite quickly so should be prepared as near as possible to when it is required, or kept refrigerated.
[H]	FA 3	175 cm ³	1.0 mol dm ⁻³ sulfuric acid	See preparation instructions on page 59 of the 2014 syllabus.
	FA 4	75 cm ³	0.50 mol dm ⁻³ potassium iodide	Dissolve 83.0 g of KI in each dm ³ of solution.
	FA 5	50 cm ³	0.025 mol dm ⁻³ sodium thiosulfate	Dissolve 6.2 g of Na ₂ S ₂ O ₃ ·5H ₂ O in each dm ³ of solution.
	FA 6	10 cm ³	0.10 mol dm ⁻³ zinc sulfate and 0.10 mol dm ⁻³ sodium bromide	Dissolve 28.8 g of ZnSO ₄ ·7H ₂ O [H] [N] and 10.3 g of NaBr in each dm ³ of solution.
[H]	FA 7	10 cm ³	0.10 mol dm ⁻³ iron(II) sulfate	Dissolve 27.8 g of FeSO ₄ ·7H ₂ O [H] in each dm ³ of 1.0 mol dm ⁻³ sulfuric acid [H].
[H]	'20 vol' hydrogen peroxide	5 cm ³	'20 vol' hydrogen peroxide	Dilute 200 cm ³ of '100 vol' hydrogen peroxide [C] to 1 dm ³ . The solution can deteriorate quite quickly so should be prepared as near as possible to when it is required, or kept refrigerated.
	starch indicator	10 cm ³	freshly prepared aqueous starch indicator (approx. 2% solution w/v)	See preparation instructions on page 60 of the 2014 syllabus.
	distilled water	50 cm ³	distilled water	

- 3 The reagents below should also be provided. Unless otherwise stated, each candidate should require no more than 10 cm³ of any of these reagents. 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 contamination of reagents and enhance the opportunity for malpractice between candidates.

hazard	label	per candidate	notes
[H]	dilute hydrochloric acid		See identity details and preparation instructions on pages 59 and 60 of the 2014 syllabus.
[C]	dilute nitric acid		
[H]	dilute sulfuric acid		
[H]	aqueous ammonia	25 cm ³	
[C]	aqueous sodium hydroxide	25 cm ³	
[H]	0.1 mol dm ⁻³ barium chloride [or 0.1 mol dm ⁻³ barium nitrate]		
[N] [H]	0.05 mol dm ⁻³ silver nitrate		
[H]	limewater		
[H] [N]	acidified aqueous potassium manganate(VII)		
			Mix equal volumes of 0.02 mol dm ⁻³ KMnO ₄ [N] [O] [H] and 1.0 mol dm ⁻³ sulfuric acid [H].

- 4 The following materials and apparatus should be available.

red and blue litmus papers, plain filter paper strips for use with acidified manganate(VII), 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

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 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 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 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.

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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CHEMISTRY

9701/32

Paper 3 Advanced Practical Skills 2

May/June 2014

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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

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3 *For each candidate*

1 × 25 cm³ pipette
1 × 50 cm³ burette
1 × burette stand and clamp
1 × funnel (for filling burette)
2 × 250 cm³ conical flask
1 × 250 cm³ beaker
1 × 100 cm³ beaker
1 × white tile
1 × heat proof mat
1 × Bunsen burner
1 × tripod
1 × pipe-clay triangle
1 × gauze
1 × crucible (at least 15 cm³ capacity) and lid
1 × crucible tongs
1 × spatula
8-12 × clean dry test-tubes*
1 × boiling tube*
1 × test-tube rack
1 × test-tube holder
1 × glass rod
3 × teat/dropping pipette
1 × wash bottle containing distilled water
1 × thermometer (−10 °C to +110 °C at 1 °C)
paper towels
access to a balance reading to at least 0.1 g

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

Where balance provision is limited, some candidates should be instructed to start the examination with different questions.

