



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

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**PHYSICS**

**5054/03**

Paper 3 Practical Test

**May/June 2009**

**CONFIDENTIAL INSTRUCTIONS**

\* 3 9 6 8 0 4 7 4 1 6 \*

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

**No access to the Question Paper is permitted in advance of the examination.**

If you have any problems or queries regarding these Instructions, please contact CIE  
by e-mail: [International@cie.org.uk](mailto:International@cie.org.uk),  
by phone: +44 1223 553554,  
by fax: +44 1223 553558,  
stating the Centre number, the nature of the query and the syllabus number quoted above.

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. No additional apparatus 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.

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 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 Question Paper. 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.

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

Wooden metre rule with a millimetre scale.

100 g mass.

Pivot. See Note 1.

30 cm rule with a millimetre scale.

**Notes**

- 1 The candidate will balance the metre rule on the pivot. A knife edge may be used as the pivot.
- 2 At the changeover, the Supervisor should dismantle any apparatus left set up by the candidate.

**Information required by Examiners**

Sample set of numerical results, clearly marked "Supervisor's Results".

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

4.5V or 5V d.c. power supply – e.g. three 1.5V dry cells in a suitable holder.

Voltmeter capable of measuring a voltage of up to 3V to a precision of 0.01V; a digital or analogue meter is suitable.

Milliammeter capable of measuring a current of up to 15mA to a precision of 0.1 mA; a digital or analogue meter is suitable.

Resistor of nominal value  $330\Omega$ .

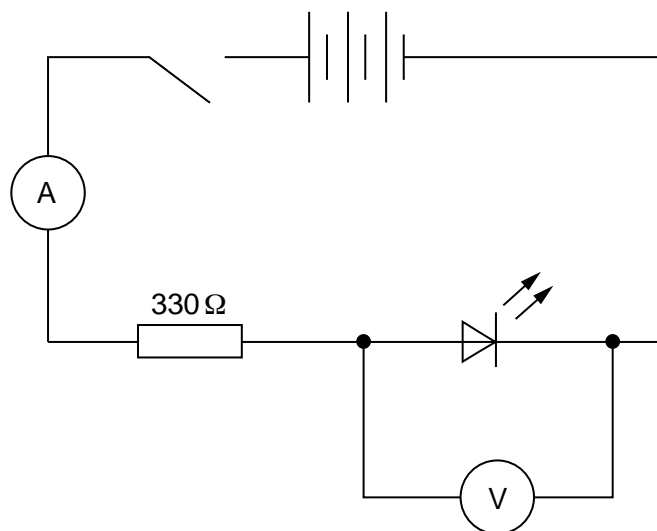
Switch or plug key.

Red light-emitting diode (LED). See Note 1.

Connecting leads to enable the Supervisor to set up the circuit shown in Fig. 2.1.

Resistor of nominal value  $10\,000\Omega$ . This should be supplied separately: the candidate will connect this resistor into the circuit.

One additional connecting lead.



**Fig. 2.1**

**Notes**

- 1 The red LED should have a diameter of approximately 5 mm and be of the diffused light type. RS Components reference 826-363 is suitable. It is important to check that the LED will light up when connected to the power supply in series with both the  $330\Omega$  and  $10\,000\Omega$  resistors.
- 2 The resistors and the LED should all have suitable terminations to enable them to be connected into the circuit.
- 3 The nominal values of the two resistors should be clearly marked on the resistors. This can be done by placing masking tape around the resistor and then writing the value of the resistance on the masking tape. All values should be written in  $\Omega$  – e.g.  $10\,000\Omega$ .
- 4 At the changeover, the Supervisor should remove the  $10\,000\Omega$  resistor from the circuit and check that the circuit is set up as shown in Fig. 2.1. The  $330\Omega$  resistor should be in the circuit and the switch should be open.

**Information required by Examiners**

Complete set of numerical results, clearly marked "Candidate's Results"

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

Polystyrene or plastic cup of volume at least  $120\text{ cm}^3$ .

Supply of water at room temperature. See Note 1.

$100\text{ cm}^3$  measuring cylinder.

Thermometer, with a range of  $-10\text{ }^\circ\text{C}$  to  $110\text{ }^\circ\text{C}$ .

Supply of crushed ice. See Note 2.

5 ml plastic spoon or plastic teaspoon to enable candidates to transfer ice from the supply to the cup.

Stirrer.

Paper towels.

