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**PHYSICS**

**9702/34**

Paper 3 Advanced Practical Skills 2

**May/June 2014**

**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](mailto: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 **11** 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 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 (9702/34).

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 11 and 12 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 50 g slotted masses.

27 cm length of steel wire with approximate diameter 2 mm (e.g. coat hanger wire). See Note 1 and Note 2.

180° protractor with 1° divisions.

30 cm ruler with millimetre divisions.

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).

Mass hanger and masses with a total mass of 200 g. See Note 3.

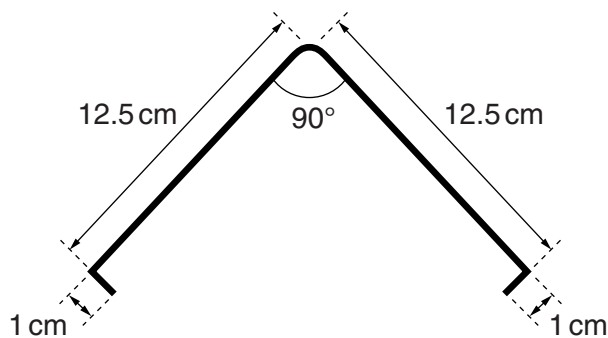
Stand, boss and clamp.

5 cm length of metal strip of approximate width 5 mm and approximate thickness 1 mm. Steel, copper or aluminium is suitable. See Note 4.

Stopwatch reading to 0.1 s or better.

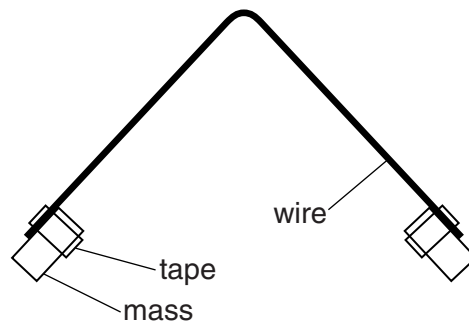
**Notes**

1 The steel wire should be bent into the shape shown in Fig. 1.1.



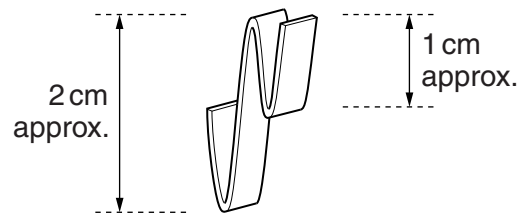
**Fig. 1.1**

- 2 The two 50 g masses should be taped to the wire as shown in Fig. 1.2. The ends of the steel wire should fit into the central holes in the slotted masses.



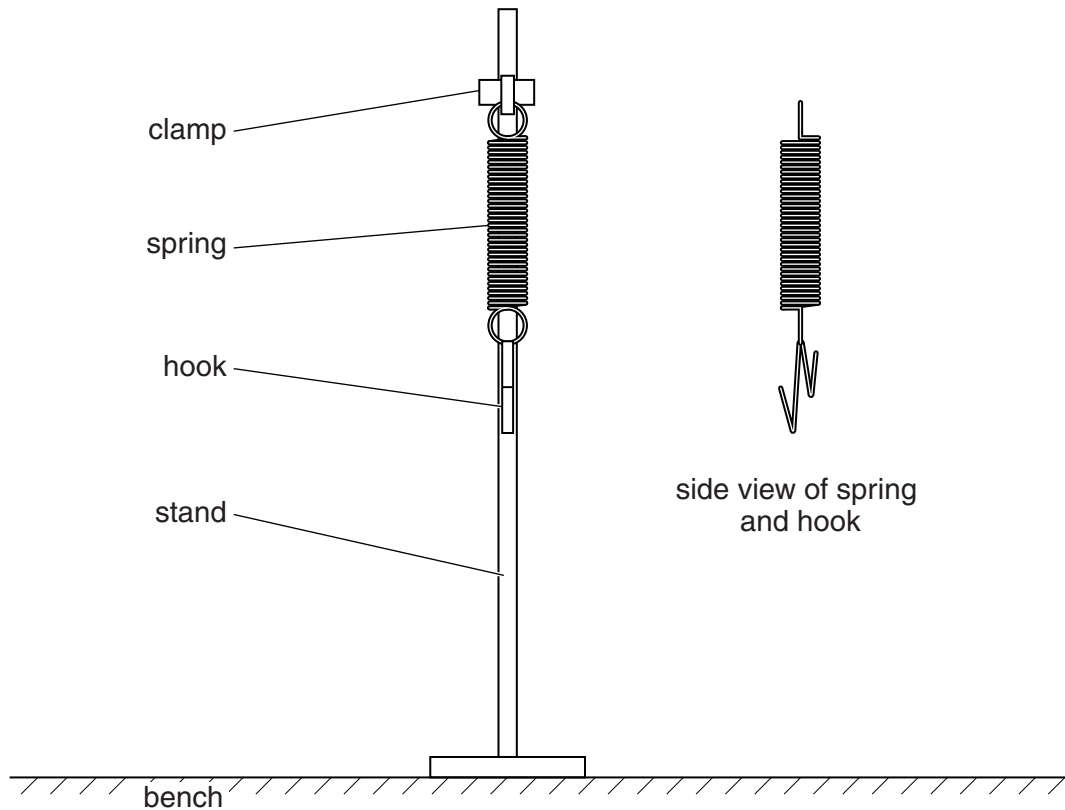
**Fig. 1.2**

- 3 The mass hanger and masses should be securely taped together.
- 4 The metal strip should be bent into a hook with the shape shown in Fig. 1.3.



