
PHYSICS

9702/31

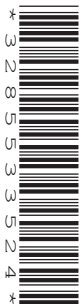
Paper 3 Advanced Practical Skills 1

October/November 2014

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Preparing apparatus

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Supervisor's Report

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Question 1

Apparatus requirements (per set of apparatus unless otherwise specified)

Stand of height at least 60 cm, boss and clamp.

Metre rule with a millimetre scale.

String. See Note 1.

180° protractor reading to the nearest degree or better.

Eight 10 g slotted masses.

Stopwatch reading to 0.1 s or better.

Notes

- 1 The string should be supplied as shown in Fig. 1.1.

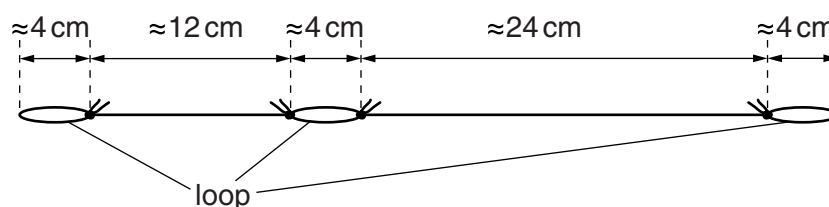


Fig. 1.1

Each loop should be big enough to accommodate the eight slotted masses as shown in Fig. 1.2.

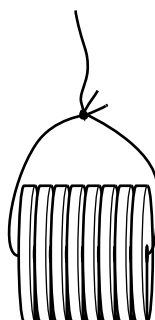


Fig. 1.2

- 2 The apparatus should be laid out on the bench. If it 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)**

Wooden rod of approximate diameter 8 mm and approximate length 10 cm.

100 g mass hanger.

60 cm of 26 swg constantan or nichrome wire.

60 cm of 38 swg constantan or nichrome wire.

Scissors.

Metre rule with a millimetre scale.

Micrometer (shared between at most two candidates).

Small container for the wires.

Notes

- 1 The apparatus should be laid out on the bench. If the apparatus is to be used by another candidate, the rod and all the used wire should be removed. New wires and a new wooden rod should be provided.

Information required by Examiners

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Supervisor's Report



Supervisor's Report (continued)**Declaration**

(to be signed by the Supervisor)

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Signed

Name

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PHYSICS

9702/33

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Question 1

Apparatus requirements (per set of apparatus unless otherwise specified)

Stand of height at least 60 cm.

Boss.

Flat-headed nail of approximate length 5 cm and approximate diameter 2.5 mm.

Wooden cylindrical rod of length 55 cm with approximate diameter 9 mm and approximate mass 20 g. See Note 1 and Note 2.

Small closed hook. See Note 1.

Two paper clips each of approximate length 3 cm.

Sphere of modelling clay (e.g. Plasticine). See Note 2.

Metre rule with a millimetre scale.

Stopwatch reading to 0.1 s or better.

Notes

- 1 The diameter of the hook should be similar to that of the wooden rod. The nail should fit easily through the hook. The hook should be screwed centrally into one end of the wooden rod as shown in Fig. 1.1.

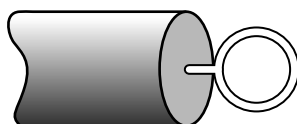


Fig. 1.1

- 2 The sphere of modelling clay must have the same mass as the total mass of the wooden rod and hook.
- 3 The apparatus should be laid out on the bench. If it is to be used by a second candidate, then it should be restored to its original state. A fresh sphere of modelling clay 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.

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

Two stands.

Two clamps and two bosses.

Stiff, smooth board with approximate dimensions 60 cm × 15 cm × 1 cm made from wood, plywood or MDF.

Metre rule with a millimetre scale.

Table tennis (ping-pong) ball of approximate mass 2 g and approximate diameter 4.0 cm.

100 g slotted mass.

180° protractor with 1° divisions.

Open-topped container (e.g. plastic crate or cardboard container) with approximate dimensions 40 cm × 30 cm and approximate height 25 cm.

Small box or dish for the table tennis ball.

Notes

- 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.

