
CHEMISTRY

9701/31

Paper 3 Advanced Practical Skills 1

May/June 2017

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 Supervisor's Report on page 7 which must be completed and returned with the scripts.

If you have any queries regarding these Confidential Instructions, please contact Cambridge stating the Centre number, the nature of the query and the syllabus number quoted above.

email info@cie.org.uk

phone +44 1223 553554

fax +44 1223 553558

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.

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. The following codes are used where relevant.

C	corrosive	MH	moderate hazard
HH	health hazard	T	acutely toxic
F	flammable	O	oxidising
N	hazardous to the aquatic environment		

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

Hazard Data Sheets should be available from your chemical suppliers.

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.

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

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Materials must be labelled as specified in these Confidential 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.

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It should be noted that descriptions of materials given in the Question Paper may not correspond with the specifications in these Confidential 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), suitable eye protection and disposable gloves should be used where necessary.

3 *For each candidate*

1 × 25 cm³ pipette
1 × 50 cm³ burette
2 × 150 cm³ or 250 cm³ conical flask
1 × 25 cm³ measuring cylinder
1 × burette stand and clamp
1 × funnel (for filling burette)
1 × white tile
1 × spatula
2 × teat/dropping pipette
1 × glass rod
2 × crucible with lid, capacity approximately 15 cm³
1 × crucible tongs
1 × heatproof mat
1 × tripod
1 × Bunsen burner
1 × pipe-clay triangle
1 × hard-glass test-tube
3 × boiling tube
8 × test-tube*
1 × test-tube rack
1 × test-tube holder
1 × wash bottle containing distilled water
1 × marker pen (suitable for labelling glassware)
1 × stop clock or sight of a clock
paper towels
access to a balance weighing to a **minimum** accuracy of 0.1 g

*Candidates are expected to rinse and reuse 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. See the current syllabus for balance : candidate ratio.

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- 2 It should be noted that descriptions of substances given in the Question Paper may not correspond with the specifications in these Confidential Instructions.
- 3 Particular requirements

hazard	label	per candidate	identity	notes (hazards given in this column are for the raw materials)
	FA 1	130 cm ³	0.104 mol dm ⁻³ copper(II) sulfate	Dissolve 26.0 g of hydrated copper(II) sulfate, CuSO ₄ ·5H ₂ O, [MH] [N] in each dm ³ of solution.
[MH]	FA 2	50 cm ³	1.00 mol dm ⁻³ sulfuric acid	See preparation instructions in the current syllabus.
	FA 3	100 cm ³	0.500 mol dm ⁻³ potassium iodide	Dissolve 83.0 g of potassium iodide, KI, in each dm ³ of solution.
	FA 4	150 cm ³	0.110 mol dm ⁻³ sodium thiosulfate	Dissolve 27.3 g of hydrated sodium thiosulfate, Na ₂ S ₂ O ₃ ·5H ₂ O, in each dm ³ of solution.
[MH] [N]	FA 5	5.5 g	basic copper(II) carbonate (malachite)	5.5–5.6 g of malachite, CuCO ₃ ·Cu(OH) ₂ ·H ₂ O [MH] [N] in a stoppered container. Any kind of basic copper carbonate is suitable.
[MH] [C] [N]	FA 6	1.5–1.6 g	copper(II) nitrate	1.5–1.6 g of Cu(NO ₃) ₂ ·3H ₂ O [MH] [C] [N] in a stoppered container.
[MH]	FA 7	10 cm ³	0.1 mol dm ⁻³ iron(III) chloride in 0.2 mol dm ⁻³ hydrochloric acid	Dissolve 27.0 g of FeCl ₃ ·6H ₂ O [MH] [C] in 100 cm ³ of 2.0 mol dm ⁻³ hydrochloric acid. Make this solution up to 1.00 dm ³ with distilled water. See preparation instructions for 2.0 mol dm ⁻³ hydrochloric acid in the current syllabus.
	starch indicator	10 cm ³	2% aqueous starch	See preparation instructions in the current syllabus.
[F]	magnesium ribbon	2 × 3 cm length	magnesium ribbon	Each candidate will require two strips of Mg [F], each 2.5–3.0 cm in length

NOTE: Small amounts of SO₂ [C] [T] and NO₂ [C] [O] [T], which can cause respiratory distress in some people, may be produced. **The laboratory must be well ventilated.**

