

**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

**OCTOBER/NOVEMBER SESSION 2001**

2 hours

Candidates answer on the enclosed answer booklet.

Additional materials:

As listed in Instructions to Supervisors

Graph paper

**TIME** 2 hours

**INSTRUCTIONS TO CANDIDATES**

Write your name, Centre number and candidate number in the spaces provided on the answer booklet.

Answer **all** questions.

Write your answers in the spaces provided in the answer booklet.

For each of the questions in Section A, you will be allowed to work with the apparatus for a maximum of 20 minutes. For the question in Section B, you will be allowed to work with the apparatus for a maximum of 1 hour.

You are expected to record all your observations as soon as these observations are made. All of your answers should be written in the answer booklet; scrap paper should **not** be used.

An account of the method of carrying out the experiments is **not** required unless it is asked for.

At the end of the examination, hand in only the answer booklet.

**INFORMATION FOR CANDIDATES**

Graph paper is provided in the enclosed answer booklet. Additional sheets of graph paper should be used only if it is necessary to do so.

Any additional sheets should be attached firmly to the answer booklet.

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**This question paper consists of 5 printed pages, 3 blank pages and an inserted answer booklet.**

**Section A**

Answer **all** the questions in this section.

- 1** *In this experiment, you will determine the density of Plasticene. Record your answers on page 2 of your answer booklet.*

You are to use the apparatus provided to determine the density of Plasticene. You may alter the shape of the Plasticene and/or use a smaller quantity if you wish. You will need to use the relationship

$$\text{density} = \frac{\text{mass}}{\text{volume}} .$$

- (a)** In your answer booklet, describe carefully the method which you used to find the volume of the Plasticene. You may include diagrams if you wish.
- (b)** **(i)** Record all your measurements.
- (ii)** Calculate the density of the Plasticene.

2 In this experiment, you will determine the focal length of a lens by finding the magnification produced by the lens when it is used as a magnifying glass. Record your answers on page 3 of your answer booklet.

- (a) On page 3 of your answer booklet there is a mm scale. The lens is held in a clamp in a stand. Place the lens above the mm scale. Adjust the height of the centre of the lens to be 100 mm above the mm scale. This is the distance  $u$  of the object from the lens.
- (b) Position your eye about 30 cm above the lens. Look through the lens at the mm scale and observe the points labelled A and B. These points are a distance  $h_0$ , 10 mm, apart.
- (c) Hold the short rule on top of the lens and measure the apparent distance  $h_1$  between A and B as viewed through the lens. This is illustrated in Fig. 2.1.

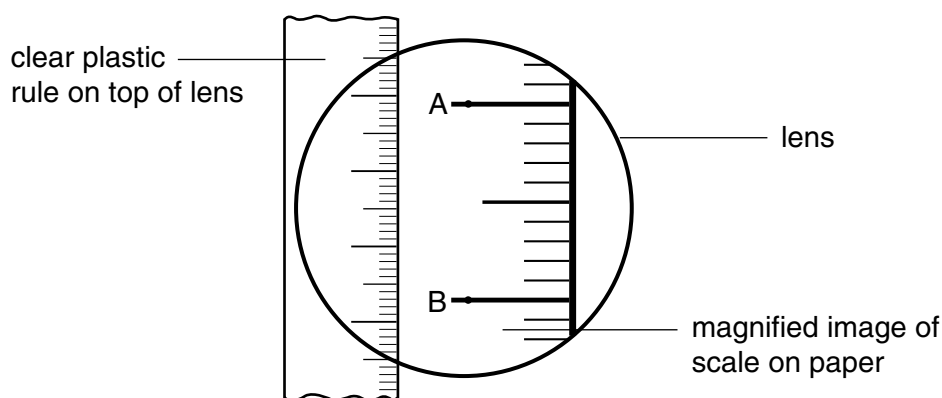


Fig. 2.1

- (d) Record  $u$ ,  $h_0$  and  $h_1$ .
- (e) Calculate the magnification  $m$  produced by the lens given that