Information required by Examiners

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Supervisor's Report



Supervisor's Report (continued)**Declaration**

(to be signed by the Supervisor)

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Signed

Name

Centre number

Name of Centre



PHYSICS

9702/34

Paper 3 Advanced Practical Skills 2

October/November 2014

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Number of sets of apparatus

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Supervisor's Report

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Question 1**Apparatus requirements (per set of apparatus unless otherwise specified)**

Board of minimum dimensions 22 cm × 31 cm. See Note 1.

Three pins of approximate length 3 cm, e.g. optical pins.

Small tray for the pins.

Semicircular perspex or glass block of approximate diameter 9 cm (e.g. Philip Harris product code B8A45470). See Note 2.

180° protractor with 1° divisions.

30 cm ruler with a millimetre scale.

Small set square.

Notes

- 1 The board should be made from a material into which it is possible to stick pins securely, e.g. cork or the material used for a noticeboard.

A photocopy of Fig. 1.1 should be pasted on to the board.



A ————— B

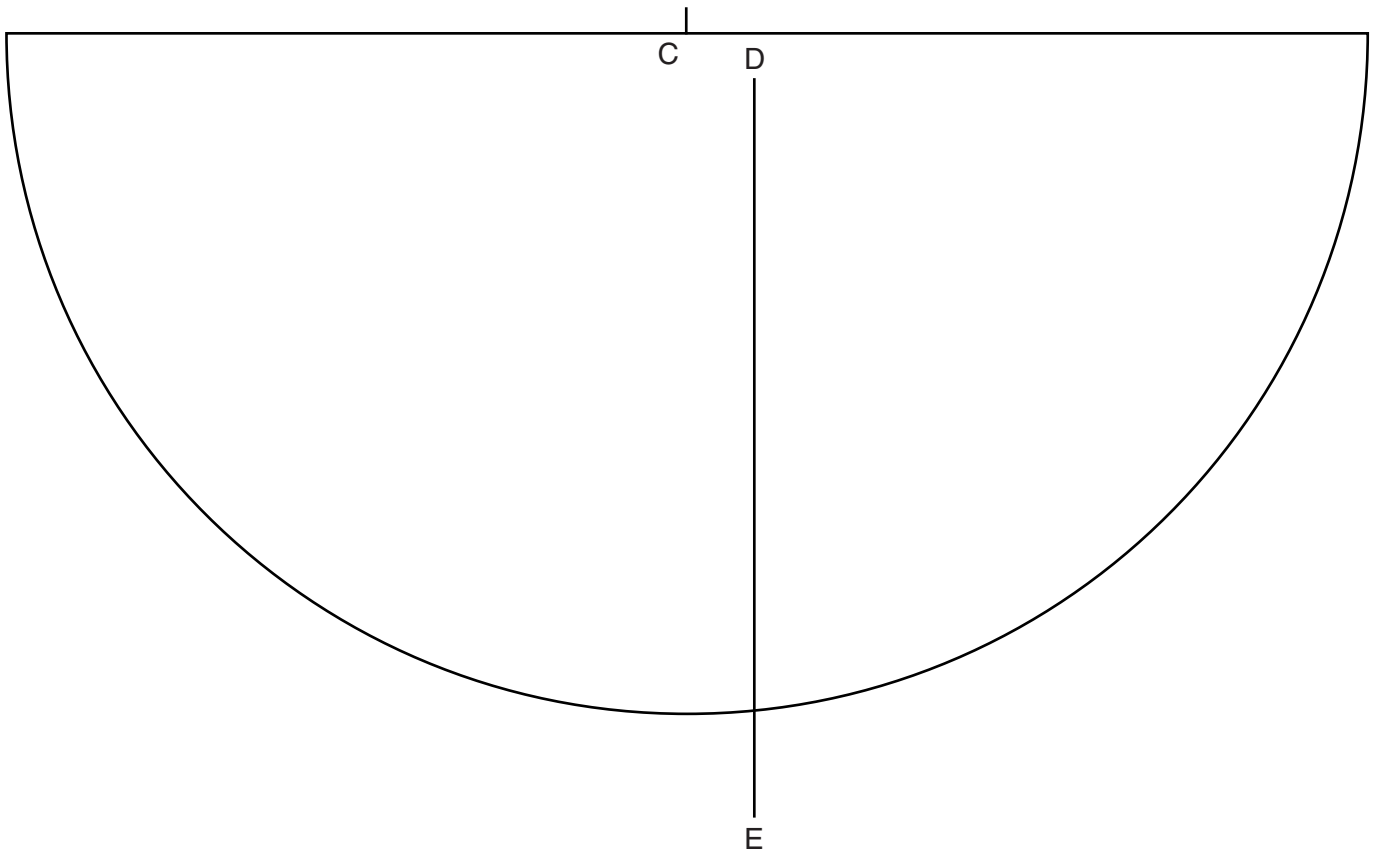


Fig. 1.1

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- 2 Use a fine permanent marker pen to make a small mark on one of the flat faces of the block at the centre of the semicircle, as shown in Fig. 1.2.

