Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CHEMISTRY **9701/31**

Paper 3 Advanced Practical Skills 1 **May/June 2018**

CONFIDENTIAL INSTRUCTIONS

8587386072

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.

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Safety

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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 **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 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.

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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 cm^3 burette
1 × 25 cm^3 pipette
1 × thermometer (–10 °C to +110 °C at 1 °C)
2 × burette stand and clamp
1 × funnel (for filling burette)
1 × white tile
2 × 150 cm^3 or 250 cm^3 conical flask
1 × 250 cm^3 beaker
1 × Bunsen burner
1 × heatproof mat
1 × tripod
1 × gauze
1 × test-tube holder
7 × test-tube*
3 × boiling tube
1 × spatula
1 × test-tube rack
2 × teat/dropping pipette
1 × wash bottle containing distilled water
1 × pen for labelling glassware
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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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	150 cm^3	0.049 mol dm^{-3} sodium carbonate	Dissolve 5.20 g anhydrous Na_2CO_3 **[MH]** or 14.0 g $Na_2CO_3.10H_2O$ **[MH]** in each dm^3 of solution.
	FA 2	150 cm^3	0.100 mol dm^{-3} hydrochloric acid	Prepare 2.0 mol dm^{-3} HCl using the instructions in the current syllabus. Dilute 50 cm^3 in each dm^3 of solution. This is the same as **FA 4**.
[T][C] [N][F] [MH] [HH]	**methyl orange**	5 cm^3	methyl orange indicator	See preparation instructions in the current syllabus.
	FA 3	120 cm^3	0.100 mol dm^{-3} sodium hydroxide	Dissolve 4.00 g NaOH **[C]** in each dm^3 of solution.
	FA 4	150 cm^3	0.100 mol dm^{-3} hydrochloric acid	Prepare 2.0 mol dm^{-3} HCl using the instructions in the current syllabus. Dilute 50 cm^3 in each dm^3 of solution. This is the same as **FA 2**.
[F][MH] [HH]	**bromophenol blue**	5 cm^3	bromophenol blue indicator	See preparation instructions in the current syllabus.
[MH]	**FA 5**	10 cm^3	2.0 mol dm^{-3} methanoic acid	Dilute 100 g concentrated HCOOH **[C]** (85-90%) in each dm^3 of solution.
	FA 7	1 g	zinc carbonate	1 g ± 0.1 g $ZnCO_3$ in a stoppered container. Basic zinc carbonate is suitable.
[C]	**FA 8**	10 cm^3	0.2 mol dm^{-3} copper(II) nitrate	Dissolve 48.3 g $Cu(NO_3)_2.3H_2O$ **[C][MH][N]** in each dm^3 of solution.
[MH]	**sodium carbonate**	1 g	anhydrous sodium carbonate	1 g ± 0.1 g anhydrous Na_2CO_3 **[MH]** in a stoppered container.
	distilled water	300 cm^3		

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4 The reagents below should also be provided. Unless otherwise stated, each candidate should require no more than 10 cm^3 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	
	0.05 mol dm^{-3} silver nitrate	
[MH]	**limewater**	
[MH]	**acidified aqueous 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 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.

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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*

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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.

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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 2018**

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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.

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Apparatus

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2 Pipette fillers (or equivalent safety devices), suitable eye protection and disposable gloves should be used where necessary.

3 *For each candidate*

1 × 250 cm^3 beaker
1 × 100 cm^3 beaker
1 × 50 cm^3 measuring cylinder
1 × spatula
2 × teat/dropping pipette
1 × glass rod
2 × crucible (capacity 15 cm^3) with lid
1 × heatproof mat
1 × Bunsen burner
1 × pipe-clay triangle
1 × crucible tongs
1 × tripod
1 × gauze
1 × stop watch (or sight of clock)
2 × foamed plastic (polystyrene) cup
1 × thermometer (–10 °C to +110 °C at 1 °C)
8 × test-tube*
1 × test-tube rack
1 × wash bottle containing distilled water
1 × pen for labelling glassware
paper towels
access to balance, weighing to a **minimum** of 0.1 g

