

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

PHYSICS

PAPER 3 Practical Test

INSTRUCTIONS

5054/3

MAY/JUNE SESSION 2002

2 hours

Great care should be taken that any confidential information given does not reach the candidates either directly or indirectly.

These instructions consist of 10 printed pages and 2 blank pages.



Instructions for preparing apparatus

These instructions detail the apparatus required for each experiment in this paper. A summary of the questions that will be presented to the candidates is included, to allow the Physics teacher to test the apparatus appropriately. No access is permitted to the question paper in advance of the examination session.

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.

Extra graph paper and Mathematical tables should be available. It is assumed that candidates will supply their own geometrical instruments, such as a set square, 0° to 180° protractor, pair of compasses and 30 cm rule. Candidates should be advised, in advance, that they may, if they wish, use quartz wristwatches with stopwatch facilities, providing that such wristwatches afford the required precision.

Instructions for the supervision of the examination

The Supervisor, who may be a Physics teacher, is responsible for the administration of the examination according to the procedures detailed in the Handbook for Centres. In all instances, a Physics teacher should be present. Preferably, this teacher should have been responsible for the preparation of the apparatus. Two invigilators must be present at all times: it is not acceptable for a teacher who has been responsible for preparing the candidates for this paper to be the sole Supervisor or Invigilator.

Supervisors may make the following announcement at the start of the examination.

‘The Examiners do not want you to waste time when you are unable to do any experiment. Any candidate who is unable to get results with an experiment may ask for help. The extent of this help will be reported to the Examiners, who may make a deduction of marks.’

Supervisors should note that a candidate may only be given enough assistance to allow some raw readings of observations to be made. On no account should any assistance be given with the treatment or analysis of these readings and observations.

Supervisors may draw to the attention of the candidates any significant deviation between the apparatus provided and that detailed in the question paper, particularly where diagrams are given in the paper.

Candidates should be reminded that all their work should be written on the printed Answer Booklet. Rough paper must not be used.

The Supervisor must complete the Report at the back of these Instructions. Details should be given of any significant deviation between the apparatus used and that specified in these Instructions. A sample set of results can often help Examiners. A copy of this Report must be included in each packet of scripts.

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

Two stands, clamps and bosses

Newton meter reading up to 10 N to a precision of 0.1 N

Approximately 1 m length of thin string

100 g slotted mass hanger with three 100 g slotted masses

Two G clamps

Metre rule

Set square

Protractor

Notes

- (i) One stand should be tall in order to support the newton meter. The lower end of the newton meter will need to be at a height of approximately 50 cm above the bench.
- (ii) The apparatus should be set up as shown in Fig.1.1 with the mass hanger tied to the string at B. The base of the mass hanger should be just above the bench surface.
- (iii) The G clamps will be required to secure the stands to the bench.
- (iv) Supervisors should check that, when a total mass of 400 g is suspended from B, the clamp holding the newton meter can be raised to a suitable height to make AB horizontal.
- (v) At the changeover, Supervisors should remove the three 100 g slotted masses and adjust the height of the clamp holding the newton meter so that the string AB is approximately horizontal.