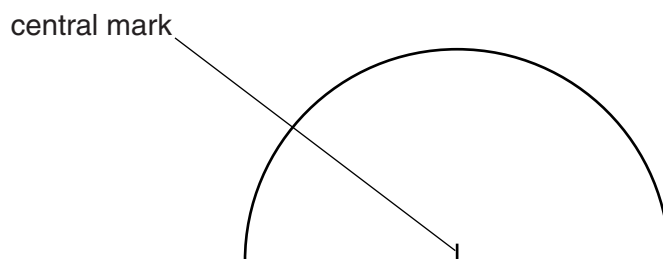


Fig. 1.2

- 3 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 with a new board and paper.

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 sharpened, hexagonal pencils with equal lengths. The length should be approximately 16 cm. The exteriors of the pencils should be a plain light colour. See Note 1.

Measuring cylinder (glass or plastic) of approximate diameter 3 cm and approximate height 25 cm. See Note 2.

Enough uncooked rice to fill the measuring cylinder. See Note 2.

Round, flat-headed nail with approximate length 6 cm and approximate diameter 3 mm.

Wooden strip with an approximate length 30 cm and approximate cross-section 1.5 cm × 1.5 cm. See Note 3.

Stand and boss.

30 cm ruler with a millimetre scale.

Stopwatch reading to 0.1 s or 0.01 s.

Access to vernier calipers, shared between at most three candidates.

Notes

- 1 Use a fine permanent marker pen to make marks around each pencil and to label them as shown in Fig. 2.1.

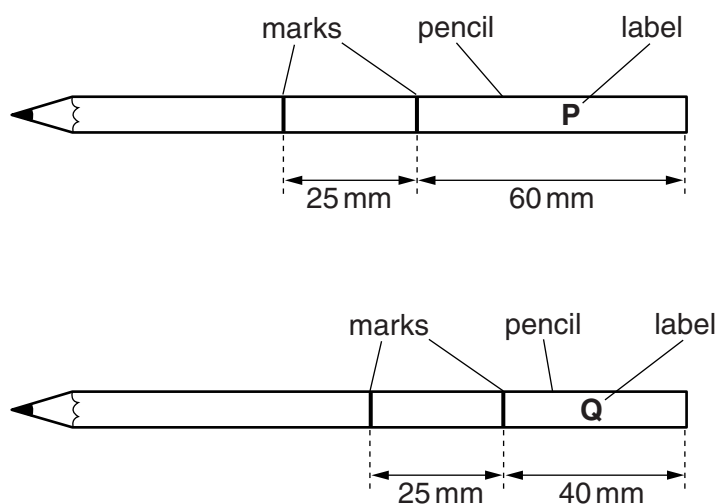


Fig. 2.1

- 2 Fill the measuring cylinder to the top with rice.

- 3 Drill a hole through the wooden strip approximately 1 cm from one end, as shown in Fig. 2.2. The diameter of the hole should be slightly larger than the diameter of the nail.

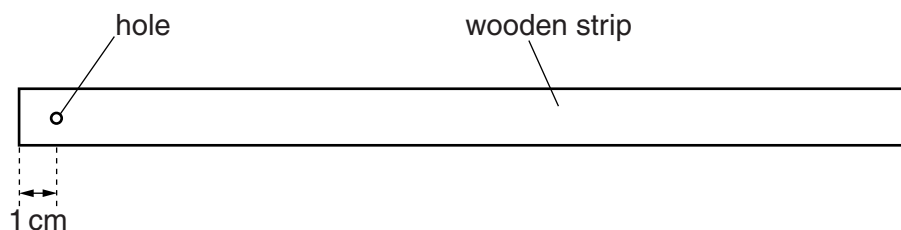


Fig. 2.2

- 4 Assemble the stand, boss, nail and wooden strip as shown in Fig. 2.3, and ensure that the wooden strip swings freely.