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

Chemicals required

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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)
	FB 1	2.0–2.1 g	magnesium hydroxide	2.0–2.1 g of $Mg(OH)_2$ in a stoppered container.
[MH]	**FB 2**	100 cm^3	3.0 mol dm^{-3} hydrochloric acid	Dilute 272 cm^3 of concentrated (35–37%; approximately 11 mol dm^{-3}) hydrochloric acid **[C][MH]** to 1.00 dm^3 with distilled water.
[C] [MH]	**FB 3**	1.9–2.0 g	calcium hydroxide	1.9–2.0 g of $Ca(OH)_2$ **[C][MH]** in a stoppered container.
[C] [MH]	**FB 4**	1.4–1.5 g	calcium oxide	1.4–1.5 g of CaO **[C][MH]** in a stoppered container.
[MH]	**FB 5**	20 cm^3	1.0 mol dm^{-3} sulfuric acid	For preparation instructions see the current syllabus.
	FB 6	20 cm^3	0.2 mol dm^{-3} barium chloride	Dissolve 48.8 g of $BaCl_2.2H_2O$ **[T]** in each dm^3 of solution. (Note: barium nitrate is **not** a suitable alternative.)
	FB 7	20 cm^3	0.05 mol dm^{-3} silver nitrate	For preparation instructions see the current syllabus. Each candidate will require 20 cm^3 in a stoppered bottle. A darkened glass bottle should **not** be used.
[F]	**magnesium ribbon**	3 × 2 cm strips	magnesium	Strips of Mg ribbon **[F]** cut into approximately 2 cm lengths.
	aqueous sodium carbonate	10 cm^3	0.5 mol dm^{-3} sodium carbonate	Dissolve 53.0 g of Na_2CO_3 **[MH]** in each dm^3 of solution or dissolve 143.0 g $Na_2CO_3.10H_2O$ **[MH]** in each dm^3 of solution.
	aqueous potassium iodide	5 cm^3	0.5 mol dm^{-3} potassium iodide	Dissolve 83.0 g of KI in each dm^3 of solution.

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CHEMISTRY **9701/33**

Paper 3 Advanced Practical Skills 1 **May/June 2018**

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3 *For each candidate*

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2 × 50 cm^3 burette
2 × burette stand and clamp
2 × funnel (for filling burette)
1 × white tile
2 × 150 or 250 cm^3 conical flask
1 × 250 cm^3 beaker
1 × 25.0 cm^3 measuring cylinder
1 × foamed plastic (polystyrene) cup approximately 150 cm^3
1 × thermometer (–10 °C to +110 °C at 1 °C)
1 × glass rod
1 × Bunsen burner
1 × heatproof mat
1 × test-tube holder
3 × hard-glass test-tube
8 × test-tube*
2 × boiling tube
1 × test-tube rack
2 × teat / dropping pipette
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pen for labelling glassware
paper towels

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

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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	150 cm^3	0.100 mol dm^{-3} hydrochloric acid	Prepare 2.0 mol dm^{-3} HCl according to the instructions in the current syllabus. 50 cm^3 of this solution should be used in each dm^3.
	FA 2	150 cm^3	0.105 mol dm^{-3} sodium hydroxide	Dissolve 4.20 g NaOH **[C]** in each dm^3 of solution.
[F][MH] [HH]	**bromophenol blue indicator**	10 cm^3	bromophenol blue indicator	Prepare according to the instructions in the current syllabus.
[C]	**FA 3**	100 cm^3	1.80 mol dm^{-3} sodium hydroxide	Dissolve 72.0 g NaOH **[C]** in each dm^3 of solution.
	FA 4	50 cm^3	2.00 mol dm^{-3} hydrochloric acid	Prepare according to the instructions in the current syllabus.
	FA 5	10 cm^3	0.10 mol dm^{-3} sulfuric acid	Prepare 1.0 mol dm^{-3} H_2SO_4 **[MH]** according to the instructions in the current syllabus. 100 cm^3 of this solution should be used in each dm^3.
[MH]	**FA 6**	10 cm^3	1.00 mol dm^{-3} sulfuric acid	Prepare according to the instructions in the current syllabus.
	FA 7	10 cm^3	1.00 mol dm^{-3} hydrochloric acid	Prepare 2.0 mol dm^{-3} HCl according to the instructions in the current syllabus. 500 cm^3 of this solution should be used in each dm^3.
	FA 8	1 g	magnesium hydroxide	Approximately 1.0 g of $Mg(OH)_2$ supplied in a stoppered container.
[MH]	**FA 9**	1 g	ammonium chloride	Approximately 1.0 g of NH_4Cl **[MH]** supplied in a stoppered container.

