Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

PHYSICS **5054/32**

Paper 3 Practical Test **October/November 2014**

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 **11** printed pages and **1** blank page.

DC (LK/CGW) 77279/2

CAMBRIDGE
International Examinations

[Turn over

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° to 180° 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.

BLANK PAGE

Question 1

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

Wooden dowel (see Note 1).

99.0 cm length of bare metal wire (see Note 2).

Metre rule with a millimetre scale.

30 cm ruler with a millimetre scale.

Four pieces of adhesive tape of length approximately 5 cm (see Note 3).

Access, without undue delay, to a top-pan balance reading to a precision of 0.1 g or 0.01 g (see Note 4).

Notes

1. The wooden dowel should have an approximate length of 10 cm and an approximate diameter of 2 cm.

2. The wire should be chosen so that the **candidate** can easily wind it around the wooden dowel. The **candidate** will also push the turns together so that they are touching. Resistance wire or copper wire is suitable. The diameter should be between 0.30 mm and 1.5 mm. Larger diameters in the range are recommended provided the wire can be easily wound around the dowel. A fresh length of wire should be given to each candidate.

3. These will be used by the candidate to fix the wire to the bench whilst its length is being measured and to fix the turns of wire to the dowel when they are being counted. Again fresh pieces should be given to each candidate.

4. If a balance with a precision of 0.1 g is used, the wire should have a diameter of at least 1 mm.

5. At the changeover, the Supervisor should replace the wire and the adhesive tape.

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)

Converging lens of focal length 15 cm (see Note 1).

Stand, boss and clamp to hold the lens horizontally.

Half-metre rule with a millimetre scale.

Small piece of Blu-Tack (see Note 2).

Additional boss and clamp to hold the half-metre rule vertically (see Note 3).

Set square.

Notes

1. The Supervisor should ensure that each lens has a focal length between 14.5 cm and 15.5 cm. This may be done by focusing the image of a distant object on a screen. The focal length is the distance between the centre of the lens and the screen.

2. The Blu-Tack will be used by the **candidate** to mark a position on the half-metre rule.

3. The bosses will be connected to the same stand. The **candidate** will clamp the half-metre rule vertically and will need to adjust the height of the lens.

4. At the changeover, the Supervisor should dismantle any apparatus left set up by the candidate, and remove the Blu-Tack from the half-metre rule.

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)

Block of wood of mass approximately 200 g (see Note 1).

Pulley with a means of supporting it close to the edge of the bench.

Small hook (see Note 2).

10 g slotted mass hanger, nine 10 g slotted masses and one 100 g slotted mass (see Note 3).

Length of thin string (see Note 4).

Metre rule with a millimetre scale.

Stand, boss and clamp to hold the metre rule.

Set square.

Stopwatch reading to 0.1 s or better.

Notes

1. One of the larger faces of the block of wood should be labelled A. The mass of the block, given to the nearest 0.001 kg, should also be written on the label in the form "M = ……. kg".

2. The small hook should be screwed into one end of the wooden block. It should be at such a height that the string that will be attached to it will be approximately parallel to the bench when it passes over the pulley.

3. The Supervisor should check that all the slotted masses will fit onto the mass hanger at the same time.

4. One end of the thin string should be tied to the hook and the other end should be tied to the mass hanger. The length of the string between these two points should be approximately 5 cm greater than the height of the bench. The apparatus should then be assembled as shown in Fig. 3.1.

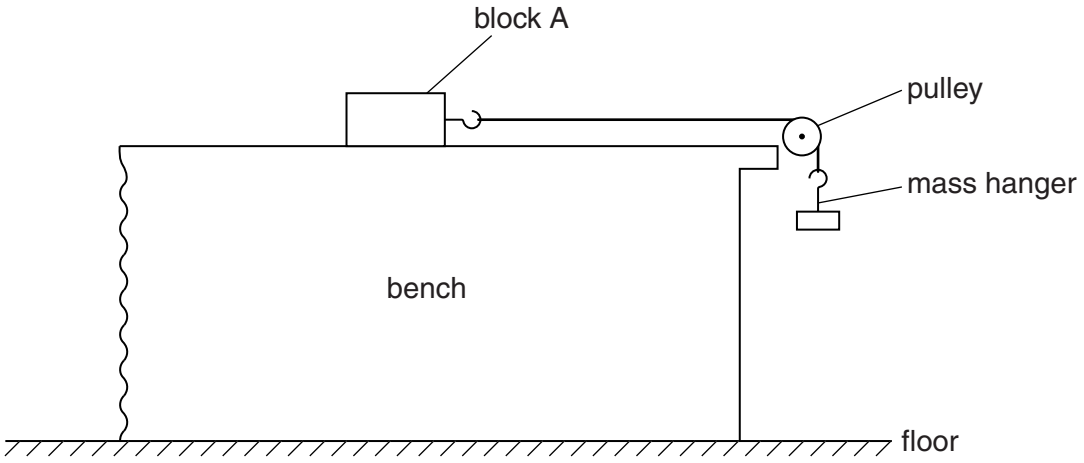

Fig. 3.1

5. At the changeover, the Supervisor should remove any masses from the mass hanger and should ensure that the apparatus is still set up as shown in Fig. 3.1.

