

Cambridge  
International  
AS & A Level

**Cambridge International Examinations**  
Cambridge International Advanced Subsidiary and Advanced Level

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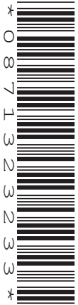
**PHYSICS**

**9702/32**

Paper 3 Advanced Practical Skills 2

**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 **6** printed pages and **2** blank pages.

### **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)**

Wooden strip of length 90.0 cm, with approximate cross-section 2 cm × 1 cm. See Note 1.

One woodscrew of approximate length 2 cm. See Note 1.

105cm length of resistance wire. The wire should have a resistance of approximately  $20\Omega\text{m}^{-1}$  (e.g. 0.20mm diameter constantan, 36swg constantan, 0.25mm diameter nichrome or 32swg nichrome). See Note 1.

3V d.c. power supply (e.g. two 1.5V cells).

Switch.

Eleven connecting leads.

Three crocodile clips, suitable for connecting to leads. See Note 2.

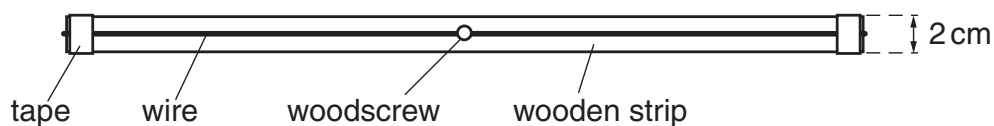
Two voltmeters, each with a range of 0–20V and reading to 0.01V. Multimeters set to this range are suitable provided the range switch is fixed and any unused terminals are covered.

Two resistors each with resistance  $10\Omega$  and power rating 0.5W (e.g. RS Components product code 132-012). Each should be fitted with terminals to enable connection to leads.

Metre rule with a millimetre scale.

**Notes**

- 1 Screw the woodscrew into the wooden strip half-way along its length. Wrap the middle of the resistance wire tightly around the woodscrew. Wrap the ends of the resistance wire over the ends of the wooden strip, and secure them with tape, as shown in Fig. 1.1.



**Fig. 1.1**

- 2 The jaws of the crocodile clips should be cleaned so that they make good electrical contact with the wire.
- 3 The apparatus should be laid out on the bench. If the apparatus is to be used by another candidate, then it should be restored to its original state.

**Information required by Examiners**

Resistance per metre of the resistance wire.

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)**

Five expendable springs each with approximate outside diameter 15 mm, approximate coiled length 20mm and approximate spring constant  $25\text{Nm}^{-1}$  (e.g. Philip Harris product code B8G87194). See Note 1.

50g mass hanger.

100g slotted mass to fit on the mass hanger. The diameter of the 100g slotted mass should be greater than the diameter of the mass hanger.

Stand, boss and clamp.

Stopwatch reading to 0.1 s or better.

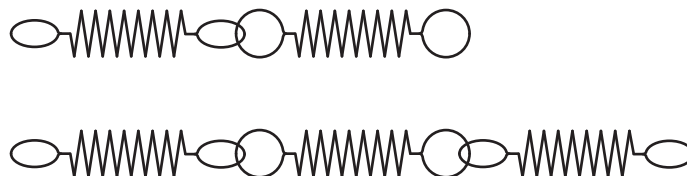
$180^\circ$  protractor with  $1^\circ$  divisions.

Metre rule with a millimetre scale.

Adhesive tape (e.g. Sellotape) and scissors.

**Notes**

- Two springs should be linked together in series, and the other three springs should be linked together in series, as shown in Fig. 2.1.



**Fig. 2.1**

- The apparatus should be laid out on the bench. If the apparatus is to be used by another candidate, then it should be restored to its original state. Any adhesive tape attached to the springs should be removed, or new sets of springs should be provided.

**Information required by Examiners**

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

1. Resistance per metre of the resistance wire used in **Question 1**.

resistance per metre = .....  $\Omega \text{ m}^{-1}$

2. 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 .....