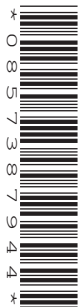

PHYSICS

9702/36

Paper 3 Advanced Practical Skills 2

October/November 2019

CONFIDENTIAL INSTRUCTIONS



This document gives details of how to prepare for and administer the practical exam.

The information in this document and the identity of any materials supplied by Cambridge International are confidential and must NOT reach candidates either directly or indirectly.

The supervisor must complete the report at the end of this document and return it with the scripts.

If you have any queries regarding these confidential instructions, contact Cambridge International stating the centre number, the syllabus and component number and the nature of the query.

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This document consists of **8** printed pages.

General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
 - the scripts of the candidates specified on the bar code label provided
 - the supervisor's results relevant to these candidates
 - the supervisor's reports relevant to these candidates
 - seating plans for each practical session, referring to each candidate by candidate number
 - the attendance register.

Specific information for this practical exam

The supervisor must be a teacher of Physics or other competent physicist. During the exam, the supervisor (NOT the invigilator) should obtain a sample set of numerical results by following the relevant steps in the question paper. The results should be clearly labelled 'Supervisor's results' and recorded on the supervisor's report or on a spare copy of the question paper.

Organisation of the exam

- 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 exam.
- Candidates should not be provided with any additional apparatus beyond that specified in these instructions.
- 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 not award full credit for the relevant skills.
- Assistance should only be given when it is asked for by a candidate 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.
- In cases of faulty apparatus that prevent the required measurements being taken, the supervisor should allow extra time to give the candidate a fair opportunity to perform the experiment as if the fault had not been present.
- Any assistance or extra time given to candidates must be recorded in the supervisor's report.

Materials and apparatus for Question 1 (per set of apparatus unless otherwise specified)

- Straight, uniform wooden strip with dimensions 90 cm × 2 cm × 1 cm.
- 20 g cylindrical or slotted mass. See Note 1.
- Triangular prism to provide a pivot approximately 3 cm above the bench.
- Sphere of modelling clay (e.g. Plasticine) of approximate mass 65 g.
- Blunt knife to cut the modelling clay, e.g. palette knife.
- Metre rule with a millimetre scale.
- Stop-watch reading to 0.1 s or better.
- Sharpened pencil.

Notes

- 1 If a 20 g mass is not available, it could be made from two 10 g masses securely taped together.
- 2 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. Any pencil marks on the wooden strip should be removed. The modelling clay should be returned to a spherical shape.

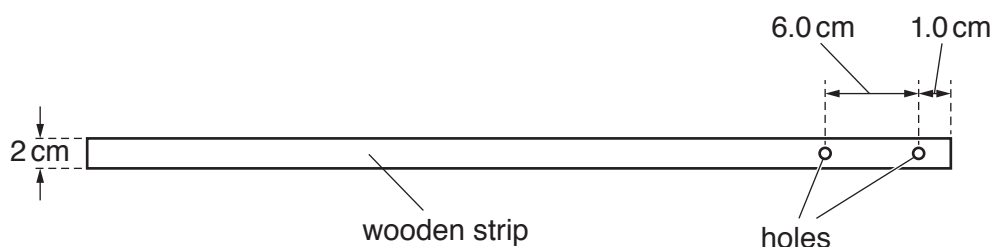
Materials and apparatus for Question 2 (per set of apparatus unless otherwise specified)

- Wooden strip of length 50.0 cm and approximate cross-section 2 cm × 1 cm. See Note 1 and Note 3.
- 65 cm length of 32 swg (0.27 mm diameter) constantan wire. See Note 2 and Note 3.
- Flat-headed nail of diameter in the range 2–3 mm and approximate length 7 cm. See Note 3.
- Wooden rod of approximate length 10 cm and approximate diameter 8 mm. See Note 3.
- Stand and two bosses. One of the bosses must be able to hold the nail securely. See Note 3.
- Two crocodile clips suitable for connecting into circuits. See Note 3.
- Variable d.c. power supply capable of providing at least 6 V.
- 0–10 A ammeter reading to 0.01 A or better. If a multimeter is used, it should be fixed on this range and any unused terminals should be covered.
- 0–10 V voltmeter reading to 0.01 V or better. If a multimeter is used, it should be fixed on this range and any unused terminals should be covered.
- Switch.
- Six connecting leads, one of which should have a length of at least 70 cm.
- Metre rule with a millimetre scale.
- Card showing the value of room temperature T_0 in kelvin. An example is shown in Fig. 2.1.

$$T_0 = 294 \text{ K}$$

Fig. 2.1**Notes**

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

**Fig. 2.2**

- 2 If 32 swg (0.27 mm diameter) constantan wire is not available, 28 swg (0.38 mm diameter) nichrome wire may be used.