- 4 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	notes
	dilute hydrochloric acid	See identity details and preparation instructions in the current syllabus.
[C]	dilute nitric acid	
[MH]	dilute sulfuric acid	
[C] [MH] [N]	aqueous ammonia	
[C]	aqueous sodium hydroxide	
	0.1 mol dm⁻³ barium chloride or 0.1 mol dm⁻³ barium nitrate	
[N]	0.05 mol dm⁻³ silver nitrate	
[MH]	limewater	
[MH]	aqueous acidified potassium manganate(VII)	

- 5 The following materials and apparatus should be available.

red and blue litmus papers, 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. This should be labelled 'Supervisor's Results' and show the Centre number and appropriate session/laboratory number.

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 front 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 Supervisor's Report on page 7 to show which candidates attended each session. If all candidates took the examination in one session, please indicate this on the Supervisor's Report. A copy of the Supervisor's Report 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 barcode label provided.
- 2 A copy of the Supervisor's Results relevant to the candidates in 1.
- 3 A copy of the Supervisor's Report, 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 Form.

SUPERVISOR'S REPORT

This form must be completed and returned in the envelope with the scripts, the Supervisor's Results, the Attendance Register and the Seating Plan.

Centre number Name of Centre

The candidate numbers of candidates attending each session were:

first session

second session

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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- difficulties due to faulty apparatus or materials;
- accidents to apparatus or materials;
- assistance with respect to colour blindness.

Other cases of hardship, e.g. illness, temporary disability, should be reported directly to Cambridge on the Special Consideration Form.

Report on any difficulties experienced by candidates.

Declaration (to be signed by the Supervisor)

The preparation of this practical examination has been carried out so as to maintain fully the security of the examination.

Signed

Name (in block capitals) (Supervisor)

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CHEMISTRY

9701/32

Paper 3 Advanced Practical Skills 2

May/June 2017

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3 Labelling of materials

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4 Identity of materials

It should be noted that descriptions of materials given in the Question Paper may not correspond with the specifications in these Confidential 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.
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3 *For each candidate*

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1 × burette stand and clamp
1 × 25 cm³ pipette
1 × funnel (for filling burette)
2 × 150 cm³ or 250 cm³ conical flask
1 × white tile
1 × 25 cm³ measuring cylinder
1 × 50 cm³ measuring cylinder
1 × 250 cm³ beaker
1 × foamed plastic (polystyrene) cup
1 × thermometer (−10 °C to +110 °C at 1 °C)
1 × glass rod
8 × test-tube*
2 × boiling tube*
1 × test-tube rack
1 × test-tube holder
2 × teat/dropping pipette
1 × Bunsen burner
1 × heatproof mat
1 × wash bottle of distilled water
1 × pen suitable for labelling glassware
1 × spatula
paper towels

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

Chemicals required

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- 3 Particular requirements

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	FB 1	150 cm ³	0.100 mol dm ⁻³ hydrochloric acid	Dilute 50.0 cm ³ of 2.00 mol dm ⁻³ HCl to 1 dm ³ . (See preparation instructions in the current syllabus for 2.00 mol dm ⁻³ HCl.)
	FB 2	150 cm ³	0.110 mol dm ⁻³ sodium hydroxide	Dissolve 4.4 g NaOH [C] in each dm ³ of solution.
	FB 3	100 cm ³	2.00 mol dm ⁻³ hydrochloric acid	See preparation instructions in the current syllabus.
[C]	FB 4	100 cm ³	1.80 mol dm ⁻³ sodium hydroxide	Dissolve 72.0 g NaOH [C] in each dm ³ of solution.
	FB 5	5 cm ³	1.00 mol dm ⁻³ ethanoic acid	Dilute 57.5 cm ³ of glacial (17.4 mol dm ⁻³) CH ₃ COOH [C][F] to 1 dm ³ of solution.
	FB 6	5 cm ³	2.00 mol dm ⁻³ hydrochloric acid	See preparation instructions in the current syllabus.
[C]	FB 7	10 cm ³	2.00 mol dm ⁻³ nitric acid	See preparation instructions in the current syllabus.
	FB 8	10 cm ³	0.10 mol dm ⁻³ copper(II) sulfate	Dissolve 25.0 g CuSO ₄ ·5H ₂ O [MH] [N] in each dm ³ of solution.
[F][MH] [HH]	thymol blue indicator	5 cm ³	thymol blue indicator	See preparation instructions in the current syllabus.
[C][MH]	conc. HCl	2 cm ³	concentrated hydrochloric acid	Provide 2 cm ³ concentrated hydrochloric acid [C][MH] in a stoppered container.
	FB 9	5 cm ³	0.10 mol dm ⁻³ ethylene diamine tetraacetic acid disodium salt dihydrate	Dissolve 37.2 g Na ₂ (CH ₂ N(CH ₂ COOH)CH ₂ COO) ₂ ·2H ₂ O in each dm ³ of solution. This substance is commonly known as edta disodium salt.
[MH]	sodium carbonate	10 cm ³	1.0 mol dm ⁻³ sodium carbonate	Dissolve 286.0 g Na ₂ CO ₃ ·10H ₂ O [MH] in each dm ³ of solution. OR Dissolve 106.0 g Na ₂ CO ₃ [MH] in each dm ³ of solution.
	potassium iodide	5 cm ³	0.2 mol dm ⁻³ potassium iodide	Dissolve 33.2 g KI in each dm ³ of solution.
	sodium thiosulfate	5 cm ³	0.2 mol dm ⁻³ sodium thiosulfate	Dissolve 49.6 g Na ₂ S ₂ O ₃ ·5H ₂ O in each dm ³ of solution.

