Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

3662711518

PHYSICS **5054/42**

Paper 4 Alternative to Practical **May/June 2015**

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.

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1 Two students decide to mark out a 100 m length to use as a running track on a school field.

(a) One student decides to measure the average length of one of his strides and then pace out 100 m. The student is shown walking in Fig. 1.1.

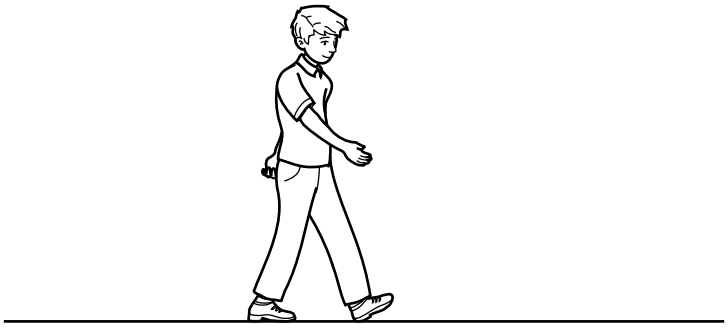


Fig. 1.1

(i) On Fig. 1.1, mark and label the length l of one stride. [1]

(ii) Estimate a value for the length l of the stride of the student.

l = ...[1]

(iii) Using your value for l, calculate the number of strides the student takes when walking 100 m.

number of strides = ...[1]

(b) The second student uses a trundle wheel, as shown in Fig. 1.2. The circumference of the wheel is 50.0 cm and the wheel makes a click each time it turns once.

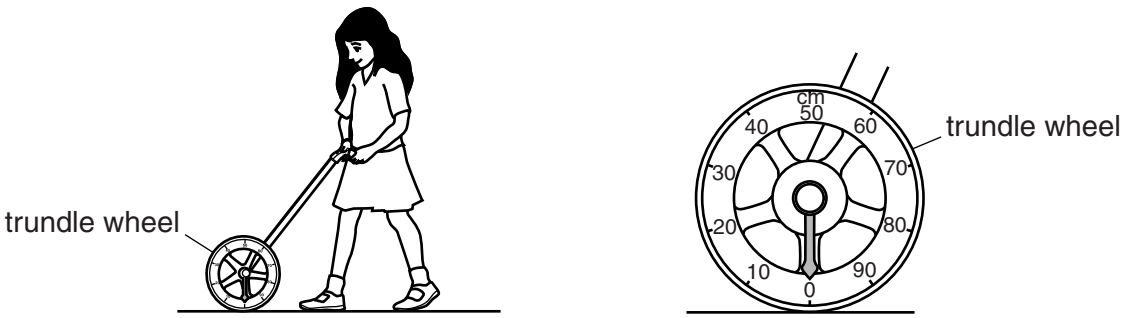


Fig. 1.2

(i) Explain how a trundle wheel is used to measure the distance of 100 m for the track.

.....

.....[1]

(ii) Explain why this is a more accurate method of measuring a distance of 100 m than the method in **(a)**.

.....

.....[1]

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2 A student investigates how the area of a parachute affects the time taken for it to fall.

The student cuts a square from an A4 sheet of paper to make the parachute. He attaches the parachute to an eraser using four pieces of thin string of equal length, as shown in Fig. 2.1.

An A4 sheet of paper is the same size as one page of the examination paper.

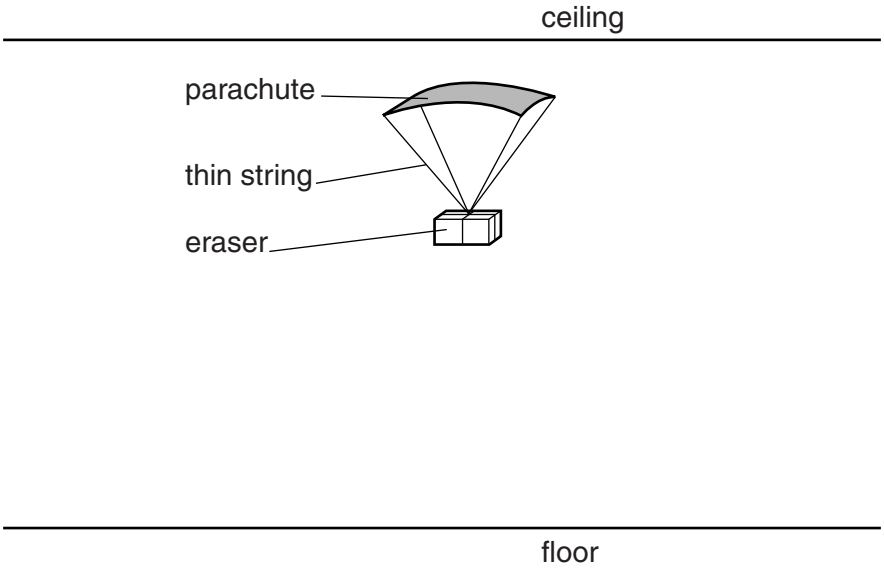


Fig. 2.1 (not to scale)

The student holds the top of the parachute against the ceiling. He releases the parachute and measures the time *t* it takes for the eraser to hit the floor.