- 3 The apparatus should be assembled as shown in Fig. 2.3.
 The wire should be securely fixed to both the wooden strip and the wooden rod by wrapping and twisting.
 The distance between the crocodile clips should be 50 cm.
 The wooden strip should be approximately parallel to the bench.
 The rod of the stand should be wrapped with insulating tape for a distance of 10 cm below the upper boss.
 The crocodile clips should grip the wire securely, and should be cleaned to make a good electrical contact.

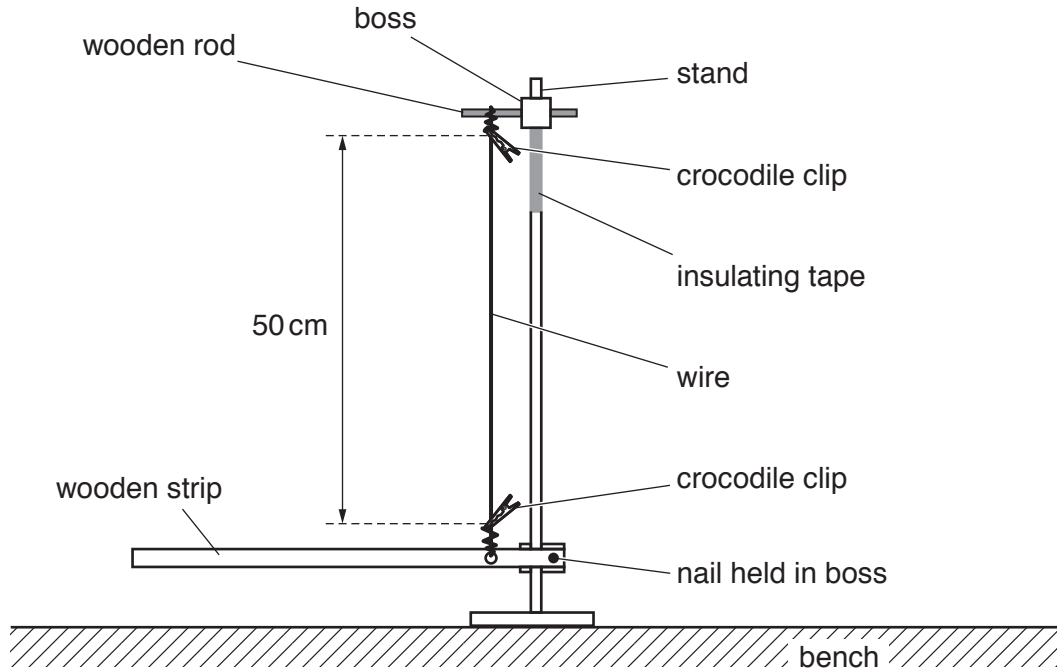


Fig. 2.3

- 4 The remaining apparatus should be laid out on the bench, with the power supply set to its minimum voltage. If the apparatus is to be used by another candidate, then it should be restored to its original state.

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Supervisor's report

Syllabus and component number

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Centre number

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Centre name

Time of the practical session

Laboratory name/number

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:

- any difficulties experienced by the centre in the preparation of materials
- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

Declaration

- 1 Each packet that I am returning to Cambridge International contains the following items:
 - the scripts of the candidates specified on the bar code label provided
 - the supervisor's results relevant to these candidates
 - the supervisor's reports relevant to these candidates
 - seating plans for each practical session, referring to each candidate by candidate number
 - the attendance register
- 2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for each practical session.
- 3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.
- 4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed (supervisor)

Name (in block capitals)