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**PHYSICS**

**9702/32**

Paper 3 Advanced Practical Skills 2

**May/June 2015**

**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 Cambridge  
by e-mail: info@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 **8** printed pages.

## 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 Cambridge:

by e-mail: info@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 (9702/32).

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)**

Wooden strip of length 100 cm and approximate cross-section 2 cm × 0.5 cm (a metre rule would be suitable). See Note 1.

Two expendable springs 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 Notes 1 and 2.

300 g mass with a hook. See Note 3.

Two stands, each of minimum height 50 cm.

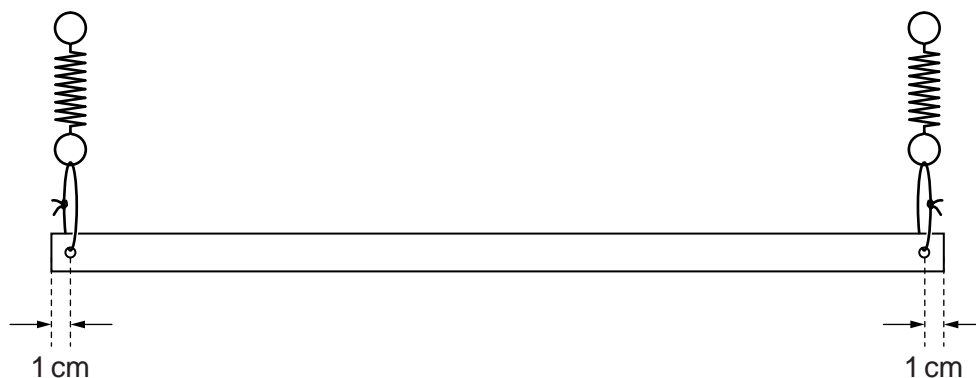
Two bosses and two clamps.

Stopwatch reading to 0.1 s or better.

Metre rule with a millimetre scale.

**Notes**

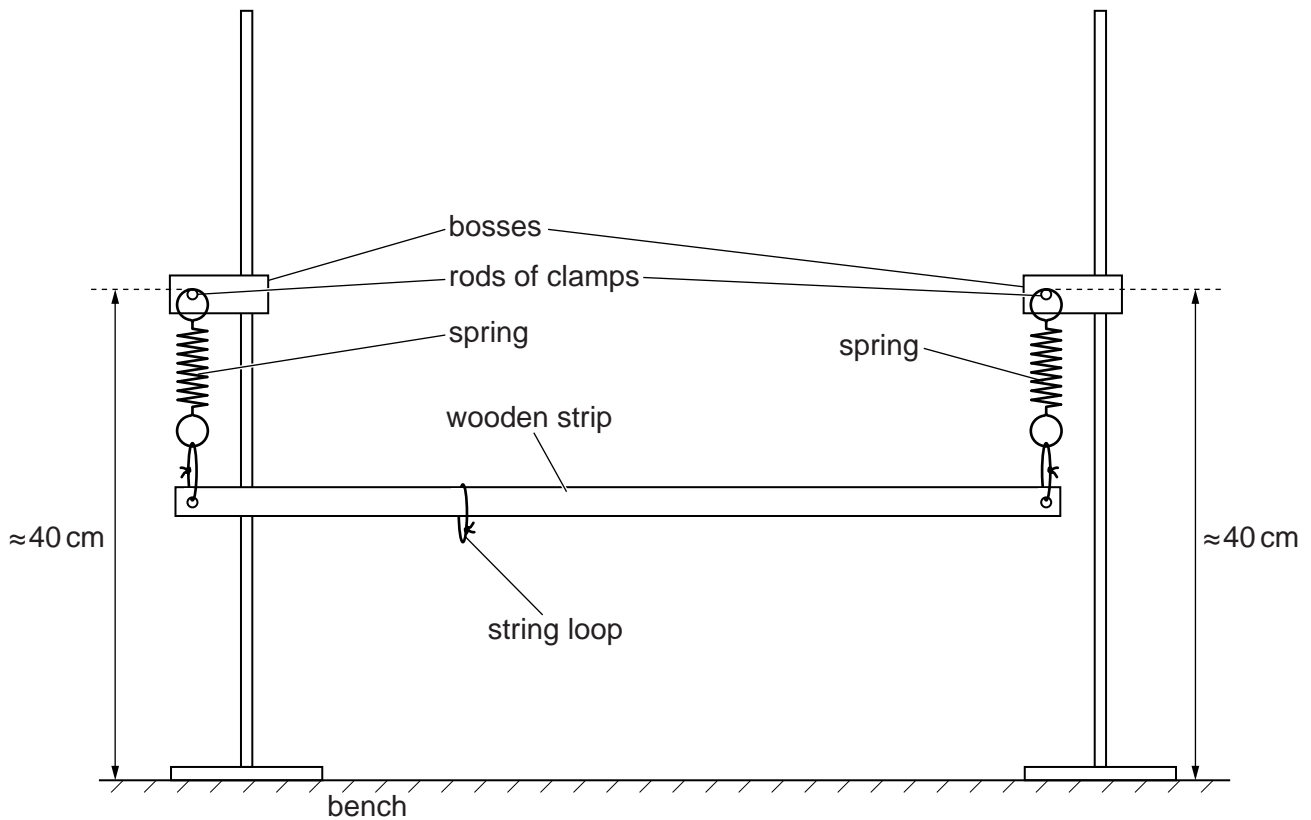
- 1 The wooden strip should have two holes drilled through it at the positions shown in Fig. 1.1. A spring should be attached to each end of the strip using a string loop of approximate circumference 8 cm as shown.



