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 2016**

CONFIDENTIAL INSTRUCTIONS

*5692297843*

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

**The Supervisor's attention is drawn to the form on page 7 which must be completed and returned with the scripts.**

If you have any problems or queries regarding these Instructions, please contact CIE
by email: info@cie.org.uk,
by phone: +44 1223 553554,
by fax: +44 1223 553558,
stating the Centre number, the nature of the query and the syllabus number quoted above.

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


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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. Please also see under 'Apparatus' on the use of pipette fillers, safety goggles and plastic gloves.

In accordance with COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

Attention is drawn in particular, to certain materials used in the examination. The following codes are used where relevant.

| | | | |
|---|---|---|---|
| **C** | corrosive | **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', relating to materials used in this examination, should be available from your chemical supplier.

## Before the Examination

**1 Access to the question paper is NOT permitted in advance of the examination.**

**2 Preparation of materials**

Where quantities are specified for each candidate, they are sufficient for the experiments described in the question paper to be completed.

**In preparing materials, the bulk quantity for each substance should be increased by 25%** as spare material should be available to cover accidental loss. More material may be supplied if requested by candidates, without penalty.

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

Every effort should be made to keep the concentrations accurate to within one part in two hundred of those specified.

**Supervisors are asked to carry out any confirmatory tests given on page 4 to ensure the materials supplied are appropriate.**

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

**3 Labelling of materials**

Materials must be labelled as specified in these Instructions. Materials with an **FA** code number should be so labelled **without** the identities being included on the label. Where appropriate the identity of an **FA** coded chemical is given in the question paper itself.

**4 Identity of materials**

It should be noted that descriptions of materials given in the question paper may not correspond with the specifications in these Instructions. **The candidates must assume the descriptions given in the question paper.**

**5 Size of group**

In view of the difficulty of the preparation of large quantities of solution of uniform concentration, it is recommended that the maximum number of candidates per group be 30 and that separate supplies of solutions be prepared for each group.

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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), safety goggles and disposable gloves should be used where necessary.

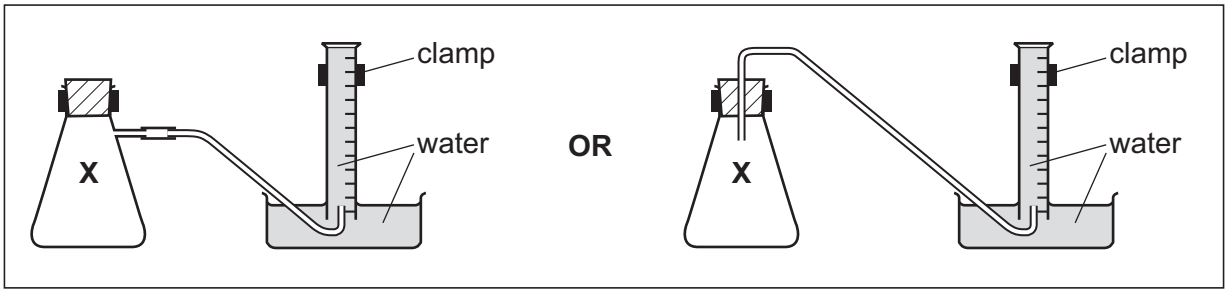
**3** *For each candidate*

1 × 250 $cm^3$ plastic or glass measuring cylinder
2 × stand, clamp and boss
1 × tub suitable for acting as trough (minimum capacity 1 $dm^3$)
1 × side-arm conical flask, labelled **X**, with bung and approximately 50 cm of plastic / rubber delivery tube to fit
**or**
1 × 150 $cm^3$ or 250 $cm^3$ conical flask, labelled **X**, with one-hole bung connected to approximately 50 cm of plastic / rubber delivery tube (see below for diagrams)
1 × 50 $cm^3$ burette
1 × burette stand and clamp (stand and clamp from above may be used)
1 × 25 $cm^3$ pipette
1 × 250 $cm^3$ volumetric (graduated) flask
1 × funnel (for filling burette)
2 × 150 $cm^3$ or 250 $cm^3$ conical flask
1 × white tile
1 × glass rod
1 × spatula
6 × test-tube*
1 × Bunsen burner
1 × heatproof mat
2 × hard-glass test-tube
2 × boiling tube*
2 × bung for use with test-tube
1 × test-tube rack
1 × test-tube holder
2 × teat / dropping pipette
1 × wash bottle of distilled water
1 × pen or labels 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 the provision of balances and / or 250 $cm^3$ measuring cylinders is limited, some candidates should be instructed to start the examination with Question 3. See page 58 of the current syllabus for balance : candidate ratio.**

These diagrams are to assist technicians in selecting apparatus but the apparatus is **not** to be set up for the candidates.



## 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 the description of **FA 3** given in the question paper **does not** correspond with the specification in these instructions.

