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Cambridge Assessment International Education

Cambridge International AS & A Level

PHYSICS **9702/31**

Paper 3 Advanced Practical Skills 1 **October/November 2023**

CONFIDENTIAL INSTRUCTIONS

2900617836

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.

INSTRUCTIONS

- 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.
  email info@cambridgeinternational.org
  phone +44 1223 553554

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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.

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Specific information for this practical exam

The supervisor must be a teacher of physics or other competent physicist who is familiar with the requirements of this syllabus. 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 must **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 from 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.

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

- 1.5 V dry cell with terminals.
- Two digital ammeters set to the range 0–200 mA reading to the nearest 0.1 mA. If digital multimeters are used, the range should be fixed and any unused terminals should be covered.
- 18 Ω resistor in a component holder. This resistor should be labelled R. See Note 1.
- Metre rule with a millimetre scale.
- Eight connecting leads.
- Wooden strip of length 90 cm, approximate width 6 cm and minimum depth 5 mm. See Note 2.
- Four nails each of approximate diameter 2 mm and approximate length 2 cm. See Note 2.
- 200 cm length of 34 swg or 0.25 mm diameter constantan wire. See Note 2 and Note 3.
- Three crocodile clips. See Note 4.
- Switch.

Notes

1 The resistor should have a maximum tolerance of 5% and a minimum power rating of 0.25 W e.g. RS Components stock number 683-5379.

2 Four nails should be hammered into the wooden strip as shown in Fig. 1.1.

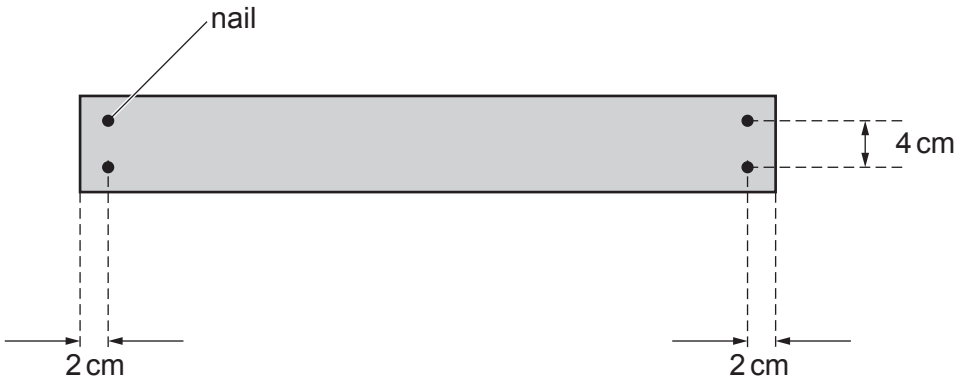


Fig. 1.1

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The wire should be laid flat on the strip and soldered to the nails as shown in Fig. 1.2. Remove any excess wire.

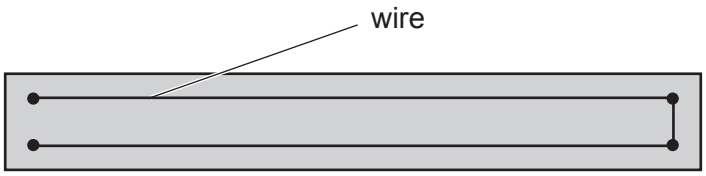


Fig. 1.2

3 If this wire is not available, other resistance wire of approximate resistance $10\,\Omega\,m^{-1}$ may be used.

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

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

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

- Wheeled trolley or toy car with approximate mass 200 g. See Note 1 and Note 2.
- Board with approximate dimensions 100 cm × 20 cm × 0.5 cm. See Note 1 and Note 2.
- Strong string of approximate diameter 1 mm. See Note 1 and Note 2.
- Stand with height at least 60 cm. See Note 2.
- Boss. See Note 2.
- Clamp. See Note 2.
- Pulley securely attached to the edge of the bench. See Note 2.
- 10 g mass hanger. See Note 2.
- Four 10 g slotted masses. See Note 2.
- Stop-watch reading to 0.1 s or better.
- Metre rule with a millimetre scale.
- 100 cm^3 measuring cylinder measuring to 1 cm^3 or better.
- Plastic or metal cylinder of approximate diameter 7 cm and approximate height 10 cm e.g. 250 cm^3 plastic beaker, bottom half of a 500 cm^3 water bottle or copper calorimeter.
- Plastic cylinder of minimum diameter 10 cm and approximate height 20 cm e.g. base of a 2000 cm^3 drinks bottle or small bucket.
- 180° protractor with 1° divisions.
- Jug or beaker containing approximately 800 cm^3 of water.
- Towel(s) to mop up spills.

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Notes

1 Drill two holes approximately 2 cm from one end of the board, as shown in Fig. 2.1. Use a string loop to attach the back of the trolley to the board. Ensure that the trolley stops approximately 10 cm from the end of the board when the string loop is gently stretched.

