Cambridge Assessment International Education

Cambridge International AS & A Level

CHEMISTRY **9701/31**

Paper 3 Advanced Practical Skills 1 **May/June 2020**

CONFIDENTIAL INSTRUCTIONS

8773083773

This document gives details of how to prepare for and administer the practical exam.

The information in this document and the identity of any materials supplied by Cambridge International are confidential and must NOT reach candidates either directly or indirectly.

The supervisor must complete the report at the end of this document and return it with the scripts.

INSTRUCTIONS

- If you have any queries regarding these confidential instructions, contact Cambridge International stating the centre number, the syllabus and component number and the nature of the query.
  email info@cambridgeinternational.org
  phone +44 1223 553554

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General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

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Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

The following hazard codes are used in these confidential instructions, where relevant:

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

Hazard data sheets relating to substances used in this exam should be available from your chemical supplier.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

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- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:

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  - the attendance register.

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The apparatus listed must be provided to each candidate.

1 × pipette filler
1 × 25 cm^3 pipette
1 × 50 cm^3 burette
2 × 150 cm^3 or 250 cm^3 conical flask
1 × 25 cm^3 measuring cylinder
1 × 50 cm^3 measuring cylinder
1 × burette stand and clamp
1 × 250 cm^3 volumetric flask
2 × 250 cm^3 beaker
1 × funnel (for filling burette)
1 × white tile
1 × thermometer (–10 °C to +110 °C at 1 °C)
2 × foamed plastic (or cardboard) cup
1 × glass rod
2 × teat/dropping pipette
1 × spatula
1 × tripod
1 × gauze
1 × Bunsen burner
1 × heat-proof mat
1 × test-tube holder
1 × boiling tube*
8 × test-tube*
1 × test-tube rack
wash bottle containing distilled water
pen for labelling glassware
paper towels
access to a balance weighing to **at least** 0.1 g
red and blue litmus papers
aluminium foil for testing nitrate/nitrite
wooden splints
the apparatus normally used in the centre for use with limewater in testing for carbon dioxide

*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 exam with different questions. See the current syllabus for balance : candidate ratio.

Materials

The materials listed in the table must be provided to each candidate.

Warning: 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.**

label	per candidate	identity	notes
FA 1 [MH]	9.3 ± 0.1 g	ammonium iron(II) sulfate	Provide 9.2–9.4 g of $(NH_4)_2Fe(SO_4)_2{\bullet}6H_2O$ **[MH]** in a stoppered container.
FA 2 [MH]	200 cm^3	1.0 mol dm^{-3} sulfuric acid	See preparation instructions in the current syllabus.
FA 3	120 cm^3	0.0200 mol dm^{-3} potassium manganate(VII)	See preparation instructions in the current syllabus.
FA 5 [MH]	11.0 ± 0.1 g	anhydrous sodium carbonate	Provide 10.9–11.1 g of Na_2CO_3 **[MH]** in a stoppered container. A newly opened supply of Na_2CO_3 should be used.
FA 6 [MH]	1.0 ± 0.1 g	ammonium iron(II) sulfate	Provide 1.0 ± 0.1 g of $(NH_4)_2Fe(SO_4)_2{\bullet}6H_2O$ **[MH]** in a stoppered container.
FA 7	20 cm^3	10 'volume' hydrogen peroxide	Dilute 100 cm^3 of 100 'volume' hydrogen peroxide **[C]** to 1.0 dm^3 with distilled water. Provide 20 cm^3 in a stoppered container.
FA 8 [F][HH][MH]	20 cm^3	aqueous ethanol (50% by volume)	Mix together equal volumes of ethanol **[F][HH][MH]** and distilled water. Provide 20 cm^3 in a stoppered container.
aqueous potassium iodide	5 cm^3	0.5 mol dm^{-3} potassium iodide	Dissolve 83.0 g KI in each dm^3 of solution. Provide 5 cm^3 in a stoppered container.
aqueous iodine	5 cm^3	0.10 mol dm^{-3} iodine	Dissolve 25.4 g of I_2 **[MH][N]** in 500 cm^3 of 0.5 mol dm^{-3} KI. Make up to 1.0 dm^3 with distilled water. (To prepare 0.5 mol dm^{-3} KI, dissolve 83.0 g KI in each dm^3 of solution.) Provide 5 cm^3 in a stoppered container.
aqueous starch	5 cm^3	starch indicator	See preparation instructions in the current syllabus.
distilled water	300 cm^3	distilled water	