Information required by Examiners

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

[Turn over

Question 4

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

Power source (see Note 1).

Switch or plug key.

Metre rule with a millimetre scale.

1.1 m length of 28 swg (0.38 mm diameter) or 30 swg (0.32 mm diameter) resistance wire (see Note 2).

Card on which is written the resistance of a 1.000 m length of the resistance wire to the nearest 0.1 Ω in the form "R = ...Ω".

Two crocodile clips (see Note 3).

Resistor labelled X (see Note 4).

Four connecting leads to enable the Supervisor to set up the circuit shown in Fig. 4.1. The points A, B, C and D should be labelled.

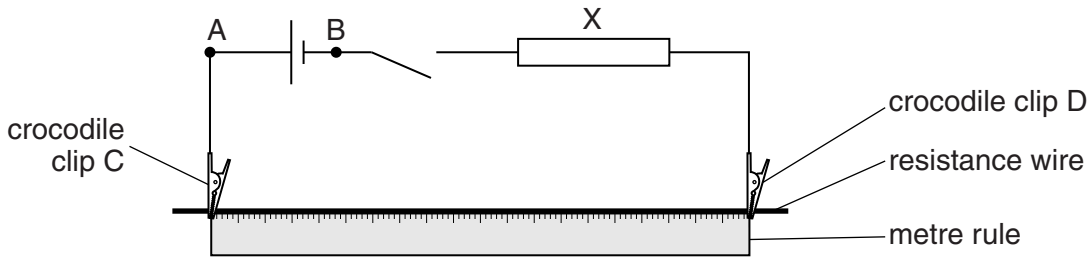

Fig. 4.1

Voltmeter capable of measuring a potential difference of up to 2.0 V to a precision of 0.01 V. An analogue or digital meter is suitable (see Note 5).

Two connecting leads to enable the **candidate** to connect the voltmeter into the circuit between A and B or between C and D.

Notes

1. The following are suitable power sources but all the candidates at a Centre must be supplied with the same source:

- 1.5 V dry cell in a suitable holder,
- 1.2 V rechargeable cell in a suitable holder,
- d.c. power supply of 1.5 V or 2 V.

If a d.c. power supply is used, the Supervisor should tell candidates that a d.c. power supply has been used instead of the cell shown on the circuit diagram. If a variable d.c. power supply is used, the variable control should be taped to prevent candidates altering the output voltage.

2. Nichrome wire or constantan wire should be used. The wire should be attached to the metre rule at three points so that it is reasonably taut. This should be done with thin strips of adhesive tape at the 3 cm, 45 cm and 97 cm marks on the rule. The same resistance wire should be used at all stations at a given Centre. The Supervisor may need to clean the wire gently with fine abrasive paper prior to the start of the experiment.

3. The two crocodile clips labelled C and D are used to connect the resistance wire to the remainder of the circuit. Clip C is connected to the wire as close as possible to 0.0 cm and clip D as close as possible to 100.0 cm.

4. The resistor X should have suitable terminals to enable it to be connected into the remainder of the circuit. The value of this resistor should be chosen to be about $\frac{1}{3}$ of the value of the resistance of the resistance wire. Fig. 4.2 gives possible values. When the candidate uses short lengths of wire the current can become high. Supervisors should therefore use a resistor with a relatively high power rating. Suitable RS Components product codes for such resistors are given in Fig. 4.2.

Resistance wire	Resistor X	Product code with power rating
28 swg nichrome	3.3 Ω	683-5473 (1 W)
30 swg nichrome	4.7 Ω	683-5506 (1 W)
28 swg constantan	1.5 Ω	683-5619 (2 W)
30 swg constantan	2.2 Ω	683-5439 (1 W)

Fig. 4.2

5. The Supervisor should ensure that it is possible to measure the e.m.f. of the power supply with the voltmeter.

6. At the changeover, the Supervisor should disconnect the voltmeter from the circuit and check that the circuit is set up as in Fig. 4.1 with the switch open and the crocodile clips at the ends of the metre rule. The voltmeter and the two connecting leads should be placed on the bench. If cells are used, they should be checked, and replaced if necessary.

Information required by Examiners

1. The resistance of X used at all stations.

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

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 .....

[Turn over

Information required

1. The resistance of X used in **Question 4**.

resistance of X = ...

2. 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