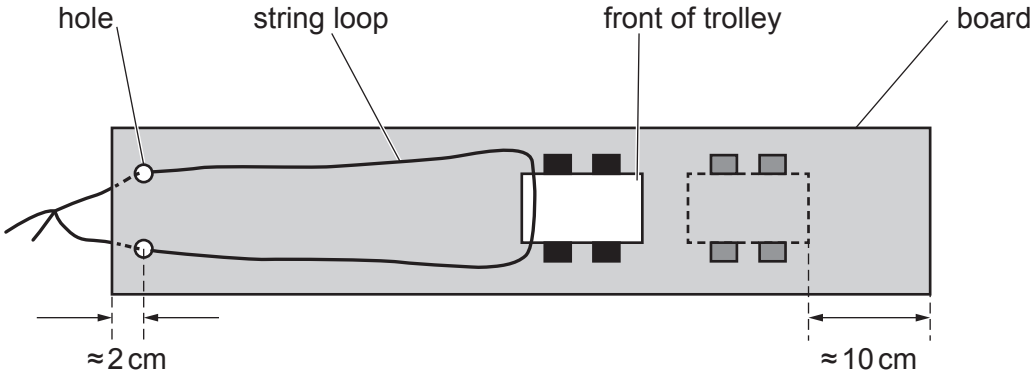


Fig. 2.1 (not to scale)

2 Firmly attach a second string to the front of the trolley and assemble the apparatus as shown in Fig. 2.2. Adjust the length of the string until the bottom of the mass hanger is approximately 4 cm above the floor. Remove the mass hanger and masses from the string loop.

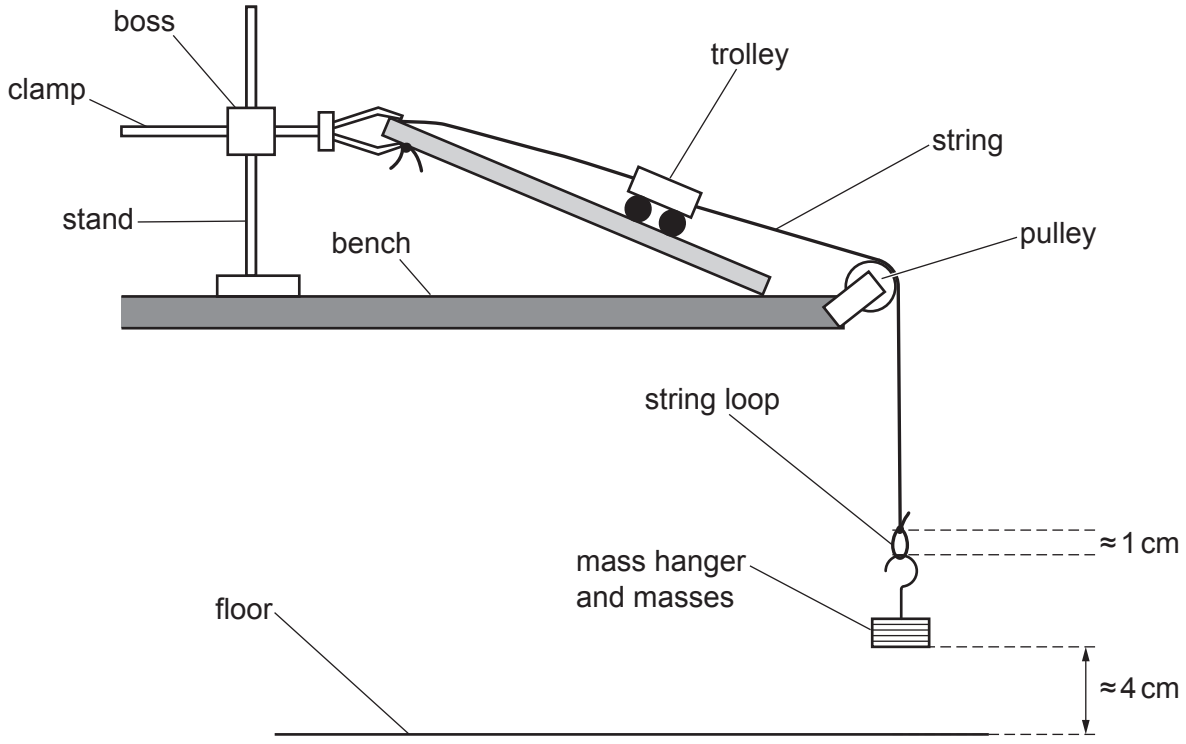


Fig. 2.2 (not to scale)

3 The apparatus should be set up as in Fig. 2.2. The mass hanger and masses should then be placed on the bench. All other 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.

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Supervisor's report

Syllabus and component number | | | | | / | | |

Centre number | | | | | |

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.

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Declaration

1 Each packet that I am returning to Cambridge International contains all of 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) .....

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