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label	per candidate	identity	notes
dilute hydrochloric acid	10 cm^3	2.0 mol dm^{-3} HCl	See preparation instructions in the current syllabus. If necessary, each of these reagents can be provided as a communal supply for groups of up to 6 candidates. Invigilators must be alert to the risk of contamination and the opportunity for malpractice when using a communal supply.
dilute nitric acid **[C]**	10 cm^3	2.0 mol dm^{-3} HNO_3	
dilute sulfuric acid **[MH]**	10 cm^3	1.0 mol dm^{-3} H_2SO_4	
aqueous ammonia **[C][MH][N]**	10 cm^3	2.0 mol dm^{-3} NH_3	
aqueous sodium hydroxide **[C]**	10 cm^3	2.0 mol dm^{-3} NaOH	
aqueous barium chloride or aqueous barium nitrate	10 cm^3	0.1 mol dm^{-3} $BaCl_2$ or 0.1 mol dm^{-3} $Ba(NO_3)_2$	
limewater **[MH]**	10 cm^3	saturated aqueous calcium hydroxide, $Ca(OH)_2$	
aqueous silver nitrate	10 cm^3	0.05 mol dm^{-3} $AgNO_3$	
aqueous acidified potassium manganate(VII) **[MH]**	10 cm^3	0.01 mol dm^{-3} $KMnO_4$ in 0.5 mol dm^{-3} H_2SO_4	

- An excess of at least 10% of each material must be prepared to cover accidental loss.
- All solutions must be thoroughly mixed.
- If you are unable to source any of these chemicals, you must contact Cambridge International as far as possible in advance of the exam for advice.
- **Materials must be labelled only as specified in the 'label' column. The identities of chemicals labelled with letter codes, e.g. FA 1, may be different from their descriptions in the question paper. Candidates must use the descriptions given in the question paper.**

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Supervisor's report

Syllabus and component number | | | | | / | | |

Centre number | | | | | |

Centre name .....

Time of the practical session .....

Laboratory name/number .....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:

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- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
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Declaration

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3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed ..... (supervisor)

Name (in block capitals) .....

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Cambridge Assessment International Education

Cambridge International AS & A Level

CHEMISTRY **9701/32**

Paper 3 Advanced Practical Skills 2 **May/June 2020**

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1 × spatula
1 × Bunsen burner
1 × heat-proof mat
1 × test-tube holder
2 × boiling tube*
6 × test-tube*
1 × test-tube rack
wash bottle containing distilled water
pen for labelling glassware
paper towels
access to a balance weighing to **at least** 0.1 g
red and blue litmus papers
aluminium foil for testing nitrate/nitrite
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label	per candidate	identity	notes
FB 1	180 cm^3	0.015 mol dm^{-3} potassium iodate(V)	Dissolve 3.21 g of KIO_3 **[O][MH]** in each dm^3 of solution.
FB 2 [MH]	150 cm^3	1.00 mol dm^{-3} sulfuric acid	See preparation instructions in the current syllabus.
FB 3	100 cm^3	0.50 mol dm^{-3} potassium iodide	Dissolve 83.0 g of KI in each dm^3 of solution.
FB 4	180 cm^3	0.10 mol dm^{-3} sodium thiosulfate	Dissolve 24.82 g of $Na_2S_2O_3{\bullet}5H_2O$ in each dm^3 of solution.
FB 5	4.0 ± 0.2 g	hydrated sodium thiosulfate	Provide 4.0 ± 0.2 g of $Na_2S_2O_3{\bullet}5H_2O$ in a stoppered container.
FB 6	10 cm^3	0.50 mol dm^{-3} ammonium bromide	Dissolve 49.0 g of NH_4Br **[MH]** in each dm^3 of solution.
FB 7 [MH]	10 cm^3	acidified 0.10 mol dm^{-3} iron(III) chloride	Dissolve 27.03 g of $FeCl_3{\bullet}6H_2O$ **[C][MH]** in each dm^3 of 1.00 mol dm^{-3} hydrochloric acid. To prepare 1.00 mol dm^{-3} hydrochloric acid, dilute 84 cm^3 of concentrated (35–37%; approximately 11 mol dm^{-1}) hydrochloric acid **[C][MH]** to 1 dm^3.
FB 8 [MH]	10 cm^3	acidified 0.10 mol dm^{-3} iron(II) sulfate	Dissolve 27.80 g of $FeSO_4{\bullet}7H_2O$ **[MH]** in each dm^3 of 1.00 mol dm^{-3} sulfuric acid **[MH]**. To prepare 1.00 mol dm^{-3} sulfuric acid see instructions in the current syllabus.
aqueous hydrogen peroxide [MH]	10 cm^3	20 'vol' hydrogen peroxide	Dilute 200 cm^3 of 100 'vol' (8.3 mol dm^{-3}) H_2O_2 **[C]** (8.3 mol dm^{-3}) to 1 dm^3.
starch indicator	10 cm^3	starch indicator	See preparation instructions in the current syllabus.
distilled water	30 cm^3	distilled water	

