Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **5054/42**

Paper 4 Alternative to Practical **May/June 2014**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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 **all** questions.

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

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.

This document consists of **8** printed pages.

CAMBRIDGE International Examinations

1 A student investigates a floating wooden rod.

The wooden rod is placed in a tall beaker. A rubber band around one end of the rod makes it float vertically, as shown in Fig. 1.1.

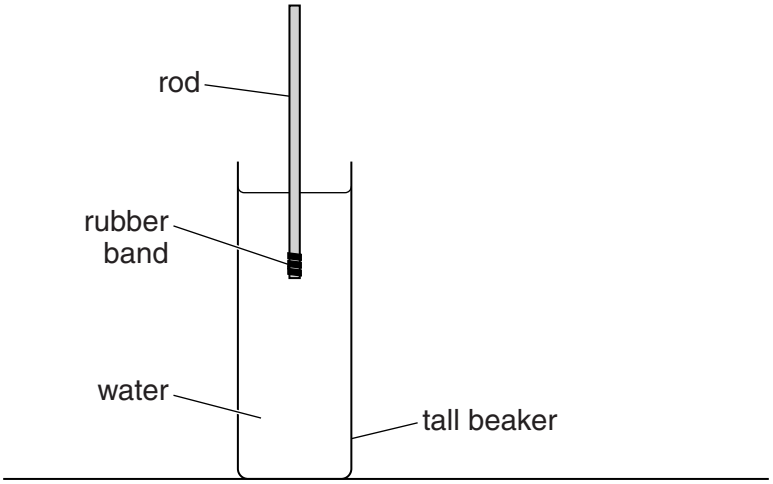


Fig. 1.1 (not to scale)

(a) (i) On Fig. 1.1, mark and label the length l of the rod above the water. [1]

(ii) Explain why it is difficult to measure l.

.....

.....[1]

(iii) Describe a method of measuring l accurately.

.....

.....

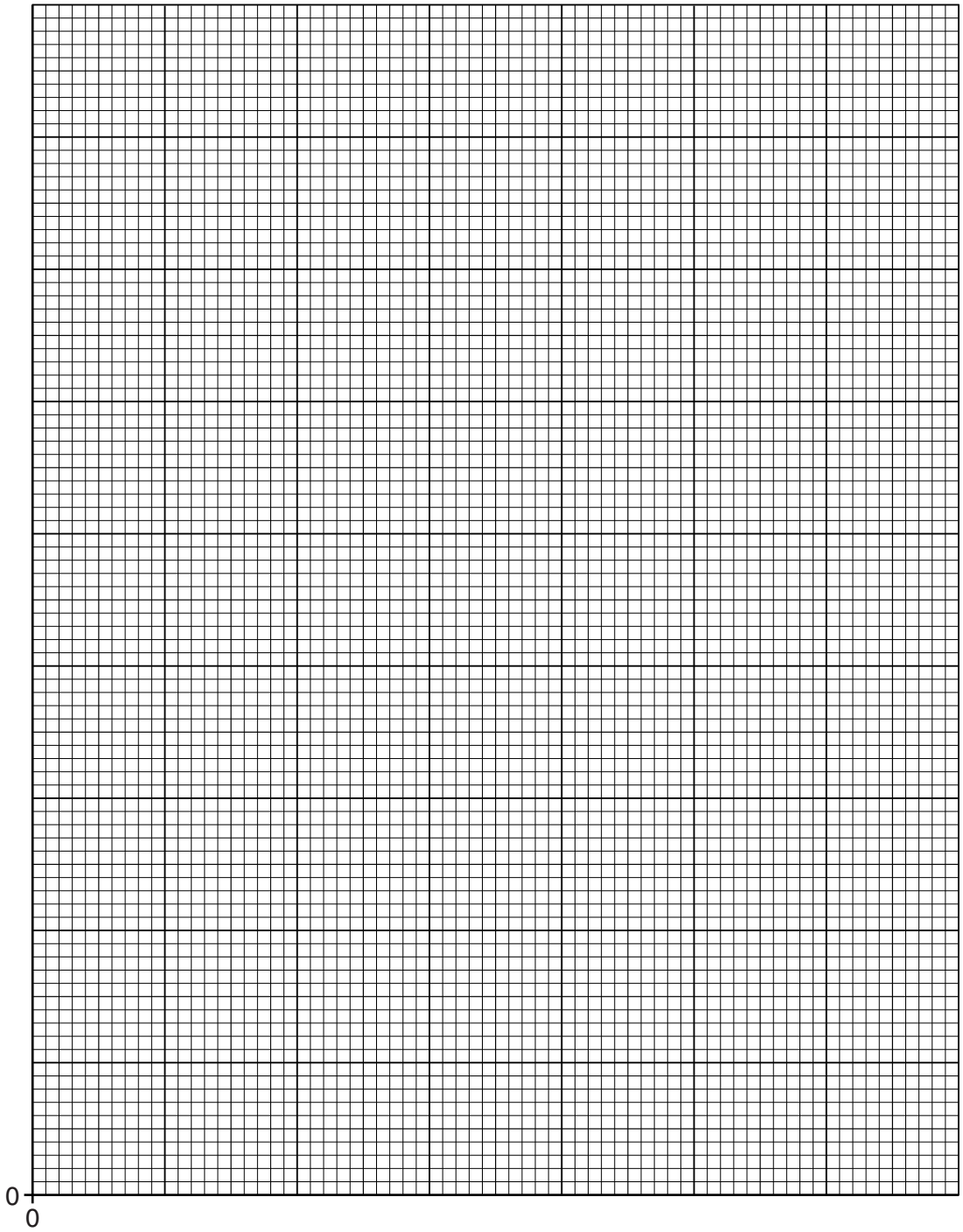
.....[2]