**3** Particular requirements

| hazard | label | per candidate | identity | notes (hazards given in this column are for the raw materials) |
|---|---|---|---|---|
| | **FA 1** | 0.90 g | calcium carbonate | Provide 0.90 ± 0.10 g of **small** marble chips, $CaCO_3$, in a stoppered container. |
| | **FA 2** | 40 $cm^3$ | 2.00 mol $dm^{-3}$ hydrochloric acid | See preparation instructions on page 56 of the current syllabus. |
| **[MH]** | **FA 3** | 120 $cm^3$ | 0.130 mol $dm^{-3}$ sodium hydroxide | Dissolve 5.20 g NaOH **[C]** in each $dm^3$ of solution. |
| **[HH] [O]** | **FA 5** | 1.5 g | sodium nitrate(V) | Provide approximately 1.5 g $NaNO_3$ **[HH] [O]** in a stoppered container. |
| **[HH]** | **FA 6** | 1.5 g | copper(II) carbonate | Provide approximately 1.5 g $CuCO_3$ **[HH]** in a stoppered container. Any form of basic copper(II) carbonate is suitable. |
| | **FA 7** | 15 $cm^3$ | 0.10 mol $dm^{-3}$ sodium bromide | Dissolve 10.3 g of NaBr in each $dm^3$ of solution. |
| **[F] [MH] [HH]** | **bromophenol blue indicator** | 5 $cm^3$ | bromophenol blue indicator | See preparation instructions on page 57 of the current syllabus. |
| | **distilled water** | 250 $cm^3$ | distilled water | |

**NOTE: In the course of the examination, unpleasant fumes may be released. As a consequence the laboratory should 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 on pages 56 and 57 of the current syllabus.** |
| **[C]** | **dilute nitric acid** | |
| **[MH]** | **dilute sulfuric acid** | |
| **[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** | |
| **[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 which should be labelled 'Supervisor's Results'.

| |
|---|
| **This should be done for:**<br>**each session held and each laboratory used in that session, and each batch of solutions supplied.** |

**N.B. The question paper cover requests the candidate to fill in details of the examination session and the laboratory used for the examination.**

**It is essential that each packet of scripts contains a copy of the applicable Supervisor's Results as the candidates' work cannot be assessed accurately without such information.**

**2** The Supervisor must complete the Report Form on page 7 to show which candidates attended each session. If all candidates took the examination in one session, please indicate this on the Report Form. A copy of the Report Form must accompany each copy of the Supervisor's Results in order for the candidates' work to be assessed accurately.

The Supervisor must give details on page 8 of any particular difficulties experienced by a candidate, especially if the Examiner would be unable to discover this from the written answers.

## After the Examination

**Each envelope returned to Cambridge must contain the following items.**

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

**2** A copy of the Supervisor's Results relevant to the candidates in **1**.

**3** A copy of the Report Form, including details of any difficulties experienced by candidates (see pages 7 and 8).

**4** The Attendance Register.

**5** **A Seating Plan for each session/laboratory.**

**Failure to provide appropriate documentation in each envelope may cause candidates to be penalised.**

## COLOUR BLINDNESS

With regard to colour blindness it is permissible to advise candidates who request assistance on colours of, for example, precipitates and solutions (especially titration end-points). Please include with the scripts a note of the candidate numbers of such candidates.

Experience suggests that candidates who are red/green colour-blind – the most common form – do not generally have significant difficulty. Reporting such cases with the scripts removes the need for a 'Special Consideration' application.

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## REPORT FORM

**This form must be completed and sent to the Examiner in the envelope with the scripts.**

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

**1 Supervisor's Results**

Please submit details of the readings obtained in **Question 1** and **Question 2** on a spare copy of the question paper clearly marked 'Supervisor's Results' **and showing the Centre number and appropriate session/laboratory number.**

**2** The candidate numbers of candidates attending each session were:

| *First Session* | *Second Session* |
|---|---|
| | |

**3** The Supervisor is required to give details overleaf of any difficulties experienced by particular candidates, giving names and candidate numbers. These should include reference to:

**(a)** any general difficulties encountered in preparation of materials;

**(b)** difficulties due to faulty apparatus or materials;

**(c)** accidents to apparatus or materials;

**(d)** assistance with respect to colour blindness.

Other cases of hardship, e.g. illness, temporary disability, should be reported direct to CIE on the normal 'Application for Special Consideration' form.

**4 A plan of work benches, giving details by candidate numbers of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.**

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**Report on any difficulties experienced by candidates.**

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Cambridge International Advanced Subsidiary and Advanced Level

**CHEMISTRY** **9701/33**

Paper 3 Advanced Practical Skills 1 **October/November 2016**

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| | | | |
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| **HH** | health hazard | **T** | acutely toxic |
| **F** | flammable | **O** | oxidising |
| **N** | hazardous to the aquatic environment | | |

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**2 Preparation of materials**

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

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**Supervisors are asked to carry out any confirmatory tests given on page 4 to ensure the materials supplied are appropriate.**

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

**3 Labelling of materials**

Materials must be labelled as specified in these Instructions. Materials with an **FA** code number should be so labelled **without** the identities being included on the label. Where appropriate the identity of an **FA** coded chemical is given in the question paper itself.