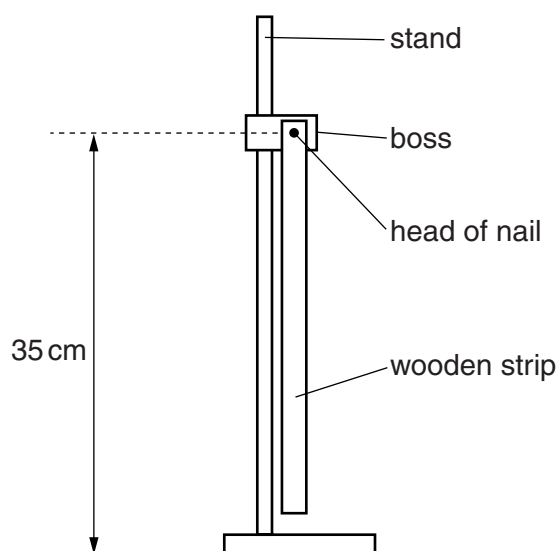


Fig. 2.3

- 5 The pencils 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, ensuring that the measuring cylinder is filled to the top with rice.

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Sample set of numerical results, clearly labelled "Supervisor's Results", and obtained out of sight of the candidates.

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Supervisor's Report



Supervisor's Report (continued)**Declaration**

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Name

Centre number

Name of Centre



PHYSICS

9702/35

Paper 3 Advanced Practical Skills 1

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Question 1

Apparatus requirements (per set of apparatus unless otherwise specified)

Two stands.

Two bosses and two clamps.

Metre rule with a millimetre scale.

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

Three 100 g slotted masses.

50 g slotted mass.

Three 10 g slotted masses.

Two 100 g mass hangers. See Note 2.

Stopwatch reading to 0.1 s or better.

Notes

- 1 The springs should be linked together in pairs as shown in Fig. 1.1.



Fig. 1.1

- 2 It must be possible to fit all the slotted masses onto a 100 g mass hanger. All the slotted masses should have their values of mass clearly displayed.
- 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

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

Two plastic cups. See Note 1 and Note 2.

Bucket of water. See Note 3.

Metal hook. See Note 4.

Plastic tray with approximate dimensions 30 cm × 20 cm × 5 cm.

Sharpened HB pencil of minimum length 15 cm.

10 g slotted mass.

10 g of modelling clay (e.g. Plasticine).

Adhesive tape (e.g. Sellotape).

String of approximate length 30 cm.

Scissors.

Stopwatch reading to 0.1 s or better.

Paper towels.

Access to a micrometer screw gauge (shared between at most three candidates).

Notes

- 1 The approximate dimensions of the cups should be as shown in Fig. 2.1.

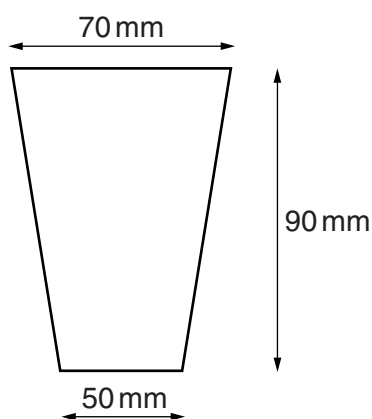


Fig. 2.1

The plastic should have approximate thickness 0.20 mm and the cups should each have approximate mass 4 g.

- 2 One of the cups should have its base removed so that the bottom is a hole of approximate diameter 50 mm. This cup should be clearly labelled D with a permanent marker pen.

The other cup should have part of its base removed so that the bottom has a hole with diameter in the range 35 mm to 40 mm as shown in Fig. 2.2. This cup should be labelled C with a permanent marker pen.

