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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

PHYSICS **5054/31**

Paper 3 Practical Test **May/June 2010**

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.

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If you have any problems or queries regarding these Instructions, please contact CIE
by e-mail: 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.

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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.

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Question 1

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

Two half-metre rules, each with a millimetre scale.

20 glass spheres of diameter between 1 cm and 2 cm (see Note 1).

Container for glass spheres, e.g. petri dish or small beaker.

Two set squares.

Access to a top-pan balance (see Note 2).

Notes

1. For each set of apparatus, the 20 spheres should be of similar size. Glass marbles would be suitable.

2. There should be sufficient top-pan balances to avoid delay when candidates are taking mass readings.

3. At the changeover, the Supervisor should dismantle any apparatus left set up by the candidate. The top-pan balance should also be reset to zero.

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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Question 2

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

Wooden block of mass approximately 100 g.

Small hook (see Note 1).

Additional mass to be placed on top of the wooden block (see Note 2).

Blu-tack.

Approximately 1 m of thin string.

Pulley with a means of securing it to the edge of the bench.

10 g slotted mass hanger with nine 10 g slotted masses.

Card on which is written “mass of mass hanger = 10 g”.

Metre rule with a millimetre scale.

Set square.

Stand, boss and clamp.

Stopwatch, reading to 0.1 s or better.

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Notes

1. The small hook should be screwed into one end of the wooden block. One end of the thin string should be tied to the hook and the other end should be tied to the mass hanger. The apparatus should then be assembled as shown in Fig. 2.1.

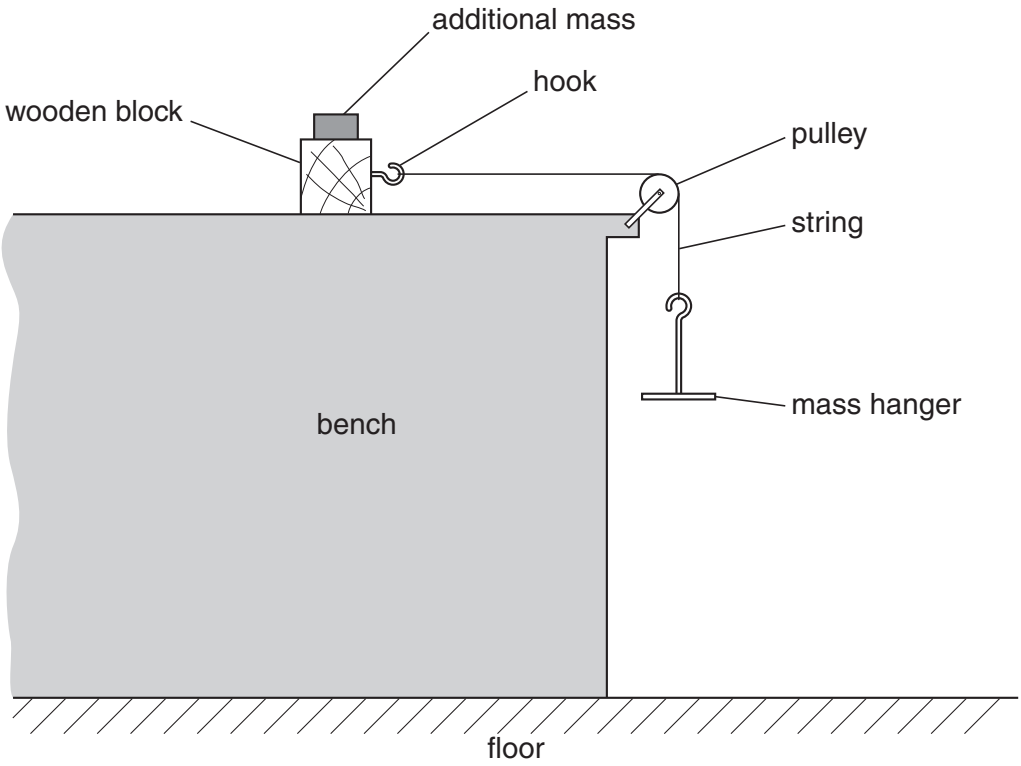

Fig. 2.1

2. When the experiment is being performed, the block must **accelerate** across the bench when released. This should be achieved by a total mass of between 40 g and 80 g for the mass hanger and slotted masses. Supervisors should adjust the additional mass on the top of the wooden block until this is achieved. A value of 100 g for the additional mass may be suitable, but the value will be dependent on the smoothness of the bench and the wooden block. Once the mass has been chosen, it should be secured to the wooden block with Blu-tack.

