



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education  
Advanced Subsidiary Level and Advanced Level

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**PHYSICAL SCIENCE**

**8780/04**

Paper 4 Advanced Practical Skills

**For Examination from 2011**

SPECIMEN CONFIDENTIAL INSTRUCTIONS

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

**No access to the Question Paper is permitted in advance of the examination.**

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**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 e-mail: [international@cie.org.uk](mailto:international@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 and paper number.

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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. Pipette fillers and safety goggles should be used where necessary.

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 hazard codes are used where relevant.

**[C]** corrosive substance

**[F]** highly flammable substance

**[H]** harmful or irritating substance

**[O]** oxidising substance

**[T]** toxic substance

**[N]** dangerous for the environment

The attention of Centres 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 These instructions detail the apparatus required for the experiments in the Question Paper. **Access to the Question Paper is NOT permitted in advance of the examination.** The contents of these Confidential Instructions must not be revealed either directly or indirectly to the candidates.

#### 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.

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

#### 3 Labelling of materials

Materials must be labelled as specified in these Confidential Instructions. It may be required for some materials to be labelled but **without** the identities being included on the label.

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.**

#### 4 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.

#### 5 Number of sets of apparatus

The minimum number of sets of apparatus provided for each experiment is half the number of candidates taking the examination. There should, in addition, be a few spare sets of apparatus available in case problems arise during the examination.

## The Examination

### 1 Organisation of the Examination

Essential Information relating to the conduct and invigilation of the Practical Examination is given in the Handbook for Centres.

Candidates should be allowed access to the apparatus for each experiment for 45 minutes only. After spending 45 minutes on one experiment, candidates should change over to the other experiment. The order in which a candidate attempts the two experiments is immaterial.

### 2 Assistance to Candidates

Supervisors should make the following announcement at the start of the examination:

'The Examiners do not want you to waste time when you are unable to do any experiment.

Any candidate who is unable to get results with an experiment may ask for help. The extent of this help will be reported to the Examiners, who may make a deduction of marks.'

Assistance should only be given when it is asked for by a candidate, or as directed in the Notes sections of these Instructions, or where apparatus is seen to have developed a fault. Assistance should be restricted to enabling candidates to make observations and measurements. Observations and measurements must not be made for candidates, and no help should be given with data analysis or evaluation.

All assistance given to candidates must be reported on the Supervisor's Report Form.

### 3 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. Reporting such cases with the scripts removes the need for a 'Special Consideration' application.

Candidates who are red/green colour blind do not generally have significant difficulty.

### 4 Faulty apparatus

In cases of faulty apparatus that prevent the required measurements from being taken, the Supervisor may allow extra time to give the candidate a fair opportunity to perform the experiment as if the fault had not been present.

### 5 Supervisor's Results

If asked to do so in the Confidential Instructions, the Supervisor, or other competent Physical Scientist, should carry out the required experimental work **out of sight of the candidates**. Access to the Question Paper is NOT permitted in advance of the examination.

Supervisor's Results are required for each session and each laboratory used in that session, and each set of solutions supplied. The Question Paper cover requests candidates 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 Supervisor's Results as the candidate's work cannot be assessed accurately without such information.

## 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 if required by the Confidential Instructions,
- 3 the Supervisor's Report, including details of any difficulties experienced by candidates (see pages 7 and 8),
- 4 the Attendance Register,
- 5 a plan of work benches, giving details by candidate number of the places occupied by the candidates for each experiment and session.

## Instructions for Preparing Apparatus and Materials

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

### Question 1

#### Apparatus requirements (per set of apparatus unless otherwise specified)

- Eleven  $100\ \Omega$  carbon film resistors. The resistors should be soldered together to form a chain as shown in Fig. 1.1.



**Fig. 1.1**

- Three 1.5 V dry cells connected in series to form a battery. Candidates must be able to make connections to this battery without difficulty.
- Mounted  $470\ \Omega$  carbon film resistor. The resistor should be labelled  $R_2$ . The value of the resistance of the resistor (i.e. the colour coding) should be hidden from candidates. Candidates must be able to make connections to this resistor without difficulty.
- Digital voltmeter. The meter must be capable of measuring voltages in the range 0–5 V to a precision of 0.01 V.
- Two crocodile clips.
- Seven connecting wires.

#### Notes

- 1 At the beginning of the experiment, Supervisors must be particularly vigilant to ensure that candidates have connected the circuit correctly. The extent of any help given to candidates must be detailed in the Supervisor's Report and sent with the scripts.
- 2 If the apparatus is to be used by a second candidate, it should be dismantled at the end of the first candidate's experiment and the equipment laid out on the bench ready for the next candidate to use.

#### Information required by Examiners

None.

**Question 2**

Under no circumstances must the identities of P, Q and X be divulged to candidates.

**Apparatus required (per set of apparatus unless otherwise specified)**

- 2 × 50 cm<sup>3</sup> burettes (per candidate)
- 2 × burette clamps
- 2 × stands
- 2 × funnels for filling burettes
- 1 × 250 cm<sup>3</sup> volumetric flask, labelled Y, with stopper (per candidate)
- 1 × 250 cm<sup>3</sup> conical flask (per candidate)
- 1 × 25 cm<sup>3</sup> pipette (per candidate)
- 1 × pipette filler
- 1 × white tile
- 1 × wash-bottle containing distilled water
- 1 × boiling-tube (per candidate)
- 4 × test-tubes (per candidate)
- 1 × test-tube rack
- 2 × teat/squeeze/dropping pipettes (per candidate)
- 1 × glass rod (per candidate)
- paper towels

**Chemicals**

See table on page 6.