(b) The student increases the number N of rubber bands on the bottom of the rod and measures l for each value of N. Fig. 1.2 shows the student's results.

N	l/cm
1	8.5
3	6.8
5	5.1
7	3.5
9	1.6

Fig. 1.2

(i) On Fig. 1.3, plot the graph of l/cm on the *y*-axis against *N* on the *x*-axis. Start your graph from the origin. Draw the line of best fit.



[4]

Fig. 1.3

(ii) Describe the relationship between l and *N*.

.....

.....[2]

(iii) Use the graph to estimate the smallest number of bands needed to sink the rod.

number of bands = ...[1]

(c) Explain why it is important to use identical rubber bands.

.....

.....

.....

.....[1]

2 A student investigates the use of ammeters in a circuit.

(a) State the quantity measured with an ammeter.

.....[1]

(b) Explain why it is important for an ammeter to have a low resistance.

.....

.....[1]

(c) Fig. 2.1 shows an analogue ammeter.

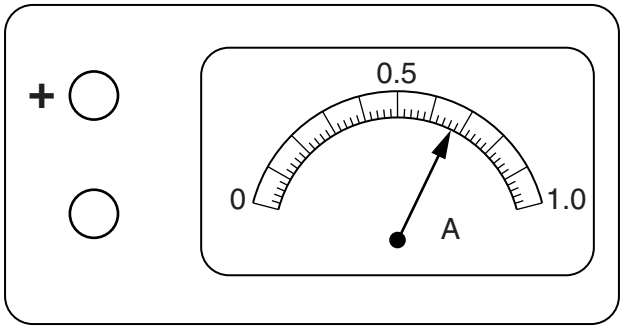


Fig. 2.1

State the reading on the ammeter.

reading = ...[1]

(d) A school has both digital and analogue ammeters.
Suggest one advantage of using a digital ammeter rather than an analogue ammeter.

.....[1]

(e) Fig. 2.2 shows a simple circuit.

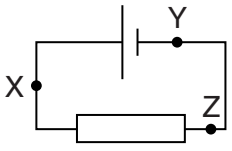


Fig. 2.2

A student connects three similar ammeters at X, at Y and at Z. The ammeters give slightly different readings.

(i) Explain why all the ammeters should give the same reading.

.....

.....[1]

(ii) Suggest a reason for the slight differences in the three readings.

.....

.....[1]

[Turn over

3 An experiment is carried out to investigate refraction of light through a glass block.

Fig. 3.1 shows a rectangular glass block. A ray of light is incident at P at an angle of incidence of 40°. The angle of refraction in the block is 24°.

(a) On Fig. 3.1, draw lines to represent

(i) the normal at P, [1]

(ii) the refracted ray. [1]

(b) The lower face of the block is labelled XY.

(i) On Fig. 3.1, continue the normal to meet XY. Label this point A.

(ii) On Fig. 3.1, continue the line of the refracted ray to meet XY. Label this point B.

(iii) Measure AB and PB.

AB = ...

PB = ...
[1]

(iv) On Fig. 3.1, continue the line of the incident ray to meet XY. Label this point C.

(v) Measure AC and PC.

AC = ...

PC = ...
[1]

(vi) Theory suggests that the refractive index of the glass is given by the ratio

$$\frac{AC \times PB}{AB \times PC}.$$

Calculate this ratio.
Give your answer to a suitable number of significant figures.

ratio = ...[1]

(c) On Fig. 3.1, draw a line to represent the ray of light that emerges from the block.

