



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**PHYSICS**

**5054/32**

Paper 3 Practical Test

**October/November 2013**

**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 Cambridge  
by e-mail: info@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 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.

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).

Expendable steel spring, with spring constant of approximately 25 N/m, e.g. Griffin product code 12463080 (see Note 1).

Metal stand (see Note 1).

Knife-edge (see Note 2).

Support for the knife-edge, e.g. wooden block (see Note 2).

Blu-Tack (see Note 2 and Note 3).

Metre rule with millimetre divisions.

Stand, clamp and boss to support the spring (see Note 3).

#### Notes

1. Ideally the metal stand should have a cuboid base with an upright rod. The diameter of the rod should be less than the diameter of the loop at the end of the spring so that the candidate can easily slide the loop over the rod. Other types of stand bases will work but may be more difficult to balance. The stand should be labelled A.
2. In the first part of the experiment, the **candidate** will set up the apparatus as shown in Fig. 1.1. The height of the support must therefore be greater than the length of the base of the stand. Also the width of the support should be sufficiently small to allow candidates to balance the stand. It may be easier to place the support on one of its ends, in which case the Supervisor may wish to fix the position of the support with Blu-Tack. The knife-edge should be attached to the support with Blu-Tack.

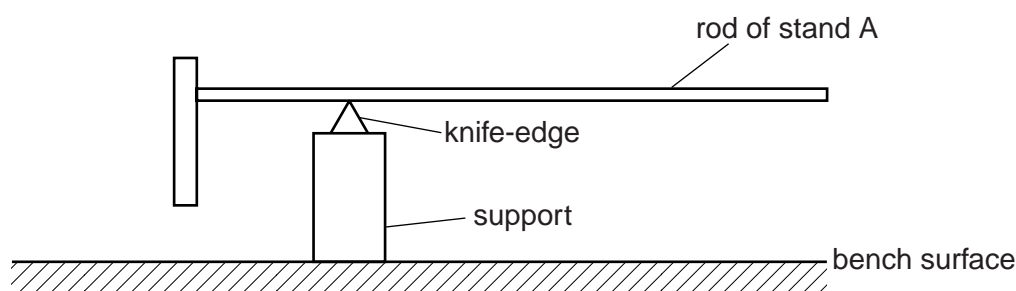
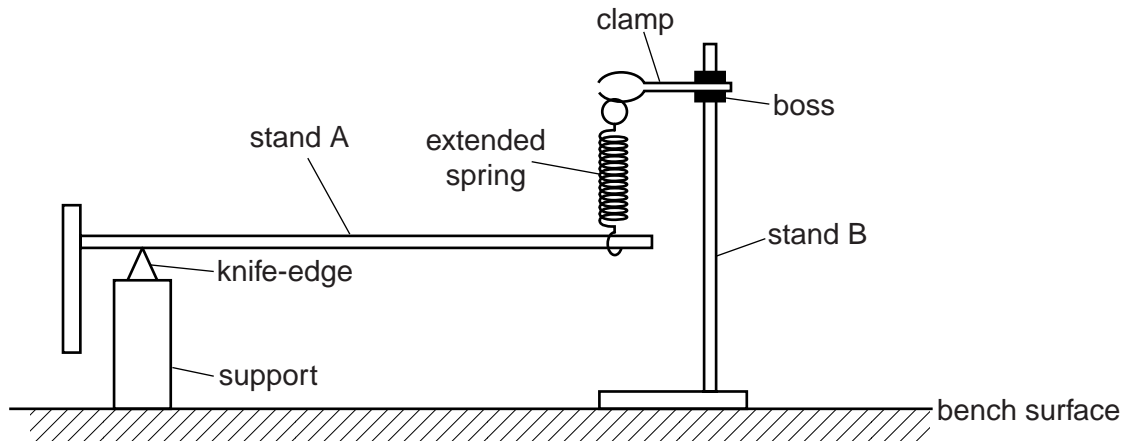


Fig. 1.1

3. In the second part of the experiment, the **candidate** will set up the apparatus as shown in Fig. 1.2. The loop of the spring must therefore easily pass over the rod but should not easily slip off it. If necessary, the Supervisor should supply a small piece of Blu-Tack to hold the loop in position. The purpose of the Blu-Tack should be explained to the candidates. The stand used to support the spring should be labelled B.



**Fig. 1.2**

4. 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 labelled "Supervisor's Results", obtained out of sight of the candidates.

## Question 2

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

250 cm<sup>3</sup> Pyrex beaker labelled A (see Note 1).

250 cm<sup>3</sup> beaker labelled “water at room temperature” (see Note 2).

Supply of hot water, e.g. kettle shared between candidates (see Note 3).

100 cm<sup>3</sup> measuring cylinder (see Note 4).

Thermometer with range –10 °C to 110 °C.

Stand, boss and clamp to hold the thermometer (see Note 5).

Plastic stirrer.

Paper towels or cloths to mop up spillages.