**4 Identity of materials**

It should be noted that descriptions of materials given in the question paper may not correspond with the specifications in these Instructions. **The candidates must assume the descriptions given in the question paper.**

**5 Size of group**

In view of the difficulty of the preparation of large quantities of solution of uniform concentration, it is recommended that the maximum number of candidates per group be 30 and that separate supplies of solutions be prepared for each group.

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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), safety goggles and disposable gloves should be used where necessary.

**3** *For each candidate*

1 × 250 $cm^3$ beaker
1 × 100 $cm^3$ beaker
1 × 25 $cm^3$ measuring cylinder
1 × 250 $cm^3$ volumetric (graduated) flask
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 × funnel (for filling burette)
1 × white tile
9 × test-tube*
2 × boiling tube*
1 × test-tube rack
1 × test-tube holder
1 × Bunsen burner
1 × heatproof mat
1 × spatula
1 × glass rod
2 × teat/dropping pipette
1 × stopwatch (sight of clock reading to 1 second)
1 × wash bottle containing distilled water
1 × marker pen or labels (suitable 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

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 materials given in the question paper may not correspond with the specifications in these Instructions.

3 Particular requirements

| hazard | label | per candidate | identity | notes (hazards given in this column are for the raw materials) |
|---|---|---|---|---|
| | **FA 1** | 50 $cm^3$ | 5 'vol' hydrogen peroxide | Dilute 50 $cm^3$ of 100 'vol' hydrogen peroxide **[C]** to 1 $dm^3$.* |
| | **FA 2** | 150 $cm^3$ | 0.02 mol $dm^{-3}$ potassium manganate(VII) | See preparation instructions on page 56 of the current syllabus. |
| **[MH]** | **FA 3** | 200 $cm^3$ | 1.0 mol $dm^{-3}$ sulfuric acid | See preparation instructions on page 56 of the current syllabus. |
| | **FA 5** | 75 $cm^3$ | 1.0 mol $dm^{-3}$ potassium iodide | Dissolve 166 g of KI in each $dm^3$ of solution. |
| | **FA 6** | 50 $cm^3$ | 0.025 mol $dm^{-3}$ sodium thiosulfate | Dissolve 6.2 g of $Na_2S_2O_3.5H_2O$ in each $dm^3$ of solution. |
| **[C][MH][N]** | **FA 7** | 10 $cm^3$ | 0.20 mol $dm^{-3}$ zinc sulfate | Dissolve 57.5 g of $ZnSO_4.7H_2O$ **[C] [MH] [N]** in each $dm^3$ of solution. |
| **[MH]** | **FA 8** | 10 $cm^3$ | 0.10 mol $dm^{-3}$ diammonium iron(II) sulfate | Dissolve 39.2 g of $(NH_4)_2Fe(SO_4)_2.6H_2O$ **[MH]** in each $dm^3$ of **1.0 mol $dm^{-3}$ sulfuric acid**. |
| | **FA 9** | 10 $cm^3$ | 0.10 mol $dm^{-3}$ chromium(III) potassium sulfate | Dissolve 49.9 g of $CrK(SO_4)_2.12H_2O$ **[MH]** in each $dm^3$ of solution. |
| | **FA 10** | 10 $cm^3$ | 0.10 mol $dm^{-3}$ manganese(II) sulfate | Dissolve 22.3 g of $MnSO_4.4H_2O$ **[HH] [N]** in each $dm^3$ of solution. Other hydrates of $MnSO_4$ are suitable. |
| **[O][T][N]** | **FA 11** | 1.5 g | sodium nitrate(III) | 1.5 g of $NaNO_2$ **[O] [T] [N]** in a stoppered tube. |
| **[MH]** | **20 'vol' hydrogen peroxide** | 5 $cm^3$ | 20 'vol' hydrogen peroxide | Dilute 200 $cm^3$ of 100 'vol' hydrogen peroxide **[C]** to 1 $dm^3$.* |
| | **starch indicator** | 30 $cm^3$ | freshly prepared aqueous starch indicator (approx. 2% solution w/v) | See preparation instructions on page 56 of the current syllabus. |
| | **distilled water** | 300 $cm^3$ | distilled water | |

*The solution can deteriorate quickly so should be prepared as near as possible to when it is required or kept refrigerated.

**NOTE: In the course of the examination, unpleasant fumes may be released. As a consequence the laboratory should 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 | per candidate | notes |
|---|---|---|---|
| | **dilute hydrochloric acid** | | **See identity details and preparation instructions on pages 56 and 57 of the current syllabus.** |
| **[C]** | **dilute nitric acid** | | |
| **[MH]** | **dilute sulfuric acid** | | |
| **[C] [MH] [N]** | **aqueous ammonia** | 25 $cm^3$ | |
| **[C]** | **aqueous sodium hydroxide** | 25 $cm^3$ | |
| | **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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**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

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

Paper 3 Advanced Practical Skills 2 **October/November 2016**

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

**1** In addition to the fittings ordinarily contained in a chemical laboratory, the apparatus and materials specified below will be necessary.

