



Cambridge International AS & A Level

PHYSICS**9702/36**

Paper 3 Advanced Practical Skills 2

October/November 2021

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.

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

This document has **8** 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 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

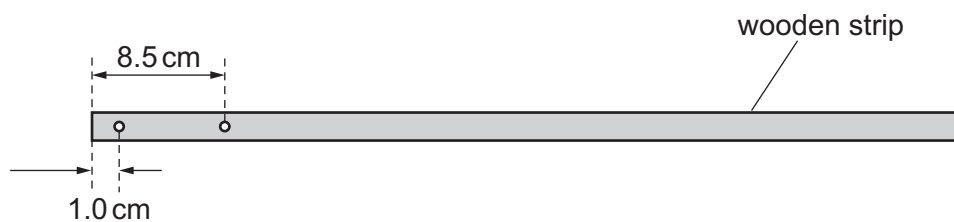
- Candidates should be informed that, if they find themselves in real difficulty, they may ask the supervisor for practical assistance, but that the extent of this assistance will be reported to the examiner, who may not award full credit for the relevant skills.
- Assistance should only be given when 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.

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

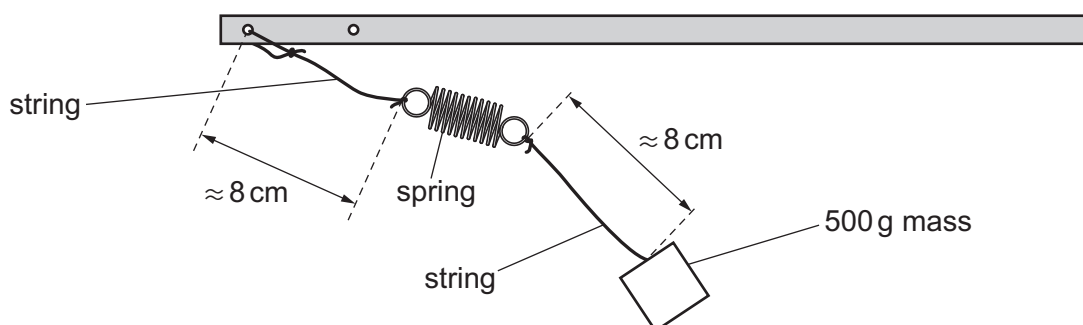
- Wooden strip of length 55.0 cm and approximate cross-section 12 mm × 12 mm. See Note 1.
- Expendable spring with approximate outside diameter 15 mm, approximate coiled length 20 mm and approximate spring constant 25 N m^{-1} (e.g. Philip Harris product code B8G87194). See Note 2.
- 500 g mass. See Note 2.
- String. See Note 2 and Note 3.
- 10 g mass labelled M. See Note 3.
- Flat-headed nail of approximate diameter 2.3 mm and approximate length 6 cm.
- Stand and boss. The boss should be able to hold the nail securely.
- 180° protractor with 1° divisions.
- Metre rule with millimetre divisions.
- Stop-watch reading to 0.1 s or better.

Notes

- 1 Two holes of diameter 3.0 mm should be drilled through the wooden strip at the positions shown in Fig. 1.1.

**Fig. 1.1** (not to scale)

- 2 The strip, spring and 500 g mass should be securely joined with string as shown in Fig. 1.2.

**Fig. 1.2** (not to scale)

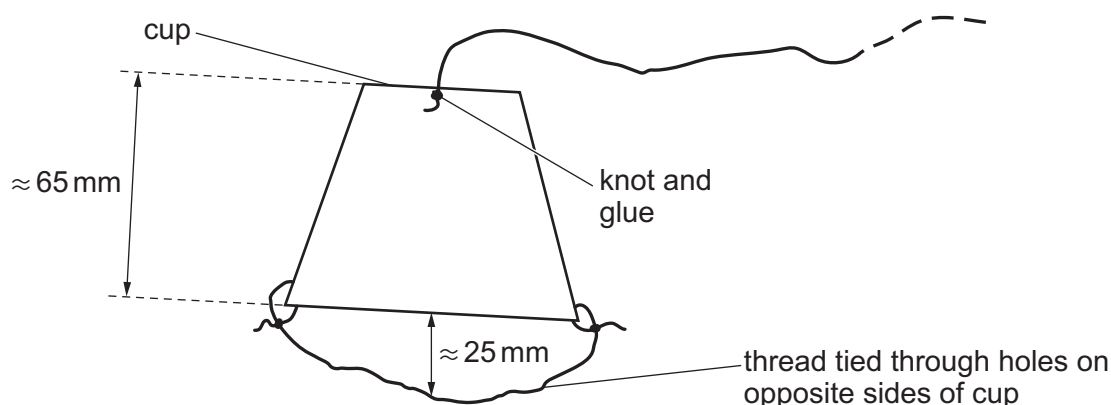
- 3 A string loop of circumference 10 cm should be fixed securely to the 10 g mass.
- 4 The apparatus should be laid out on the bench. If the apparatus is to be used by another candidate, then it should be restored to its original state.

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

- Transparent 2 litre plastic drinks bottle with approximate height 30 cm and approximate diameter 10 cm. See Note 1.
- Thin plastic disposable drinking cup of approximate capacity 200 cm³. See Note 2.
- Strong thread or thin string. See Note 2.
- 50 cm³ plastic syringe with 1 cm³ scale divisions. See Note 3.
- 70 cm length of transparent plastic tubing with an internal diameter of 4 mm, e.g. aquarium tubing. See Note 3.
- 45 cm length of copper wire with approximate diameter 1.7 mm. See Note 3.
- 15 identical steel rings each of mass in the range 2.0–3.5 g, e.g. M10 flat steel washers (inside diameter 10.5 mm, outside diameter 20 mm, thickness 2.0 mm) similar to RS Components stock number 527-640.
- Card with the mass M of one of the steel rings written on it. See Note 4.
- Wire paper clip with approximate length 3 cm.
- 30 cm ruler with a millimetre scale.
- Tray to stand the apparatus in.
- Paper towels to mop up any spillages.
- Small tray for the steel rings.

Notes

- 1 Cut off the top section of the plastic bottle to form a cylindrical container of approximate height 26 cm. Remove any labels. Fill the container with water to a level 2 cm from the top.
- 2 Cut the cup to a height of approximately 65 mm and attach threads to it as shown in Fig. 2.1.

**Fig. 2.1**

A 50 cm length of thread should pass through a hole in the centre of the base. The end inside the cup should be knotted and fixed with glue to give a **watertight** seal.

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- 3 Push the tubing onto the nozzle of the syringe. Insert the copper wire fully into the open end of the tubing, as shown in Fig. 2.2.

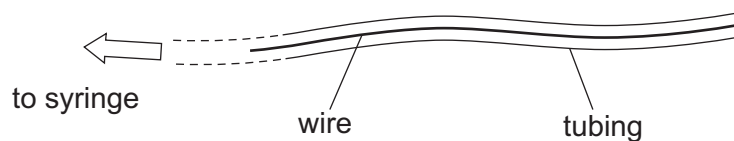


Fig. 2.2

- 4 The mass should be written on the card to the nearest 0.1 g, as shown in the example in Fig. 2.3.

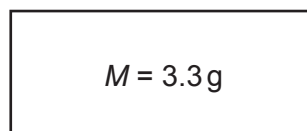


Fig. 2.3

- 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 with a new paper clip provided. The tubing and wire should be returned to their original shape, as shown in Fig. 2.2.

Spare steel rings should be available.

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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 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)