

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

PHYSICS

5054/03

Paper 3 Practical Test

May/June 2004

CONFIDENTIAL INSTRUCTIONS

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

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This document consists of **9** printed pages and **3** blank pages.

UNIVERSITY OF CAMBRIDGE

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 should be available. 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 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 or 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)

100 g mass hanger

Two 100 g slotted masses

Thin string of approximate length 60 cm

Split cork

Stand, clamp and boss

Stopwatch reading to 0.2 s or better. A digital stopwatch is suitable.

Optics pin in cork to act as a marker at the centre of the oscillation

Notes

- (i) If a 100 g mass hanger is not available, a 50 g slotted mass should be taped to a 50 g mass hanger to give a total mass of 100 g. This should be labelled 100 g.
- (ii) If 100 g slotted masses are not available, pairs of 50 g slotted masses should be taped together, so that the slots coincide, to make a total mass of 100 g. These should be labelled 100 g.
- (iii) One end of the string should be tied to the mass hanger. The other end of the string should then be passed through the split cork and this should be clamped about 60 cm above the bench so that the mass hanger is suspended. The length from the base of the split cork to the bottom of the mass hanger should be set to 55 cm.
- (iv) At the changeover, Supervisors should remove the two 100 g masses from the mass hanger and ensure that the apparatus is set up as described in note (iii) above.

Procedure to be followed by candidates

Candidates will be required to determine the period of oscillation of the pendulum formed from both the 100 g mass hanger and the hanger with the two added masses.

Information required by examiners

Sample set of results

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

Metre rule

Adhesive tape

Resistance wire of length 1.2 m of approximate resistance $10\ \Omega$ e.g. 28 swg Nichrome wire (or 32 swg Constantan wire)

Resistance wire made of the same material as the previous wire of length 1.2 m and of approximate resistance $15\ \Omega$ e.g. 30 swg Nichrome wire (or 36 swg Constantan wire)

Three dry cells connected in series by means of a suitable holder in order to form a 4.5 V battery

Ammeter capable of measuring a current of up to 0.5 A to a precision of 0.01 A, an analogue or digital meter is suitable

Voltmeter capable of measuring a potential difference of up to 5 V to a precision of 0.1 V, an analogue or digital meter is suitable

Switch or plug key

Two crocodile clips

Six connecting leads

Notes

- (i) The last 15 cm at each end of the two resistance wires should be cleaned with abrasive paper.
- (ii) The two lengths of wire should be taped to opposite edges of the metre rule, as shown in Fig. 2.1. Approximately 10 cm of wire should protrude at each end.

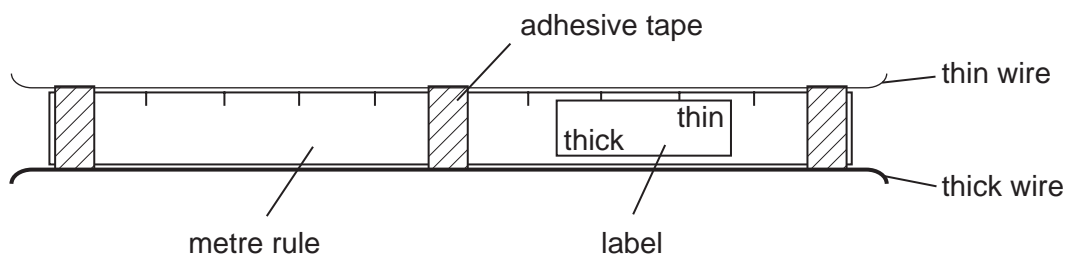


Fig. 2.1

A label should be taped to the rule to indicate which is the thinner wire and which is the thicker wire.

- (iii) The Supervisor should set up the apparatus as shown in Fig. 2.2. The leads at points A and B should terminate in crocodile clips. These leads should be long enough to enable the candidate to connect a length of 1.0 m of resistance wire into the circuit.

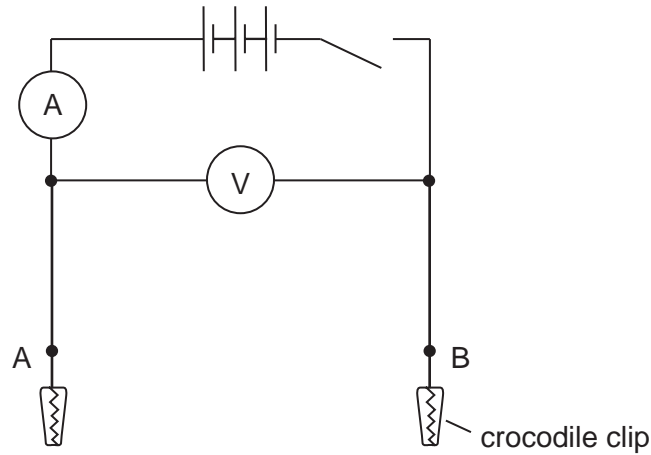


Fig. 2.2

- (iv) At the changeover, the Supervisor should check that the circuit is set up as in Fig. 2.2, with nothing connected between points A and B and with the switch open.