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label	per candidate	identity	notes
dilute hydrochloric acid	10 cm^3	2.0 mol dm^{-3} HCl	See preparation instructions in the current syllabus. If necessary, each of these reagents can be provided as a communal supply for groups of up to 6 candidates. Invigilators must be alert to the risk of contamination and the opportunity for malpractice when using a communal supply.
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limewater **[MH]**	10 cm^3	saturated aqueous calcium hydroxide, $Ca(OH)_2$	
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Name (in block capitals) .....

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Cambridge International AS & A Level

CHEMISTRY **9701/33**

Paper 3 Advanced Practical Skills 1 **May/June 2020**

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1 × 50 cm^3 measuring cylinder
1 × burette stand and clamp
1 × 250 cm^3 beaker
1 × funnel (for filling burette)
1 × white tile
1 × thermometer (–10 °C to +110 °C at 1 °C)
1 × foamed plastic (or cardboard) cup
1 × glass rod
2 × teat/dropping pipette
1 × spatula
1 × tripod
1 × gauze
1 × Bunsen burner
1 × heat-proof mat
1 × test-tube holder
1 × hard-glass test-tube
8 × test-tube*
1 × test-tube rack
wash bottle containing distilled water
pen for labelling glassware
paper towels
red and blue litmus papers
aluminium foil for testing nitrate/nitrite
wooden splints
the apparatus normally used in the centre for use with limewater in testing for carbon dioxide

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

Materials

The materials listed in the table must be provided to each candidate.

label	per candidate	identity	notes
FA 1	120 cm^3	0.100 mol dm^{-3} hydrochloric acid	Dilute 50 cm^3 of 2.0 mol dm^{-3} HCl to 1 dm^3. For preparation of 2.0 mol dm^{-3} HCl see current syllabus.
FA 2	120 cm^3	0.105 mol dm^{-3} sodium hydroxide	Dissolve 4.20 g NaOH **[C]** in each dm^3 of solution.
FA 3	150 cm^3	1.00 mol dm^{-3} hydrochloric acid	Dilute 500 cm^3 of 2.0 mol dm^{-3} HCl to 1 dm^3. For preparation of 2.0 mol dm^{-3} HCl see current syllabus.
FA 4 [C]	150 cm^3	1.00 mol dm^{-3} sodium hydroxide	Dissolve 40.0 g NaOH **[C]** in each dm^3 of solution.
***FA 5 [F][MH]**	10 cm^3	1.0 mol dm^{-3} methanoic acid	Dilute 46.0 g of HCOOH **[C]** to 1 dm^3.
***FA 6 [F][MH]**	10 cm^3	propanal	Provide C_2H_5CHO **[F][MH]** in a stoppered container. (Ethanal, CH_3CHO **[F][MH][HH]**, is a suitable substitute if propanal is not available.)
***FA 7 [F][MH]**	10 cm^3	20% aqueous propanone	Dilute 200 cm^3 CH_3COCH_3 **[F][MH]** in 1 dm^3 of solution. Provide 10 cm^3 in a stoppered container.
FA 8	1 g	hydrated magnesium sulfate	Provide approximately 1 g of $MgSO_4 \cdot 7H_2O$ in a stoppered container.
thymol blue [F][MH][HH][N]	5 cm^3	thymol blue indicator	See preparation instructions in the current syllabus.
magnesium ribbon [F]	3 × 1 cm^3	magnesium ribbon	Provide 3 × 1 cm strip of magnesium ribbon **[F]**.

