Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

**CHEMISTRY** **9701/31**

Paper 3 Advanced Practical Skills 1 **October/November 2017**

CONFIDENTIAL INSTRUCTIONS

*3610255692*

**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 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

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.

**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*

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 × 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 (approximate capacity 15 $cm^3$)
1 × crucible tongs
1 × heatproof mat
1 × tripod
1 × Bunsen burner
1 × pipe-clay triangle
3 × boiling tube*
8 × test-tube*
1 × test-tube rack
1 × test-tube holder
1 × wash bottle containing distilled water
1 × pen (for labelling glassware)
1 × stop-clock or sight of clock
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 tubes should be available.

**Where balance provision is limited, some candidates should be instructed to start the examination with Question 2. 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) |
|---|---|---|---|---|
| | **FA 1** | 125 $cm^3$ | 0.0197 mol $dm^{-3}$ potassium iodate(V) | Dissolve 4.22 g of $KIO_3$ **[O] [MH]** 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 KI in each $dm^3$ of solution. |
| | **FA 4** | 150 $cm^3$ | 0.105 mol $dm^{-3}$ sodium thiosulfate | Dissolve 26.1 g of $Na_2S_2O_3.5H_2O$ in each $dm^3$ of solution |
| | **FA 5** | 5.0 g | basic zinc carbonate | Provide 5.0–5.1 g of $ZnCO_3.Zn(OH)_2$ in a stoppered container. (Note: any type of 'basic zinc carbonate' is suitable.) |
| **[MH] [N]** | **FA 6** | 20 $cm^3$ | 0.4 mol $dm^{-3}$ sodium nitrite | Dissolve 27.6 g of $NaNO_2$ **[T] [O] [N]** in each $dm^3$ of solution. |
| | **FA 7** | 20 $cm^3$ | 0.2 mol $dm^{-3}$ ammonium bromide | Dissolve 19.6 g of $NH_4Br$ **[MH]** in each $dm^3$ of solution. (Note: if $NH_4Br$ is not available, use a mixture of 20.6 g of NaBr and 10.7 g of $NH_4Cl$ **[MH]** dissolved in each $dm^3$ of solution.) |
| | **FA 8** | 20 $cm^3$ | 0.2 mol $dm^{-3}$ barium nitrate | Dissolve 52.3 g of $Ba(NO_3)_2$ **[HH] [O]** in each $dm^3$ of solution. |
| | **starch indicator** | 10 $cm^3$ | starch indicator | See preparation instructions in the current syllabus. |

**N.B.** Small amounts of $NO_2$ **[T]**, which can cause respiratory distress in some people, may be produced. **The laboratory must be well ventilated.**

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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** | |
| **[N]** | **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 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.

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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* |
|---|---|
| | |

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:

- any general difficulties encountered in preparation of materials;
- 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** **9701/33**

Paper 3 Advanced Practical Skills 1 **October/November 2017**

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**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.

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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.