**2** Pipette fillers (or equivalent safety devices), safety goggles and disposable gloves should be used where necessary.

**3** *For each candidate*

2 × 50 $cm^3$ burette
2 × burette stand and clamp
1 × plastic tub, suitable to act as a trough for collecting gas over water (minimum capacity 1 $dm^3$)
1 × 250 $cm^3$ beaker
1 × 25 $cm^3$ pipette
1 × thermometer (–10 °C to +110 °C at 1 °C)
1 × glass rod
2 × 150 $cm^3$ or 250 $cm^3$ conical flask
1 × white tile
1 × funnel (for filling burette)
1 × Bunsen burner
1 × heatproof mat
1 × tripod and gauze
1 × test-tube holder
8 × test-tube*
2 × boiling tube*
1 × hard-glass test-tube
1 × test-tube rack
2 × teat / dropping pipette
1 × spatula
pen suitable for marking glassware
1 × wash bottle containing distilled water
paper towels

access to a balance weighing to **at least** 0.1 g (If possible a 2 d.p. balance should be provided.)

*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 Question 3. See page 58 of 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 the description of **FB 4** given in the question paper **does not** correspond with the specifications in these instructions.

3 Particular requirements

| hazard | label | per candidate | identity | notes (hazards given in this column are for the raw materials) |
|---|---|---|---|---|
| | **FB 1** | 70 $cm^3$ | 1.0 mol $dm^{-3}$ hydrochloric acid | Dilute 500 $cm^3$ of 2.0 mol $dm^{-3}$ $HCl$ to 1 $dm^3$ with distilled water. See preparation instructions on page 56 of the current syllabus for 2.0 mol $dm^{-3}$ $HCl$. |
| **[F]** | **FB 2** | 3.0 ± 0.1 cm | magnesium ribbon | 3.0 ± 0.1 cm magnesium ribbon **[F]** supplied in a stoppered container. |
| | **FB 3** | 150 $cm^3$ | 0.10 mol $dm^{-3}$ hydrochloric acid | Dilute 50 $cm^3$ of 2.0 mol $dm^{-3}$ $HCl$ to 1 $dm^3$ with distilled water. See preparation instructions on page 56 of the current syllabus for 2.0 mol $dm^{-3}$ $HCl$. |
| | **FB 4** | 150 $cm^3$ | 0.10 mol $dm^{-3}$ sodium hydroxide | Dissolve 4.00 g NaOH **[C]** in each $dm^3$ of solution. |
| **[F][MH] [HH]** | **bromophenol blue** | 10 $cm^3$ | bromophenol blue indicator | See preparation instructions on page 57 of the current syllabus. |
| ***[F][MH] [HH]** | **FB 5** | 5 $cm^3$ | propanone | 5 $cm^3$ of $CH_3COCH_3$ **[F][MH]** supplied in a stoppered container. |
| **[F][MH] [HH]** | **FB 6** | 5 $cm^3$ | ethanol | 5 $cm^3$ of $CH_3CH_2OH$ **[F][MH][HH]** supplied in a stoppered container. |
| ***[F][MH] [HH]** | **FB 7** | 5 $cm^3$ | propanal | 5 $cm^3$ of $CH_3CH_2CHO$ **[F][MH]** supplied in a stoppered container. |
| **[HH]** | **FB 8** | 1 g | hydrated copper(II) nitrate | Approximately 1 g of $Cu(NO_3)_2.3H_2O$ **[HH]** supplied in a stoppered container. Any hydrated form is suitable. |
| | **FB 8** | 10 $cm^3$ | 0.5 mol $dm^{-3}$ copper(II) nitrate | Dissolve 120.8 g $Cu(NO_3)_2.3H_2O$ **[HH]** in each $dm^3$ of solution. Other hydrated forms are suitable. |
| | **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. |
| **[C][N]** | **sodium chlorate(I)** | 5 $cm^3$ | sodium chlorate(I) | 5 $cm^3$ of $NaClO$ **[C][N]**, 10–15% w/w available chlorine in a stoppered container. |

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

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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 on pages 56 and 57 of the current syllabus.** |
| **[C]** | **dilute nitric acid** | |
| **[MH]** | **dilute sulfuric acid** | |
| **[C]<br>[MH]<br>[HH]** | **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** | |
| **[MH]** | **aqueous acidified potassium manganate(VII)** | |

**5** The following materials and apparatus should be available.

| |
|---|
| red and blue litmus papers, aluminium foil for testing nitrate/nitrite, wooden splints and the apparatus normally used in the Centre for use with limewater in testing for carbon dioxide |

## Responsibilities of the Supervisor during the Examination

**1** The Supervisor, or other competent chemist, **must, out of sight of the candidates, carry out the experiments in Question 1 and Question 2** and complete tables of readings on a spare copy of the question paper which should be labelled 'Supervisor's Results'.

| |
|---|
| **This should be done for:**<br>**each session held and each laboratory used in that session, and each batch of solutions supplied.** |

**N.B. The question paper cover requests the candidate to fill in details of the examination session and the laboratory used for the examination.**

**It is essential that each packet of scripts contains a copy of the applicable Supervisor's Results as the candidates' work cannot be assessed accurately without such information.**

**2** The Supervisor must complete the Report Form on page 7 to show which candidates attended each session. If all candidates took the examination in one session, please indicate this on the Report Form. A copy of the Report Form must accompany each copy of the Supervisor's Results in order for the candidates' work to be assessed accurately.

