



# Cambridge O Level

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**PHYSICS**

**5054/31**

Paper 3 Practical Test

**October/November 2020**

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. 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.

The following hazard codes are used in these confidential instructions, where relevant:

<b>C</b>	corrosive	<b>MH</b>	moderate hazard
<b>HH</b>	health hazard	<b>T</b>	acutely toxic
<b>F</b>	flammable	<b>O</b>	oxidising
<b>N</b>	hazardous to the aquatic environment		

Hazard data sheets relating to substances used in this exam should be available from your chemical supplier.

### 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

### Number of sets of apparatus

In addition to a few spare sets, the minimum number of sets of apparatus to be provided should be sufficient to enable candidates to spend 20 minutes with the apparatus for each of Questions 1, 2 and 3, and one hour with the apparatus for Question 4. The order in which candidates answer the questions will be determined by the supervisor. Candidates may spend one hour circulating around Questions 1, 2 and 3, followed by an hour on Question 4, or vice versa.

It is assumed that candidates will supply their own calculator and geometrical instruments, such as a set square, 0° to 180° protractor, pair of compasses and 30 cm ruler. Candidates should be advised in advance that they may, if they wish, use wrist-watches with stop-watch facilities, providing that such wrist-watches afford the required precision.

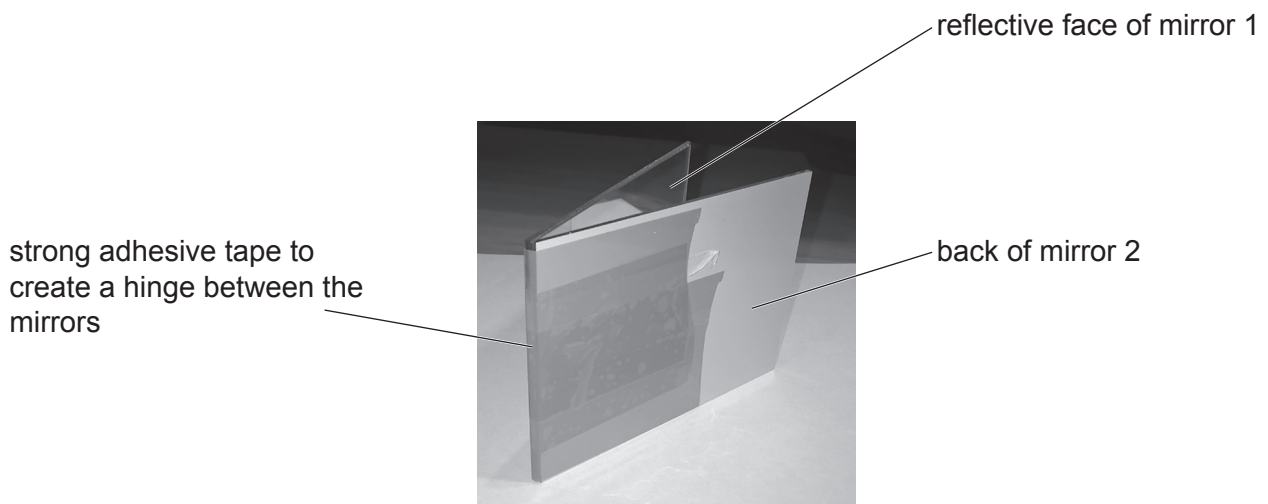
### Question 1

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified):

- two plane mirrors no smaller than 4 cm × 7 cm (see Note 1)
- small ball of modelling clay approximately 1 cm in diameter
- protractor
- sheet of A4 paper.

### Notes

1. Place the mirrors so that their reflecting surfaces are facing. Use strong adhesive tape across one edge to join them together as shown in Fig. 1.1. Using the tape as a hinge, candidates should be able to vary the angle between the mirrors.



**Fig. 1.1**

At the changeover the supervisor should

- Place the mirrors on the card as shown in Fig. 1.1 with the small ball of modelling clay and the protractor to one side. If the paper has been marked, it should be replaced.

### Information required by Examiners

None.

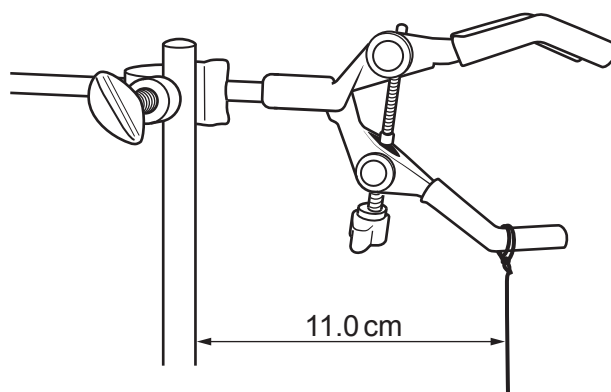
## Question 2

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified):

- thread (see Note 1)
- 100g mass holder with five 100g slotted masses
- stand, boss and clamp
- 30 cm ruler or half-metre rule with mm divisions.