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## Apparatus

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**3** *For each candidate*

1 × 50 $cm^3$ burette
1 × 25 $cm^3$ pipette
1 × burette stand and clamp
1 × funnel for filling burette
1 × 25 $cm^3$ measuring cylinder
2 × 150 $cm^3$ or 250 $cm^3$ conical flask
2 × 100 $cm^3$ beaker
1 × glass rod
1 × white tile
1 × heatproof mat
1 × Bunsen burner
1 × tripod
1 × pipe-clay triangle
1 × crucible (at least 15 $cm^3$ capacity) with lid
1 × crucible tongs
1 × stop-clock or sight of a clock with a seconds display
8 × test-tube*
2 × hard-glass test-tube
1 × test-tube rack
1 × test-tube holder
2 × teat/dropping pipette
1 × spatula
1 × wash bottle containing distilled water
1 × pen (for labelling glassware)
paper towels
access to balance weighing to **at least** 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 Question 2. 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) |
|---|---|---|---|---|
| | **FA 1** | 150 $cm^3$ | 0.150 mol $dm^{-3}$ sodium thiosulfate | Dissolve 37.23 g of $Na_2S_2O_3.5H_2O$ in each $dm^3$ of solution. |
| **[MH]** | **FA 2** | 60 $cm^3$ | 1.0 mol $dm^{-3}$ sulfuric acid | See preparation instructions in the current syllabus. |
| | **FA 3** | 60 $cm^3$ | 1.00 mol $dm^{-3}$ potassium iodide | Dissolve 166.0 g of KI in each $dm^3$ of solution. |
| | **FA 4** | 150 $cm^3$ | 0.130 mol $dm^{-3}$ copper(II) sulfate | Dissolve 32.5 g of $CuSO_4.5H_2O$ **[MH] [N]** in each $dm^3$ of solution. |
| | **starch indicator** | 15 $cm^3$ | starch indicator | See preparation instructions in the current syllabus. |
| **[T]** | **FA 5** | 2 g | hydrated barium chloride | Provide 1.9–2.1 g of $BaCl_2.2H_2O$ **[T]** in a stoppered container. |
| | **FA 6** | 5 g | hydrated magnesium sulfate | Provide 4.8–5.2 g of $MgSO_4.7H_2O$ in a stoppered container. |
| **[MH] [N]** | **FA 7** | 2 g | hydrated copper(II) chloride | Provide 1.9–2.1 g of $CuCl_2.2H_2O$ **[MH] [N]** in a stoppered container. |

**N.B.** Small amounts of $Cl_2$ **[O] [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 |
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| **[C]**<br>**[MH]**<br>**[N]** | **aqueous ammonia** | |
| **[C]** | **aqueous sodium hydroxide** | |
| | **0.1 mol $dm^{-3}$ barium chloride**<br>**or**<br>**0.1 mol $dm^{-3}$ barium nitrate** | |
| **[N]** | **0.05 mol $dm^{-3}$ silver nitrate** | |
| **[MH]** | **limewater** | |
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**5** The following materials and apparatus should be available.

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Signed .....

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

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Cambridge International Advanced Subsidiary and Advanced Level

**CHEMISTRY** **9701/34**

Paper 3 Advanced Practical Skills 2 **October/November 2017**

CONFIDENTIAL INSTRUCTIONS

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**5 Size of 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 × 50 $cm^3$ measuring cylinder
1 × 25 $cm^3$ measuring cylinder
1 × 100 $cm^3$ beaker
1 × stop-clock (stopwatch)
1 × glass rod
8 × test-tube*
1 × test-tube rack
2 × teat / dropping pipette
1 × pen (for labelling glassware)
1 × wash bottle containing distilled water
paper towels

*Candidates are expected to rinse and reuse test-tubes where possible.
Additional test-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) |
|---|---|---|---|---|
| | **FB 1** | 200 $cm^3$ | 0.10 mol $dm^{-3}$ sodium thiosulfate | Dissolve 24.82 g of $Na_2S_2O_3.5H_2O$ in each $dm^3$ of solution. |
| | **FB 2** | 200 $cm^3$ | 1.0 mol $dm^{-3}$ hydrochloric acid | Dilute 500 $cm^3$ of 2.0 mol $dm^{-3}$ $HCl$ to 1 $dm^3$. See preparation instructions in the current syllabus for 2.0 mol $dm^{-3}$ $HCl$. |
| **[C]** | **FB 3** | 20 $cm^3$ | 1.0 mol $dm^{-3}$ sodium hydroxide | Dilute 500 $cm^3$ of 2.0 mol $dm^{-3}$ NaOH **[C]** to 1 $dm^3$. See preparation instructions in the current syllabus for 2.0 mol $dm^{-3}$ NaOH. |
| **[MH] [N]** | **FB 4** | 20 $cm^3$ | 1.0 mol $dm^{-3}$ aqueous ammonia | Dilute 500 $cm^3$ of 2.0 mol $dm^{-3}$ $NH_3$ **[C] [MH] [N]** to 1 $dm^3$. See preparation instructions in the current syllabus for 2.0 mol $dm^{-3}$ $NH_3$. |
| | **FB 5** | 20 $cm^3$ | 0.50 mol $dm^{-3}$ magnesium chloride | Dissolve 101.7 g of $MgCl_2.6H_2O$ in each $dm^3$ of solution. |
| | **FB 6** | 20 $cm^3$ | 0.20 mol $dm^{-3}$ copper(II) chloride | Dissolve 34.1 g of $CuCl_2.2H_2O$ **[MH] [N]** in each $dm^3$ of solution. |
| | **FB 7** | 20 $cm^3$ | 0.20 mol $dm^{-3}$ sodium thiosulfate | Dissolve 49.6 g of $Na_2S_2O_3.5H_2O$ in each $dm^3$ of solution. |
| **[HH]** | **FB 8** | 20 $cm^3$ | 0.20 mol $dm^{-3}$ sodium peroxydisulfate | Dissolve 47.6 g of $Na_2S_2O_8$ **[O] [HH] [MH]** in each $dm^3$ of solution. |
| | **FB 9** | 20 $cm^3$ | 0.20 mol $dm^{-3}$ sodium sulfate | Dissolve 64.4 g of $Na_2SO_4.10H_2O$ in each $dm^3$ of solution. |