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	0.1 mol dm⁻³ barium chloride or 0.1 mol dm⁻³ barium nitrate	
[N]	0.05 mol dm⁻³ silver nitrate	
[MH]	limewater	
[MH]	aqueous acidified potassium manganate(VII)	
[MH]	sodium carbonate	Enough for 1 g per candidate
[F]	magnesium ribbon	Cut into 1 cm pieces (enough for two per candidate)

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1 × 250 cm³ volumetric (graduated) flask
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1 × white tile
1 × spatula
2 × teat/dropping pipette
1 × glass rod
1 × crucible with lid, capacity approximately 15 cm³
1 × crucible tongs
1 × heatproof mat
1 × tripod
1 × Bunsen burner
1 × pipe-clay triangle
1 × boiling tube
8 × test-tube*
1 × test-tube rack
1 × test-tube holder
1 × wash bottle containing distilled water
1 × marker pen (suitable for labelling glassware)
stop clock or sight of a clock
paper towels
access to a balance weighing to at least 0.1 g

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- 3 Particular requirements

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	FA 1	150 cm ³	0.0500 mol dm ⁻³ sulfuric acid	Dilute 50.0 cm ³ of 1.00 mol dm ⁻³ sulfuric acid [MH] to 1.00 dm ³ with distilled water. Prepare 1.00 mol dm ⁻³ sulfuric acid [MH] according to instructions in the current syllabus.
	FA 2	2.0-2.1 g	baking soda (impure sodium hydrogencarbonate)	Grind together with a pestle and mortar, 95.0 g of sodium hydrogencarbonate, NaHCO ₃ , and 5.0 g of sodium chloride, NaCl, to ensure thorough mixing. Provide 2.0–2.1 g of this mixture in a stoppered container. (Note: FA 4 is the same mixture as FA 2 .)
	FA 4	2.0-2.1 g	baking soda (impure sodium hydrogencarbonate)	See instructions for FA 2 .
	FA 6	20 cm ³	0.2 mol dm ⁻³ manganese(II) chloride	Dissolve 39.6 g of manganese(II) chloride, MnCl ₂ ·4H ₂ O [MH] , in 1.00 dm ³ of solution. Provide 20 cm ³ in a stoppered bottle.
	FA 7	20 cm ³	0.2 mol dm ⁻³ aluminium sulfate	Dissolve 126.1 g of aluminium sulfate, Al ₂ (SO ₄) ₃ ·16H ₂ O, in 1.00 dm ³ of solution. Provide 20 cm ³ in a stoppered bottle.
[F] [MH] [HH]	methyl orange	10 cm ³	methyl orange	See preparation instructions in the current syllabus.
[MH]	sodium carbonate	1.0-1.1 g	sodium carbonate	1.0-1.1 g of sodium carbonate, Na ₂ CO ₃ , [MH] or Na ₂ CO ₃ ·10H ₂ O [MH] in a stoppered container.
	distilled water		distilled water	At least 300 cm ³ per candidate will be required.

