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**PHYSICS**

**9702/32**

Paper 3 Advanced Practical Skills 2

**May/June 2016**

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 CIE  
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 **9** printed pages and **3** blank 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 CIE:

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 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)**

Stiff card. See Note 1.

Scissors to cut the card.

Sphere of modelling clay (e.g. Plasticine) of approximate mass 10 g.

Plumb-line of length 40 cm, with a loop of approximate circumference 3 cm tied at its free end.

Stand, boss and clamp.

Optical pin.

Split cork to hold the pin in the clamp.

Stopwatch reading to 0.1 s or better.

30 cm ruler with a millimetre scale.

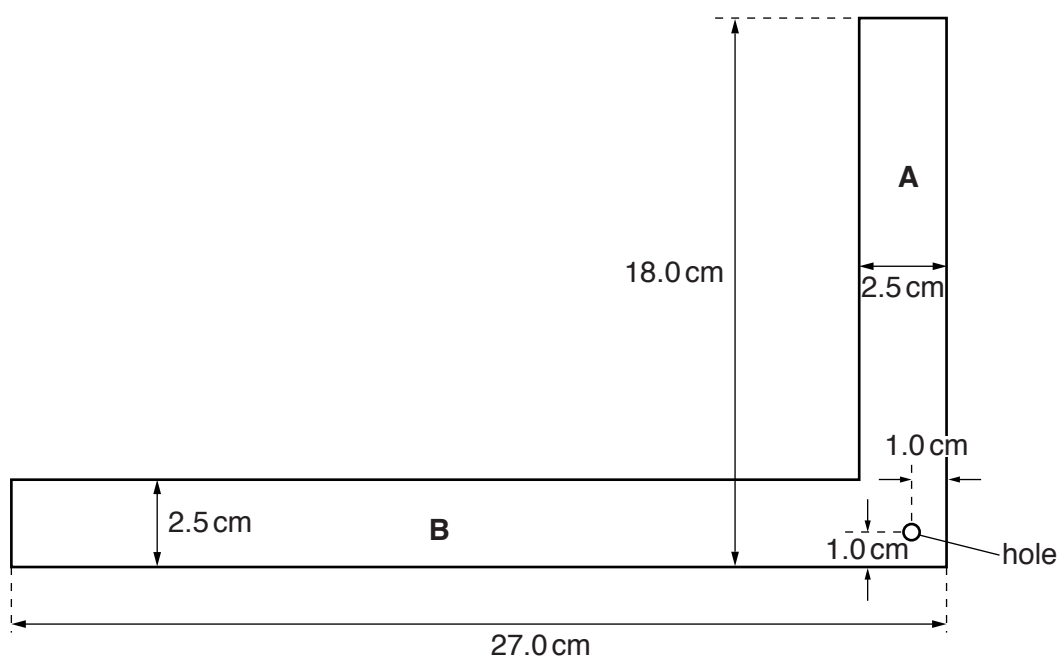
180° protractor with 1° divisions.

**Notes**

1 The card should be thick (at least 400 gsm, but 800 gsm is preferable if available).

An L-shape should be cut from the card and a hole of diameter 2 mm made as shown in Fig. 1.1.

The long arm should be labelled B and the short arm should be labelled A.



**Fig. 1.1**

- 2 Additional L-shaped cards should be available for candidates if requested.
- 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 and a new L-shaped card provided.

**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 cylindrical 500 ml plastic water bottles. See Note 1 and Note 2.

Wooden strip of approximate cross section 10 mm × 20 mm and length 50 cm. See Note 3.

String. See Note 4.

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 4.

Flat-headed nail of approximate diameter 3 mm and approximate length 50 mm. See Note 4.

Two stands.

Boss suitable for attaching the nail to the stand.

Two further bosses.

Two clamps.

Metre rule (or half metre rule) with a millimetre scale.

Two 500 ml measuring jugs (or beakers). One jug should contain 500 ml of water.

Funnel to fit into the neck of the water bottles.

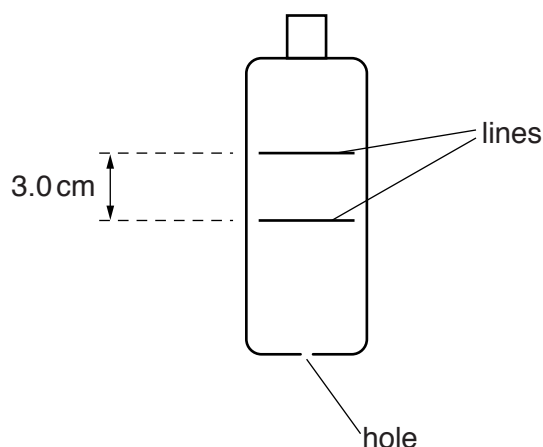
Stopwatch reading to 0.1 s or better.

