

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**PHYSICS**

**5054/03**

Paper 3 Practical Test

October/November 2004

**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 wrist-watches 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)**

Wooden block of approximate mass 120 g

Thin string of approximate length 60 cm

Small piece of adhesive tape

Second length of thin string of approximately length 50 cm

Split cork

Newton meter reading up to 1.0 N to a precision of at least 0.05 N.

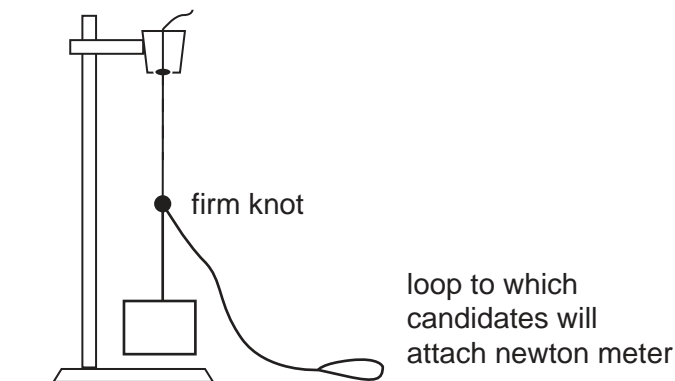
Two stands, clamps and bosses

Metre rule

Set square

**Notes**

- (i) One end of the string of length 60 cm should be attached to the wooden block with a small piece of adhesive tape. One end of the shorter string should be tied firmly to the centre of the long string. A loop should then be made at the other end of the shorter string. The longer string should then be passed through the split cork and this should be clamped about 60 cm above the bench so that the wooden block is suspended. This is shown in Fig. 1.1.

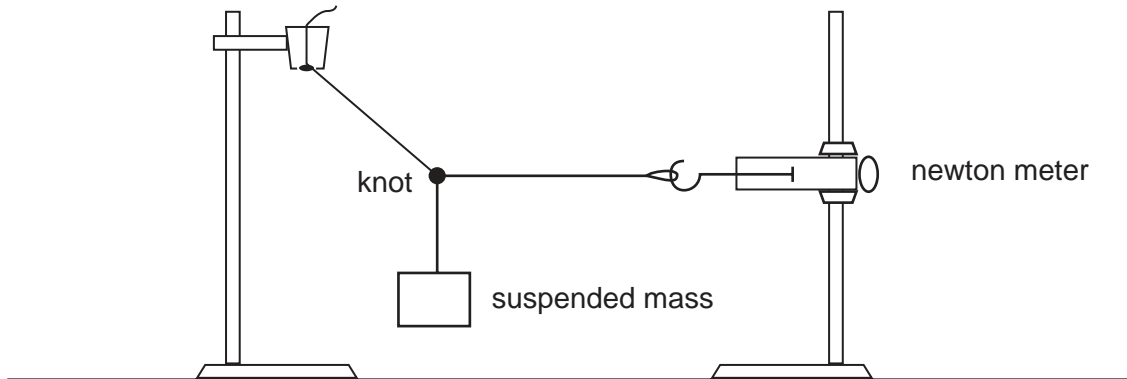


**Fig. 1.1**

- (ii) At the changeover, Supervisors should dismantle the newton meter arrangement and ensure that the wooden block is suspended as shown in Fig. 1.1.

**Procedure to be followed by candidates**

Candidates will be required to pass the hook of the newton meter through the loop and to clamp the newton meter horizontally and to the side, so that the apparatus is set up as shown in Fig. 1.2.



**Fig. 1.2**

**Information required by examiners**

Mass of the block of wood.

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

100 cm<sup>3</sup> Pyrex beaker (for boiling water)

100 cm<sup>3</sup> beaker (for water at room temperature)

Supply of water with a temperature greater than 90 °C e.g. electric kettle

Supply of water at room temperature

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

Thermometer, –10 °C to 110 °C

Stirrer

**Notes**

- (i) The Pyrex beaker should be labelled 'for hot water'. The second beaker should be labelled 'for water at room temperature'.
- (ii) The Pyrex beaker should either have a manufacturer's 50 cm<sup>3</sup> mark or a line should be ruled on its circumference with a **permanent** marker pen to indicate a volume of 50 cm<sup>3</sup>.
- (iii) The kettle may be shared between candidates but it should be in such a position that candidates do **not** have to carry very hot water across the laboratory.
- (iv) Each candidate will require approximately 50 cm<sup>3</sup> 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.
- (v) At the changeover, Supervisors should empty the beakers and ensure that there is sufficient water in both the hot water supply and the supply of water at room temperature.

**Procedure to be followed by the candidates**

Candidates will be required to pour 50 cm<sup>3</sup> of hot water into the Pyrex beaker. They will then measure the temperature of this water. 50 cm<sup>3</sup> of water at room temperature will then be added to the hot water.

**Information required by examiners**

None.

