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**PHYSICS**

**9702/31**

Paper 3 Advanced Practical Skills 1

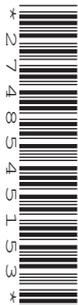
**May/June 2017**

**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 Confidential Instructions, please contact Cambridge 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 Confidential 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 Confidential Instructions must not be revealed either directly or indirectly to candidates.

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

## 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 Confidential 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.

## 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. Any action taken must be reported on the Supervisor's Report.

## Supervisor's Report

The Supervisor should complete the Supervisor's Report 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)**

Low voltage power supply fixed at 1.5 V or 2 V d.c., or 1.5 V dry cell with terminals.

Digital ammeter set to the range 0–200 mA reading to the nearest 0.1 mA.

If a digital multimeter is used, the range should be fixed and any unused terminals should be covered.

22  $\Omega$  resistor in a component holder. See Note 1.

Metre rule with a millimetre scale. See Note 2.

110 cm length of 38 swg or 0.15 mm diameter constantan wire. See Note 2 and Note 3.

Two crocodile clips. See Note 4.

Seven connecting leads.

Switch.

**Notes**

- 1 The resistor should have a minimum power rating of 0.25 W and a maximum tolerance of 5% (e.g. RS Components product code 386-666).
- 2 The wire should be attached to the metre rule as shown in Fig. 1.1. The wire should be firmly taped and as free from kinks as possible.



**Fig. 1.1**

- 3 If constantan wire is not available, 34 swg or 0.25 mm diameter nichrome wire may be used.
- 4 The jaws of the crocodile clips should be cleaned so that they make a good electrical contact with the resistance wire.
- 5 The apparatus should be laid out on the bench. If the apparatus is to be used by another candidate, then it should be dismantled and restored to its original state.

**Information required by Examiners**

Sample set of numerical results, clearly labelled “Supervisor’s Results” and obtained out of sight of the candidates by the Supervisor, who should be a teacher of Physics or other competent physicist.

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

Two stands each of height at least 60 cm.

Two bosses.

Cylindrical wooden rod of approximate length 20 cm and diameter 6 mm.

Two table tennis (ping-pong) balls.

100 g slotted mass.

Two wooden blocks, one with dimensions 15 cm × 2 cm × 2 cm and the other with dimensions 5 cm × 2 cm × 2 cm. See Note 1.

Stopwatch reading to the nearest 0.1 s or better.

Metre rule with a millimetre scale.

Two lengths of string. See Note 2.

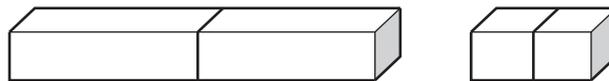
Scissors.

Small roll of adhesive tape.

Small tray for the table tennis balls.

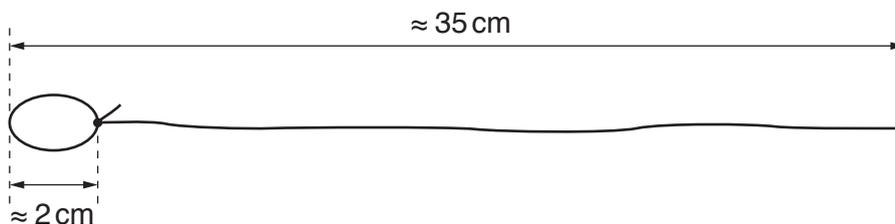
**Notes**

- 1 Each wooden block should have a line drawn around its midpoint as shown in Fig. 2.1.



**Fig. 2.1**

- 2 The two lengths of string should each be tied as shown in Fig. 2.2.



**Fig. 2.2**

- 3 The apparatus should be laid out on the bench. If the apparatus is to be used by another candidate, then it should be dismantled and restored to its original state. Any used adhesive tape should be discarded.

**Information required by Examiners**

Sample set of numerical results, clearly labelled "Supervisor's Results" and obtained out of sight of the candidates by the Supervisor, who should be a teacher of Physics or other competent physicist.

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

### **SUPERVISOR'S REPORT**

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 directly to Cambridge 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 .....