



# Cambridge International AS & A Level

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**PHYSICS**

**9702/34**

Paper 3 Advanced Practical Skills 2

**October/November 2022**

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.**

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## 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](mailto:info@cambridgeinternational.org)  
phone      +44 1223 553554

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This document has **12** pages. Any blank pages are indicated.

## 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

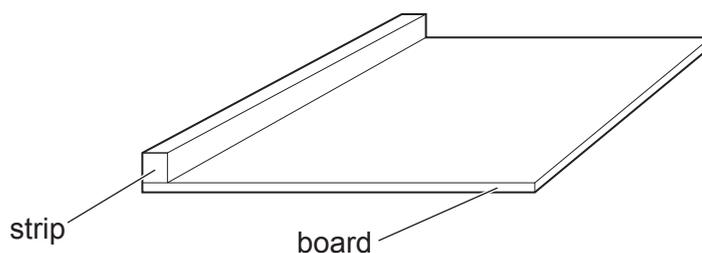
- Candidates should be informed that, if they find themselves in real difficulty, they may ask the supervisor for practical assistance, but that the extent of this assistance will be reported to the examiner, who may not award full credit for the relevant skills.
- Assistance should only be given when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

- Flat rigid board with sides of length 30 cm × 30 cm and approximate thickness 0.5 cm. See Note 1.
- Wooden strip of approximate cross-section 2 cm × 2 cm and length 30 cm. See Note 1.
- Pile of unused A4 printer paper of approximate thickness 1.0 cm.
- Half-metre rule with a millimetre scale.
- Stop-watch reading to 0.1 s or better.
- Stand, boss and clamp.
- 500 cm<sup>3</sup> carbonated drink bottle (full and unopened) with approximate diameter 6 cm. See Note 2.
- Vernier or digital calipers reading to 0.01 mm or 0.1 mm.
- Heavy book. The contents of the book must **not** be related to physics.

**Notes**

- 1 Attach the wooden strip securely (using nails, screws or glue) to one of the edges of the board, as shown in Fig. 1.1.

**Fig. 1.1**

- 2 It must be possible for the bottle to roll smoothly on the rigid board.
- 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.

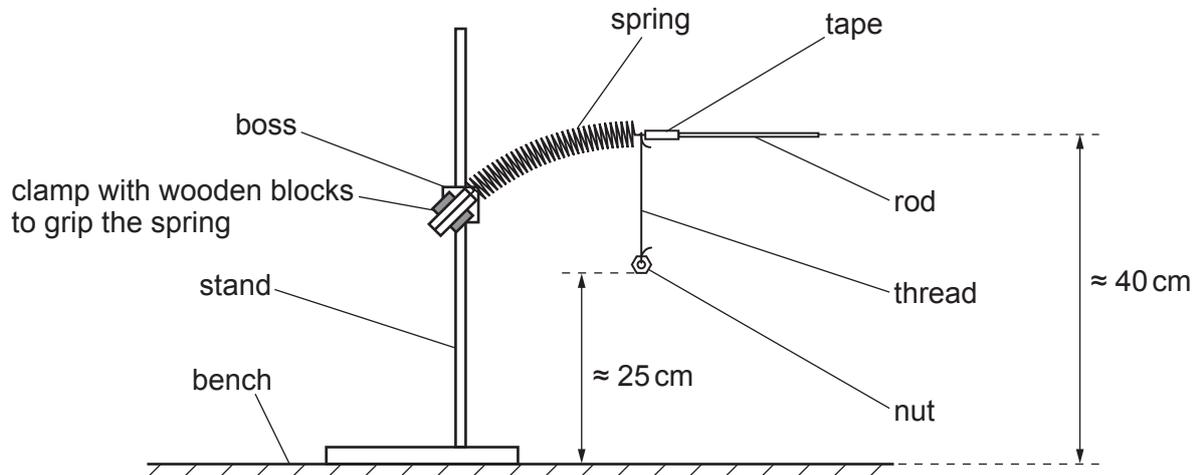
**Materials and apparatus for Question 2 (per set of apparatus unless otherwise specified)**