- 4 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]	aqueous sodium hydroxide	
	0.1 mol dm⁻³ barium chloride or 0.1 mol dm⁻³ barium nitrate	
[N]	0.05 mol dm⁻³ silver nitrate	
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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 Form.

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first session

second session

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Report on any difficulties experienced by candidates.

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Signed

Name (in block capitals) (Supervisor)

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CHEMISTRY

9701/34

Paper 3 Advanced Practical Skills 2

May/June 2017

CONFIDENTIAL INSTRUCTIONS

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If you have any queries regarding these Confidential Instructions, please contact Cambridge stating the Centre number, the nature of the query and the syllabus number quoted above.

email info@cie.org.uk
phone +44 1223 553554
fax +44 1223 553558

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Only those tests described in the Question Paper should be attempted.

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. The following codes are used where relevant.

C	corrosive	MH	moderate hazard
HH	health hazard	T	acutely toxic
F	flammable	O	oxidising
N	hazardous to the aquatic environment		

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

Hazard Data Sheets should be available from your chemical suppliers.

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.

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 Confidential 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 materials given in the Question Paper may not correspond with the specifications in these Confidential 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), suitable eye protection and disposable gloves should be used where necessary.

3 *For each candidate*

1 × 250 cm³ beaker
1 × 25 cm³ measuring cylinder
1 × thermometer (−10 °C to +110 °C at 1 °C)
1 × stop clock (stopwatch) or sight of a clock with a seconds display
1 × foamed plastic (polystyrene) cup
1 × Bunsen burner
1 × heatproof mat
1 × glass rod
1 × test-tube holder
8 × test-tube*
1 × boiling tube*
1 × test-tube rack
2 × teat/dropping pipette
1 × spatula
1 × pen (for labelling glassware)
1 × wash bottle containing distilled water
access to a balance weighing to **at least** 0.1 g
paper towels

*Candidates are expected to rinse and reuse 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. See the current 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 It should be noted that descriptions of substances given in the Question Paper may not correspond with the specifications in these Confidential Instructions.

3 Particular requirements

hazard	label	per candidate	identity	notes (hazards given in this column are for the raw materials)
[MH]	FB 1	100 cm ³	2.00 mol dm ⁻³ ethanoic acid	Dissolve 115.0 g of glacial (17.4 mol dm ⁻³) CH ₃ COOH [C][F] in each dm ³ of solution.
[F]	FB 2	10 ± 0.1 cm length	magnesium ribbon	10 ± 0.1 cm length Mg ribbon [F], supplied in a stoppered container.
	FB 3	100 cm ³	1.00 mol dm ⁻³ hydrochloric acid	Dilute 85.0 cm ³ of concentrated HCl (35-37%; approximately 11 mol dm ⁻³) [C][MH] to 1 dm ³ .
[F]	FB 4	1 × 10 ± 0.1 cm length 1 × 5 ± 0.1 cm length	magnesium ribbon	Two lengths Mg ribbon [F] 1 × 10 ± 0.1 cm length and 1 × 5 ± 0.1 cm length, supplied in a stoppered container.
	FB 5	20 cm ³	0.5 mol dm ⁻³ hydrochloric acid	Dilute 250 cm ³ of 2.0 mol dm ⁻³ HCl(aq) in each dm ³ of solution. Supplied in a stoppered container.
	FB 6	20 cm ³	0.25 mol dm ⁻³ sulfuric acid	Dilute 250 cm ³ of 1.0 mol dm ⁻³ H ₂ SO ₄ (aq) [MH] in each dm ³ of solution. Supplied in a stoppered container.
[MH]	FB 7	20 cm ³	0.5 mol dm ⁻³ nitric acid	Dilute 250 cm ³ of 2.0 mol dm ⁻³ HNO ₃ (aq) [C] in each dm ³ of solution. Supplied in a stoppered container.
	FB 8	20 cm ³	Solution that is 0.20 mol dm ⁻³ with respect to potassium iodide and 0.20 mol dm ⁻³ with respect to sodium carbonate.	Dissolve 33.2 g KI and 21.2 g Na ₂ CO ₃ [MH] in each 1 dm ³ of solution.
	hydrogen peroxide	2 cm ³	10 'vol' hydrogen peroxide	Dilute 100 cm ³ of 100 'vol' H ₂ O ₂ [C] to 1 dm ³ with distilled water.
	copper(II) sulfate	5 cm ³	0.2 mol dm ⁻³ copper(II) sulfate	Dissolve 49.9 g CuSO ₄ ·5H ₂ O [MH][N] in each dm ³ of solution.
	sodium thiosulfate	5 cm ³	0.2 mol dm ⁻³ sodium thiosulfate	Dissolve 49.6 g Na ₂ S ₂ O ₃ ·5H ₂ O in each dm ³ of solution.
	starch indicator	2 cm ³	2% starch solution	See identity details in the current syllabus.
[MH]	sodium carbonate	1 g	sodium carbonate	Supply 1 g Na ₂ CO ₃ [MH] or 2.5 g Na ₂ CO ₃ ·10H ₂ O [MH] in a stoppered container.