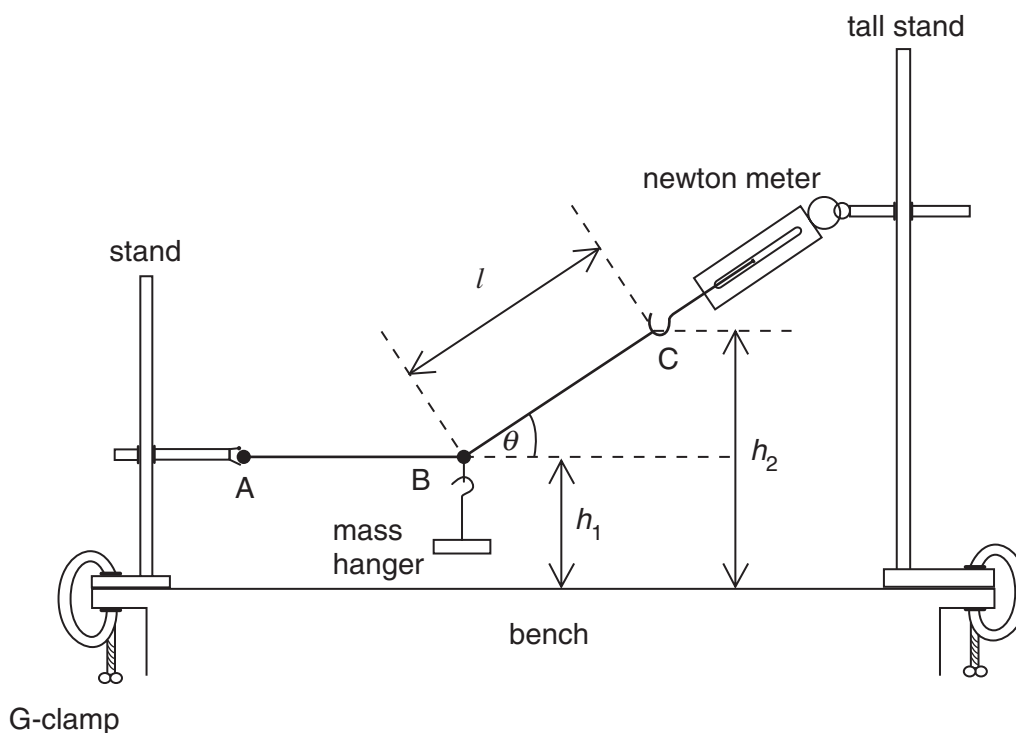


Fig. 1.1

Procedure to be followed by candidates

Candidates will be required to suspend a total mass of 400 g from B and adjust the height of the newton meter to make AB horizontal. They will then measure l , h_1 and h_2 in order to determine θ .

Information required by examiners

Sample set of results.

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

100 ml pyrex beaker

–10 °C to 110 °C thermometer with graduations that will enable candidates to interpolate between the 1 °C temperature intervals

Stand, two clamps and two bosses

Candle, with base to ensure that it will stand upright

Means of lighting the candle

Plastic stirrer e.g. teaspoon

Stopwatch

Supply of water at room temperature

Access to a top pan balance reading to 0.1 g

Notes

- (i) The candidate is to set up the apparatus as shown in Fig. 2.1.
- (ii) At the changeover, the Supervisor is to dismantle the apparatus set up by the candidate. The 100 ml beaker should be emptied and its base may need to be wiped clean as it is likely to be covered in soot.

