

**UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE**  
**Joint Examination for the School Certificate**  
**and General Certificate of Education Ordinary Level**

**PHYSICS**

**5054/3**

PAPER 3 Practical Test

INSTRUCTIONS

**OCTOBER/NOVEMBER SESSION 2001**

2 hours

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

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**These instructions consist of 8 printed pages.**

## **Instructions for preparing apparatus**

These Instructions detail the apparatus required for each experiment in this paper. A summary of the questions that will be presented to the candidates is included, to allow the Physics teacher to test the apparatus appropriately. 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.

Extra graph paper and Mathematical tables should be available. It is assumed that candidates will supply their own 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 of 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 printed Answer Booklet. 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)**

Ball of Plasticene of approximate diameter 4 cm (see note **(i)**)

100 cm<sup>3</sup> measuring cylinder (see note **(ii)**)

250 cm<sup>3</sup> beaker containing approximately 200 cm<sup>3</sup> of water

Top-pan balance capable of measuring to 0.1 g or better (see note **(iii)**)

**Notes**

- (i)** Candidates will need to alter the shape of the Plasticene and immerse it in water. At the changeover, Supervisors will need to dry the Plasticene and re-form it into a ball. It may be convenient to have spare balls available.
- (ii)** If the scale of the measuring cylinder is labelled in ml, then this marking should be covered with a self-adhesive label marked 'cm<sup>3</sup>', written with a permanent ink marker.
- (iii)** The top-pan balance may be shared between about 8 candidates.

**Procedure to be followed by candidates**

Candidates will be required to determine the volume of the Plasticene by displacement. To do this they will need to alter its shape. They will measure the mass of the Plasticene using a top-pan balance.

**Information required by Examiners**

None

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

Convex lens of focal length 15 cm

Stand, clamp and boss (see note (i))

Half-metre rule

15 cm clear plastic rule

**Note**

- (i) The lens should be held horizontally in the clamp about 30 cm above the bench. The candidate will need to adjust the height of the lens. At the changeover the lens should be returned to a height of 30 cm.

**Procedure to be followed by candidates**

The candidate will need to adjust the position of the lens so that its centre is 100 mm above the scale which is printed in the answer booklet. The lens will be used as a magnifying glass. The 15 cm rule will be used to measure the apparent size of an image.

**Information required by Examiners**

Focal length of the lens used

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

Expendable steel spring (see note (i))

300 g mass with suitable means of suspending it from the spring, e.g. 100 g slotted mass hanger and two 100 g slotted masses

Metre rule

Stand, clamp and boss to support the spring

Optics pin in cork

Second clamp and boss to support the metre rule or cork

Stopwatch reading to 0.2 s or better

**Note**

- (i) The spring must not exceed its elastic limit with a mass of 400 g suspended from it.

**Procedure to be followed by candidates**

Candidates will measure the extension of the spring when the 300 g mass is suspended from it. The period of oscillation of the 300 g mass on the spring will also be measured. They will use the optics pin in the cork as a fiducial mark.

**Information required by Examiners**

The extension of the spring produced by the 300 g mass

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

d.c. power supply of 4.5 V or 5.0 V e.g. three 1.5 V dry cells

Milliammeter capable of reading up to 50 mA to a precision of 1 mA

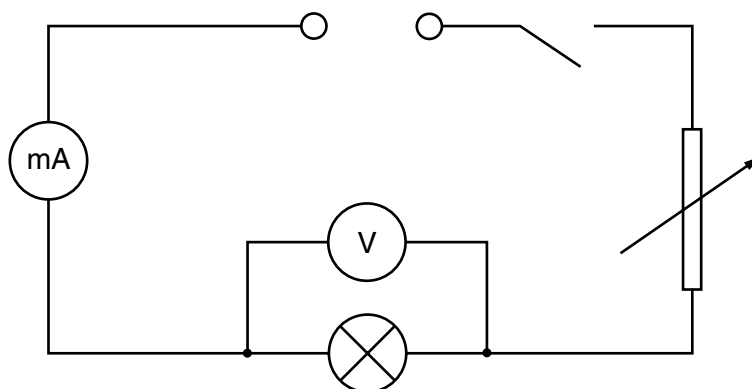
Voltmeter capable of reading up to 5.0 V to a precision of 0.2 V

Switch

6 V, 0.06 A lamp in lamp holder

1 k $\Omega$  variable resistor

Connecting leads to enable the Supervisor to set up the circuit in Fig. 4.1(see note (i))



**Fig. 4.1**

**Notes**

- (i) The Supervisor should arrange the apparatus on the bench exactly as shown in Fig. 4.1. The layout should be clear to the candidates and the leads may be taped to the bench if necessary.
- (ii) If present, the third (unused) terminal on the variable resistor should be taped over. Once the circuit has been set up and checked by the Supervisor, the switch should be opened.
- (iii) At the changeover, Supervisors should check that the circuit is still set up as described above.

**Procedure to be followed by candidates**

The candidates will draw a diagram of the circuit. They will then measure the p.d. across the lamp for a range of values of current in it.

**Information required by Examiners**

Specification of the lamp if different to that described in the instructions

**This form must be completed and returned with the Answer Booklets**

**REPORT ON PRACTICAL PHYSICS**

The Supervisor is asked to give the following details, using the space provided on page 8.

- (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 index 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 index numbers of the places occupied by the candidates for each session. The plan should be enclosed with the Answer Booklets together with the Information required by Examiners.

**Declaration to be signed by the Principal**

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

Signed .....

Name (in block capitals) .....

Centre Number .....

Centre Name .....



**Information required by examiners**

- 2 focal length of lens =
- 3 extension of spring produced by 300 g mass =
- 4 specification of lamp if different to that described

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