

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**PHYSICS**

**5054/03**

Paper 3 Practical Test

October/November 2006

**2 hours**

Additional Materials: As listed in the Confidential Instructions

**READ THESE INSTRUCTIONS FIRST**

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.  
Write your Centre number, candidate number and name on all the work you hand in.  
Write in dark blue or black pen.  
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

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 they are made.

An account of the method of carrying out the experiments is **not** required.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

## Section A

Answer **all** questions in this section.

- 1 *In this experiment you will make measurements on a lens to determine its focal length.*

You have been provided with a converging lens, a small piece of Blu-tack, a metre rule and two set squares.

- (a) By placing the lens on the metre rule, determine an average value for the diameter  $D$  of the lens, as shown in Fig. 1.1. Record your measurements and calculations on page 3 of your Answer Booklet. [1]

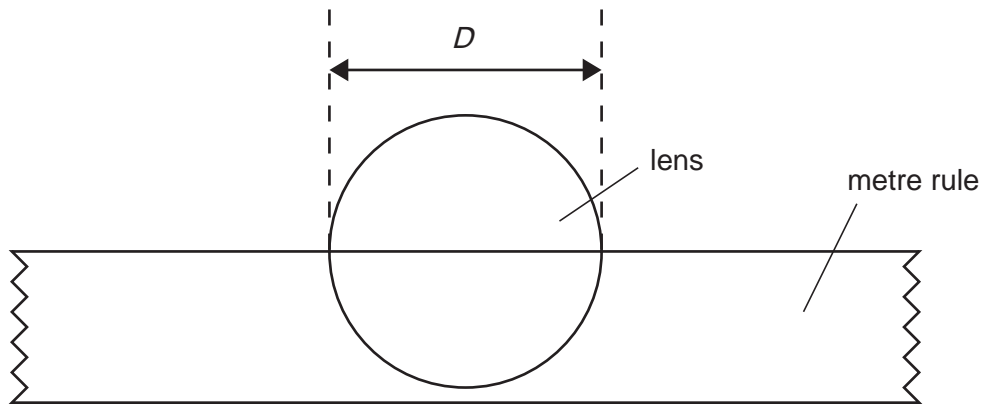
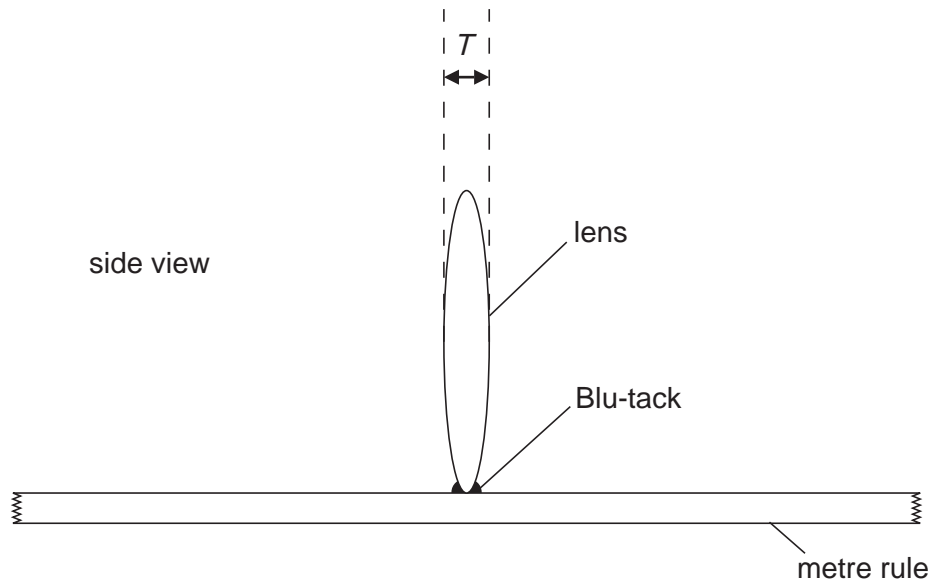


Fig. 1.1

- (b) Describe, with the aid of a diagram, how you made sure that an accurate value was obtained for  $D$ . [1]

- (c) Using a **small** piece of Blu-tack, stand the lens vertically on the metre rule, Fig.1.2. Using the two set squares, determine the thickness  $T$  of the lens.



**Fig. 1.2**

- (d) Draw a diagram to show how you used the two set squares to measure  $T$ . [1]
- (e) Calculate the focal length  $f$  of the lens given that

$$f = \frac{D^2}{4.16 T}. \quad [1]$$

- 2 *In this experiment you will investigate what happens to the resistance of a device of constant length and cross-sectional area when the amount of light falling on the device changes.*

You have been provided with a circuit containing a d.c. power supply, a light-dependent resistor (LDR), a voltmeter, an ammeter and a switch.