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 are for the raw materials)
	FB 1	150 cm ³	0.10 mol dm ⁻³ hydrochloric acid	Dilute 50.0 cm ³ of 2.0 mol dm ⁻³ HCl [H] to 1 dm ³ with distilled water. Preparation instructions for 2.0 mol dm ⁻³ HCl are on page 59 of the 2014 syllabus.
	FB 2	150 cm ³	0.090 mol dm ⁻³ sodium hydrogen carbonate	Dissolve 7.56 g of NaHCO ₃ in each dm ³ of solution.
[H]	FB 3	1.5 g	hydrated sodium carbonate	Supply 1.5 ± 0.2 g Na ₂ CO ₃ · 10H ₂ O [H] per candidate in a stoppered container.
	FB 4	10 cm ³	0.10 mol dm ⁻³ magnesium sulfate	Dissolve 24.6 g of MgSO ₄ · 7H ₂ O in each dm ³ of solution.
*[F] [H]	FB 5	5 cm ³	1.0 mol dm ⁻³ glucose	Dissolve 180 g of glucose in each dm ³ of solution. This should be provided in a stoppered container.
*[F] [H]	FB 6	5 cm ³	distilled water	Provided in a stoppered container.
[F] [H]	FB 7	5 cm ³	ethanol	Ethanol [F], or IMS, Industrial Methylated Spirits [F] [H]. Provided in a stoppered container.
[C]	FB 8	5 cm ³	3.0 mol dm ⁻³ methanoic acid	Dilute 126 cm ³ of HCOOH, methanoic acid (90%) [C] to 1 dm ³ with distilled water.
	methyl orange indicator	10 cm ³	methyl orange indicator	See preparation instructions on page 60 of the 2014 syllabus.
	solid sodium hydrogen carbonate	0.5 g	sodium hydrogen carbonate	Supply 0.5 g ± 0.1 g NaHCO ₃ per candidate in a stoppered container.

*Please note, while the hazard labels for **FB 5** and **FB 6** are not correct for the chemicals involved, in order to not confuse candidates they should be labelled the same as **FB 7**.

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[C]	dilute nitric acid	
[H]	dilute sulfuric acid	
[H]	aqueous ammonia	
[C]	aqueous sodium hydroxide	
[H]	0.1 mol dm⁻³ barium chloride	
	[or 0.1 mol dm⁻³ barium nitrate]	
[H] [N]	0.05 mol dm⁻³ silver nitrate	
[H]	limewater	
[N]	0.02 mol dm⁻³ potassium manganate(VII)	
[H] [N]	acidified aqueous potassium manganate(VII)	Mix equal volumes of 0.02 mol dm ⁻³ KMnO ₄ [N] [O] [H] and 1.0 mol dm ⁻³ sulfuric acid [H].

- 4 The following materials and apparatus should be available.

red and blue litmus papers, plain filter paper strips for use with acidified manganate(VII), 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

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1 × 50 cm³ burette
1 × burette stand and clamp
1 × funnel (for filling burette)
1 × 250 cm³ conical flask
1 × white tile
1 × 100 cm³ beaker
1 × 250 cm³ beaker
1 × foamed plastic (polystyrene) cup
1 × 50 cm³ measuring cylinder
1 × thermometer (−10° to +110 °C at 1 °C)
1 × glass rod
1 × Bunsen burner
1 × heat proof mat
1 × test-tube holder
9 × test-tubes*
3 × boiling tubes*
1 × test-tube rack
2 × teat/dropping pipette
1 × wash bottle containing distilled water
paper towels
access to a balance weighing to at least 0.1 g

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[H]	FA 2	150 cm ³	0.106 mol dm ⁻³ ammonium iron(II) sulfate	Dissolve 41.6 g of (NH ₄) ₂ SO ₄ ·FeSO ₄ ·6H ₂ O [H] in each dm ³ of solution made with 1.0 mol dm ⁻³ H ₂ SO ₄ [H]. Note: FA 2 and FA 6 are the same solution but they must be supplied separately.
[H]	FA 3	250 cm ³	1.0 mol dm ⁻³ sulfuric acid	See preparation instructions on page 59 of the 2014 syllabus.
[F]	magnesium ribbon	1 × 10 cm 1 × 20 cm	magnesium ribbon	Provide each candidate with two lengths of magnesium ribbon [F] 1 × 10.0 cm ± 0.2 cm and 1 × 20.0 cm ± 0.2 cm. The ribbon should be coiled so that it fits into the bottom of the plastic cups.
	FA 4	20 cm ³	0.1 mol dm ⁻³ iron(III) chloride	Dissolve 27.0 g of FeCl ₃ ·6H ₂ O [C] in each dm ³ of 0.2 mol dm ⁻³ hydrochloric acid. To prepare 0.2 mol dm ⁻³ hydrochloric acid, dilute 17.0 cm ³ of concentrated (35-37%; approximately 11 mol dm ⁻³) acid [C] to 1 dm ³ .
[N]	FA 5	20 cm ³	0.1 mol dm ⁻³ manganese(II) sulfate	Dissolve 27.7 g of MnSO ₄ ·7H ₂ O [H] [N] in each dm ³ of solution.
[H]	FA 6	20 cm ³	0.106 mol dm ⁻³ ammonium iron(II) sulfate	Dissolve 41.6 g of (NH ₄) ₂ SO ₄ ·FeSO ₄ ·6H ₂ O [H] in each dm ³ of solution made with 1.0 mol dm ⁻³ H ₂ SO ₄ [H].