The Supervisor must give details on page 8 of any particular difficulties experienced by a candidate, especially if the Examiner would be unable to discover this from the written answers.

## After the Examination

**Each envelope returned to Cambridge must contain the following items.**

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

**2** A copy of the Supervisor's Results relevant to the candidates in **1**.

**3** A copy of the Report Form, including details of any difficulties experienced by candidates (see pages 7 and 8).

**4** The Attendance Register.

**5** **A Seating Plan for each session/laboratory.**

**Failure to provide appropriate documentation in each envelope may cause candidates to be penalised.**

## COLOUR BLINDNESS

With regard to colour blindness it is permissible to advise candidates who request assistance on colours of, for example, precipitates and solutions (especially titration end-points). Please include with the scripts a note of the candidate numbers of such candidates.

Experience suggests that candidates who are red/green colour-blind – the most common form – do not generally have significant difficulty. Reporting such cases with the scripts removes the need for a 'Special Consideration' application.

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## REPORT FORM

**This form must be completed and sent to the Examiner in the envelope with the scripts.**

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

**1 Supervisor's Results**

Please submit details of the readings obtained in **Question 1** and **Question 2** on a spare copy of the question paper clearly marked 'Supervisor's Results' **and showing the Centre number and appropriate session/laboratory number.**

**2** The candidate numbers of candidates attending each session were:

| *First Session* | *Second Session* |
|---|---|
| | |

**3** The Supervisor is required to give details overleaf of any difficulties experienced by particular candidates, giving names and candidate numbers. These should include reference to:

**(a)** any general difficulties encountered in preparation of materials;

**(b)** difficulties due to faulty apparatus or materials;

**(c)** accidents to apparatus or materials;

**(d)** assistance with respect to colour blindness.

Other cases of hardship, e.g. illness, temporary disability, should be reported direct to CIE on the normal 'Application for Special Consideration' form.

**4 A plan of work benches, giving details by candidate numbers of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.**

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**Report on any difficulties experienced by candidates.**

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**CHEMISTRY** **9701/35**

Paper 3 Advanced Practical Skills 1 **October/November 2016**

CONFIDENTIAL INSTRUCTIONS

*2709390386*

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

**The Supervisor's attention is drawn to the form on page 7 which must be completed and returned with the scripts.**

If you have any problems or queries regarding these Instructions, please contact CIE
by email: info@cie.org.uk,
by phone: +44 1223 553554,
by fax: +44 1223 553558,
stating the Centre number, the nature of the query and the syllabus number quoted above.

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

IB16 11_9701_35CI/4RP
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[Turn over

## Safety

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

Only those tests described in the question paper should be attempted. Please also see under 'Apparatus' on the use of pipette fillers, safety goggles and plastic gloves.

In accordance with COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

Attention is drawn in particular, to certain materials used in the examination. The following codes are used where relevant.

| | | | |
|---|---|---|---|
| **C** | corrosive | **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', relating to materials used in this examination, should be available from your chemical supplier.

## Before the Examination

**1 Access to the question paper is NOT permitted in advance of the examination.**

**2 Preparation of materials**

Where quantities are specified for each candidate, they are sufficient for the experiments described in the question paper to be completed.

**In preparing materials, the bulk quantity for each substance should be increased by 25%** as spare material should be available to cover accidental loss. More material may be supplied if requested by candidates, without penalty.

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

Every effort should be made to keep the concentrations accurate to within one part in two hundred of those specified.

**Supervisors are asked to carry out any confirmatory tests given on page 4 to ensure the materials supplied are appropriate.**

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

**3 Labelling of materials**

Materials must be labelled as specified in these Instructions. Materials with an **FA** code number should be so labelled **without** the identities being included on the label. Where appropriate the identity of an **FA** coded chemical is given in the question paper itself.

**4 Identity of materials**

It should be noted that descriptions of materials given in the question paper may not correspond with the specifications in these Instructions. **The candidates must assume the descriptions given in the question paper.**

**5 Size of group**

In view of the difficulty of the preparation of large quantities of solution of uniform concentration, it is recommended that the maximum number of candidates per group be 30 and that separate supplies of solutions be prepared for each group.

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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), safety goggles and disposable gloves should be used where necessary.

