Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

PHYSICS **9702/33**

Paper 3 Advanced Practical Skills 1 **February/March 2018**

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 queries regarding these Confidential Instructions, please contact Cambridge stating the Centre number, the nature of the query and the syllabus number quoted above.

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This document consists of **7** printed pages and **1** blank page.

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Preparing apparatus

These Confidential 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 Confidential Instructions must not be revealed either directly or indirectly to candidates.

No access is permitted to the Question Paper in advance of the examination.

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 Confidential 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.

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. Any action taken must be reported on the Supervisor's Report.

Supervisor's Report

The Supervisor should complete the Supervisor's Report 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.

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Question 1

Apparatus requirements (per set of apparatus unless otherwise specified)

3 V d.c. power supply.

Switch. This may be a part of the power supply, in which case the candidates must be informed.

Thirty-five small 10 kΩ resistors (e.g. RS Components stock number 148-736). See Note 1.

Two component holders with terminals.

Wooden strip approximately 60 cm × 2 cm × 1 cm. See Note 2.

32 swg constantan resistance wire (diameter 0.27 mm) of length 65 cm. See Note 2.

Coil made from 28 swg constantan wire (diameter 0.38 mm); coil should have about 10 loops and be about 1 cm in diameter.

Five crocodile clips. See Note 3.

Ten connecting leads.

Voltmeter with a range of 0–20 V and reading to 0.01 V. A multimeter set to this range is suitable provided the range switch is fixed and any unused terminals are covered.

1 kΩ resistor (e.g. RS Components stock number 707-7666). Label this resistor R and mount it in one of the component holders.

Metre rule with a millimetre scale.

Notes

1 The resistors should be separated into seven groups containing 8, 7, 6, 5, 4, 3 and 2 resistors. The resistors in each group should be soldered together in parallel. It should be possible to connect each group, in turn, into a component holder.

2 The resistance wire should be attached to the wooden strip with adhesive tape (e.g. Sellotape), as shown in Fig. 1.1.

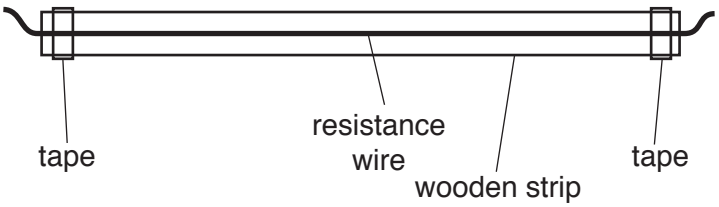

Fig. 1.1

If 32 swg constantan is not available, another type of resistance wire with resistance approximately $10\,\Omega\,m^{-1}$ may be used.

3 The jaws of the crocodile clips should be cleaned so that they make a good electrical contact with the resistance wire.

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.

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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Question 2

Apparatus requirements (per set of apparatus unless otherwise specified)

10 cm by 6 cm piece of graph paper with 2 mm grid.

Sheet of glass or Perspex with approximate dimensions 12 cm × 15 cm × 0.3 cm (if using Perspex it should have a thickness of 0.5 cm). Any sharp edges should be smoothed.

Sheet of glass or Perspex with approximate dimensions 7 cm × 11 cm × 0.3 cm (if using Perspex it should have a thickness of 0.5 cm). Any sharp edges should be smoothed.

Two 10 cm lengths of 28 swg wire (diameter 0.38 mm). See Note 1.

Two 8 cm lengths of 22 swg wire (diameter 0.71 mm). See Note 2.

Micrometer screw gauge or digital calliper reading to 0.01 mm (shared between a maximum of two candidates).

Dropper capable of producing a water drop of approximate volume 0.05 ml (e.g. a medicine dropper or a 3 ml chemistry dropper).

Stopwatch reading to 0.1 s.

100 ml beaker containing approximately 50 ml of water.

Paper towels.

Notes

1 Each length of 28 swg wire should be labelled A at one end, as shown in Fig. 2.1.

Fig. 2.1

2 Each length of 22 swg wire should be labelled B at its centre and then bent into a curve as shown in Fig. 2.2.

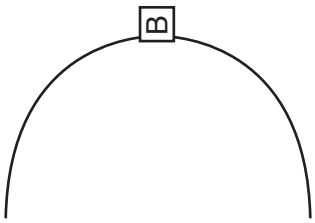

Fig. 2.2

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, with new pieces of wire provided.
Spare pieces of graph paper should be available.

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

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 directly 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 .....

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