**Fig. 1.1**

- 2 An additional string loop of approximate circumference 10 cm should be provided.
- 3 The 300 g mass (which could be a mass hanger with masses securely taped to it) should have its value of mass concealed and should be labelled M.

- 4 The apparatus should be assembled as shown in Fig. 1.2. The rods of the clamps should be 40 cm above the bench. The remaining apparatus should be laid out on the bench.



**Fig. 1.2**

- 5 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.

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

250 ml beaker (approximate diameter 70 mm) containing water to 2 cm below the top.

Two 30 cm lengths of copper wire with diameter between 0.6 mm and 0.8 mm. See Note 1.

Expendable spring 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 2.

Stand, boss and clamp.

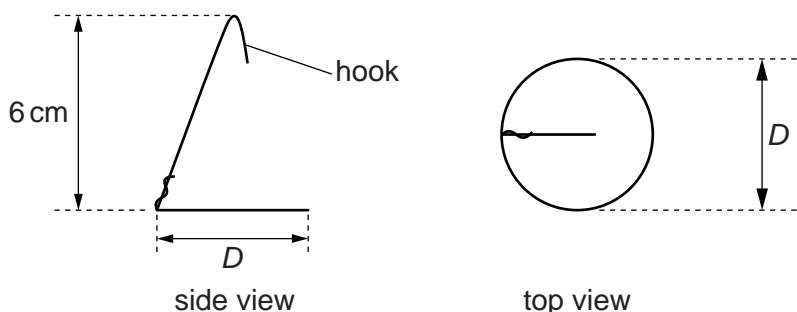
Thin wooden stick of approximate length 7 cm (e.g. a cocktail stick). See Note 2.

30 cm ruler with a millimetre scale.

Paper towels.

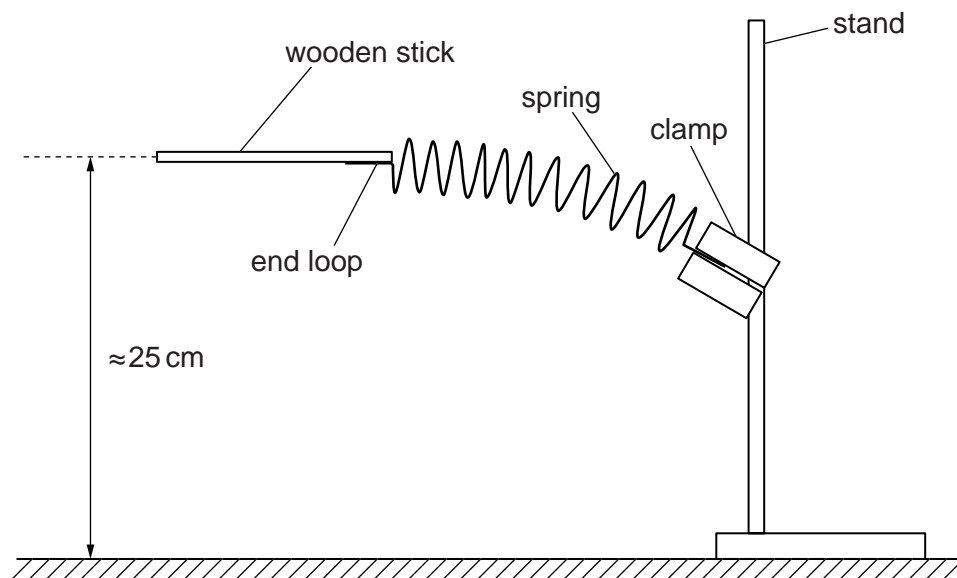
**Notes**

- 1 Each length of wire should be formed into a circular loop with a hook as shown in Fig. 2.1. Any excess wire should be cut off.  
The circular loop should be horizontal when the wire is suspended by its hook.  
One loop should have a diameter  $D$  between 5 cm and 6 cm and the other loop should have a diameter  $D$  between 2.5 cm and 3.0 cm.



**Fig. 2.1** (not to scale)

- 2 The spring should be stretched so that it is permanently deformed. When the force is removed, there should be spaces of approximately 2 mm between the coils. The wooden stick should be attached (e.g. with glue or tape) to one of the end loops. The other end loop should be clamped as shown in Fig. 2.2, with the wooden stick horizontal and approximately 25 cm above the bench.



**Fig. 2.2**

- 3 The remaining apparatus should be laid out on the bench.
- 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”, and 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**

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 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 .....