*Please ensure **FA 5**, **FA 6** and **FA 7** are all labelled **[F][MH]**.

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dilute hydrochloric acid	10 cm^3	2.0 mol dm^{-3} HCl	See preparation instructions in the current syllabus. If necessary, each of these reagents can be provided as a communal supply for groups of up to 6 candidates. Invigilators must be alert to the risk of contamination and the opportunity for malpractice when using a communal supply.
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aqueous barium chloride or aqueous barium nitrate	10 cm^3	0.1 mol dm^{-3} $BaCl_2$ or 0.1 mol dm^{-3} $Ba(NO_3)_2$	
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Supervisor's report

Syllabus and component number | | | | | / | | |

Centre number | | | | | |

Centre name .....

Time of the practical session .....

Laboratory name/number .....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:

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- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

If chemicals have been prepared in more than one batch, list the candidates using each batch.

Declaration

1 Each packet that I am returning to Cambridge International contains the following items:

- ☐ the scripts of the candidates specified on the bar code label provided
- ☐ the supervisor's results relevant to these candidates
- ☐ the supervisor's reports relevant to these candidates
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3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed ..... (supervisor)

Name (in block capitals) .....

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Cambridge Assessment International Education

Cambridge International AS & A Level

CHEMISTRY **9701/34**

Paper 3 Advanced Practical Skills 2 **May/June 2020**

CONFIDENTIAL INSTRUCTIONS

This document gives details of how to prepare for and administer the practical exam.

The information in this document and the identity of any materials supplied by Cambridge International are confidential and must NOT reach candidates either directly or indirectly.

The supervisor must complete the report at the end of this document and return it with the scripts.

INSTRUCTIONS

- If you have any queries regarding these confidential instructions, contact Cambridge International stating the centre number, the syllabus and component number and the nature of the query.
  email info@cambridgeinternational.org
  phone +44 1223 553554

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General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

The following hazard codes are used in these confidential instructions, where relevant:

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

Hazard data sheets relating to substances used in this exam should be available from your chemical supplier.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:

  - the scripts of the candidates specified on the bar code label provided
  - the supervisor's results relevant to these candidates
  - the supervisor's reports relevant to these candidates
  - seating plans for each practical session, referring to each candidate by candidate number
  - the attendance register.

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Specific information for this practical exam

During the exam, the supervisor (NOT the invigilator) must do all the experiments and record the results on a spare copy of the question paper, clearly labelled 'supervisor's results'.

If chemicals are prepared in more than one batch, clearly labelled supervisor's results must be provided for each batch. The candidates using each batch must be listed on the supervisor's report.

Apparatus

The apparatus listed must be provided to each candidate.

1 × pipette filler
1 × 10 cm^3 pipette
1 × 25 cm^3 pipette
1 × 50 cm^3 burette
2 × 150 cm^3 or 250 cm^3 conical flask
1 × burette stand and clamp
1 × 250 cm^3 beaker
1 × funnel (for filling burette)
1 × white tile
1 × stopclock
2 × teat/dropping pipette
1 × spatula
1 × crucible with lid (approximate capacity 15 cm^3)
1 × crucible tongs
1 × pipe-clay triangle
1 × tripod
1 × gauze
1 × Bunsen burner
1 × heat-proof mat
1 × test-tube holder
8 × test-tube*
1 × test-tube rack
wash bottle containing distilled water
pen for labelling glassware
paper towels
access to a balance weighing to **at least** 0.1 g
red and blue litmus papers
aluminium foil for testing nitrate/nitrite
wooden splints
the apparatus normally used in the centre for use with limewater in testing for carbon dioxide

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

Materials

The materials listed in the table must be provided to each candidate.