**Notes**

- 1 Spare materials and equipment should be available and can be provided without penalty.  
**Candidates should be made aware of this.**
- 2 Pipette fillers (or equivalent safety devices), safety goggles and disposable plastic gloves should be used where necessary.

**Information required by Examiners**

Sample set of numerical results for part (b), clearly marked 'Supervisor's Results', obtained out of sight of the candidates.

## Chemicals Required for Question 2

## Particular requirements

hazard	label	per candidate	identity	notes (Hazard symbols given in this column are for the raw materials.)
[C]	<b>solution X</b>	80 cm <sup>3</sup>	0.525 mol dm <sup>-3</sup> ethanoic acid	Dissolve 31.50 g of freshly purchased glacial ethanoic acid [C] in each dm <sup>3</sup> of distilled water.
[H]	<b>3.40 g dm<sup>-3</sup> sodium hydroxide</b>	150 cm <sup>3</sup>	0.085 mol dm <sup>-3</sup> sodium hydroxide	Dissolve 3.40 g of freshly purchased NaOH [C] in each dm <sup>3</sup> of distilled water. <i>Issue this solution in a stoppered container or beaker covered with 'Clingfilm' or 'Gladwrap' to prevent absorption of carbon dioxide.</i>
[F]	<b>phenolphthalein indicator</b>	10 cm <sup>3</sup>	phenolphthalein indicator	Dissolve 1.0 g of solid phenolphthalein [H] in 600 cm <sup>3</sup> of ethanol (IMS) [F] and dilute the resulting solution to 1 dm <sup>3</sup> with distilled water. Alternatively use commercially produced indicator solution.
<b>Check Titre.</b> Pipette 100.0 cm <sup>3</sup> of the sodium hydroxide solution into a conical flask and add 3– 4 drops of phenolphthalein indicator. Titrate with solution X until the solution just turns colourless. <b>Adjust the concentration of sodium hydroxide, if necessary, to give a titre of 16.2 ± 0.2 cm<sup>3</sup>.</b>				
[H]	<b>P</b>	5 cm <sup>3</sup>	0.1 mol dm <sup>-3</sup> iron(II) sulphate	Dissolve 27.8 g of freshly purchased FeSO <sub>4</sub> .7H <sub>2</sub> O [H] in 100 cm <sup>3</sup> of 1 mol dm <sup>-3</sup> sulphuric acid [H] and make up to 1 dm <sup>3</sup> with distilled water. <i>To prevent aerial oxidation it is best to use boiled distilled water in preparing this solution and to keep it stoppered or covered before issue to candidates.</i>
[H]	<b>Q</b>	20 cm <sup>3</sup>	10 volume aqueous hydrogen peroxide	Dilute 1 part of 100 volume (30% w/w, 8.3 mol dm <sup>-3</sup> ) hydrogen peroxide [C] [O] with 9 parts distilled water <b>OR</b> Dilute 1 part of 20 volume (6% w/w, 1.7 mol dm <sup>-3</sup> ) hydrogen peroxide [H] [O] with 1 part of distilled water.

The standard bench reagents are set out below. 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 enhance the opportunity for malpractice between candidates.

hazard	label	identity	notes (Hazard symbols given in this column are for the raw materials.)
[C]	<b>bench reagent aqueous sodium hydroxide</b>	2.0 mol dm <sup>-3</sup> NaOH	Dissolve 80.0 g of NaOH [C] in each dm <sup>3</sup> of solution. <b>Care – the process of solution is exothermic and any concentrated solution is very corrosive.</b>
[H]	<b>aqueous ammonia</b>	2.0 mol dm <sup>-3</sup> NH <sub>3</sub>	Dilute 112 cm <sup>3</sup> of concentrated (35% w/w) ammonia [C] [N] to 1 dm <sup>3</sup> .

**This form should be completed and sent to the Examiner with the scripts.**

### **SUPERVISOR'S REPORT FORM**

The Supervisor's Report should give full details of:

- (a) any help given to a candidate (including the nature of the help given and the name and candidate number of the candidate),
- (b) any cases of faulty apparatus (including the nature of the problem, the action taken to rectify it, any additional time allowed, and the name and candidate number of the candidate),
- (c) assistance provided in the case of colour blindness,
- (d) any other difficulties experienced by candidates, or any other information that is likely to assist the Examiner, especially if this information cannot be discovered in the scripts.

Cases of individual hardship, such as illness, bereavement or disability, should be reported direct to CIE on the normal Special Consideration form.

#### **Supervisor's Report**



**Information required by Examiners**

Sample set of numerical results, clearly marked 'Supervisor's Results'. These may be marked on a spare copy of the Question Paper.

**A plan of work benches for each session/laboratory.**

**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) .....

Centre Number .....

Centre Name .....

If scripts are required by CIE to be despatched in more than one envelope, it is essential that a copy of the relevant Supervisor's report, Supervisor's results and the appropriate seating plan(s) are sent inside **each** envelope.