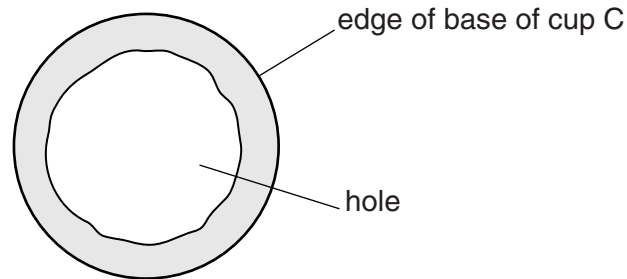


Fig. 2.2

The plastic in both cases should be removed with a sharp knife.

The hole in cup C need not be perfectly circular.

- 3 The approximate dimensions of the bucket should be as shown in Fig. 2.3.

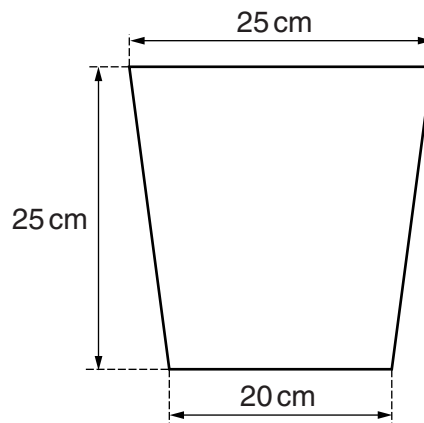


Fig. 2.3

The bucket should be filled with water to within 3 cm of the top.

- 4 The hook should be made from thin metal and shaped as shown in Fig. 2.4.

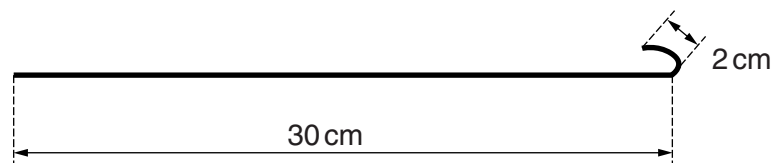


Fig. 2.4

- 5 The apparatus should be laid out on the bench. If it is to be used by a second candidate, then it should be restored to its original state.

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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



PHYSICS

9702/36

Paper 3 Advanced Practical Skills 2

October/November 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.



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.

This document consists of **7** 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 (9702/36).

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)

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

Switch.

Resistors with values $4.7\text{ k}\Omega$, $3.3\text{ k}\Omega$, $2.2\text{ k}\Omega$, $1.5\text{ k}\Omega$, $1.0\text{ k}\Omega$, $0.68\text{ k}\Omega$, $0.47\text{ k}\Omega$, $0.33\text{ k}\Omega$ and $0.22\text{ k}\Omega$ each labelled with its value in $\text{k}\Omega$ to 2 significant figures, e.g. ' $0.68\text{ k}\Omega$ ' and ' $3.3\text{ k}\Omega$ '. See Note 1.

Component holder with crocodile clips and terminals.

680Ω resistor labelled A with its value of resistance concealed. It should be fitted with terminals to allow connection in a circuit. See Note 1.

330Ω resistor labelled B with its value of resistance concealed. It should be fitted with terminals to allow connection in a circuit. See Note 1.

105 cm length of bare resistance wire. See Note 2 and Note 3.

Metre rule with a millimetre scale. See Note 3.

Two crocodile clips.

D.C. voltmeter with a range of 0–2V. A multimeter set to this range is suitable provided the range switch is fixed and any unused terminals are covered.

Twelve connecting leads of approximate length 60 cm. One of the leads should have an end suitable for making contact on the resistance wire, and this end should be labelled M.

Notes

- 1 All the resistors should be rated at 0.25 W , with a maximum tolerance of 5%.
- 2 The resistance wire should have an approximate resistance of $15\Omega\text{ m}^{-1}$ (e.g. 34 swg constantan, 36 swg constantan, 30 swg nichrome or 32 swg nichrome).
- 3 The resistance wire should be attached to the metre rule using adhesive tape as shown in Fig. 1.1.