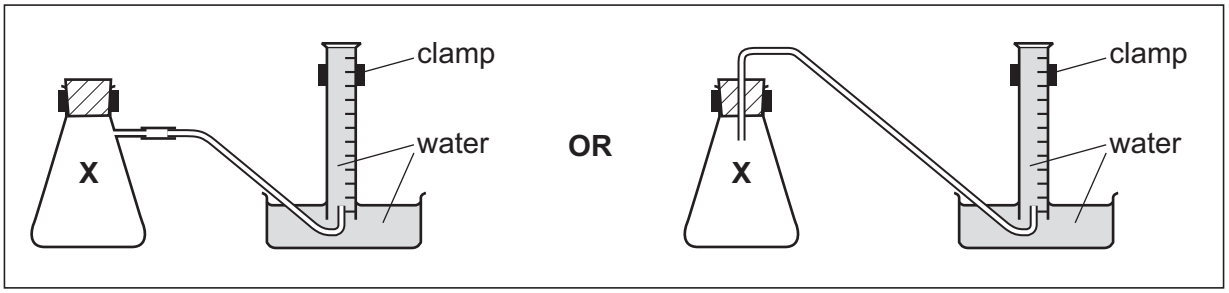
**3** *For each candidate*

1 × 250 $cm^3$ plastic or glass measuring cylinder
2 × stand, clamp and boss
1 × tub suitable for acting as trough (minimum capacity 1 $dm^3$)
1 × side-arm conical flask, labelled **X**, with bung and approximately 50 cm of plastic / rubber delivery tube to fit
**or**
1 × 150 $cm^3$ or 250 $cm^3$ conical flask, labelled **X**, with one-hole bung connected to approximately 50 cm of plastic / rubber delivery tube (see below for diagrams)
1 × 50 $cm^3$ burette
1 × burette stand and clamp (stand and clamp from above may be used)
1 × 25 $cm^3$ pipette
1 × 250 $cm^3$ volumetric (graduated) flask
1 × funnel (for filling burette)
2 × 150 $cm^3$ or 250 $cm^3$ conical flask
1 × white tile
1 × glass rod
1 × spatula
6 × test-tube*
1 × Bunsen burner
1 × heatproof mat
2 × hard-glass test-tube
2 × boiling tube*
2 × bung for use with test-tube
1 × test-tube rack
1 × test-tube holder
2 × teat / dropping pipette
1 × wash bottle of distilled water
1 × pen or labels 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 the provision of balances and / or 250 $cm^3$ measuring cylinders is limited, some candidates should be instructed to start the examination with Question 3. See page 58 of the current syllabus for balance : candidate ratio.**

These diagrams are to assist technicians in selecting apparatus but the apparatus is **not** to be set up for the candidates.



## 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 the description of **FA 3** given in the question paper **does not** correspond with the specification in these instructions.

3 Particular requirements

| hazard | label | per candidate | identity | notes (hazards given in this column are for the raw materials) |
|---|---|---|---|---|
| | **FA 1** | 0.90 g | calcium carbonate | Provide 0.90 ± 0.10 g of **small** marble chips, $CaCO_3$, in a stoppered container. |
| | **FA 2** | 40 $cm^3$ | 2.00 mol $dm^{-3}$ hydrochloric acid | See preparation instructions on page 56 of the current syllabus. |
| **[MH]** | **FA 3** | 120 $cm^3$ | 0.130 mol $dm^{-3}$ sodium hydroxide | Dissolve 5.20 g NaOH **[C]** in each $dm^3$ of solution. |
| **[HH] [O]** | **FA 5** | 1.5 g | sodium nitrate(V) | Provide approximately 1.5 g $NaNO_3$ **[HH] [O]** in a stoppered container. |
| **[HH]** | **FA 6** | 1.5 g | copper(II) carbonate | Provide approximately 1.5 g $CuCO_3$ **[HH]** in a stoppered container. Any form of basic copper(II) carbonate is suitable. |
| | **FA 7** | 15 $cm^3$ | 0.10 mol $dm^{-3}$ sodium bromide | Dissolve 10.3 g of NaBr in each $dm^3$ of solution. |
| **[F] [MH] [HH]** | **bromophenol blue indicator** | 5 $cm^3$ | bromophenol blue indicator | See preparation instructions on page 57 of the current syllabus. |
| | **distilled water** | 250 $cm^3$ | distilled water | |

**NOTE: In the course of the examination, unpleasant fumes may be released. As a consequence the laboratory should be well ventilated.**

**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 on pages 56 and 57 of 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 which should be labelled 'Supervisor's Results'.

| |
|---|
| **This should be done for:**<br>**each session held and each laboratory used in that session, and each batch of solutions supplied.** |

**N.B. The question paper cover requests the candidate to fill in details of the examination session and the laboratory used for the examination.**

**It is essential that each packet of scripts contains a copy of the applicable Supervisor's Results as the candidates' work cannot be assessed accurately without such information.**

**2** The Supervisor must complete the Report Form on page 7 to show which candidates attended each session. If all candidates took the examination in one session, please indicate this on the Report Form. A copy of the Report Form must accompany each copy of the Supervisor's Results in order for the candidates' work to be assessed accurately.

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.