Paper towels to mop up any spillages.

Shallow tray with approximate dimensions 30 cm × 20 cm and depth 5 cm.

### Notes

- Each bottle should have two lines drawn on it 3.0 cm apart and near the middle of the bottle, as shown in Fig. 2.1. A permanent ink pen should be used.

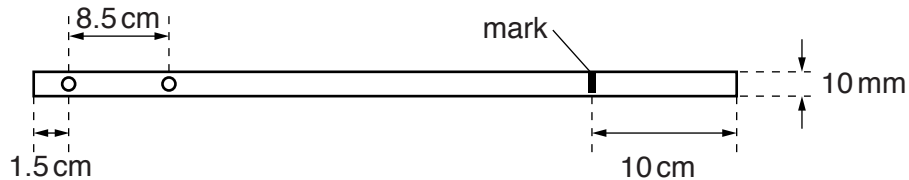


**Fig. 2.1**

- 2 One bottle should be labelled A using a permanent ink pen, and should have a hole of diameter 1.5 mm drilled in its base, as shown in Fig. 2.1.

The other bottle should be labelled B and should have a hole of diameter 2.5 mm drilled in its base.

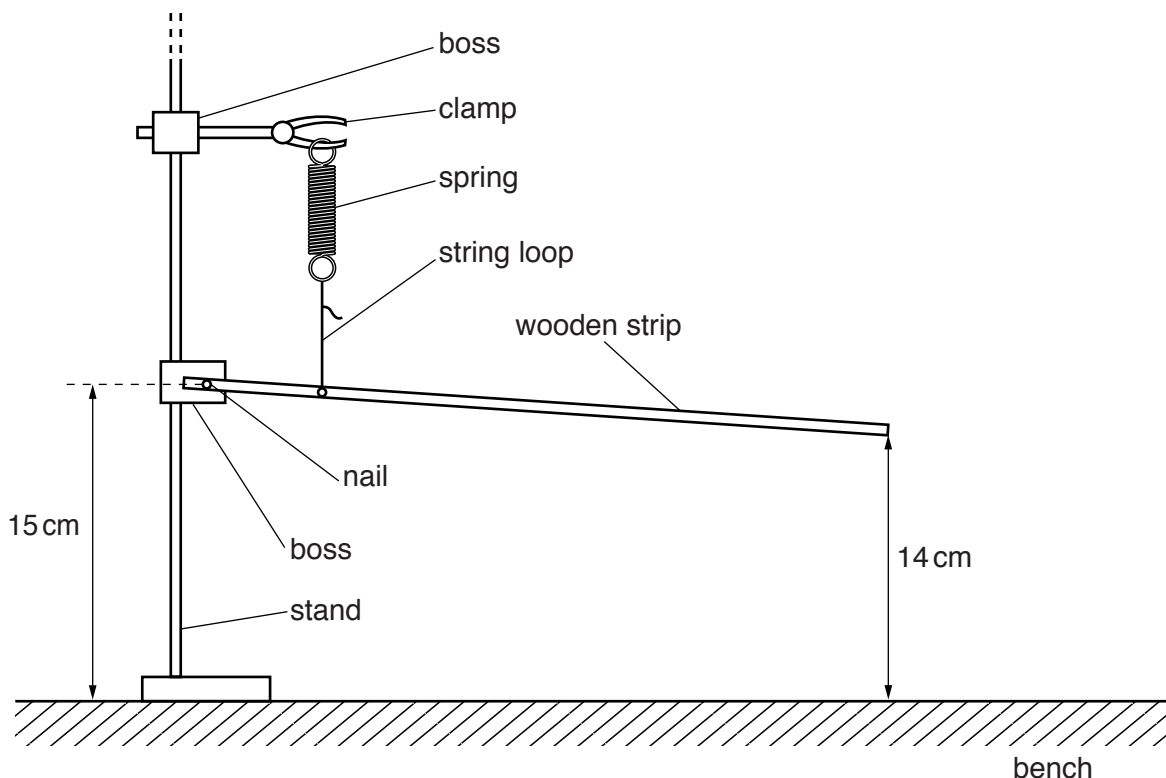
- 3 The wooden strip should have two holes of diameter 3.5 mm drilled in it at the positions shown in Fig. 2.2.



**Fig. 2.2** (not to scale)

Using a fine permanent ink marker pen, a small mark should be made on the side of the strip as shown in Fig. 2.2.

- 4 Assemble the apparatus as shown in Fig. 2.3.



**Fig. 2.3**

The wooden strip should pivot freely on the nail.

The nail should be 15 cm above the bench and the free end of the wooden strip should be 14 cm above the bench.

- 5 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 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 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 CIE 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 .....