**Fig. 1.3**

- 5 The spring should be clamped vertically approximately 40 cm above the bench as shown in Fig. 1.4. The top of the spring should be held rigidly in the clamp and the hook should be hooked on to the bottom of the spring.



**Fig. 1.4**

- 6 The remaining 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.

## Question 2

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

Two identical hard spheres, e.g. glass marbles, with diameter  $18 \pm 3$  mm.

Small container for the spheres (e.g. plastic Petri dish).

Grooved ramp. See Note 1.

Flat, smooth wooden board with approximate dimensions  $35 \text{ cm} \times 35 \text{ cm} \times 1 \text{ cm}$ .

Wooden strip of approximate length  $34 \text{ cm}$  and approximate cross-section  $2 \text{ cm} \times 2 \text{ cm}$ . See Note 2.

Two cylindrical wooden or metal rods of diameter  $1.8$  to  $2.2 \text{ mm}$  and approximate length  $5 \text{ cm}$  (e.g. cocktail sticks or lengths of wire).

Double-sided adhesive tape (but not foam tape). See Note 2.

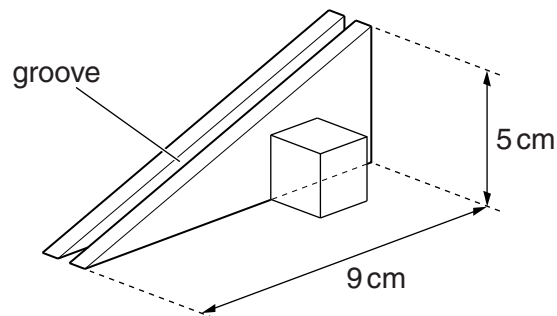
Half-metre rule (or metre rule) with a millimetre scale.

30 cm ruler with a millimetre scale.

Vernier calipers, shared between at most 3 candidates.

### Notes

- 1 Make the ramp from a triangle cut from grooved board (e.g. tongue and groove board). Glue a wooden block to the side so that the ramp stands vertically, as shown in Fig. 2.1.

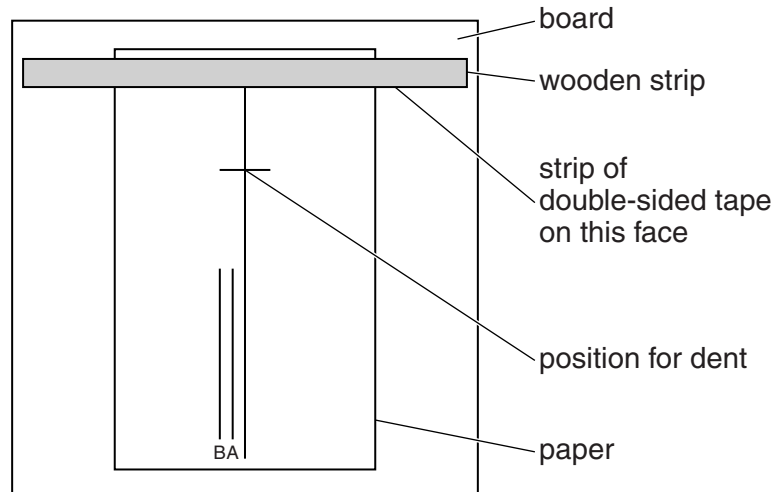


**Fig. 2.1**

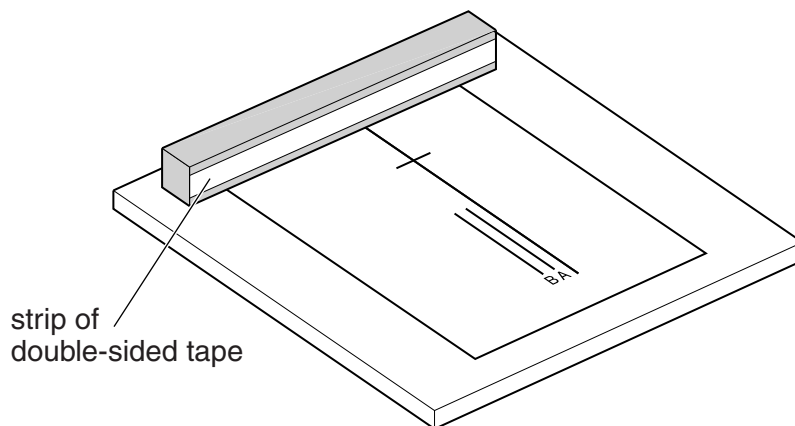
- 2 Make a photocopy of page 8 and then lay it on the board and fix the wooden strip to the board and paper using double-sided adhesive tape, as shown in Figs. 2.2 and 2.3.