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**Each envelope returned to Cambridge must contain the following items.**

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

**2** A copy of the Supervisor's Results relevant to the candidates in **1**.

**3** A copy of the Report Form, including details of any difficulties experienced by candidates (see pages 7 and 8).

**4** The Attendance Register.

**5** **A Seating Plan for each session/laboratory.**

**Failure to provide appropriate documentation in each envelope may cause candidates to be penalised.**

## COLOUR BLINDNESS

With regard to colour blindness it is permissible to advise candidates who request assistance on colours of, for example, precipitates and solutions (especially titration end-points). Please include with the scripts a note of the candidate numbers of such candidates.

Experience suggests that candidates who are red/green colour-blind – the most common form – do not generally have significant difficulty. Reporting such cases with the scripts removes the need for a 'Special Consideration' application.

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## REPORT FORM

**This form must be completed and sent to the Examiner in the envelope with the scripts.**

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

**1 Supervisor's Results**

Please submit details of the readings obtained in **Question 1** and **Question 2** on a spare copy of the question paper clearly marked 'Supervisor's Results' **and showing the Centre number and appropriate session/laboratory number.**

**2** The candidate numbers of candidates attending each session were:

| *First Session* | *Second Session* |
|---|---|
| | |

**3** The Supervisor is required to give details overleaf of any difficulties experienced by particular candidates, giving names and candidate numbers. These should include reference to:

**(a)** any general difficulties encountered in preparation of materials;

**(b)** difficulties due to faulty apparatus or materials;

**(c)** accidents to apparatus or materials;

**(d)** assistance with respect to colour blindness.

Other cases of hardship, e.g. illness, temporary disability, should be reported direct to CIE on the normal 'Application for Special Consideration' form.

**4 A plan of work benches, giving details by candidate numbers of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.**

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**Report on any difficulties experienced by candidates.**

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Cambridge International AS & A Level

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**CHEMISTRY** **9701/36**

Paper 3 Advanced Practical Skills 2 **October/November 2016**

CONFIDENTIAL INSTRUCTIONS

*4333486694*

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

**The Supervisor's attention is drawn to the form on page 7 which must be completed and returned with the scripts.**

If you have any problems or queries regarding these Instructions, please contact CIE
by email: info@cie.org.uk,
by phone: +44 1223 553554,
by fax: +44 1223 553558,
stating the Centre number, the nature of the query and the syllabus number quoted above.

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


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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. Please also see under 'Apparatus' on the use of pipette fillers, safety goggles and plastic gloves.

In accordance with COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

Attention is drawn in particular, to certain materials used in the examination. The following codes are used where relevant.

| | | | |
|---|---|---|---|
| **C** | corrosive | **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', relating to materials used in this examination, should be available from your chemical supplier.

## Before the Examination

**1 Access to the question paper is NOT permitted in advance of the examination.**

**2 Preparation of materials**

Where quantities are specified for each candidate, they are sufficient for the experiments described in the question paper to be completed.

**In preparing materials, the bulk quantity for each substance should be increased by 25%** as spare material should be available to cover accidental loss. More material may be supplied if requested by candidates, without penalty.

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

Every effort should be made to keep the concentrations accurate to within one part in two hundred of those specified.

**Supervisors are asked to carry out any confirmatory tests given on page 4 to ensure the materials supplied are appropriate.**

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

**3 Labelling of materials**

Materials must be labelled as specified in these Instructions. Materials with an **FB** code number should be so labelled **without** the identities being included on the label. Where appropriate the identity of an **FB** coded chemical is given in the question paper itself.

**4 Identity of materials**

It should be noted that descriptions of materials given in the question paper may not correspond with the specifications in these Instructions. **The candidates must assume the descriptions given in the question paper.**

**5 Size of group**

In view of the difficulty of the preparation of large quantities of solution of uniform concentration, it is recommended that the maximum number of candidates per group be 30 and that separate supplies of solutions be prepared for each group.

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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), safety goggles and disposable gloves should be used where necessary.

**3** *For each candidate*

1 × 250 $cm^3$ beaker
1 × foamed plastic (polystyrene) cup
1 × 25 $cm^3$ measuring cylinder
1 × thermometer (–10 °C to +110 °C at 1 °C)
1 × stop clock or sight of a clock with a seconds display
1 × glass rod
1 × spatula
1 × 15 $cm^3$ crucible without lid
1 × tripod
1 × gauze
1 × pipe-clay triangle
1 × crucible tongs
1 × Bunsen burner
1 × heatproof mat
1 × test-tube holder
8 × test-tube*
2 × boiling tube*
1 × test-tube rack
2 × teat / dropping pipette
1 × wash bottle containing distilled water
pen suitable for marking 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 Question 3. See page 58 of 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 materials given in the question paper may not correspond with the specifications in these instructions.