(a) The student makes the parachute from a square of paper of side 21.0 cm.

He obtains the following five values of *t*, measured in seconds.

1.25 1.29 1.31 1.22 1.27

(i) Calculate t_{av}, the average value for *t*.
Give your answer to 2 decimal places.

t_{av} = ...[2]

(ii) Suggest a reason why the value for t_{av} is not given to more than 2 decimal places.

.....

.....[1]

(iii) Suggest a reason why the distance that the parachute falls is chosen to be as large as possible.

.....

.....

.....[1]

(iv) The length l of one side of the parachute is 21.0 cm. Calculate the area A of the paper that is used to make parachute.

A = ...[1]

(v) Suggest a reason why the student cannot make a parachute with an area greater than your answer to **(a)(iv)** when using the sheet of A4 paper.

.....

.....[1]

(b) The student repeats the experiment for different values of l. The results obtained are recorded in Fig. 2.2.

l / cm	A / cm^2	t_{av} / s
21.0		
20.0		1.19
18.0		1.11
16.0		1.01
14.0		0.97
12.0		0.89

Fig. 2.2

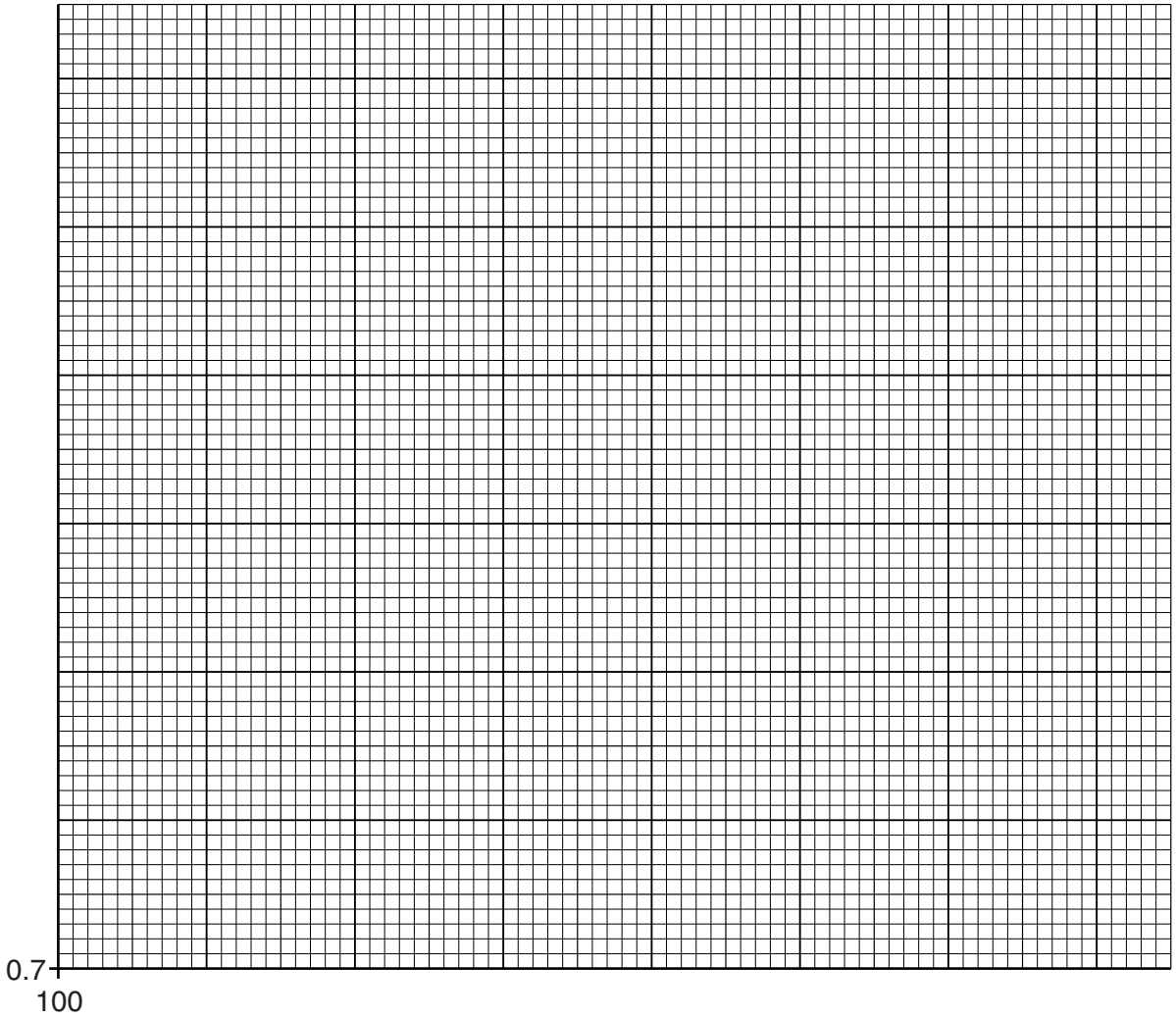
On Fig. 2.2,

(i) write your values of A and t_{av} for l = 21.0 cm, [1]

(ii) complete the column for A. [1]

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(iii) On Fig. 2.3, plot the graph of t_{av}/s on the *y*-axis against A/cm^2 on the *x*-axis. Start your axes from (100, 0.7). Draw the straight line of best fit.



[4]

Fig. 2.3

(iv) When extended, the line of best fit does not go through the origin (0,0). Explain why.

.....

.....[1]

3 A student uses a cathode-ray oscilloscope (c.r.o.) to measure a voltage.

(a) In the space below, draw a circuit diagram containing a battery, a switch, a fixed resistor and a variable resistor, all connected in series.

