Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0456423532

PHYSICS **9702/34**

Paper 3 Advanced Practical Skills 2 **May/June 2015**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **both** questions.
You will be allowed to work with the apparatus for a maximum of one hour for each question.
You are expected to record all your observations as soon as these observations are made, and to plan the presentation of the records so that it is not necessary to make a fair copy of them.
You are reminded of the need for good English and clear presentation in your answers.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

Additional answer paper and graph paper should be used only if it becomes necessary to do so.

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.

For Examiner's Use	
1	
2	
Total	

This document consists of **10** printed pages and **2** blank pages.

DC (CW/SW) 94418/2

CAMBRIDGE International Examinations

BLANK PAGE

You may not need to use all of the materials provided.

1 In this experiment, you will investigate a metre rule rocking on a beaker.

(a) Assemble the apparatus as shown in Fig. 1.1 with the beaker horizontal. The centres of each of the two masses should be at the same distance r from the centre of the metre rule, where r is approximately 30 cm.

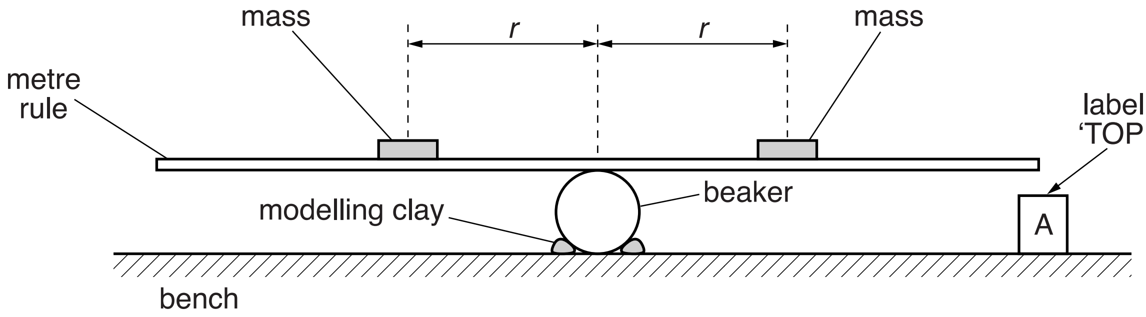

Fig. 1.1

(b) (i) Measure and record the distance r.

r = ... [1]

(ii) Adjust the position of the metre rule on the beaker so that the metre rule is balanced and approximately parallel to the bench.

(c) (i) Hold down the end of the metre rule on A, as shown in Fig. 1.2.

(ii) Release the metre rule and measure and record the time T for it to move up and then down again to its lowest position, as shown in Fig. 1.2.

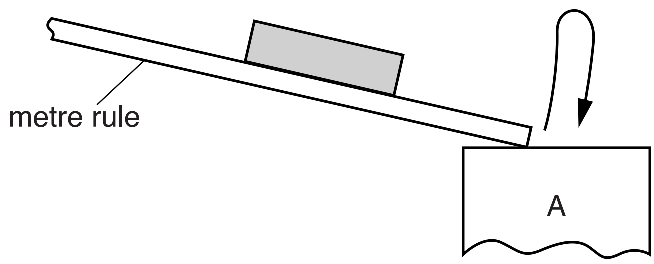

Fig. 1.2

T = ... s [2]

(d) Reposition the two masses at a different distance r from the centre of the metre rule and repeat **(b)** and **(c)** until you have six sets of values of r and T.

Use values of r less than or equal to 40 cm.
Include values of r^2 and T^3 in your table.

[9]

(e) **(i)** Plot a graph of T^3 on the y-axis against r^2 on the x-axis. [3]

(ii) Draw the straight line of best fit. [1]

(iii) Determine the gradient and y-intercept of this line.

gradient = ...

y-intercept = ...
[2]

(f) The quantities T and r are related by the equation

$$T^3 = ar^2 + b$$

where a and b are constants.

Use your answers from **(e)(iii)** to determine the values of a and b.
Give appropriate units.

a = ...

b = ...
[2]

You may not need to use all of the materials provided.

2 In this experiment, you will investigate how the optical properties of a lens depend on its shape.

(a) (i) Select one of the two glass lenses.

(ii) Take measurements to determine the thickness t, diameter D and edge height h of the lens, as shown in Fig. 2.1.

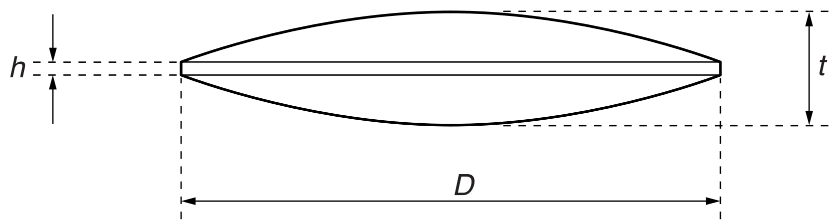

Fig. 2.1

t = ... cm

D = ... cm

h = ... cm
[3]

(b) Calculate R, where

$$R = \frac{D^2 + (t - h)^2}{4(t - h)}.$$

R = ... cm [2]

(c) You are provided with a small card which names a bright object in your exam room. You are also provided with a white screen.

(i) Use the lens to focus a sharp image of the bright object onto the screen, as shown in Fig. 2.2.

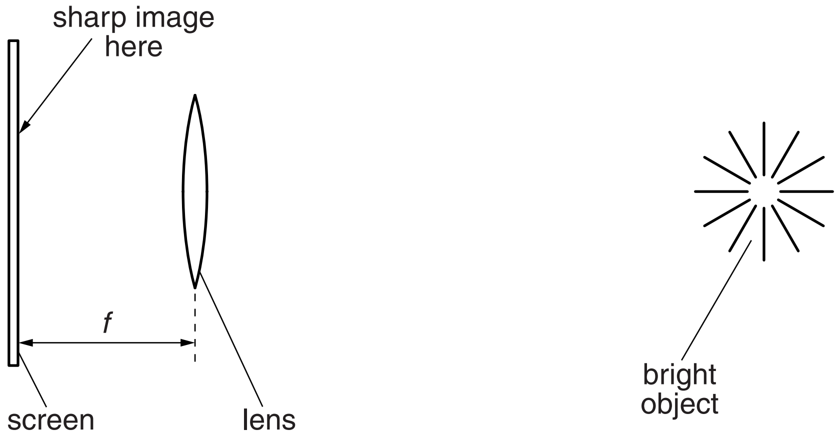

Fig. 2.2 (not to scale)

(ii) Measure the distance *f* from the lens to the screen, as shown in Fig. 2.2.

f = ... cm [1]

(iii) Estimate the percentage uncertainty in your value of *f*.

percentage uncertainty = ... [1]

(d) Using the second lens, repeat **(a)(ii)**, **(b)**, **(c)(i)** and **(c)(ii)**.

t = ... cm

D = ... cm

h = ... cm

R = ... cm

f = ... cm
[2]

Question 2 continues on page 10.

(e) It is suggested that the relationship between R and f is

$$R = kf$$

where k is a constant.

(i) Using your data, calculate two values of k.

first value of k = ...

second value of k = ...
[2]

(ii) Explain whether your results support the suggested relationship.

....

....

....

.... [1]

(f) **(i)** Describe four sources of uncertainty or limitations of the procedure for this experiment.

1. ....

....

2. ....

....

3. ....

....

4. ....

....
[4]

(ii) Describe four improvements that could be made to this experiment. You may suggest the use of other apparatus or different procedures.

1. ....

....

2. ....

....

3. ....

....

4. ....

....
[4]

BLANK PAGE