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**PHYSICS**

**9702/35**

Paper 3 Advanced Practical Skills 1

**October/November 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](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 **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 (9702/35).

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)**

Low voltage power supply fixed at 1.5V or 2V d.c., or 1.5V dry cell with terminals.

Digital voltmeter set to the range 0 – 2V reading to the nearest 0.001 V.

If a digital multimeter is used, the range should be fixed and any unused terminals should be covered.

10Ω resistor in a component holder. See Note 1.

Metre rule with a millimetre scale.

Two wooden strips each with approximate dimensions 60 cm × 2 cm × 1 cm.

Four nails each with approximate length 2 cm and approximate diameter 1.5 mm. See Note 2.

60 cm length of 32 swg constantan wire. See Note 3 and Note 4.

60 cm length of 36 swg constantan wire. See Note 3 and Note 4.

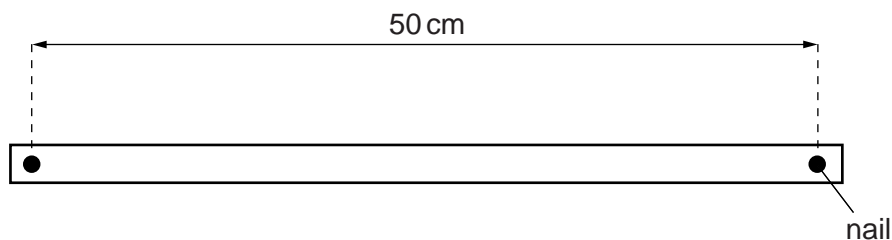
Four crocodile clips.

Seven connecting leads. Two of the leads should each have a length of at least 50 cm.

Switch.

**Notes**

- 1 The resistor should have a minimum power rating of 0.25W and a tolerance of 5% (e.g. RS Components product code 385-932). Tape should be used to hide the value of its resistance.
- 2 Two nails should be hammered into each wooden strip at a distance of 50 cm apart as shown in Fig. 1.1, leaving at least 1 cm of nail above the surface of the wood.

**Fig. 1.1**

- 3 Each of the 60 cm lengths of wire should be attached to a wooden strip by wrapping the wire tightly around the nails and soldering it to the nails. The wire between the nails should be free of kinks.  
It should be possible to attach a crocodile clip to each of the nails.

The wooden strip with the 32 swg wire attached should be labelled A.

The wooden strip with the 36 swg wire attached should be labelled B.

- 4 If 32 swg or 36 swg constantan wire are unavailable, then any of the alternative combinations P, Q or R may be used instead.

	Attached to wooden strip labelled A	Attached to wooden strip labelled B
P	28 swg nichrome	32 swg nichrome
Q	30 swg constantan	34 swg constantan
R	26 swg nichrome	30 swg nichrome

- 5 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.

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

Stand, boss and clamp.

Wooden rod with approximate diameter 1 cm and approximate length 30 cm.

Two strong bar magnets e.g. Philip Harris product code B8A46929. See Note 1.

30 cm plastic ruler with a millimetre scale.

Steel nail with approximate diameter 2.5 mm and approximate length 5 cm.

Stopwatch reading to 0.1 s or better.

Paper. See Note 2.

Thin cotton thread. See Note 2.

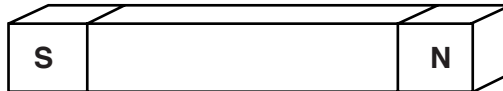
Adhesive tape. See Note 2.

A4 sheet of plain paper. See Note 3.

180° protractor with 1° divisions.

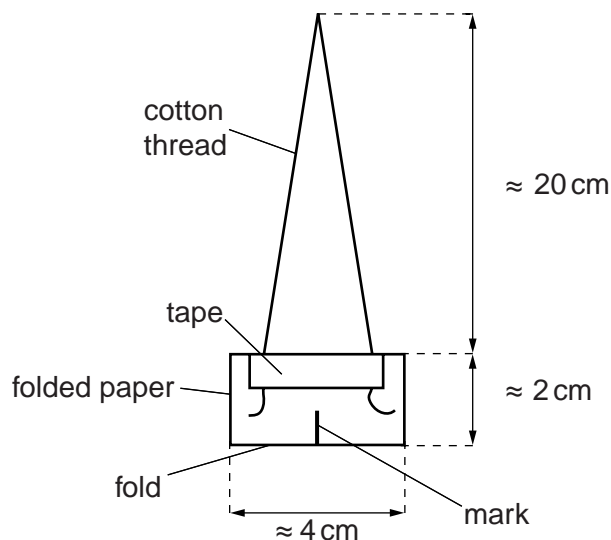
**Notes**

- 1 Each magnet should have its N pole labelled 'N' and its S pole labelled 'S' as shown in Fig. 2.1.

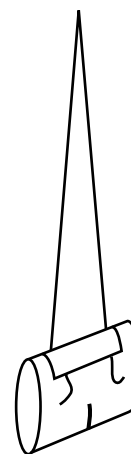


**Fig. 2.1**

- 2 A paper loop should be constructed as shown in Fig. 2.2 and Fig. 2.3.



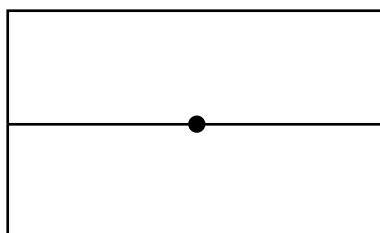
**Fig. 2.2**



**Fig. 2.3**

Draw a short mark half-way along the loop as shown.

- 3 The sheet of A4 paper is shown in Fig. 2.4.



**Fig. 2.4**

There should be a line drawn with a spot of approximate diameter 3 mm half-way along the line.

- 4 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. The candidate should be provided with a new nail and sheet of A4 plain paper with a line and a spot on it.

### 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 .....