- (a) Close the switch and record, on page 4 of your Answer Booklet, the current  $I$  in the circuit and the potential difference  $V$  across the LDR. Try not to shade the LDR when you are taking your readings. [1]
- (b) Using your values from (a), calculate the resistance of the LDR. [1]
- (c) Cover the LDR with the disc provided and record a second set of values for  $I$  and  $V$ . Open the switch. [1]
- (d) Hence determine the resistance of the LDR when it is covered. [1]
- (e) Write a conclusion based on your observations. [1]

- 3 *In this experiment you will trace the path of a ray of light reflected by a plane mirror.*

You have been provided with a plane mirror in a holder, four optics pins, a protractor and a soft board on a surface in which to stick the pins.

- (a) A horizontal line has been drawn on page 5 of your Answer Booklet. Draw a normal to the line at point X, with the normal in the lower part of the page. Draw a line XY corresponding to an angle of incidence of  $30^\circ$ . [1]
- (b) Place page 5 of your Answer Booklet onto the soft board. Place the mirror along the horizontal line, with the mirror vertical. Place two optics pins perpendicular to the page and along XY. Label the positions of the pins A and B. [1]
- (c) View the images of pins A and B in the mirror. Place two more optics pins C and D so that C and D are in a straight line with the images of A and B. Label the positions C and D. [1]
- (d) Remove all the pins from the page and draw the line containing C and D back to the horizontal line on the page. Measure and record the angle of reflection. [1]
- (e) Suggest a reason why the line CD may not meet the horizontal line at X. [1]

## Section B

- 4 In this experiment you will investigate the acceleration of a sphere rolling down a channel between two metre rules.

You have been provided with the apparatus shown in Fig. 4.1 and Fig. 4.2. The zero ends of each metre rule are in contact with the bench.

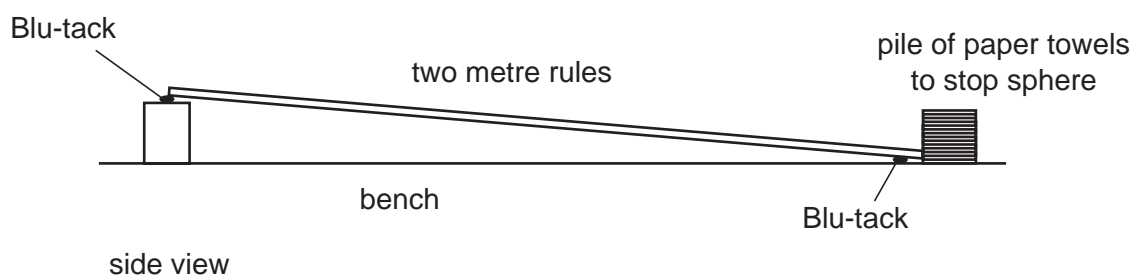


Fig. 4.1

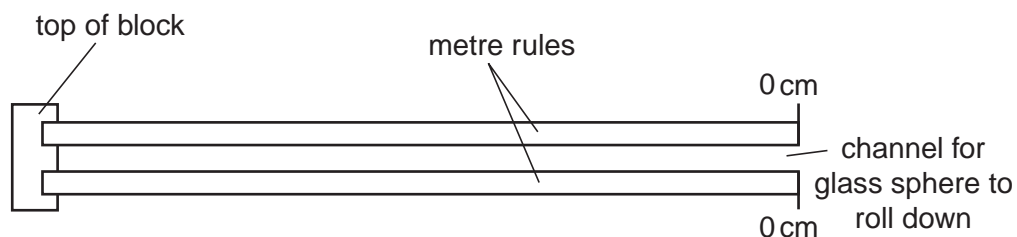


Fig. 4.2

- (a) Release the glass sphere from rest from the 80.0 cm mark on the rule. Determine the average time  $t$  taken for the sphere to travel a distance  $x$  down the ramp to the bench. Record all your measurements and calculations on page 6 of your Answer Booklet. [1]
- (b) Calculate the average speed  $w$  of the sphere as it travels down the ramp given that

$$w = \frac{x}{t}.$$

Calculate the final speed  $v$  of the sphere at the end of the ramp given that

$$v = 2w. \quad [1]$$

- (c) Repeat (a) and (b) for values of  $x$  greater than 40.0 cm. In the table include your results for (a) and (b), your measurements and the results of your calculations.
- (d) Complete the column headings in the table.
- (e) Using the grid on page 7 of your Answer Booklet, plot a graph of  $v/(cm/s)$  on the  $y$ -axis against  $t/s$  on the  $x$ -axis. [4]
- (f) Using your graph, describe qualitatively the acceleration of the sphere as it travels down the ramp. Explain how your graph leads you to this conclusion. [2]
- (g) Determine the average rate of change of velocity with time over the range of your graph. [2]

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