- 4 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	notes
	dilute hydrochloric acid	See identity details and preparation instructions in the current syllabus.
[C]	dilute nitric acid	
[MH]	dilute sulfuric acid	
[C] [MH] [N]	aqueous ammonia	
[C]	aqueous sodium hydroxide	
	0.1 mol dm⁻³ barium chloride or 0.1 mol dm⁻³ barium nitrate	
[N]	0.05 mol dm⁻³ silver nitrate	
[MH]	limewater	
[MH]	aqueous acidified potassium manganate(VII)	
[F]	magnesium	
		A supply of magnesium strips [F] of approximate length 2 cm, enough for 2 per candidate.

- 5 The following materials and apparatus should be available.

red and blue litmus papers, 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. This should be labelled 'Supervisor's Results' and show the Centre number and appropriate session/laboratory number.

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CHEMISTRY

9701/35

Paper 3 Advanced Practical Skills 1

May/June 2017

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* 0 1 1 9 5 2 3 2 0 4 *



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All solutions should be bulked and mixed thoroughly before use to ensure uniformity.

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3 Labelling of materials

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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), suitable eye protection and disposable gloves should be used where necessary.

3 *For each candidate*

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

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

Chemicals required

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- 3 Particular requirements

hazard	label	per candidate	identity	notes (hazards given in this column are for the raw materials)
	FA 1	120 cm ³	0.020 mol dm ⁻³ potassium peroxodisulfate	Dissolve 5.41 g of K ₂ S ₂ O ₈ [HH] [MH] [O] in each dm ³ of solution.
	FA 2	150 cm ³	1.0 mol dm ⁻³ potassium iodide	Dissolve 166.0 g of KI in each dm ³ of solution.
	FA 3	100 cm ³	0.0050 mol dm ⁻³ sodium thiosulfate	Dissolve 24.8 g of Na ₂ S ₂ O ₃ ·5H ₂ O in each dm ³ of solution. Dilute this 20-fold.
	starch indicator	15 cm ³	starch indicator	See preparation instructions in the current syllabus.
	FA 4	20 cm ³	0.2 mol dm ⁻³ ammonium iron(II) sulfate	Dissolve 78.4 g of (NH ₄) ₂ Fe(SO ₄) ₂ ·6H ₂ O [MH] in each dm ³ of solution.
	FA 5	20 cm ³	0.2 mol dm ⁻³ potassium aluminium sulfate	Dissolve 94.8 g of KAl(SO ₄) ₂ ·12H ₂ O in each dm ³ of solution.
[HH]	FA 6	0.5 g	sodium sulfite	Each candidate should be provided with approximately 0.5 g of Na ₂ SO ₃ [HH] in a stoppered bottle.
[MH]	FA 7	10 cm ³	1.0 mol dm ⁻³ sulfuric acid	See preparation instructions in the current syllabus.
[MH] [N]	FA 8	10 cm ³	1.0 mol dm ⁻³ sodium nitrite	Dissolve 69.0 g of NaNO ₂ [O] [T] [N] in each dm ³ of solution.
[F]	magnesium	1 × 2 cm strip	magnesium ribbon	More pre-cut strips should be available for candidates who wish to repeat the test.
	distilled water	100 cm ³	distilled water	

NOTE: Small amounts of SO₂ **[C] [T]** and NO₂ **[C] [O] [T]**, which can cause respiratory distress in some people, may be produced. **The laboratory must be well ventilated.**

- 4 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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