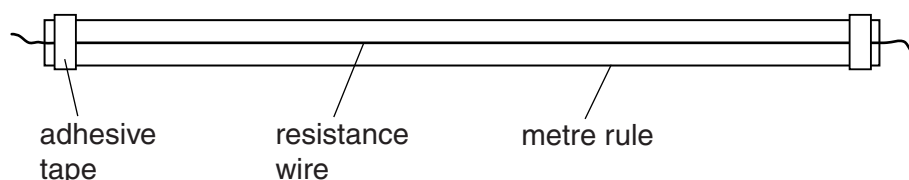


Fig. 1.1

- 4 The apparatus should be laid out on the bench. If it 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)

Empty, lightweight plastic bottle with approximately constant cross-section and approximate height 200 mm. See Note 1.

Flat-headed nail of approximate length 6 cm and approximate diameter 3 mm. See Note 1.

Stopwatch reading to 0.1 s or better.

Stand, boss and clamp.

Tray of sufficient size to hold the base of the stand.

Container with enough water to fill the bottle, and suitable for pouring water into the bottle.

100 g slotted mass.

String of approximate length 50 cm.

Paper towels.

30 cm ruler with a millimetre scale.

Notes

- 1 Remove the cap and discard it. Drill a hole through the neck of the bottle. The diameter of the hole should be slightly greater than the diameter of the nail. The hole should pass through the axis of the bottle and should be perpendicular to the axis of the bottle, as shown in Fig. 2.1.

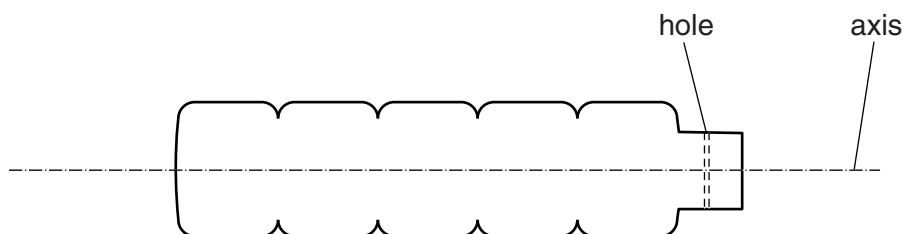


Fig. 2.1

- 2 The **candidate** will set up the apparatus as shown in Fig. 2.2. Ensure that the bottle can swing freely with this arrangement.

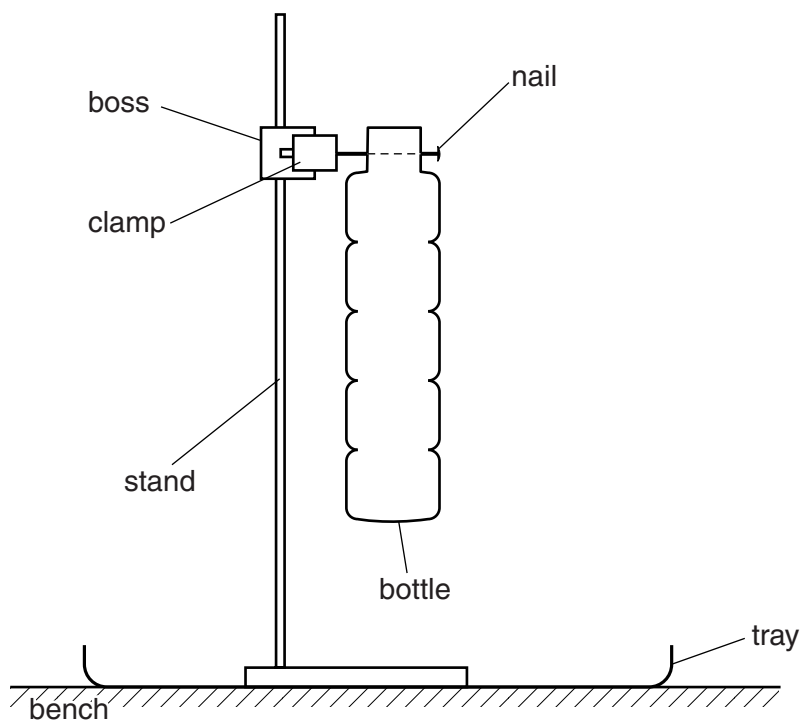


Fig. 2.2

- 3 The apparatus should be disassembled and laid out on the bench. If the apparatus is to be used by another candidate, then it should be returned 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;
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Supervisor's Report



Supervisor's Report (continued)**Declaration**

(to be signed by the Supervisor)

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Signed

Name

Centre number

Name of Centre

