



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

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**PHYSICS**

**5054/03**

Paper 3 Practical Test

**October/November 2009**

**CONFIDENTIAL INSTRUCTIONS**

**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 **10** printed pages and **2** 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)**

Supply of boiling water – see Note 1.

–10°C to 110°C liquid-in-glass thermometer – see Note 2.

250 cm<sup>3</sup> plastic or glass beaker.

Three or four paper tissues – see Note 3.

Stand, boss and clamp – see Note 4.

Stopwatch.

**Notes**

1. The supply of boiling water should be secured in some way so that there is no danger of spillage – e.g. if a beaker above a bunsen burner, tripod and gauze is used, then the beaker should be securely clamped. The same supply of boiling water may be used by several candidates provided candidates do not have to carry hot thermometers across the room.
2. Candidates will be required to place their thermometer into the boiling water. Just before the examination starts, Supervisors should demonstrate how this is done and instruct candidates not to move the supply of boiling water.
3. The tissues should be loosely crunched into a ball and then packed loosely into the plastic or glass beaker. Candidates will have to place the bulb of the thermometer in the middle of the tissues.
4. The stand should be of sufficient height to ensure that, when the thermometer is clamped close to its top, the bulb of the thermometer is above the bench.
5. At the changeover, Supervisors should replenish the supply of boiling water, if necessary, and should ensure that the tissues are still in place and dry. Wet tissues should be replaced by dry ones.

**Information required by Examiners**

Sample set of numerical results, clearly marked “Supervisor’s Report”.

**Question 2****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.

10 cm length of thread – see Note 2.

A 100 g mass hanger with four 100 g slotted masses – see Note 3.

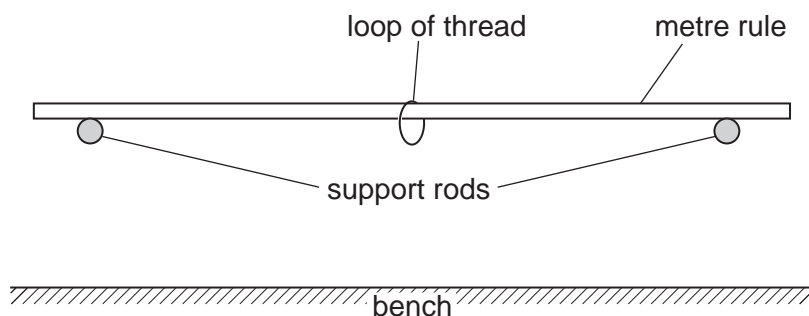
Half-metre rule with a millimetre scale.

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

Set square.

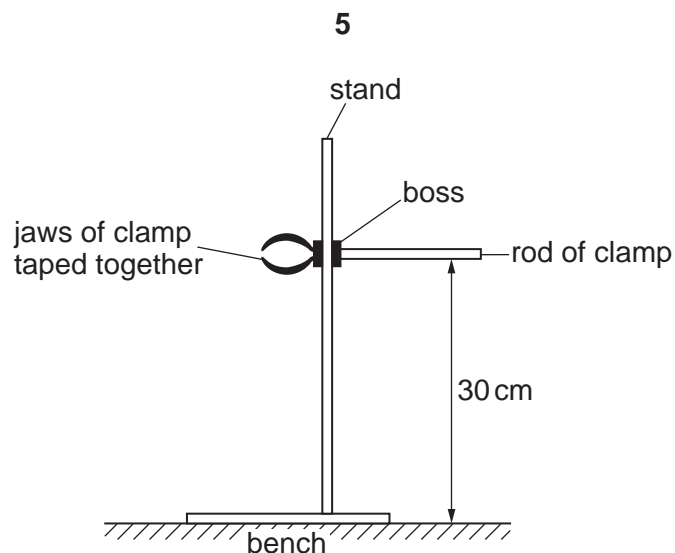
**Notes**

1. The candidate will use the metal support rods to support the metre rule, as shown in Fig. 2.1.



**Fig. 2.1**

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. 2.2.