[1]

(b) The c.r.o. is used to measure the voltage across the fixed resistor. On your circuit diagram, label the two points A and B where the c.r.o. is connected to the circuit. [1]

(c) Fig. 3.1a shows the c.r.o. screen when the switch in the circuit is open.

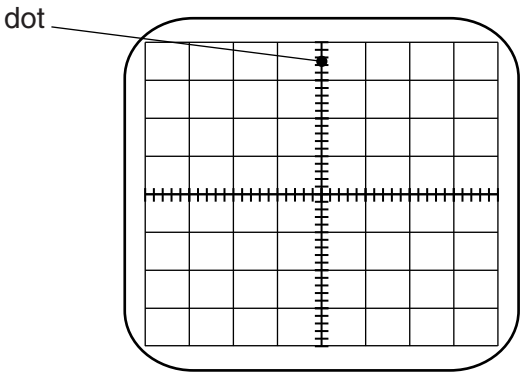


Fig. 3.1a

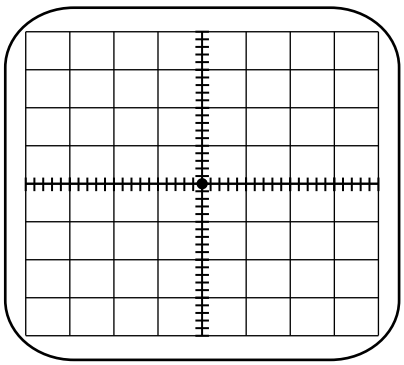


Fig. 3.1b

There are four control knobs on the c.r.o.:

X-shift
Y-shift
Y-gain
time-base

State which control knob is adjusted to move the dot to the centre of the screen, as shown in Fig. 3.1b.

.....[1]

(d) The Y-gain is set at 2 V / div. With the dot in the centre of the screen, the switch is then closed and the dot moves to the position shown in Fig. 3.2.

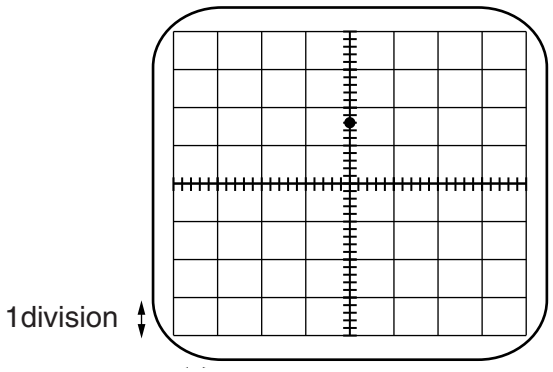


Fig. 3.2

(i) Calculate the voltage V_{AB} across the fixed resistor.

V_{AB} = ...[1]

(ii) The resistance of the variable resistor is reduced.
State what happens to the dot on the screen.

.....

.....[1]

4 You are asked to take a set of readings to plot a cooling curve that shows how quickly hot water in a test-tube cools.

(a) You are given a test-tube about half-full of hot water. List the additional apparatus you need.

.....

.....

.....[1]

(b) In the space below, draw a diagram of the apparatus, showing the position of the eye when taking the readings.

[2]

(c) Fig. 4.1 is the top of a table for the readings. Complete the headings in the table.

[2]

Fig. 4.1

(d) Suggest two ways in which the apparatus is arranged to make the readings accurate.

1. .....

.....

2. .....

.....
[2]

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