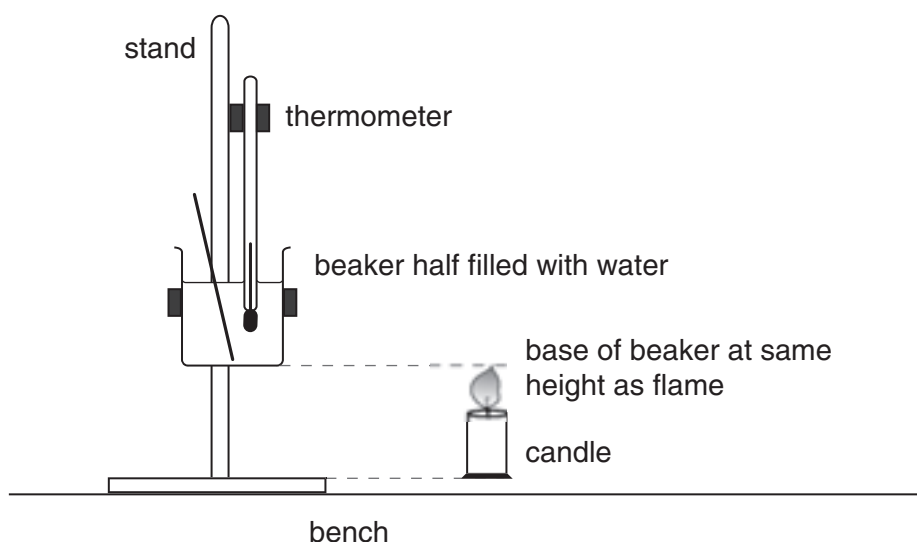


Fig. 2.1

Procedure to be followed by the candidates

Candidates will be required to measure the mass of the empty beaker and then to determine the mass of water in the beaker when it is half full. They will then be required to set up the apparatus as shown in Fig. 2.1 and to measure the temperature of the water in the beaker. Candidates will then light the candle at the side of the apparatus and adjust the height of the base of the beaker until it is at the same height as the top of the candle flame. After this they will heat the water in the beaker for two minutes and determine the rise in temperature.

Information required by examiners

Sample set of results.

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

5 V power supply (a 4.5 V battery may be used if necessary)

10 Ω , 1 W resistor, labelled R_1

4.7 Ω , 1 W resistor, labelled R_2

Switch or plug key

d.c. ammeter capable of reading up to 1 A

d.c. voltmeter of full-scale deflection 5 V

Leads to enable the Supervisor to set up the circuit shown in Fig. 3.1

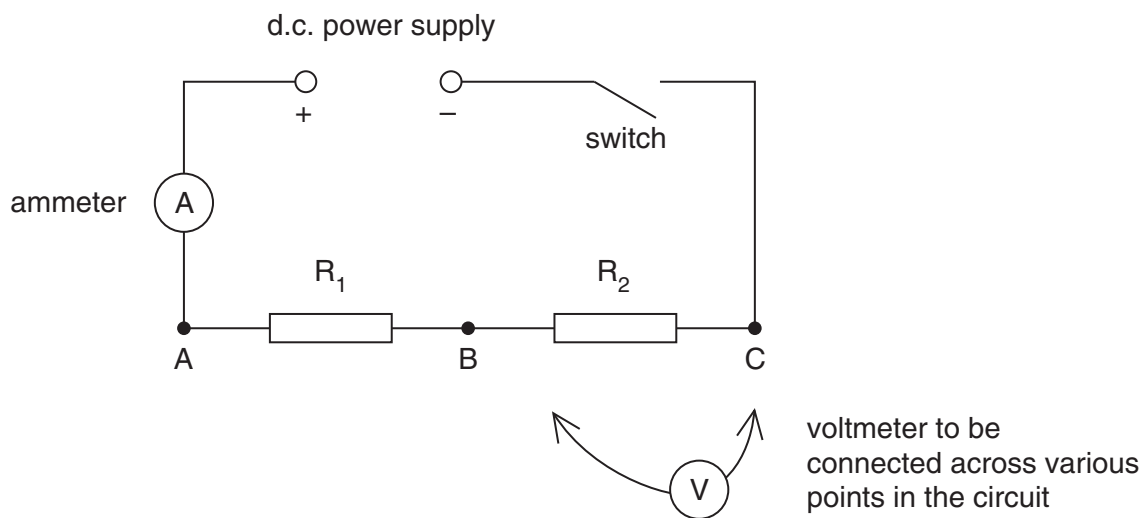


Fig. 3.1

Notes

- (i) The points A, B and C should have suitable terminations to enable the voltmeter to be connected into the circuit.
- (ii) The values of the two resistors should be obscured.
- (iii) The points A, B and C in the circuit should be labelled.
- (iv) At the changeover, the Supervisor should disconnect the voltmeter from the circuit and check that the circuit is still set up as described above, with the switch open.

Procedure to be followed by the candidates

The candidate is to connect the voltmeter between the pairs of points AB, BC and AC. The candidate will then record the current in the circuit.

Information required by examiners

Sample set of results.