Fix another strip of double-sided tape to the front face of the wooden strip, as shown in Fig. 2.3, leaving its backing tape in position until shortly before the examination.

Use a nail to make a small dent (approximate diameter 2 mm) through the paper into the board at the position shown in Fig. 2.2.

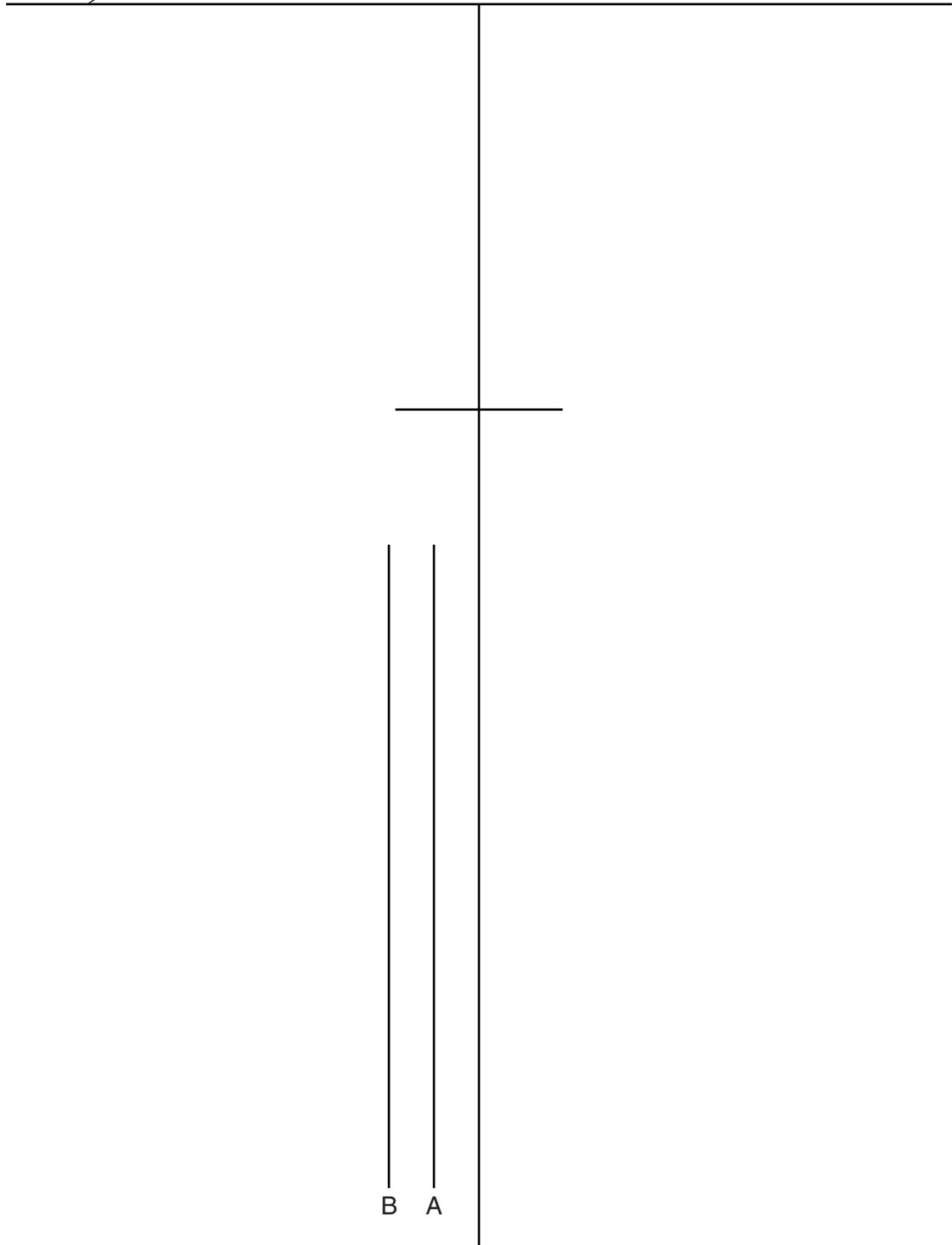


**Fig. 2.2**



**Fig. 2.3**

align front face of wooden strip with this line





- 3 The apparatus should be laid out on the bench with the board level. If it is to be used by another candidate, then it should be returned to its original state. It may be necessary to replace the wooden strip, double-sided tape and paper. If the wooden ramp has been marked, then the marks should be removed or the ramp replaced.

### **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 .....