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[H]	aqueous ammonia	20 cm ³	
[C]	aqueous sodium hydroxide	20 cm ³	
[H]	0.1 mol dm ⁻³ barium chloride [or 0.1 mol dm ⁻³ barium nitrate]		
[H] [N]	0.05 mol dm ⁻³ silver nitrate		
[H]	limewater		
[H] [N]	acidified aqueous potassium manganate(VII)		
			Mix equal volumes of 0.02 mol dm ⁻³ KMnO ₄ [N] [O] [H] and 1.0 mol dm ⁻³ sulfuric acid [H].

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red and blue litmus papers, plain filter paper strips for use with acidified manganate(VII), 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

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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.**

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COLOUR-BLINDNESS

With regard to colour-blindness 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.

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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CHEMISTRY

9701/34

Paper 3 Advanced Practical Skills 2

May/June 2014

CONFIDENTIAL INSTRUCTIONS

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If you have any problems or queries regarding these Instructions, please contact Cambridge

by e-mail: info@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 **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 gloves should be used where necessary.

3 *For each candidate*

- 1 × 25 cm³ pipette
- 1 × 50 cm³ burette
- 1 × burette stand and clamp
- 1 × funnel (for filling burette)
- 1 × funnel (for transferring solution)
- 1 × 250 cm³ volumetric (graduated) flask
- 2 × 250 cm³ conical flask
- 1 × 250 cm³ beaker
- 1 × 100 cm³ beaker
- 1 × white tile
- 1 × crucible (at least 15 cm³ capacity) without lid
- 1 × pipe-clay triangle
- 1 × Bunsen burner
- 1 × heat proof mat
- 1 × tripod and gauze
- 1 × crucible tongs
- 1 × glass rod
- 1 × test-tube holder
- 8 × test-tubes*
- 1 × hard-glass test-tube
- 1 × test-tube rack
- 2 × teat/dropping pipette
- 1 × spatula
- 1 × marker or labels (suitable for labelling glassware)
- 1 × wash bottle containing distilled water

sight of a clock with a minutes display
access to a balance weighing to at least 0.1 g
paper towels

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

Where balance provision is limited, some candidates should be instructed to start the examination with different questions.

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 are for the raw materials)
	FB 1	2.5 g	a mixture of calcium carbonate and potassium chloride	Grind together a mixture of 80% by mass powdered CaCO_3 with 20% by mass KCl. Supply 2.5 ± 0.1 g per candidate in a stoppered bottle or tube. Note: FB 1 and FB 5 have the same composition but must be provided separately.
[H]	FB 2	60 cm ³	2.0 mol dm ⁻³ hydrochloric acid	See preparation instructions on page 59 of the 2014 syllabus.
[H]	FB 4	150 cm ³	0.20 mol dm ⁻³ sodium hydroxide	Dissolve 8.0 g of NaOH [C] in each dm ³ of solution.
	FB 5	2 g	a mixture of calcium carbonate and potassium chloride	Grind together a mixture of 80% by mass powdered CaCO_3 with 20% by mass KCl. Supply 2.0 ± 0.2 g per candidate in a stoppered bottle or tube.
	FB 6	10 cm ³	0.20 mol dm ⁻³ magnesium sulfate in nitric acid	Dissolve 49.3 g $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ in each dm ³ of solution made with 10 cm ³ 2.0 mol dm ⁻³ nitric acid [C] and distilled water.
	FB 7	1.2 g	a mixture of zinc carbonate and potassium iodide	Grind together a mixture of 70% by mass ZnCO_3 (or basic zinc carbonate, $(\text{ZnCO}_3)_2 \cdot (\text{Zn}(\text{OH})_2)_3$) with 30% KI by mass. Supply 1.2 ± 0.2 g per candidate in a stoppered tube or bottle.
	methyl orange indicator	10 cm ³	methyl orange indicator	See preparation instructions on page 60 of the 2014 syllabus.
	distilled water	300 cm ³	distilled water	

- 3 The reagents below should also be provided. Unless otherwise stated, each candidate should require no more than 10 cm³ of any of these reagents. 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 contamination of reagents and enhance the opportunity for malpractice between candidates.

hazard	label	per candidate	notes
[H]	dilute hydrochloric acid		See identity details and preparation instructions on pages 59 and 60 of the 2014 syllabus.
[C]	dilute nitric acid		
[H]	dilute sulfuric acid		
[H]	aqueous ammonia	20 cm ³	
[C]	aqueous sodium hydroxide		
[H]	0.1 mol dm ⁻³ barium chloride [or 0.1 mol dm ⁻³ barium nitrate]		
[H] [N]	0.05 mol dm ⁻³ silver nitrate		
[H]	limewater		
[N]	0.02 mol dm ⁻³ potassium manganate(VII)		
	0.1 mol dm ⁻³ potassium iodide		
	starch solution		See preparation instructions for starch indicator on page 60 of the 2014 syllabus.
[H] [N]	acidified aqueous potassium manganate(VII)		Mix equal volumes of 0.02 mol dm ⁻³ KMnO ₄ [N] [O] [H] and 1.0 mol dm ⁻³ sulfuric acid [H].