- Stand, boss and clamp. See Note 1.
- Expendable spring with approximate outside diameter 15 mm, approximate coiled length 20 mm and approximate spring constant  $25\text{Nm}^{-1}$  (e.g. Philip Harris product code B8G87194). See Note 1.
- Thin wooden rod of length 10.0 cm and approximate diameter 3 mm (part of a bamboo skewer is suitable). See Note 1.
- Thin thread. See Note 1.
- Small hexagonal steel nut of approximate mass 0.6 g and outside diameter less than 8 mm. See Note 1.
- Two wooden blocks each with approximate dimensions  $3\text{cm} \times 3\text{cm} \times 0.5\text{cm}$ . See Note 1.
- 2.5 m length of **enamelled** copper wire of diameter between 0.27 mm and 0.50 mm (e.g. RS Components stock number 779-0700). See Note 2.
- Test-tube with approximate diameter 12 mm and approximate length 8 cm. See Note 2.
- Component holder. See Note 2.
- Second boss and clamp.
- Metre rule with a millimetre scale.
- $180^\circ$  protractor with  $1^\circ$  divisions.
- Neodymium magnet of approximate diameter 5 mm and approximate length 3 mm.
- Card with the mass of the magnet written on it. See Note 3.
- Small plastic tray to hold the magnet.
- Ammeter with range 0–10 A reading to 0.01 A. If a multimeter is used, the range should be fixed and any unused terminals should be covered.
- Rheostat with approximate range 0– $8\Omega$  and rated at 2 A or more, to be used as a variable resistor. The unused terminal should be covered.
- Switch.
- 1.5 V or 2 V d.c. power supply (a 1.5 V cell with terminals is suitable).
- Five connecting leads.

## Notes

- 1 Stretch the spring past its elastic limit so that its free length is approximately 10 cm. Attach the rod to one end loop of the spring with adhesive tape.

Assemble the spring, rod, thread and nut before mounting it using the stand, boss, wooden blocks and clamp as shown in Fig. 2.1.



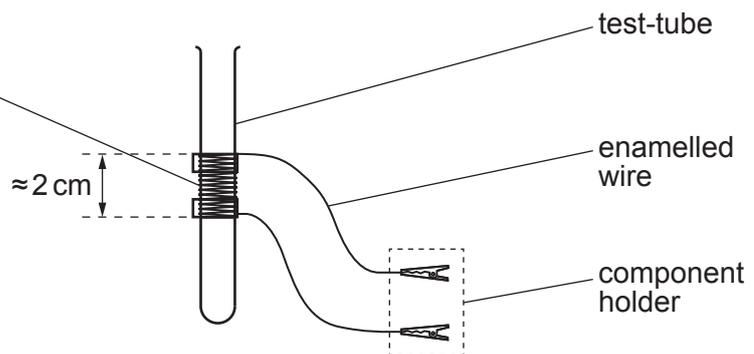
**Fig. 2.1**

The rod should be horizontal and approximately 40 cm above the bench. The nut should be approximately 25 cm above the bench.

- 2 The insulation should be removed from the last 2 cm of each end of the enamelled wire by sanding or scraping.

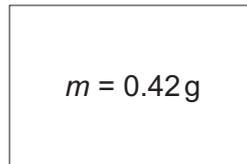
The wire, test-tube and component holder should be assembled as shown in Fig. 2.2.

50 turns of enamelled wire wrapped around the test-tube and secured with transparent tape at each end of this coil. The length of this coil should be approximately 2 cm and it should be positioned near the middle of the test-tube.



**Fig. 2.2**

- 3 The mass of the magnet should be given in grams to the nearest 0.01 g. Fig. 2.3 shows an example.


$$m = 0.42\text{ g}$$

**Fig. 2.3**

- 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. Dismantle any circuit set up by the candidate and return the magnet to the plastic tray.



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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) .....