**Notes**

- 1 Each candidate will require approximately  $100\text{ cm}^3$  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.
- 2 The supply of crushed ice should ideally be at  $0\text{ }^\circ\text{C}$ .
- 3 At the changeover, the Supervisor should empty the measuring cylinder and either dry or replace the cup. The Supervisor should ensure that the supply of water at room temperature and the supply of crushed ice is sufficient for the next candidate. Wet paper towels should be removed and replaced by dry ones.

**Information required by Examiners**

Sample set of numerical results, clearly marked "Supervisor's Results".

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

Wooden metre rule with a millimetre scale.

Two metal support rods. See Note 1.

100 g mass hanger and four 100 g masses to give a total mass of 500 g.

10 cm length of strong thread. See Note 2.

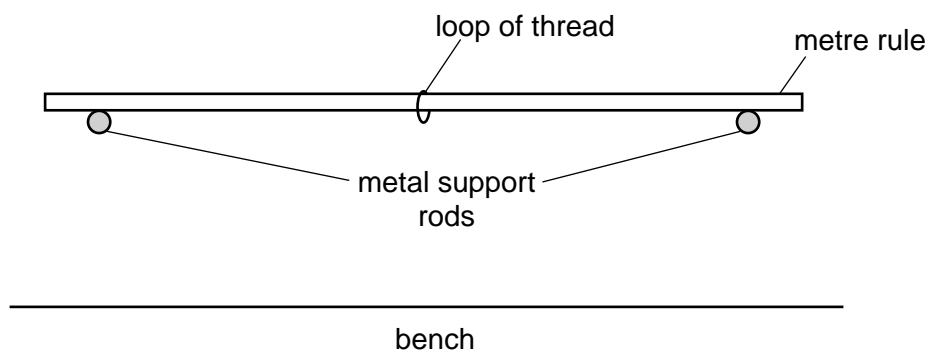
Half-metre rule with a millimetre scale.

Stand, boss and clamp to support the half-metre rule vertically.

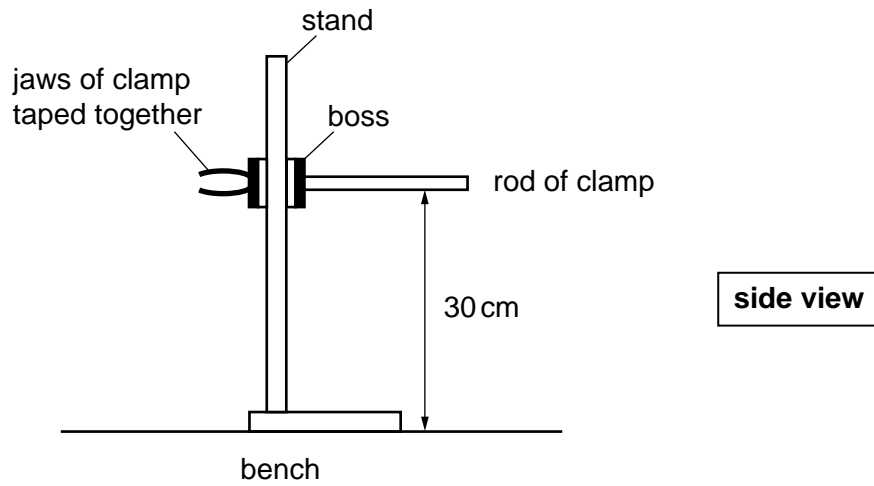
Set square.

**Notes**

- 1 The candidate will use the metal support rods to support the wooden metre rule, as shown in Fig. 4.1.

**Fig. 4.1**

The rods may be the ends of two clamps (with the jaw ends taped closed) or long round nails. In all cases, the support rods must be fixed in position at identical heights of about 30 cm above the bench. This may require extra stands and bosses. The Supervisor must assemble the rod arrangement so that it is ready for the candidate to use. A possible arrangement for one rod is shown in Fig. 4.2.



**Fig. 4.2**

- 2 The length of thread should be tied loosely around the centre of the rule to form a loop.
- 3 At the changeover, the Supervisor should remove the metre rule from the supports and place this and the mass hanger on the bench. The Supervisor should also check that the heights of the support rods have not been adjusted.

**Information required by Examiners**

Sample set of numerical results, clearly marked "Supervisor's Results".









**This form must be completed and returned with the candidates' scripts.**

### 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 the Syndicate 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 and report should be enclosed in the envelope containing the candidates' scripts. If more than one envelope is used, a copy of the report must be enclosed in each envelope.

#### Declaration to be signed by the Principal

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

Signed .....

Name (in block capitals) .....

Centre Number .....

Centre Name .....



**Information required**

Sample set of numerical results for each question, clearly marked "Supervisor's Results".

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