N.B. 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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**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** | |
| **[N]** | **0.05 mol $dm^{-3}$ silver nitrate** | |
| **[MH]** | **limewater** | |
| **[MH]** | **acidified aqueous potassium manganate(VII)** | |
| | **0.1 mol $dm^{-3}$ potassium iodide** | See preparation instructions in the current syllabus. |
| **[N]** | **aqueous iodine** | 0.1 mol $dm^{-3}$ iodine in potassium iodide. Dissolve 80.00 g KI and 25.38 g $I_2$ **[MH] [N]** in each $dm^3$ of solution. |
| | **aqueous starch** | Prepare starch indicator according to preparation instructions in the current syllabus. |

**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 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.

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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* |
|---|---|
| | |

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:

- any general difficulties encountered in preparation of materials;
- 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** **9701/35**

Paper 3 Advanced Practical Skills 1 **October/November 2017**

CONFIDENTIAL INSTRUCTIONS

*4010232561*

**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 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
tel +44 1223 553554
fax +44 1223 553558

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


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## Safety

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution.

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

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*

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 × 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 (approximate capacity 15 $cm^3$)
1 × crucible tongs
1 × heatproof mat
1 × tripod
1 × Bunsen burner
1 × pipe-clay triangle
3 × boiling tube*
8 × test-tube*
1 × test-tube rack
1 × test-tube holder
1 × wash bottle containing distilled water
1 × pen (for labelling glassware)
1 × stop-clock or sight of clock
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 tubes should be available.

**Where balance provision is limited, some candidates should be instructed to start the examination with Question 2. 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) |
|---|---|---|---|---|
| | **FA 1** | 125 $cm^3$ | 0.0197 mol $dm^{-3}$ potassium iodate(V) | Dissolve 4.22 g of $KIO_3$ **[O] [MH]** 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 KI in each $dm^3$ of solution. |
| | **FA 4** | 150 $cm^3$ | 0.105 mol $dm^{-3}$ sodium thiosulfate | Dissolve 26.1 g of $Na_2S_2O_3.5H_2O$ in each $dm^3$ of solution |
| | **FA 5** | 5.0 g | basic zinc carbonate | Provide 5.0–5.1 g of $ZnCO_3.Zn(OH)_2$ in a stoppered container. (Note: any type of 'basic zinc carbonate' is suitable.) |
| **[MH] [N]** | **FA 6** | 20 $cm^3$ | 0.4 mol $dm^{-3}$ sodium nitrite | Dissolve 27.6 g of $NaNO_2$ **[T] [O] [N]** in each $dm^3$ of solution. |
| | **FA 7** | 20 $cm^3$ | 0.2 mol $dm^{-3}$ ammonium bromide | Dissolve 19.6 g of $NH_4Br$ **[MH]** in each $dm^3$ of solution. (Note: if $NH_4Br$ is not available, use a mixture of 20.6 g of NaBr and 10.7 g of $NH_4Cl$ **[MH]** dissolved in each $dm^3$ of solution.) |
| | **FA 8** | 20 $cm^3$ | 0.2 mol $dm^{-3}$ barium nitrate | Dissolve 52.3 g of $Ba(NO_3)_2$ **[HH] [O]** in each $dm^3$ of solution. |
| | **starch indicator** | 10 $cm^3$ | starch indicator | See preparation instructions in the current syllabus. |

