



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

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**PHYSICS**

**9702/31**

Paper 31 Advanced Practical Skills 1

**May/June 2010**

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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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 number quoted above.

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This document consists of **7** printed pages and **1** blank page.



## Preparing apparatus

These instructions detail the apparatus required for the experiments in the Question Paper. It is essential that absolute confidentiality is maintained in advance of the examination: the contents of these instructions must not be revealed either directly or indirectly to candidates.

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

If you have problems or queries regarding these instructions, please contact CIE:

by e-mail: international@cie.org.uk,  
or by telephone: +44 1223 553554,  
or by fax: +44 1223 553558,

stating the nature of the query and quoting the syllabus and paper numbers (9702/31).

It is assumed that the ordinary apparatus of a Physics laboratory will be available.

## Number of sets of apparatus

The number of sets of apparatus provided for each experiment should be  $\frac{1}{2}N$ , where  $N$  is 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.

## Organisation of the examination

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

## Assistance to Candidates

Candidates should be informed that, if they find themselves in real difficulty, they may ask the Supervisor for practical assistance, but that the extent of this assistance will be reported to the Examiner, 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.

## Faulty apparatus

In cases of faulty apparatus (not arising from a candidate's mishandling) that prevent the required measurements 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. The candidate should use a spare copy of the Question Paper when the fault has been rectified or when working with a second set of apparatus.

## Supervisor's Report

The Supervisor should complete the Supervisor's Report Form on pages 7 and 8 and enclose it in the envelope containing the answers of the candidates. If more than one envelope is used, a copy of the report must be enclosed in each envelope.

## Question 1

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

4.5V power supply ( $3 \times 1.5\text{V}$  dry cells would be suitable) with suitable terminals. The positive and negative terminals should be clearly labelled.

Ammeter. The meter must be capable of measuring currents in the range of  $0 - 100\text{mA}$  to a precision of  $0.1\text{mA}$ . An analogue or digital meter is suitable.

Voltmeter. The meter must be capable of measuring voltages in the range of  $0 - 5\text{V}$  to a precision of  $0.01\text{V}$ . An analogue or digital meter is suitable.

Nine connecting leads.

Section of wood measuring approximately  $40\text{cm}$  long  $\times$   $4\text{cm}$  wide  $\times$   $2\text{cm}$  deep.

Section of wood measuring approximately  $4\text{cm}$  long  $\times$   $4\text{cm}$  wide  $\times$   $2\text{cm}$  deep.

Twelve  $22\Omega$  resistors with a tolerance of  $\leq 5\%$ ; e.g. Rapid Catalogue reference 62-0330. See Note 1.

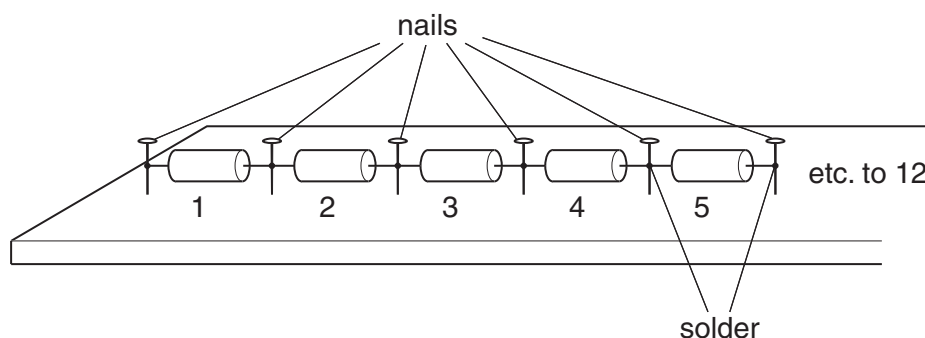
One  $100\Omega$  resistor (or any arrangement of resistors with a total resistance of approximately  $100\Omega$ ) with a tolerance of  $\leq 5\%$ ; e.g. Rapid Catalogue reference 62-0346. See Note 2.

Four crocodile clips.

Switch.

### Notes

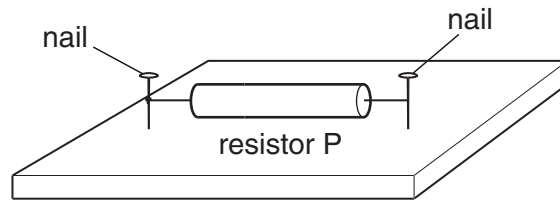
- 1 Connect the twelve  $22\Omega$  resistors in series onto the longer section of wood, as shown in Fig. 1.1.



**Fig. 1.1**

Terminals must be provided so that candidates can make connections between the resistors. One suitable way of providing this is to solder the resistors between evenly spaced nails. Label each resistor in order with a number from 1 to 12.

- 2 Attach the  $100\Omega$  resistor to the shorter section of wood, as shown in Fig. 1.2. Label this “resistor P”. Cover the resistor with opaque plastic tape so that candidates cannot determine its value. Terminals must be provided so that candidates can make connections to the resistor.



**Fig. 1.2**

- 3 If the equipment is to be used by a second candidate, then the apparatus should be dismantled and laid out on the bench.

### **Information required by Examiners**

Sample set of numerical results, clearly labelled “Supervisor’s Results”, obtained out of sight of the candidates.

**Question 2****Apparatus requirements (per set of apparatus unless otherwise specified)**

70 cm length of string. See Note 1.

30 cm length of thin-walled metal or plastic tube of diameter 1 cm – 2 cm. See Note 2.

30 cm ruler with a millimetre scale.

Stopwatch reading to 0.1 s or better.

Access to manual vernier calipers (not digital). See Note 3.

200 ml beaker.

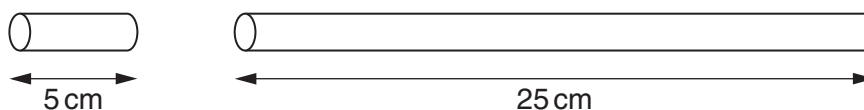
Retort stand of minimum height of 65 cm and clamp. The clamp should initially be attached about 10 cm above the base of the stand.

**Notes**

- 1 Tie a loop at either end of the string so that the total length of the string is about 55 cm. See Fig. 2.1. The loops should be large enough to slide easily onto a clamp.

**Fig. 2.1**

- 2 Cut the tube into two sections of length approximately 5 cm and 25 cm, as shown in Fig. 2.2.

**Fig. 2.2**

- 3 Place the vernier calipers where they can be shared. There should ideally be one set of vernier calipers between every three to four candidates.
- 4 If the apparatus is to be used by a second candidate, then it should be restored to its original state.

**Information required by Examiners**

Sample set of numerical results, clearly labelled “Supervisor’s Results”, obtained out of sight of the candidates.

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

**SUPERVISOR'S REPORT FORM**

**General Certificate of Education Advanced Subsidiary Level and Advanced Level**

**May/June Session 2010**

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) any accidents that occurred during the examination;
- (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.

**Information required by Examiners**

For each question, please enclose a sample set of numerical results, obtained out of sight of the candidates and clearly labelled "Supervisor's Results".

**Supervisor's Report**



**Supervisor's Report (continued)**

**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 .....

Centre Number .....

Name of Centre .....