N.B. Small amounts of NH_3 **[C] [T] [N]**, which can cause respiratory distress in some people, may be produced. **The laboratory must be well ventilated.**

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hazard	label	notes
	dilute hydrochloric acid	**See identity details and preparation instructions in the current syllabus.**
[C]	**dilute nitric acid**	
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[C][MH][N]	**aqueous ammonia**	
[C]	**aqueous sodium hydroxide**	
	0.1 mol dm^{-3} barium chloride or 0.1 mol dm^{-3} barium nitrate	
	0.05 mol dm^{-3} silver nitrate	
[MH]	**limewater**	
[MH]	**acidified aqueous potassium manganate(VII)**	
[MH]	**aqueous sodium carbonate**	Dissolve 286.0 g $Na_2CO_3.10H_2O$ **[MH]** in each dm^3 of solution.
[F]	**magnesium strips**	Provide a supply of 1 cm strips of magnesium ribbon **[F]**, enough for 3 per candidate.
[F]	**universal indicator**	

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

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SUPERVISOR'S REPORT

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Centre number ..... Name of Centre .....

The candidate numbers of candidates attending each session were:

first session	*second session*

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Report on any difficulties experienced by candidates.

Declaration (to be signed by the Supervisor)

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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 2018**

CONFIDENTIAL INSTRUCTIONS

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Safety

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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.

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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 × 50 cm^3 burette
1 × burette stand and clamp
1 × funnel for filling burette
1 × 50 cm^3 measuring cylinder
1 × 25 cm^3 measuring cylinder
1 × 250 cm^3 beaker
1 × thermometer (–10 °C to +110 °C at 1 °C)
1 × stop watch or sight of clock with second display
1 × white tile
1 × glass rod
8 × test-tube*
1 × test-tube rack
2 × teat/dropping pipette
1 × Bunsen burner
1 × tripod
1 × gauze
1 × heatproof mat
1 × wash bottle of distilled water
1 × pen for labelling glassware
paper towels

*Candidates are expected to rinse and reuse test-tubes where possible.
Additional test-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 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**	80 cm^3	acidified 0.010 mol dm^{-3} potassium manganate(VII)	See preparation instructions in the current syllabus.
[MH]	**FB 2**	300 cm^3	1.0 mol dm^{-3} sulfuric acid	See preparation instructions in the current syllabus.
	FB 3	150 cm^3	0.20 mol dm^{-3} glucose	Dissolve 36.0 g $C_6H_{12}O_6$ in each dm^3 of solution.
	FB 4	10 cm^3	starch indicator	See preparation instructions in the current syllabus.
	FB 5	10 cm^3	0.5 mol dm^{-3} glucose	Dissolve 90 g $C_6H_{12}O_6$ in each dm^3 of solution.
	FB 6	10 cm^3	0.5 mol dm^{-3} sucrose	Dissolve 171 g $C_{12}H_{22}O_{11}$, sucrose, in each dm^3 of solution.
[C][N]	**FB 7**	10 cm^3	0.2 mol dm^{-3} copper(II) sulfate	Dissolve 49.9 g $CuSO_4.5H_2O$ **[C][MH][N]** in each dm^3 of solution.
[C]	**FB 8**	10 cm^3	2.0 mol dm^{-3} sodium hydroxide	See preparation instructions in the current syllabus.
	aqueous iodine	10 cm^3	0.05 mol dm^{-3} iodine	Dissolve 40 g KI and 12.7 g I_2 **[MH][N]** in each dm^3 of solution.
[MH]	**Sandell's solution**	20 cm^3	Sandell's solution	Dissolve 8.0 g $CuSO_4.5H_2O$ **[C][MH][N]** + 18.0 g EDTA (disodium salt) **[MH]** in 750 cm^3 distilled water. Add 200 cm^3 2.0 mol dm^{-3} NaOH **[C]** and make the solution up to 1 dm^3 with distilled water.
[MH]	**aqueous iron(II) sulfate**	5 cm^3	0.2 mol dm^{-3} iron(II) sulfate	Dissolve 55.6 g $FeSO_4.7H_2O$ **[MH]** in each dm^3 of 1 mol dm^{-3} sulfuric acid **[MH]**. This solution should be prepared shortly before use.
	distilled water	300 cm^3	distilled water	