**N.B.** Small amounts of $NO_2$ **[T]**, which can cause respiratory distress in some people, may be produced. **The laboratory must be well ventilated.**

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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** | |
| **[N]** | **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 |

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[Turn over

## 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**.

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**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* |
|---|---|
| | |

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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- assistance with respect to colour blindness.

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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** **9701/36**

Paper 3 Advanced Practical Skills 2 **October/November 2017**

CONFIDENTIAL INSTRUCTIONS

*1360697506*

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

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## Safety

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution.

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

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.

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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 × 25 $cm^3$ pipette
1 × funnel (for filling burette)
1 × white tile
2 × burette stand and clamp
1 × thermometer (–10 °C to +110 °C at 1 °C)
2 × 50 $cm^3$ burette
1 × 50 $cm^3$ measuring cylinder
2 × 150 $cm^3$ or 250 $cm^3$ conical flask
1 × Bunsen burner
1 × heatproof mat
1 × tripod and gauze
1 × test-tube holder
8 × test-tube*
1 × hard-glass test-tube
1 × test-tube rack
4 × teat / dropping pipette
1 × spatula
1 × wash bottle containing 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) |
|---|---|---|---|---|
| | **FB 1** | 200 $cm^3$ | solution that contains 0.0200 mol $dm^{-3}$ ethanedioic acid and 0.0300 mol $dm^{-3}$ sodium ethanedioate | Dissolve 2.52 g of $(COOH)_2.2H_2O$ **[MH]** and 4.02 g $(COONa)_2$ **[MH]** in each $dm^3$ of solution. |
| | **FB 2** | 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. |
| **[MH]** | **FB 3** | 150 $cm^3$ | 1.00 mol $dm^{-3}$ sulfuric acid | See preparation instructions in the current syllabus. |
| | **FB 4** | 120 $cm^3$ | 0.0400 mol $dm^{-3}$ sodium hydroxide | Dissolve 1.60 g of NaOH **[C]** 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. |
| | **FB 5** | 10 $cm^3$ | 0.2 mol $dm^{-3}$ manganese(II) chloride | Dissolve 25.2 g of $MnCl_2$ **[MH]** or 39.6 g of $MnCl_2.4H_2O$ **[MH]** in each $dm^3$ of solution. |
| | **FB 6** | 10 $cm^3$ | 0.2 mol $dm^{-3}$ iron(II) ammonium sulfate | Dissolve 78.4 g of $Fe(NH_4)_2(SO_4)_2.6H_2O$ **[MH]** in each $dm^3$ of solution. |
| | **FB 7** | 10 $cm^3$ | 0.02 mol $dm^{-3}$ potassium manganate(VII) | See preparation instructions for **FB 2**. |
| **[O] [MH] [N]** | **FB 8** | 0.4–0.5 g | potassium manganate(VII) | 0.4 g–0.5 g of $KMnO_4$ **[O] [MH] [N]** provided in a stoppered container. |
| | **aqueous starch** | 5 $cm^3$ | starch solution | See preparation instructions for starch indicator in the current syllabus. |
| | **hydrogen peroxide** | 5 $cm^3$ | 5 'vol' hydrogen peroxide | Dilute 50 $cm^3$ of 100 'vol' $H_2O_2$ **[C]** to make 1 $dm^3$. |
| | **potassium iodide** | 5 $cm^3$ | 0.1 mol $dm^{-3}$ potassium iodide | See preparation instructions in the current syllabus. |

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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** | |
| **[N]** | **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(a)** and **Question 1(e)** 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.**

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Each envelope returned to Cambridge must contain the following items.

**1** The scripts of those candidates specified on the barcode label provided.

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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* |
|---|---|
| | |

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.

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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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