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

Light source

Cross-wire object

Converging lens of focal length 15 cm

Lens holder

Screen

A4 sheet of mm graph paper (one per candidate)

Metre rule

Set square

Notes

- (i) The cross-wire object may be formed from a sheet of plywood or hardboard approximately 20 cm x 20 cm. A hole of diameter 2.0 cm should be drilled in the board. The centre of the hole should be at a height corresponding to the centre of the lens when it is in its holder. Two small lengths of fine wire of approximate length 4.0 cm should then be glued perpendicularly to each other across the hole. These should be horizontal and vertical.
- (ii) The graph paper should be cut to the size of the screen and fixed with Sellotape or Blu-Tack to the side of the screen that will face the lens.
- (iii) Supervisors should ensure that a magnified image of the object falls within the region of the graph paper when the distance between the object and the screen is 100 cm.
- (iv) At the changeover, the Supervisor should dismantle any apparatus set up by the candidate and replace the graph paper if it has been marked.

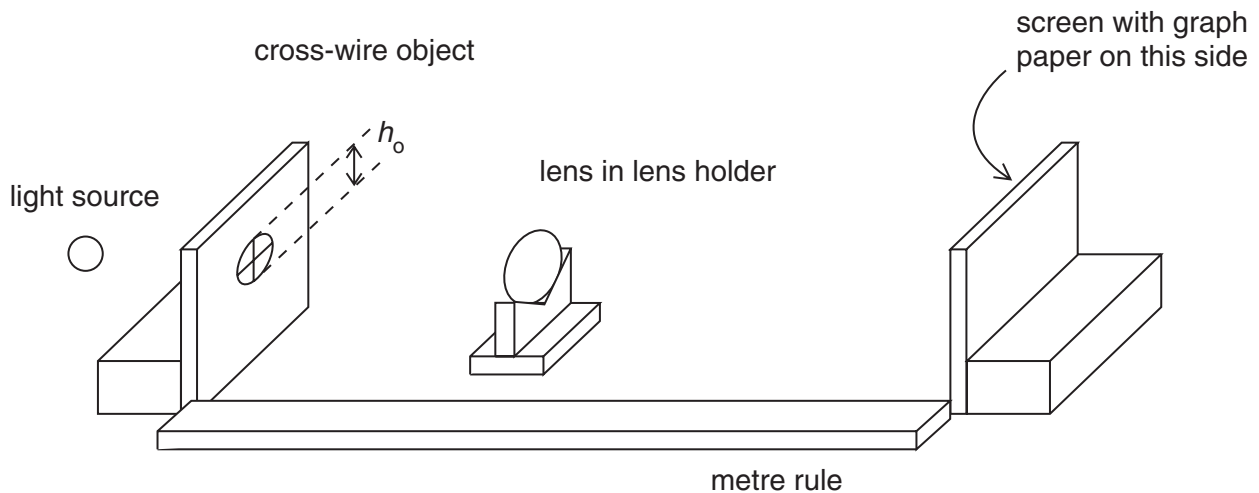


Fig. 4.1

Procedure to be followed by the candidates

The candidate is to set up the apparatus as shown in Fig. 4.1. The screen will be placed at the 100 cm mark on the rule. The position of the lens will then be adjusted until a magnified image is formed on the screen. The candidate will measure the height of the object and the height of the image. This will be repeated for a range of values of image distance.

Information required by examiners.

Sample set of results.

This form must be completed and returned with the Answer Booklets.

REPORT ON PRACTICAL PHYSICS

The Supervisor is asked to give the following details, using the space provided on page 12.

- (a) Information required at the end of the test, as indicated in the Instructions.
- (b) Any help given to a candidate.
- (c) Any general difficulties encountered in preparing the apparatus.
- (d) Any difficulties experienced by particular candidates. These should include reference to difficulties due to faulty apparatus or materials and accidental damage to apparatus or materials. Candidates should be identified by name and index number.

Other cases of hardship, such as disability or illness, should be reported to the Syndicate in the normal way.

The Supervisor is asked to provide a plan of the work benches, giving details by index numbers of the places occupied by the candidates for each session. The plan should be enclosed with the Answer Booklets, together with the Information required by Examiners.

Declaration to be signed by the Principal

The preparation of this practical examination has been carried out so as fully to maintain the security of the examination.

Signed

Name (in block capitals)

Centre Number

Centre Name



Information required

Details of difficulties and any help given to candidates