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

Converging lens of focal length 15 cm

Plane mirror

Optics pin in cork

Stand, clamp and boss

Half-metre rule

Small quantity of water in a beaker

Dropper to enable a small quantity of water to be placed on the mirror

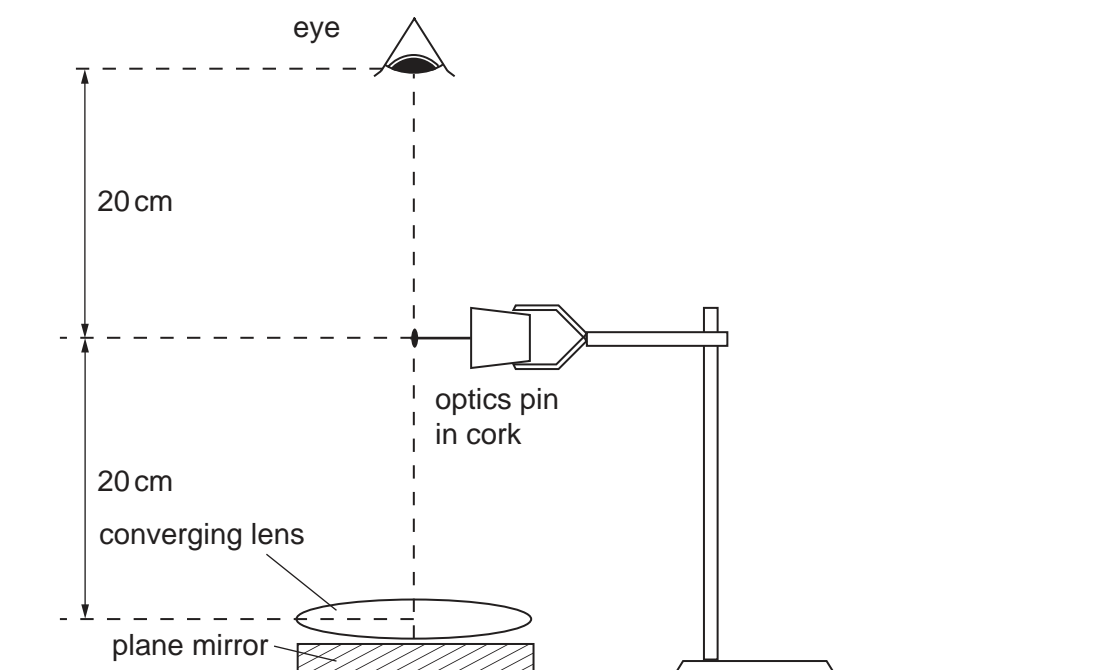
Paper towels to mop up spillage

#### Notes

- (i) Each candidate will require a few cm<sup>3</sup> of water.
- (ii) Candidates will need to look down on the apparatus from an approximate height of 50 cm above the working surface. Supervisors may have to supply a surface below normal bench level e.g. a laboratory stool with a horizontal top.
- (iii) At the changeover, Supervisors should dismantle any apparatus left set up by the candidate. The plane mirror and the lens should be dried with the paper towels.

#### Procedure to be followed by the candidates

Candidates will set up the apparatus as shown in Fig. 3.1.



**Fig. 3.1**

They will lower the pin to find the point where the pin and its image coincide. They will then repeat the experiment with a small quantity of water placed between the lens and the mirror.

#### Information required by examiners

None.

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

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 0.05 V or better, an analogue or digital meter is suitable

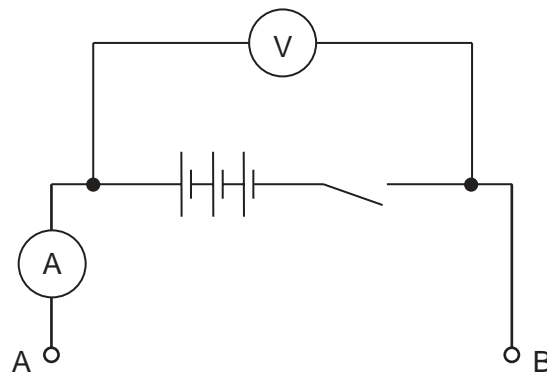
Switch or plug key

Three resistors of values  $15\ \Omega$ ,  $18\ \Omega$  and  $22\ \Omega$

Eight connecting leads

#### Notes

- (i) The three resistors should have suitable terminations to enable them to be connected to each other and to the remainder of the circuit. The resistors should be labelled with their values.
- (ii) The battery should have an internal resistance of about  $3\ \Omega$ . This means that the voltage between the terminals of the battery should drop from 4.5 V to about 3.8 V when the  $15\ \Omega$  resistor is connected between points A and B in the circuit. If this does not occur, then Supervisors should connect a small resistor, e.g.  $2\ \Omega$  or  $3\ \Omega$ , in series with the cells of the battery: this should be hidden from the candidates.
- (iii) The Supervisor should set up the apparatus as shown in Fig. 4.1. The terminals A and B should be clearly labelled.



**Fig. 4.1**

- (iv) At the changeover, the Supervisor should check that the circuit is set up as in Fig. 4.1 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 the battery and the current in the circuit with the resistors connected between points A and B singly and in series combinations.

#### 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 candidate 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 candidate 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**

Mass of the block used in experiment 1.  
Sample set of results for experiment 4.

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