**Fig. 2.2** (side view)

2. The 10 cm length of thread should be tied loosely around the centre of the rule to form a loop.
3. Candidates will use masses of 200 g and 500 g. If slotted masses are not available, then Supervisors may provide one mass of 200 g and one mass of 500 g. These masses should have suitable hooks to enable them to be suspended from the loop of thread at the centre of the rule.
4. 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".

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

Piece of wood of minimum length 1.1 m and minimum width 10 cm.

Wooden block of height approximately 10 cm – see Note 1.

Blu-Tack.

Table-tennis ball.

Two metre rules with millimetre scales – see Note 2.

Stopwatch, reading to 0.1 s or better (a digital stopwatch is suitable).

Pile of paper towels – see Note 3.

**Notes**

1. The wooden block should be placed under one end of the piece of wood to form a ramp. Supervisors should check that the table-tennis ball takes approximately 2 seconds to roll 0.800 m down the ramp from rest. If necessary, the height of the block of wood or its position under the ramp should be changed so that this time is achieved. The block should then be secured to the ramp with Blu-Tack.
2. The metre rules should be placed along the ramp. They should be parallel to the edge of the ramp with a small gap of about 1 cm between them. The gap is to form a channel down which the table-tennis ball will roll. The 0.0 cm ends of the rules should both be at the edge of the bottom of the ramp. Blu-Tack should be used beneath the rules to secure them in this position.
3. The pile of paper towels should be placed on the bench up against the bottom of the ramp to form a stop.
4. At the changeover, the Supervisor should check that the apparatus is still set up as described above.

**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)**

3V d.c. power supply – e.g. two 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.

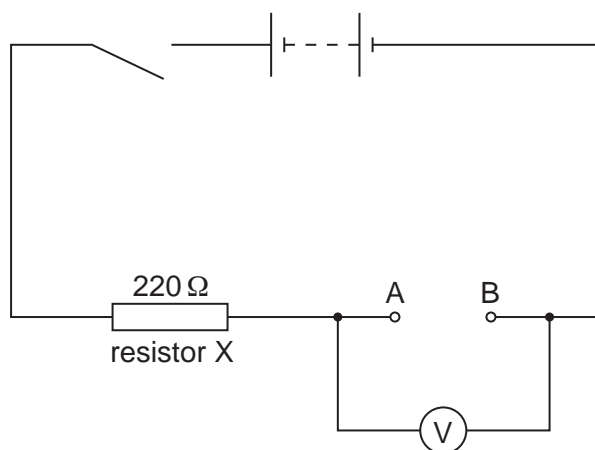
Resistor of nominal value  $220\ \Omega$  – see Notes 1 and 2.

Switch or plug key.

Two resistors of nominal value  $100\ \Omega$  – see Notes 1 and 3.

Two resistors of nominal value  $1000\ \Omega$  – see Notes 1 and 3.

Connecting leads to enable the Supervisor to set up the circuit shown in Fig. 4.1.



**Fig. 4.1**

Four further connecting leads.

**Notes**

1. The resistors should all have suitable terminations to enable them to be connected into the circuit.
2. The value of the  $220\ \Omega$  resistor should be obscured from the candidates by covering the resistor in opaque tape. The resistor should be labelled “resistor X”.
3. The nominal values of the other four resistors should be clearly marked on the resistors for the candidates to use. This can be done by placing masking tape around the resistor and then writing the value of the resistor on the masking tape. All values should be written in ohm – e.g.  $1000\ \Omega$ .
4. In the circuit shown in Fig. 4.1, the ends of the connecting leads should be clearly labelled A and B.
5. At the changeover, the Supervisor should check that the circuit is still set up as shown in Fig. 4.1. The switch should be open and the labels A and B should still be in place.

**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**