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4 The reagents below should also be provided. Unless otherwise stated, each candidate should require no more than 10 cm^3 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	
	0.05 mol dm^{-3} silver nitrate	
[MH]	**limewater**	
[MH]	**acidified aqueous 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 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 cover requests the candidate to fill in details of the examination session and the laboratory used for the examination.

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CHEMISTRY **9701/35**

Paper 3 Advanced Practical Skills 1 **May/June 2018**

CONFIDENTIAL INSTRUCTIONS

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3 Labelling of materials

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4 Identity 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.

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Apparatus

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3 *For each candidate*

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1 × glass rod
1 × spatula
1 × stopwatch (or sight of clock)
1 × 250 cm^3 volumetric flask
1 × 25.0 cm^3 pipette
1 × 50 cm^3 burette
1 × burette stand and clamp
1 × funnel (for filling burette)
1 × white tile
2 × 150 or 250 cm^3 conical flask
1 × 15 cm^3 crucible and lid
1 × pipe-clay triangle
1 × crucible tongs
1 × 100 cm^3 beaker
1 × tripod
1 × Bunsen burner
1 × heatproof mat
1 × test-tube holder
1 × hard-glass test-tube
8 × test-tube*
1 × boiling tube
1 × test-tube rack
2 × teat/dropping pipette
1 × wash bottle containing distilled water
1 × pen for labelling glassware
paper towels
access to a balance weighing to **at least** 0.1 g

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

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)
[MH]	**FA 1**	3.5 ± 0.1 g	hydrated sodium carbonate	3.5 ± 0.1 g $Na_2CO_3.10H_2O$ **[MH]** supplied in a stoppered container.
	FA 2	150 cm^3	0.110 mol dm^{-3} hydrochloric acid	Prepare 2.0 mol dm^{-3} HCl using preparation instructions in the current syllabus. 55 cm^3 of this solution should be used in each dm^3.
[T][C] [N][F] [MH] [HH]	**methyl orange indicator**	10 cm^3	methyl orange indicator	Prepare according to the instructions in the current syllabus.
	FA 4	2.5 ± 0.2 g	hydrated magnesium sulfate	2.5 ± 0.2 g $MgSO_4.7H_2O$ supplied in a stoppered container.
[MH]	**FA 5**	1 g	hydrated iron(II) sulfate	Approximately 1 g of $FeSO_4.7H_2O$ **[MH]** supplied in a stoppered container.
	hydrogen peroxide	5 cm^3	5 vol hydrogen peroxide	Dilute 50 cm^3 of 100 vol H_2O_2 **[C]** to make 1 dm^3 of solution.
	ammonium thiocyanate	5 cm^3	0.1 mol dm^{-3} ammonium thiocyanate	Dissolve 7.6 g NH_4SCN **[MH]** in each dm^3 of solution.
	distilled water	300 cm^3		

NOTE: Small amounts of SO_2 **[C] [T]**, which can cause respiratory distress in some people, may be produced. **The laboratory must be well ventilated.**

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Name (in block capitals) ..... (Supervisor)

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