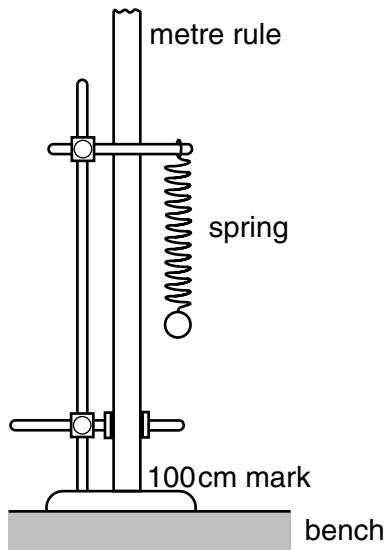
$$m = \frac{2h_1}{h_0} .$$

- (f) Calculate a value for the focal length  $f$  of the lens given that

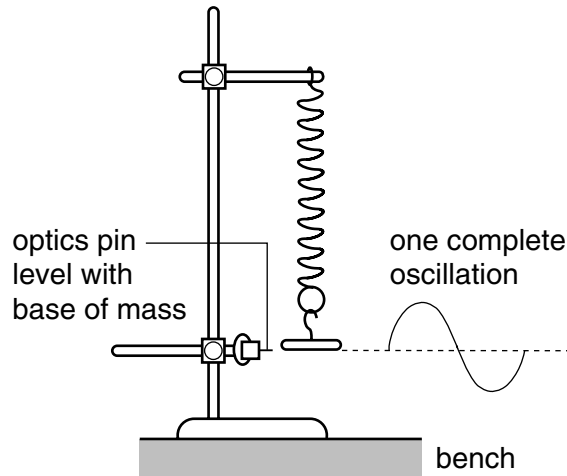
$$f = \frac{mu}{m-1} .$$

- 3** In this experiment, you will measure the extension of a spring when a mass of 300 g is suspended from it. You will also determine the period of oscillation of the mass on the spring. Record your answers on page 4 of your answer booklet.

- (a) Suspend the spring from the clamp, and support a metre rule vertically close to the spring as shown in Fig. 3.1.



**Fig. 3.1**



**Fig. 3.2**

- (b) Suspend a mass of 300 g from the end of the spring. Take and record measurements to determine the extension  $e$  of the spring.
- (c) Remove the metre rule and clamp the optics pin in the cork horizontally, level with the base of the mass and to the side, as shown in Fig. 3.2. Pull the mass down approximately 2 cm and release it. The mass will perform vertical oscillations. One complete oscillation of the mass is shown in Fig. 3.2. Take and record measurements to determine the period  $T$  of oscillation of the mass.
- (d) Calculate the acceleration of free fall  $g$  using

$$g = \frac{4\pi^2 e}{T^2}$$

## Section B

4 *In this experiment, you will measure the current in, and the potential difference across, a lamp to investigate the effect that current has on the resistance of the lamp. Use pages 5, 6 and 7 of your answer booklet for your answers.*

- (a) Draw a circuit diagram of the electrical circuit which has been set up.
- (b) Close the switch and adjust the current  $I$  in the circuit to a value of about 30 mA. Measure and record  $I$  and the value of the p.d.  $V$  across the lamp.
- (c) Calculate the resistance  $R$  of the lamp at this value of p.d. given that

$$R = \frac{V}{I}.$$

- (d) For a range of values of current in the lamp, measure the corresponding values of  $V$ . Tabulate your values of  $I$ ,  $V$  and  $R$ . Open the switch.
- (e) Plot a graph of  $R/\Omega$  ( $y$ -axis) against  $I/\text{mA}$  ( $x$ -axis).
- (f) Use your graph to determine values for the resistance of the lamp at currents of 10 mA and 40 mA.
- (g) Suggest a reason for the different values obtained in (f).

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