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**PHYSICS**

**9702/34**

Paper 3 Advanced Practical Skills 2

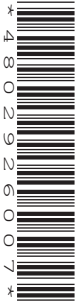
**May/June 2017**

**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 **8** printed 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)

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

String. See Note 1.

50 g mass hanger with the mass value clearly shown.

100 g or 50 g slotted masses to a total of 450 g. Each slotted mass should have the mass value clearly shown. It should be possible to fit all the slotted masses on the mass hanger.

Two stands, two bosses and two clamps.

Two G-clamps suitable for securing the stands to the bench.

Stopwatch reading to 0.1 s or better.

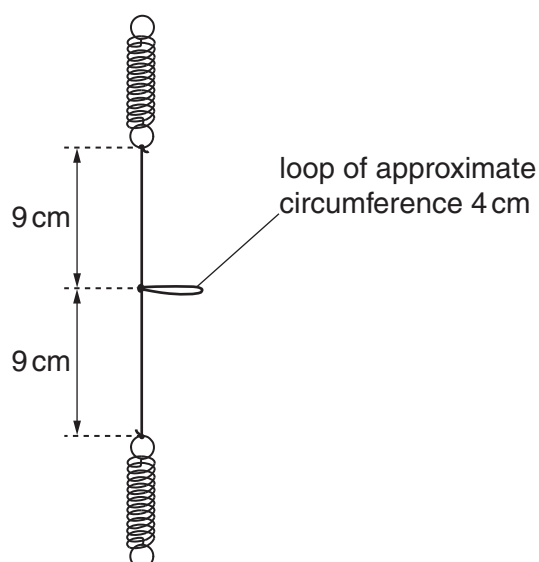
Metre rule with a millimetre scale.

30 cm ruler with a millimetre scale.

180° protractor with 1° divisions.

#### Notes

- 1 Tie the springs together with a length of string. Make a loop half-way along the string, as shown in Fig. 1.1.



**Fig. 1.1**

- 2 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**

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)**

Rigid plastic pipe of length 15.0 cm and external diameter in the range 12 mm to 25 mm (e.g. 15 mm plastic water pipe or 21.5 mm overflow pipe). See Note 1 and Note 2.

Paper clips. See Note 1.

String. See Note 1 and Note 2.

Card. See Note 1.

Wooden strip of length 50.0 cm, and approximate cross-section 2 cm × 1 cm. See Note 2.

Flat-headed nail of diameter 3.0 mm and length 6 cm.

Stand and boss. The boss should be capable of clamping the nail securely.

30 cm ruler with a millimetre scale.

180° protractor with 1° divisions.

Transparent container of approximate height 20 cm and approximate diameter 10 cm (e.g. a beaker or a cut-down plastic bottle). It should contain water to a depth of 15 cm.

Plumb-line of approximate length 15 cm with a loop at the free end of its thread.

Paper towels to mop up any spillages.

**Notes**

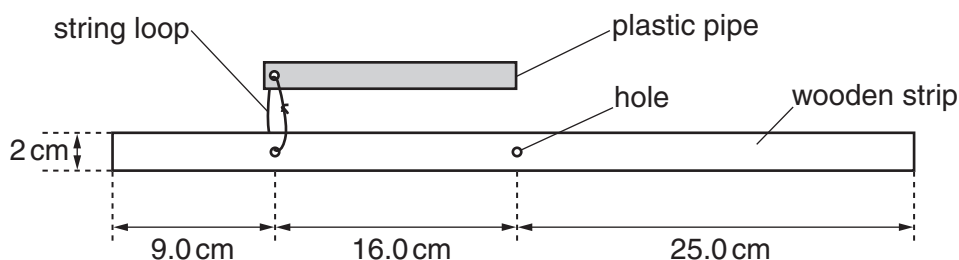
- 1 Thread a number of paper clips onto a string loop of circumference 10 cm. The total mass of the paper clips and their string loop should be approximately half of the mass of the plastic pipe.

Write the total mass of the paper clips and string loop in grams, to the nearest 0.1 g, on the card, as in the example shown in Fig. 2.1.

<p>Mass of paper clips and string loop</p> <p><math>m = \dots\dots\dots\text{g}</math></p>
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**Fig. 2.1**

- 2 Drill two holes of diameter 4 mm centrally through the wooden strip at the positions shown in Fig. 2.2.  
 Drill a hole of diameter 4 mm all the way through the plastic pipe near to one end.  
 Connect the plastic pipe and wooden strip together using a string loop of circumference 10 cm, 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 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.

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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 .....