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

label	per candidate	identity	notes
FB 1	50 cm^3	0.131 mol dm^{-3} sodium carbonate	Dissolve 37.5 g of $Na_2CO_3 \cdot 10H_2O$ **[MH]** in each dm^3 of solution.
FB 2	120 cm^3	0.20 mol dm^{-3} hydrochloric acid	Dilute 100 cm^3 of 2.0 mol dm^{-3} HCl, to 1 dm^3. See current syllabus for preparation of 2.0 mol dm^{-3} HCl.
FB 3	120 cm^3	0.100 mol dm^{-3} sodium hydroxide	Dissolve 4.00 g of NaOH **[C]** in each dm^3 of solution.
bromophenol blue [F][MH][HH]	10 cm^3	bromophenol blue indicator	See preparation instructions in the current syllabus.
FB 4	2.6 ± 0.1 g	hydrated magnesium sulfate	Provide 2.6 ± 0.1 g of $MgSO_4 \cdot 7H_2O$ in a stoppered container.
FB 5 [F][N]	1 g	zinc powder	Provide 1 g of Zn powder **[F][N]** in a stoppered container.
FB 6 [C][N]	10 cm^3	0.2 mol dm^{-3} zinc sulfate	Dissolve 57.5 g of $ZnSO_4 \cdot 7H_2O$ **[C][MH][N]** in each dm^3 of solution.
FB 7 [F][MH][HH]	5 cm^3	20% aqueous propanone	Dilute 200 cm^3 of CH_3COCH_3 **[F][MH]** in 1 dm^3 of solution. Provide 5 cm^3 in a stoppered container.
aqueous ammonium vanadate(V) [C]	10 cm^3	0.07 mol dm^{-3} ammonium vanadate(V) in 3.7 mol dm^{-3} sulfuric acid	Add 800 cm^3 of 1.0 mol dm^{-3} H_2SO_4 **[MH]** to 8.0 g of NH_4VO_3 **[T]**. Carefully add 160 cm^3 of concentrated H_2SO_4 **[C]** and stir to dissolve the solid. Make the solution up to 1 dm^3 with distilled water. Suppliers may provide NH_4VO_3 as ammonium vanadate(V), ammonium metavanadate or ammonium polytrioxovanadate.

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label	per candidate	identity	notes
dilute hydrochloric acid	10 cm^3	2.0 mol dm^{-3} HCl	See preparation instructions in the current syllabus. If necessary, each of these reagents can be provided as a communal supply for groups of up to 6 candidates. Invigilators must be alert to the risk of contamination and the opportunity for malpractice when using a communal supply.
dilute nitric acid **[C]**	10 cm^3	2.0 mol dm^{-3} HNO_3	
dilute sulfuric acid **[MH]**	10 cm^3	1.0 mol dm^{-3} H_2SO_4	
aqueous ammonia **[C][MH][N]**	10 cm^3	2.0 mol dm^{-3} NH_3	
aqueous sodium hydroxide **[C]**	10 cm^3	2.0 mol dm^{-3} NaOH	
aqueous barium chloride or aqueous barium nitrate	10 cm^3	0.1 mol dm^{-3} $BaCl_2$ or 0.1 mol dm^{-3} $Ba(NO_3)_2$	
limewater **[MH]**	10 cm^3	saturated aqueous calcium hydroxide, $Ca(OH)_2$	
aqueous silver nitrate	10 cm^3	0.05 mol dm^{-3} $AgNO_3$	
aqueous acidified potassium manganate(VII) **[MH]**	10 cm^3	0.01 mol dm^{-3} $KMnO_4$ in 0.5 mol dm^{-3} H_2SO_4	

- An excess of at least 10% of each material must be prepared to cover accidental loss.
- All solutions must be thoroughly mixed.
- If you are unable to source any of these chemicals, you must contact Cambridge International as far as possible in advance of the exam for advice.
- **Materials must be labelled only as specified in the 'label' column. The identities of chemicals labelled with letter codes, e.g. FB 1, may be different from their descriptions in the question paper. Candidates must use the descriptions given in the question paper.**

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Supervisor's report

Syllabus and component number | | | | | / | | |

Centre number | | | | | |

Centre name .....

Time of the practical session .....

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Signed ..... (supervisor)

Name (in block capitals) .....

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Cambridge Assessment International Education

Cambridge International AS & A Level

CHEMISTRY **9701/35**

Paper 3 Advanced Practical Skills 1 **May/June 2020**

CONFIDENTIAL INSTRUCTIONS

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INSTRUCTIONS

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The following hazard codes are used in these confidential instructions, where relevant:

C	corrosive	**MH**	moderate hazard
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The apparatus listed must be provided to each candidate.