### Notes

1. The Supervisor should draw a line on the beaker at the 100 cm<sup>3</sup> level with a permanent marker pen. The line should be labelled 100 cm<sup>3</sup>.
2. Water should be left in the laboratory overnight so that it is in thermal equilibrium with its surroundings. The 250 cm<sup>3</sup> beaker labelled “water at room temperature” should be filled with this water.
3. There should be sufficient supplies of hot water to ensure that candidates do not have to carry hot water across the laboratory, e.g. one kettle between four sets of apparatus. Supervisors should bring the water to the boil just before the changeover so that the next candidates have a supply of water at a sufficiently high temperature.
4. If the measuring cylinder is marked in ml, candidates should be advised that 1 ml = 1 cm<sup>3</sup>.
5. The stand, boss and clamp should be assembled so that the **candidate** can clamp the thermometer with its bulb approximately 1 cm above the bench.
6. At the changeover, the Supervisor should
  - discard the water from beaker A and from the measuring cylinder,
  - replenish the supply of water at room temperature,
  - ensure that the supply of hot water has just boiled.

### Information required by Examiners

Sample set of numerical results, clearly labelled “Supervisor’s Results”, obtained out of sight of the candidates.

**Question 3**

**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.

Switch or plug key.

Resistor of nominal value  $3.3\Omega$ , e.g. RS Components product code 707-8029 (see Note 1).

Resistor of nominal value  $33\Omega$ , e.g. RS Components product code 707-8108 (see Note 1).

Low voltage filament lamp in holder (see Note 2).

Voltmeter capable of measuring a potential difference of up to 3V to a precision of 0.05V or better. An analogue or digital meter is suitable.

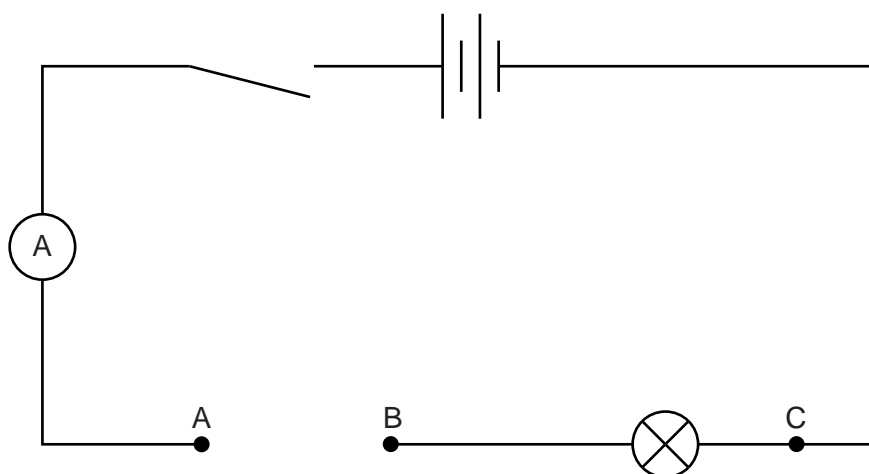
Ammeter capable of measuring a current of up to 300 mA to a precision of 1 mA or better. An analogue or digital meter is suitable.

Five connecting leads (see Note 3).

Four further connecting leads (see Note 4).

**Notes**

1. The resistors should be labelled with their values. The resistors should have a power rating of 0.5W or higher. The resistors should have suitable terminals to enable them to be connected into the remainder of the circuit.
2. The filament lamp should have a nominal voltage rating of 2.5V and a nominal current rating of between 200mA and 300mA, e.g. RS Components product code 106-329 (200mA) or 106-313 (250mA).
3. The Supervisor should set up the apparatus as shown in Fig. 3.1. The terminals A, B, and C should be clearly labelled. C is labelled where the lead is connected to the filament lamp holder.



**Fig. 3.1**

4. Two of the further connecting leads should be connected to the voltmeter so that the **candidate** can connect it across points B and C in the circuit. The other two leads will be used by the **candidate** to connect the resistors, in turn, between points A and B.
5. At the changeover, the apparatus should be restored to its original state as in Fig. 3.1, removing any resistors from the circuit. There should be a gap between A and B. If cells are used, they should be checked and replaced, if necessary.

#### **Information required by Examiners**

Sample set of numerical results, clearly labelled "Supervisor's Results", obtained out of sight of the candidates.



**Question 4**

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

Rectangular transparent block (see Note 1).

30 cm ruler with a millimetre scale.

Four optics pins.

Protractor.

Soft board of approximately A4 size (see Note 2).

**Notes**

1. The transparent block should have straight rather than bevelled edges. A glass or Perspex block may be used.
2. In order to carry out the experiment, the candidates will place their question paper on the soft board. They will then need to stick the optics pins into the board in order to trace the path of a ray through the block. The board should be soft enough to allow pins to be easily pushed in.
3. At the changeover, the Supervisor should check that all the apparatus is still present.

**Information required by Examiners**

Sample set of numerical results, clearly labelled "Supervisor's Results", obtained out of sight of the candidates.

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**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 Cambridge 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**

For each question, please enclose a sample set of numerical results, obtained out of sight of the candidates and clearly labelled "Supervisor's Results".

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