3. At the changeover, the Supervisor should dismantle any apparatus left set up by the candidate. The Supervisor should remove any masses that have been added to the mass hanger.

Information required by Examiners

Height of bench.

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

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Question 3

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

Converging lens of focal length 15 cm.

Cross-wire object (see Note 1).

Screen (see Note 2).

Light source (see Note 5).

Lens holder.

Metre rule with a millimetre scale.

30 cm rule with a millimetre scale.

Notes

1. The cross-wire object should be formed by using a 20 cm square piece of card or board. A hole of diameter 2.0 cm should be made in the card. Two small pieces of thin wire should be glued to the front of the card so that they cross the hole along two perpendicular diameters. Tracing paper should be attached to the back of the card to cover the hole.

2. The screen should be formed by using a 20 cm square piece of card or board. The screen should have a white surface.

3. The object and the screen should be supported so that they can stand perpendicular to the bench. This may be done either by attaching blocks of wood to the base of the object and screen or by supporting them with clamps, bosses and stands.

4. The centre of the cross-wire, the lamp and the centre of the lens when it is supported in the holder should all be at the same height above the bench.

5. The apparatus should be in a dimly lit area of the laboratory and the lamp should be bright enough so that candidates can see a magnified image of the cross-wires formed on the screen.

6. At the changeover, the Supervisor should dismantle any apparatus that has been 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.

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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).

Digital voltmeter capable of measuring a voltage of up to 5V to a precision of 0.01V (see Note 1).

Resistor of nominal value 470kΩ.

Electrolytic capacitor of nominal value 100μF.

Switch or plug key.

Connecting leads to enable the Supervisor to set up the circuit shown in Fig. 4.1 (see Note 3).

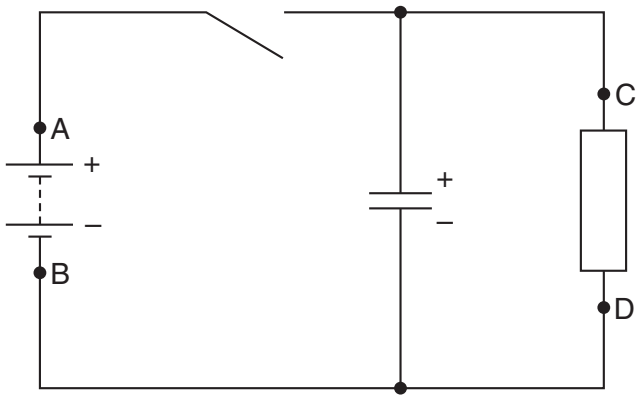

Fig. 4.1

Two further connecting leads to enable the candidate to connect the voltmeter into the circuit (see Note 4).

Stopwatch, reading to 0.1s or better.

Notes

1. A **digital voltmeter** must be used so that it has the required high resistance. A digital multimeter fixed on an appropriate voltage range would be suitable.

2. The resistor and the capacitor must have suitable terminals to enable them to be connected into the remainder of the circuit.

3. The Supervisor should take care to connect the negative terminal of the electrolytic capacitor to the negative terminal of the power supply. The points A, B, C and D should be clearly labelled. A and B should be the terminals of the power supply, and C and D should be the terminals of the resistor.

4. The two additional connecting leads should be connected to the voltmeter so that the candidate can measure the potential difference between various points in the circuit.

5. At the changeover, the Supervisor should open the switch, remove the voltmeter and check that the circuit is set up as shown in Fig. 4.1.

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 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 candidate's 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 .....

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Information required

1. Height of bench used for Question 2: ..... m

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