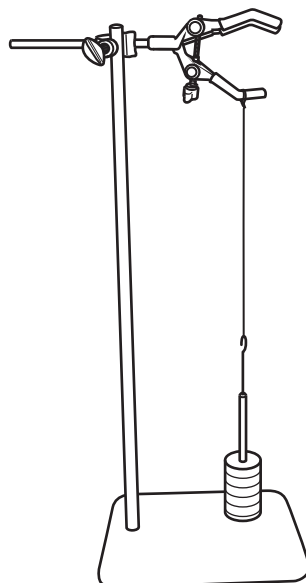
### Notes

1. One end of the piece of thread should be tied firmly to the centre of the movable claw of the clamp as shown in Fig. 2.1. The clamp should be adjusted so that it is at least three-quarters open. The distance between the edge of the stand and the centre of the thread must be 11.0 cm.



**Fig. 2.1**

The other end of the piece of thread should be tied to the mass holder as shown in Fig. 2.2.



**Fig. 2.2**

The length of the thread should be adjusted so that with the jaw of the clamp fully opened and the mass holder resting on the base of the stand there is some tension in the thread.

At the changeover the supervisor should ensure that the apparatus is in the configurations shown in Figs. 2.1 and 2.2 with the clamp at least three-quarters open.

**Information required by Examiners**

Sample set of numerical results, clearly marked “supervisor’s results”, obtained out of sight of the candidates.

### Question 3

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified):

- metre rule (see Note 1)
- rod
- stand and boss
- three pieces of Blu Tack (see Note 2)
- thread (see Note 3)
- 30 cm ruler with mm divisions.

### Notes

1. A hole should be drilled in the centre of the metre rule at the 50.0 cm mark. A smooth metal rod should be used as a pivot. One end of the rod should be clamped firmly in the boss attached to the stand. It must be possible for the other end of the rod to pass through the hole in the metre rule so that the metre rule can rotate freely about the rod and not fall off. The metre rule will be approximately balanced at this point. The zero mark on the metre rule should be to the left of the pivot when viewed by the candidate.
2. Three pieces of Blu Tack should be rolled into roughly spherical shapes. The first piece should have a mass of 50.0 g, the second piece should have a mass of 25.0 g and the third piece should have a mass of 15.0 g. Modelling clay is a suitable alternative to Blu Tack.
3. Cut a 10 cm length of thread and tie the ends together to form a loop. Mould one of the pieces of Blu Tack around the knotted end of the loop. The other end of the loop must be large enough to slide over the metre rule as shown in Fig. 3.1.

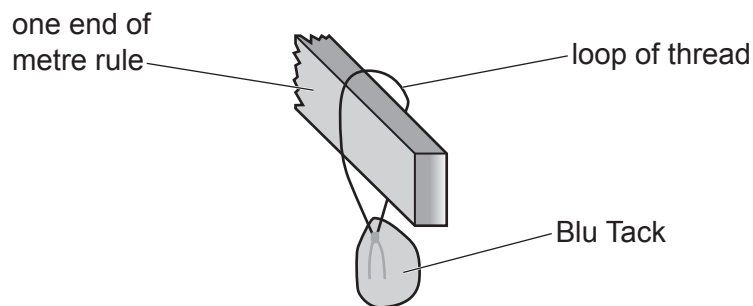


Fig. 3.1

Repeat for the other two pieces of Blu Tack.

At the changeover the supervisor should remove any loops of thread from the metre rule and place them on the bench next to the apparatus.

### Information required by Examiners

Sample set of numerical results, clearly marked “supervisor’s results”, obtained out of sight of the candidates.

**Question 4****Items to be supplied by the Centre (per set of apparatus, unless otherwise specified):**

- power supply (see Note 1)
- two electrodes (see Note 2)
- 250 cm<sup>3</sup> beaker labelled “water” and containing 200 cm<sup>3</sup> of distilled water (see Note 2)
- ammeter capable of measuring a current up to 50 mA to a precision of 0.1 mA or better. A digital multimeter set to the 200 mA range is suitable. The dial should be taped over to prevent candidates altering the range
- voltmeter capable of measuring a potential difference of up to 5.0 V to a precision of 0.1 V or better. An analogue or digital meter is suitable
- connecting leads and crocodile clips (see Note 2)
- switch or plug key
- small beaker containing a salt solution labelled “salt solution” (see Note 3)
- safety goggles
- 5.0 cm<sup>3</sup> syringe with 1 cm<sup>3</sup> or 1 ml divisions
- stop-watch
- stirring rod.

**Notes**

1. The power supply must be capable of providing a potential difference of 4.5 V. The following are suitable power sources but all the candidates at a centre must be supplied with the same type of source.
  - d.c. power supply of 4.5 V
  - three 1.5 V dry cells in suitable holders connected in series.

If a d.c. power supply is used, this must be switched on by the supervisor. However, for both power supplies, the switch or plug key must be open at the start of the investigation.



2. To make one electrode, cut a 30 cm length of 28 s.w.g. nichrome wire. Coil 25 cm of the wire around the bottom half of a wooden rod (12 cm × 0.5 cm). The coils should be evenly spaced and not touching. Attach the remaining 5 cm of the wire to the rod using adhesive tape as shown in Fig. 4.1. Both electrodes should be made in the same way.