- 4 The following materials and apparatus should be available.

red and blue litmus papers, plain filter paper strips for use with acidified manganate(VII), 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

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 batch 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.

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After the Examination

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COLOUR-BLINDNESS

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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.

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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CHEMISTRY

9701/35

Paper 3 Advanced Practical Skills 1

May/June 2014

CONFIDENTIAL INSTRUCTIONS

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* 6 1 1 0 4 8 2 3 1 8 *

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 Cambridge

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by phone: +44 1223 553554,

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



Safety

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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
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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.

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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 gloves should be used where necessary.

3 *For each candidate*

1 × 25 cm³ pipette
1 × 50 cm³ burette
1 × burette stand and clamp
1 × funnel (for filling burette)
1 × funnel (for transferring solution)
1 × 250 cm³ volumetric (graduated) flask
2 × 250 cm³ conical flask
1 × 100 cm³ beaker
1 × white tile
1 × crucible (at least 15 cm³ capacity) without lid
1 × pipe-clay triangle
1 × Bunsen burner
1 × heat proof mat
1 × tripod and gauze
1 × crucible tongs
1 × glass rod
1 × test-tube holder
7 × test-tubes*
1 × hard-glass test-tube
1 × boiling tube*
1 × test-tube rack
2 × teat/dropping pipette
1 × spatula
1 × marker or labels (suitable for labelling glassware)
1 × wash bottle containing distilled water

sight of a clock with a minutes display
access to a balance weighing to at least 0.1 g
paper towels

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

Where balance provision is limited, some candidates should be instructed to start the examination with different questions.

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 are for the raw materials)
[H]	FA 1	150 cm ³	0.048 mol dm ⁻³ sodium hydroxide	Dissolve 1.92 g NaOH [C] in each dm ³ of solution. This should be provided in a stoppered container.
	FA 2	60 cm ³	0.50 mol dm ⁻³ hydrochloric acid	Dilute 42.5 cm ³ of concentrated (35–37%; approximately 11 mol dm ⁻³) acid [C] to 1 dm ³ .
[N]	FA 4	2.5 g	a mixture of zinc carbonate and either zinc oxide or aluminium oxide	Grind together a mixture of 80% by mass ZnCO ₃ with 20% by mass ZnO [N]. or 80% by mass ZnCO ₃ with 20% by mass Al ₂ O ₃ . Supply 2.5 ± 0.2 g per candidate in a stoppered bottle or tube.
	FA 5	1 g	a mixture of zinc carbonate and aluminium sulfate or aluminium potassium sulfate	Grind together a mixture of approximately 30% by mass ZnCO ₃ (or basic zinc carbonate (ZnCO ₃) ₂ ·(Zn(OH) ₂) ₃) with 70% by mass Al ₂ (SO ₄) ₃ ·16H ₂ O or 30% by mass ZnCO ₃ (or basic zinc carbonate (ZnCO ₃) ₂ ·(Zn(OH) ₂) ₃) with 70% by mass AlK(SO ₄) ₂ ·12H ₂ O. Supply 1.0 ± 0.1 g per candidate in a stoppered bottle or tube.
[H]	FA 7	2 g	a mixture of ammonium chloride and sodium hydrogen carbonate	Grind together a mixture of approximately 50% by mass NH ₄ Cl [H] with 50% by mass anhydrous NaHCO ₃ . Supply 2.0 ± 0.2 g per candidate in a stoppered bottle or tube.
	methyl orange indicator	10 cm ³	methyl orange indicator	See preparation instructions on page 60 of the 2014 syllabus.
	distilled water	250 cm ³	distilled water	

- 3 The reagents below should also be provided. Unless otherwise stated, each candidate should require no more than 10 cm³ of any of these reagents. 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 contamination of reagents and enhance the opportunity for malpractice between candidates.

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[C]	dilute nitric acid	20 cm ³	
[H]	dilute sulfuric acid		
[H]	aqueous ammonia	20 cm ³	
[C]	aqueous sodium hydroxide	10 cm ³	
[H]	0.1 mol dm⁻³ barium chloride [or 0.1 mol dm⁻³ barium nitrate]		
[H] [N]	0.05 mol dm⁻³ silver nitrate		
[H]	limewater		
[H] [N]	acidified aqueous potassium manganate(VII)		
			Mix equal volumes of 0.02 mol dm ⁻³ KMnO ₄ [N] [O] [H] and 1.0 mol dm ⁻³ sulfuric acid [H].

- 4 The following materials and apparatus should be available.

red and blue litmus papers, plain filter paper strips for use with acidified manganate(VII), 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

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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

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- (a) any general difficulties encountered in making preparation;
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- (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.

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