3 Particular requirements

| hazard | label | per candidate | identity | notes (hazards given in this column are for the raw materials) |
|---|---|---|---|---|
| **[MH][N]** | **FB 1** | 35 $cm^3$ | 1.0 mol $dm^{-3}$ copper(II) sulfate | Dissolve 249.5 g of $CuSO_4.5H_2O$ **[MH] [N]** in each $dm^3$ of solution. |
| **[F][N]** | **FB 2** | 0.8 ± 0.1 g | zinc powder | 0.8 ± 0.1 g zinc powder **[F] [N]** supplied in a stoppered container. |
| **[MH][N]** | **FB 3** | 3.0 ± 0.2 g | hydrated copper(II) sulfate | 3.0 ± 0.2 g $CuSO_4.5H_2O$ **[MH] [N]** supplied in a stoppered container. |
| **[MH]** | **FB 4** | 10 $cm^3$ | 0.50 mol $dm^{-3}$ methanoic acid | Dilute 21 $cm^3$ conc. $HCO_2H$ (90%) **[C] [F]** in each $dm^3$ of solution. |
| | **FB 5** | 10 $cm^3$ | 0.50 mol $dm^{-3}$ hydrochloric acid | Dilute 250 $cm^3$ of 2.0 mol $dm^{-3}$ $HCl$ to 1 $dm^3$ with distilled water. See preparation instructions on page 56 of the current syllabus. |
| **[C][MH][N]** | **FB 6** | 1 g | mixture of ammonium chloride and zinc sulfate | Approximately 0.25 g of $NH_4Cl$ **[MH]** and 0.75 g of $ZnSO_4.7H_2O$ **[C] [MH] [N]** should be ground together and supplied in a stoppered container. This should be freshly prepared. |
| **[MH]** | **sodium carbonate** | 1 g | sodium carbonate | Provide approximately 1 g of $Na_2CO_3$ **[MH]** in a stoppered container. |
| **[F]** | **magnesium ribbon** | 2 × 2 cm strips | magnesium ribbon | Provide 2 × 2 cm strips of freshly cleaned magnesium ribbon **[F]**. |

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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 on pages 56 and 57 of the current syllabus.** |
| **[C]** | **dilute nitric acid** | |
| **[MH]** | **dilute sulfuric acid** | |
| **[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** | |
| **[MH]** | **aqueous acidified potassium manganate(VII)** | |

**5** The following materials and apparatus should be available.

| |
|---|
| red and blue litmus papers, aluminium foil for testing nitrate/nitrite, wooden splints and the apparatus normally used in the Centre for use with limewater in testing for carbon dioxide |

## Responsibilities of the Supervisor during the Examination

**1** The Supervisor, or other competent chemist, **must, out of sight of the candidates, carry out the experiments in Question 1 and Question 2** and complete tables of readings on a spare copy of the question paper which should be labelled 'Supervisor's Results'.

| |
|---|
| **This should be done for:**<br>**each session held and each laboratory used in that session, and each batch of solutions supplied.** |

**N.B. The question paper cover requests the candidate to fill in details of the examination session and the laboratory used for the examination.**

**It is essential that each packet of scripts contains a copy of the applicable Supervisor's Results as the candidates' work cannot be assessed accurately without such information.**

**2** The Supervisor must complete the Report Form on page 7 to show which candidates attended each session. If all candidates took the examination in one session, please indicate this on the Report Form. A copy of the Report Form must accompany each copy of the Supervisor's Results in order for the candidates' work to be assessed accurately.

The Supervisor must give details on page 8 of any particular difficulties experienced by a candidate, especially if the Examiner would be unable to discover this from the written answers.

## After the Examination

**Each envelope returned to Cambridge must contain the following items.**

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

**2** A copy of the Supervisor's Results relevant to the candidates in **1**.

**3** A copy of the Report Form, including details of any difficulties experienced by candidates (see pages 7 and 8).

**4** The Attendance Register.

**5** **A Seating Plan for each session/laboratory.**

**Failure to provide appropriate documentation in each envelope may cause candidates to be penalised.**

## COLOUR BLINDNESS

With regard to colour blindness it is permissible to advise candidates who request assistance on colours of, for example, precipitates and solutions (especially titration end-points). Please include with the scripts a note of the candidate numbers of such candidates.

Experience suggests that candidates who are red/green colour-blind – the most common form – do not generally have significant difficulty. Reporting such cases with the scripts removes the need for a 'Special Consideration' application.

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## REPORT FORM

**This form must be completed and sent to the Examiner in the envelope with the scripts.**

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

**1 Supervisor's Results**

Please submit details of the readings obtained in **Question 1** and **Question 2** on a spare copy of the question paper clearly marked 'Supervisor's Results' **and showing the Centre number and appropriate session/laboratory number.**

**2** The candidate numbers of candidates attending each session were:

| *First Session* | *Second Session* |
|---|---|
| | |

**3** The Supervisor is required to give details overleaf of any difficulties experienced by particular candidates, giving names and candidate numbers. These should include reference to:

**(a)** any general difficulties encountered in preparation of materials;

**(b)** difficulties due to faulty apparatus or materials;

**(c)** accidents to apparatus or materials;

**(d)** assistance with respect to colour blindness.

Other cases of hardship, e.g. illness, temporary disability, should be reported direct to CIE on the normal 'Application for Special Consideration' form.

**4 A plan of work benches, giving details by candidate numbers of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.**

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**Report on any difficulties experienced by candidates.**

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