Label this line L. [1]

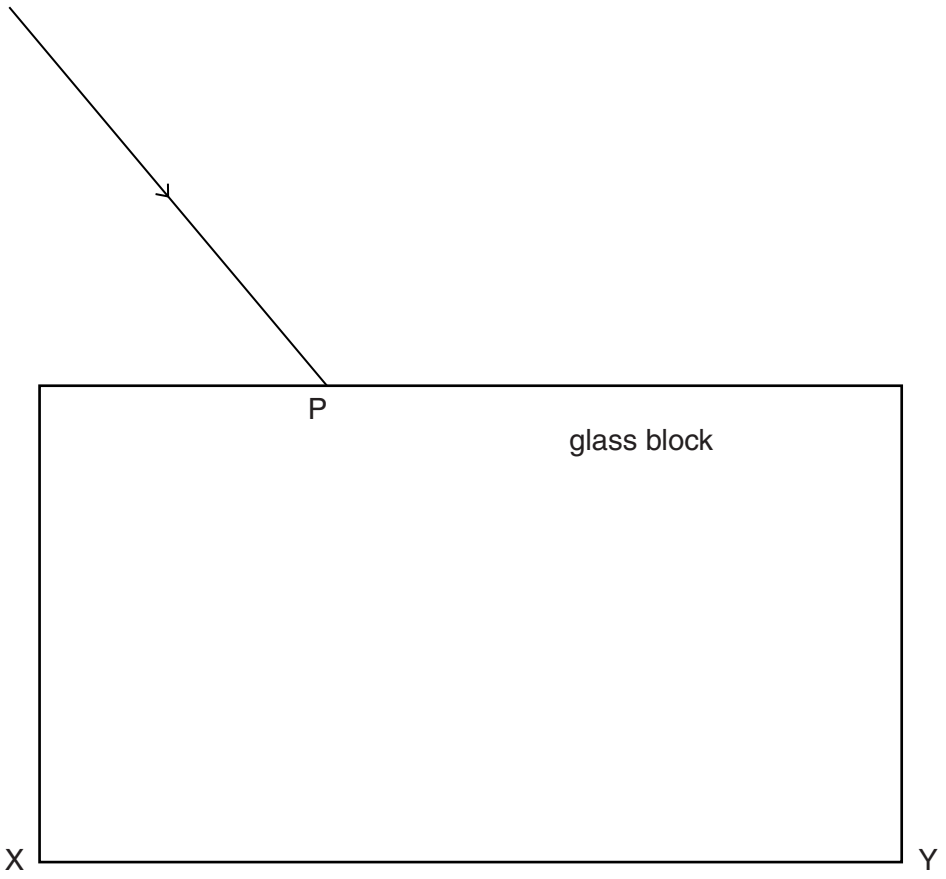


Fig. 3.1

4 An experiment is carried out to determine the density of the glass used to make microscope slides. Fig. 4.1 shows a stack of 10 microscope slides.

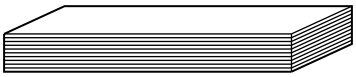


Fig. 4.1 (not to scale)

Fig. 4.2 shows full-size views of the stack of microscope slides.

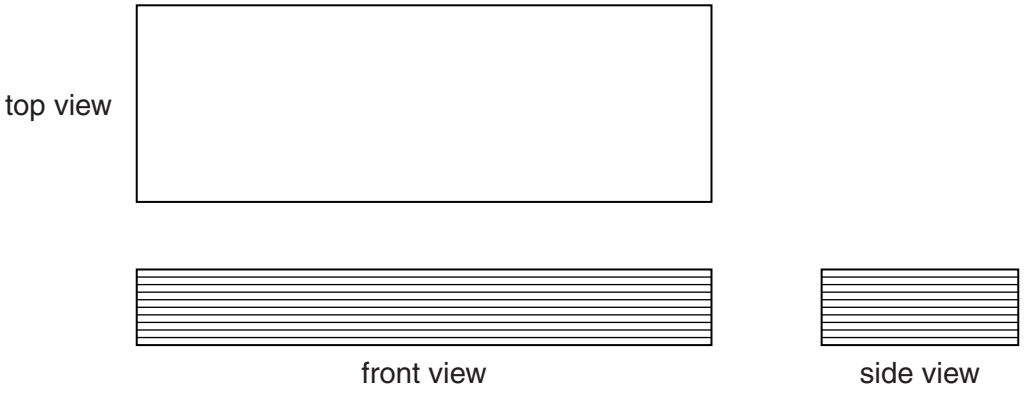


Fig. 4.2 (full size)

(a) (i) By taking measurements from Fig. 4.2, determine the average volume of a microscope slide.
State clearly any measurements taken and show how the volume is calculated.
Give your answer to 2 significant figures.

volume = ...[4]

(ii) Explain why a stack of 10 slides is used rather than just one slide.

.....

.....[1]

(b) State any additional equipment needed to find the density of the glass.

.....[1]