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1 × 50 cm^3 burette
2 × 150 cm^3 or 250 cm^3 conical flask (only use 150 cm^3 flasks if 250 cm^3 flasks are not available)
1 × 25 cm^3 measuring cylinder
1 × burette stand and clamp
1 × 250 cm^3 beaker
1 × funnel (for filling burette)
1 × white tile
1 × thermometer (–10 °C to +110 °C at 1 °C)
1 × stopclock
2 × teat/dropping pipette
1 × spatula
1 × crucible with lid (approximate capacity 15 cm^3)
1 × crucible tongs
1 × pipe-clay triangle
1 × tripod
1 × gauze
1 × Bunsen burner
1 × heat-proof mat
1 × test-tube holder
1 × boiling tube*
8 × test-tube*
1 × test-tube rack
wash bottle containing distilled water
pen for labelling glassware
paper towels
access to a balance weighing to **at least** 0.1 g
red and blue litmus papers
aluminium foil for testing nitrate/nitrite
wooden splints
the apparatus normally used in the centre for use with limewater in testing for carbon dioxide

*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 exam with different questions. See the current syllabus for balance : candidate ratio.

Materials

The materials listed in the table must be provided to each candidate.

label	per candidate	identity	notes
FA 1	150 cm^3	0.0200 mol dm^{-3} potassium manganate(VII)	Dissolve 3.16 g of $KMnO_4$ **[O][MH][N]** in each dm^3 of solution.
FA 2	150 cm^3	0.05 mol dm^{-3} sodium ethanedioate	Dissolve 6.70 g of $(COO)_2Na_2$ **[MH]** in each dm^3 of solution.
FA 3 [MH]	150 cm^3	1.0 mol dm^{-3} sulfuric acid	See preparation instructions in the current syllabus.
FA 4 [HH][N]	2.0 ± 0.1 g	hydrated manganese(II) sulfate	Provide 1.9–2.1 g $MnSO_4 \cdot 4H_2O$ or $MnSO_4 \cdot H_2O$ **[HH][N]** in a stoppered container.
FA 5	15 cm^3	0.2 mol dm^{-3} manganese(II) chloride	Dissolve 25.2 g $MnCl_2$ **[MH]** or 39.6 g $MnCl_2 \cdot 4H_2O$ **[MH]** in each dm^3 of solution.
***FA 6 [F][C][MH]**	2 cm^3	distilled water	Provide 2 cm^3 of distilled water in a stoppered container.
***FA 7 [F][C][MH]**	2 cm^3	propan-1-ol	Provide 2 cm^3 of propan-1-ol **[F][C][MH]** in a stoppered container. Butan-1-ol **[F][C][MH]** is also suitable.
***FA 8 [F][C][MH]**	2 cm^3	propan-2-ol	Provide 2 cm^3 of propan-2-ol **[F][MH]** in a stoppered container. Butan-2-ol **[F][MH]** is also suitable.
hydrogen peroxide	2 cm^3	10 'volume' hydrogen peroxide	Dilute 100 cm^3 of 100 'volume' H_2O_2 **[C]** to 1 dm^3 of solution.
aqueous iodine	5 cm^3	0.1 mol dm^{-3} iodine	Dissolve 25.4 g of I_2 **[MH][N]** in 500 cm^3 of 0.5 mol dm^{-3} KI. Make up to 1.0 dm^3 with distilled water. (To prepare 0.5 mol dm^{-3} KI, dissolve 83.0 g KI in each dm^3 of solution.) Provide 5 cm^3 in a stoppered container.

*Please ensure **FA 6**, **FA 7** and **FA 8** are all labelled **[F][C][MH]**.

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label	per candidate	identity	notes
dilute hydrochloric acid	10 cm^3	2.0 mol dm^{-3} HCl	See preparation instructions in the current syllabus. If necessary, each of these reagents can be provided as a communal supply for groups of up to 6 candidates. Invigilators must be alert to the risk of contamination and the opportunity for malpractice when using a communal supply.
dilute nitric acid **[C]**	10 cm^3	2.0 mol dm^{-3} HNO_3	
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aqueous sodium hydroxide **[C]**	10 cm^3	2.0 mol dm^{-3} NaOH	
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Supervisor's report

Syllabus and component number					/		

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Signed ..... (supervisor)

Name (in block capitals) .....

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