

---

**CHEMISTRY (PRINCIPAL)**

**9791/04**

Paper 4 Practical

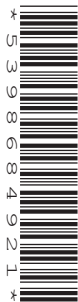
**May/June 2017**

CONFIDENTIAL INSTRUCTIONS

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

---

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



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

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

---

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 3 Pre-U Certificate.

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

## Safety

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

Only those tests described in the Question Paper should be attempted. Please also see under 'Apparatus' on the use of pipette fillers, suitable eye protection 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.

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

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

'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 concentrations accurate to within one part in two hundred of those specified.

**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.

**4 Identity of materials**

It should be noted that descriptions of solutions given in the Question Paper may not correspond exactly 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 in preparing large quantities of solution of uniform concentration, it is recommended that the maximum number of candidates per group be 30 and that separate supplies of solutions be prepared for each group.

### Apparatus

- 1 In addition to the fittings ordinarily contained in a chemical laboratory, the apparatus and materials specified below will be necessary.
- 2 Pipette fillers (or equivalent safety devices), suitable eye protection and disposable gloves should be used where necessary.

3 *For each candidate*

- 1 × 50 cm<sup>3</sup> burette
- 1 × burette clamp and stand
- 1 × funnel for filling burette
- 1 × 25 cm<sup>3</sup> pipette
- 1 × pipette filler
- 1 × conical flask within range 150 to 250 cm<sup>3</sup>
- 1 × 25 cm<sup>3</sup> measuring cylinder
- 1 × 100 cm<sup>3</sup> beaker
- 1 × 250 cm<sup>3</sup> beaker
- 1 × 250 cm<sup>3</sup> volumetric (graduated) flask and stopper
- 1 × white tile
- 1 × spatula
- 1 × heat-proof mat
- 1 × Bunsen burner
- 12 × test-tubes
- 1 × boiling tube
- 1 × metal test-tube holder
- 1 × test-tube rack
- 1 × glass rod
- 2 × dropping pipettes
- 1 × pen (suitable for marking glassware)
- 1 × wash bottle of distilled water
- paper towels

access to balance, single-pan, direct reading, minimum accuracy 0.1 g (1 per 8–12 candidates)

Centres are advised to provide a means of supporting a boiling tube on the balance.

## 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 Particular requirements

**Note: Small amounts of NO<sub>2</sub> [C] [T] [O], which can cause respiratory distress in some people, will be produced. The laboratory must be well ventilated.**

hazard	label	per candidate	identity	notes
[MH]	FA 1	5.0g	hydrated ammonium iron(II) sulfate	(Hazards symbols given in this column refer to the raw materials.) 5.0 ± 0.2g of (NH <sub>4</sub> ) <sub>2</sub> Fe(SO <sub>4</sub> ) <sub>2</sub> ·6H <sub>2</sub> O [MH] in a weighing bottle
	FA 2	180 cm <sup>3</sup>	0.0100 mol dm <sup>-3</sup> potassium manganate(VII)	Dissolve 1.58g of KMnO <sub>4</sub> [O] [MH] [N] in each dm <sup>3</sup> of solution.
[MH]	FA 3	150 cm <sup>3</sup>	1 mol dm <sup>-3</sup> H <sub>2</sub> SO <sub>4</sub>	See preparation instructions on page 51 of the 2016–18 syllabus.
[MH] [N]	FA 5	2.5g	basic copper(II) carbonate	2.5 ± 0.2g of CuCO <sub>3</sub> ·Cu(OH) <sub>2</sub> [MH] [N] The same supply of basic copper(II) carbonate should be used for all candidates and the Supervisor.
	FA 6	5 cm <sup>3</sup>	0.2 mol dm <sup>-3</sup> manganese(II) sulfate	Dissolve 44.6g of MnSO <sub>4</sub> ·4H <sub>2</sub> O [HH] [N] in each dm <sup>3</sup> of solution. (Or dissolve 33.8g of MnSO <sub>4</sub> ·H <sub>2</sub> O [HH] [N] in each dm <sup>3</sup> of solution.)
	FA 7	5 cm <sup>3</sup>	0.2 mol dm <sup>-3</sup> iron(II) sulfate	Dissolve 55.6g of FeSO <sub>4</sub> ·7H <sub>2</sub> O [MH] in each dm <sup>3</sup> of solution. The solution should be freshly prepared.
[MH] [N]	FA 8	10 cm <sup>3</sup>	1.0 mol dm <sup>-3</sup> sodium nitrate(III)/sodium nitrite	Dissolve 69.0g of NaNO <sub>2</sub> [O] [N] [T] in each dm <sup>3</sup> of solution.
	FA 9	10 cm <sup>3</sup>	0.1 mol dm <sup>-3</sup> barium chloride	See preparation instructions on page 51 of the 2016–18 syllabus. (Barium nitrate is not suitable.)
	ceramic wool		ceramic fibre wool	Supply each candidate with sufficient ceramic fibre wool/mineral wool (e.g. Rocksil wool, Kaowool®) to act as a loose plug in a boiling tube.
	distilled water	300 cm <sup>3</sup>	distilled water	

**3** The standard bench reagents specifically required are set out below. If necessary, they may be made available from a communal supply; however, the attention of the Invigilator should be drawn to the fact that such an arrangement may enhance the opportunity for malpractice between candidates.

hazard	label	notes (Hazards symbols given in this column refer to the raw materials.)
	<b>dilute hydrochloric acid</b>	
[C]	<b>dilute nitric acid</b>	
[MH]	<b>dilute sulfuric acid</b>	
[C] [MH] [N]	<b>aqueous ammonia</b>	
[C]	<b>aqueous sodium hydroxide</b>	
	<b>aqueous barium chloride [or aqueous barium nitrate]</b>	
[N]	<b>aqueous silver nitrate</b>	
[MH]	<b>1.0 mol dm<sup>-3</sup> sodium carbonate</b>	
[MH]	<b>limewater</b>	
	<b>0.1 mol dm<sup>-3</sup> potassium iodide</b>	
[MH]	<b>acidified aqueous potassium manganate(VII)</b>	

**See identity details and preparation instructions on page 51 of the 2016–18 syllabus.**

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

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

### Responsibilities of the Supervisor during the Examination

- 1 The Supervisor, or other competent chemist, **must carry out the experiments in Questions 1, 2 and 3** 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:  
each session held and each laboratory used in that session, and each set of solutions supplied.**

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

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

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

The Supervisor must give details on page 7 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 each Supervisor's Results relevant to the candidates in 1.
- 3 A copy of the Supervisor's Report, including details of any difficulties experienced by candidates (see pages 7 and 8).
- 4 The Attendance Register.
- 5 **A Seating Plan for each session/laboratory.**

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

### COLOUR BLINDNESS

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

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

## SUPERVISOR'S REPORT

**This Supervisor's Report 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 **Questions 1, 2 and 3** 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 making preparation;
- (b) difficulties due to faulty apparatus or materials;
- (c) accidents with apparatus or materials;
- (d) assistance with respect to colour blindness.

Other cases of hardship, e.g. illness, temporary disability, should be reported directly to Cambridge on the normal 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.**

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

**Declaration** (to be signed by the Supervisor)

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

**SIGNED** .....

**NAME (in block capitals)** .....

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cie.org.uk](http://www.cie.org.uk) after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.