Procedure to be followed by the candidates

Candidates will measure the potential difference across, and current in, each of the wires in turn.

Information required by examiners

Sample set of results

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

250 cm³ beaker (for water at room temperature)

Supply of water at room temperature

100 cm³ measuring cylinder

Thermometer, –10 °C to 110 °C

Supply of crushed ice

Plastic 5 ml spoon or teaspoon to enable candidates to transfer ice from the supply to the beaker

Stirrer

Paper towels

Notes

- (i) Each candidate will require approximately 100 cm³ of water at room temperature. There should therefore be sufficient water for all candidates to use. This should have been placed in a container overnight so that it is in thermal equilibrium with its surroundings.
- (ii) The supply of crushed ice should ideally be at 0 °C. Candidates will be instructed to take care not to transfer water when the ice is transferred to the beaker.
- (iii) At the changeover, Supervisors should empty and dry the beaker with paper towels. The Supervisor should ensure that the supply of water at room temperature is sufficient for the next candidate.

Procedure to be followed by the candidates

Candidates will be required to pour 100 cm³ of water at room temperature into the beaker. They will then record the temperature of the water. The temperature will be recorded again after a heaped spoonful of ice has been added to the beaker and time has been allowed for it to melt.

Information required by examiners

Sample set of results

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

Converging lens of focal length 15 cm

Lens holder

Cross-wire object with suitable support

Screen, approximately 20 cm by 20 cm, with suitable support so that it can stand vertically

Suitable illumination for the object

Metre rule

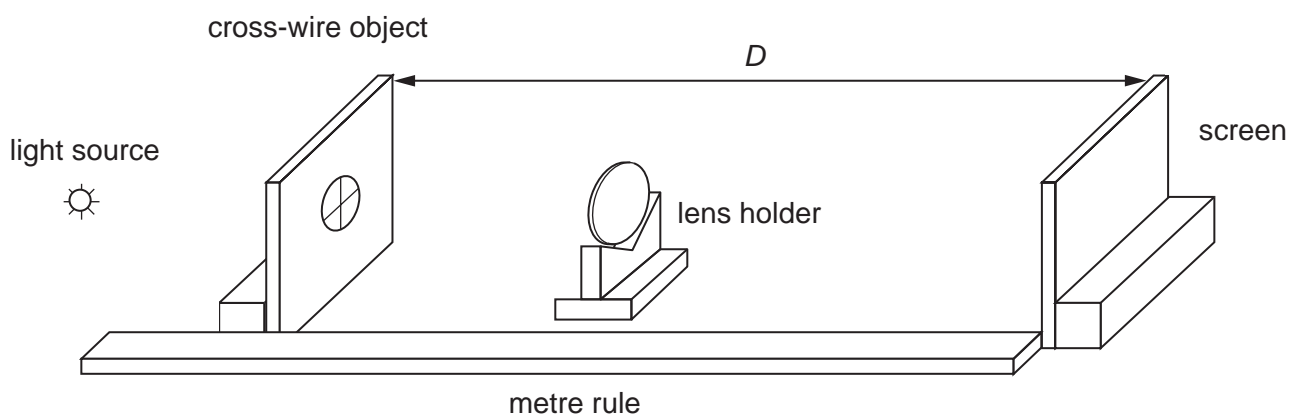
Set square

Notes

- (i) The apparatus should be positioned in a shaded part of the laboratory.
- (ii) The cross-wire object may be constructed by drilling a hole of diameter 2.0 cm in the centre of a piece of hardboard or stiff card 20 cm by 20 cm. Two pieces of wire of length 3 cm should then be placed perpendicular to each other across the hole. These should be attached to the hardboard with either glue or adhesive tape. A wooden block should be attached to the base of the hardboard so that the hardboard sheet will stand vertically.
- (iii) Supervisors should check that the cross-wire object and the centre of the lens are the same height above the bench.
- (iv) At the changeover, Supervisors should dismantle any apparatus left set up by the candidate.

Procedure to be followed by the candidates

Candidates will set up the apparatus as shown in Fig. 4.1.

**Fig. 4.1**

They will initially set the distance D to 0.800 m. They will then adjust the position of the lens so that both enlarged and diminished images are formed on the screen. This will be repeated for values of D in the range 0.65 m to 1.00 m.

Information required by examiners

None

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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 CIE 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

Sample set of results for experiments 1, 2 and 3

Details of difficulties and any help given to candidates

