

CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**PHYSICS**

**5054/03**

Paper 3 Practical Test

May/June 2003

**CONFIDENTIAL INSTRUCTIONS**

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

This document consists of **9** printed pages and **3** 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 should be available. It is assumed that candidates will supply their own calculator and geometrical instruments, such as a set square,  $0^\circ$  to  $180^\circ$  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)**

10 pieces of solid card each 3.5 cm by 6.5 cm and approximately 1 mm thick

30 cm rule with mm divisions

Access to a top-pan balance reading to the nearest gram or better

**Notes**

- (i) The pieces of card may be cut from an A4 sheet such as the card used as a stiffener when posting photographs etc.
- (ii) At the changeover, check that the 10 cards are still in place and that nothing has been written on them. Replace the cards if necessary.

**Procedure to be followed by candidates**

Candidates will be required to measure the average thickness of 10 sheets of card. They will also be required to measure the length, width and mass of the cards.

**Information required by examiners**

Sample set of results

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

Cross-wire object

Means of illuminating the object

Converging lens of focal length 15 cm

Lens holder

Screen approximately 20 cm by 20 cm

Metre rule

30 cm rule with mm scale

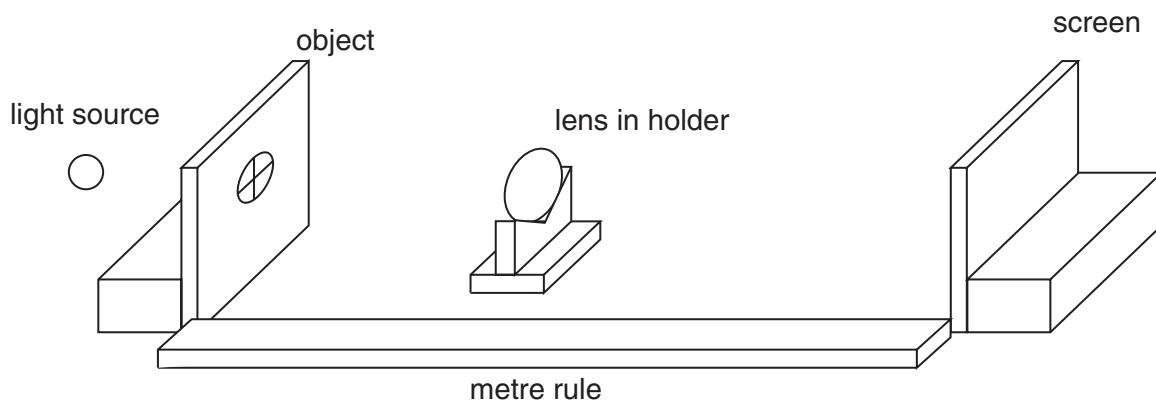
Set square

### Notes

- (i) The cross-wire object may be formed as follows. A piece of hardboard of approximate dimensions 20 cm by 20 cm should have a hole of diameter 2.0 cm drilled through its centre. Two pieces of fine wire should then be glued across the hole in perpendicular directions.
- (ii) Supervisors should ensure that the centre of the cross-wire object and the centre of the lens are at the same height above the bench.
- (iii) The apparatus should be placed in a shaded area of the examination room.
- (iv) At the changeover, the Supervisor should dismantle the apparatus.

### Procedure to be followed by the candidates

The candidate is to set up the illuminated object at one end of the metre rule and the screen at the other, as shown in Fig. 2.1.



**Fig. 2.1**

The candidate will then adjust the position of the lens in order to form the largest possible image on the screen. Measurements will then be made on the object and the image.

### Information required by examiners

Sample set of results

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

1 m length of resistance wire of approximate resistance  $10\ \Omega$ , e.g. 28 swg Nichrome wire or 32 swg Constantan wire

12 V power supply capable of delivering a current of at least 1.0 A to the resistance wire

100 cm<sup>3</sup> glass beaker

Ammeter capable of measuring a current of up to 1.5 A, e.g. 1.5 A f.s.d. analogue meter or 2 A f.s.d. digital meter

Card on which is written the potential difference across the coil to the nearest 0.1 V, written in the form ' $V = \dots V$ '