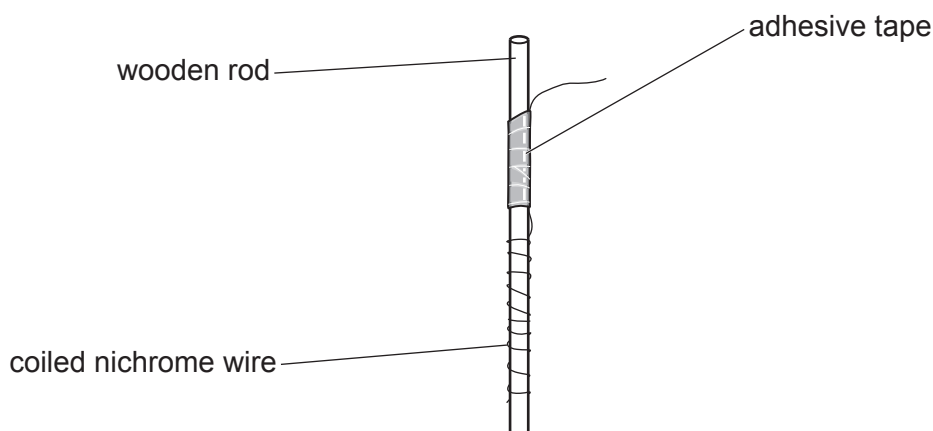


Fig. 4.1

The electrodes should be placed at opposite sides of a 250 cm<sup>3</sup> beaker and fixed in place using small pieces of Blu Tack. Add 200 cm<sup>3</sup> of distilled water to the beaker. Connecting wires should be used to connect the electrodes in series with the power supply, switch and ammeter as shown in Fig. 4.2.

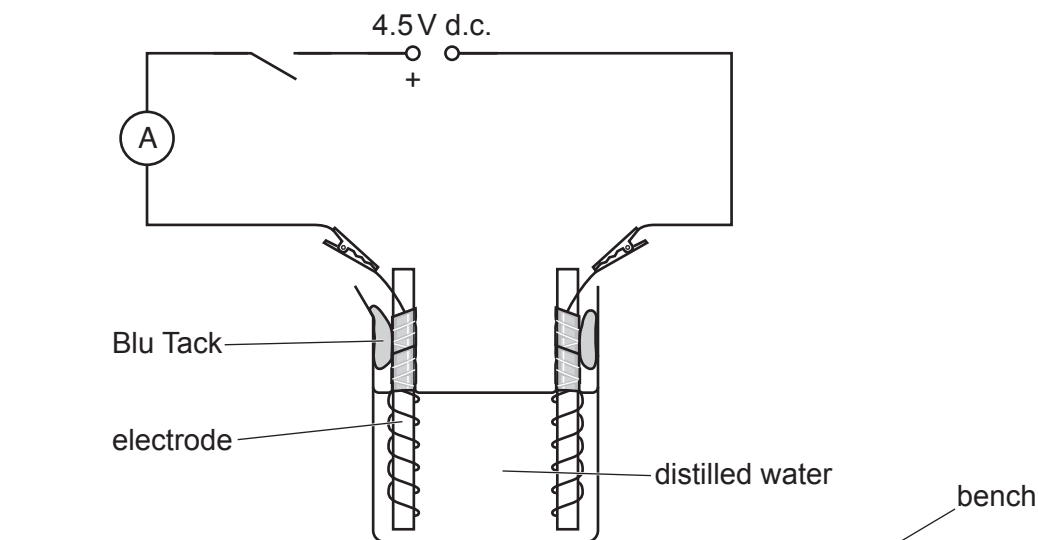


Fig. 4.2

Connecting leads should be attached to each terminal of the voltmeter. The voltmeter and its leads should be placed on the bench separate from the circuit. It must be possible for the candidates to attach the free ends of the connecting leads to the terminals of the power supply and record the p.d. of the power supply.

3. The salt solution should be made using 10.0 g of sodium chloride dissolved in 100.0 cm<sup>3</sup> of distilled water. Approximately 50 cm<sup>3</sup> of the salt solution should be placed in a small beaker labelled "salt solution". Each candidate will use only 8 cm<sup>3</sup> of the salt solution.

At the changeover the supervisor should:

- rinse out the 250 cm<sup>3</sup> beaker, dry it, and refill it with 200 cm<sup>3</sup> of distilled water. Take care to keep the Blu Tack dry as it will not work if wet.
- wipe the stirring rod and ensure the syringe is undamaged
- ensure that sufficient salt solution is available in the small beaker
- ensure that the power supply has a p.d. of 4.5V and replace any cells if necessary
- ensure that the power supply is on with the switch open
- ensure that safety goggles are available.

### Information required by Examiners

Sample set of numerical results, clearly marked “supervisor’s results”, obtained out of sight of the candidates.

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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.

Space for supervisor to record results, if relevant, e.g. temperature of the laboratory; results for Question 1.

### 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) .....