Switch or plug key

Two crocodile clips

100 cm<sup>3</sup> measuring cylinder

$-10\ ^\circ\text{C}$  to  $110\ ^\circ\text{C}$  thermometer

Stand, clamp and boss to support the thermometer

Plastic stirrer

Supply of water at room temperature

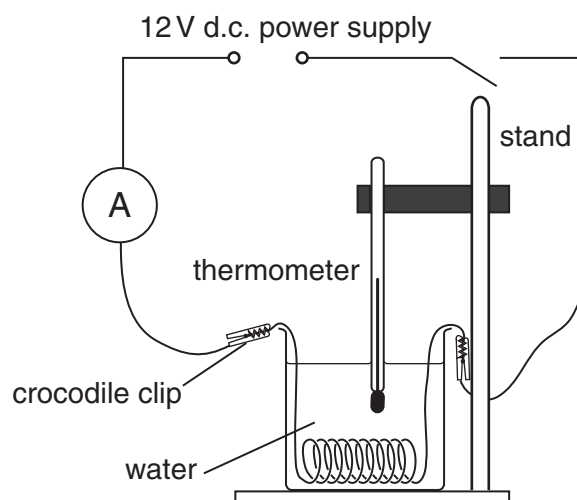
Stopwatch

Four leads

Paper towels for mopping up any spilled water

### Notes

- (i) The resistance wire should be wound around an object such as a pencil to form a coil with the turns close together but not touching. The coil should then be placed around the edge of the bottom of the small beaker.
- (ii) The Supervisor should set up the apparatus as shown in Fig. 3.1.



**Fig. 3.1**

- (iii) The Supervisor should ensure that, when  $50 \text{ cm}^3$  of water is poured into the beaker, the bulb of the thermometer and the whole of the coil are covered. The beaker should then be emptied.
- (iv) At the changeover, the Supervisor should check that the apparatus is still set up as shown in Fig. 3.1, with the switch open and the turns of the coil not touching. The beaker should be emptied.

### Procedure to be followed by the candidates

The candidate is to pour  $50 \text{ cm}^3$  of water into the small beaker. The candidate will then heat the water for 4 minutes and measure the rise in temperature.

### Information required by examiners

Sample set of results

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

Metre rule with a hole drilled at the 1.0 cm mark

Long pin or long round nail that will pass through the hole in the rule and act as a pivot

Stand and boss that will support the nail horizontally

Knife-edge

Newtonmeter reading up to 1.0 N

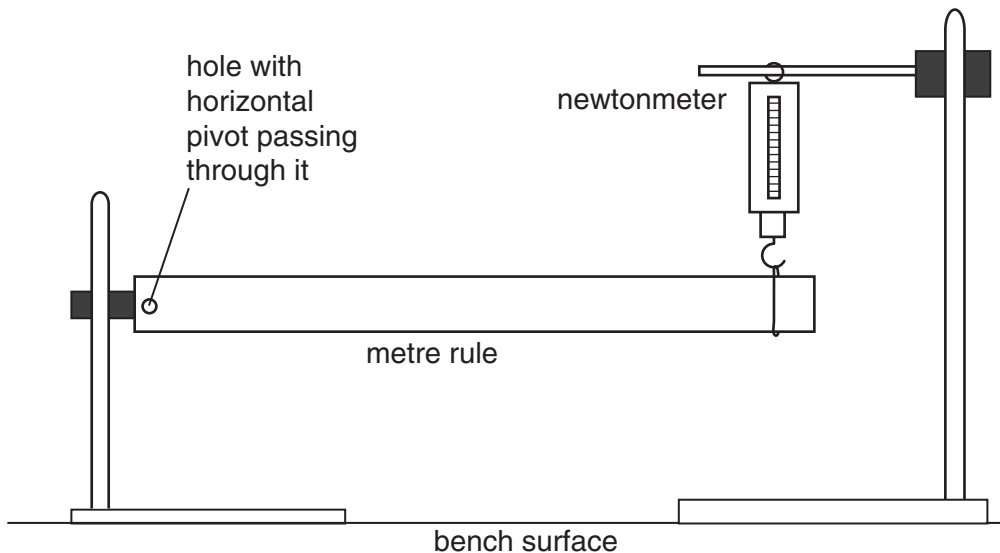
Stand, clamp and boss to support the newtonmeter vertically

Half metre rule

Set square

#### Notes

- (i) A loop of thread that is to be used to support the metre rule should be attached to the hook of the newtonmeter.
- (ii) The candidate will set up the apparatus as shown in Fig. 4.1.



**Fig. 4.1**

- (iii) At the changeover, the Supervisor should dismantle the apparatus.

#### Procedure to be followed by the candidates

The candidate is to use the knife-edge to locate the position of the centre of mass of the metre rule. The candidate will then set up the apparatus as shown in Fig. 4.1. For a range of distances from the pivot, the candidates will record the vertical force provided by the newtonmeter when the rule is horizontal.

#### Information required by examiners

Sample set of results



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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 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**

Sample set of results for each experiment.

**Details of difficulties and any help given to candidates**

