Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0289884799

PHYSICS **5054/41**

Paper 4 Alternative to Practical **May/June 2016**

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.

DC (NF/SW) 115429/2

CAMBRIDGE
International Examinations

[Turn over

1 A student makes an electromagnet by wrapping a length of wire around a piece of soft iron and connects it into a circuit, as shown in Fig. 1.1. He closes the switch and finds the maximum number of paperclips that stay on one end of the soft iron.

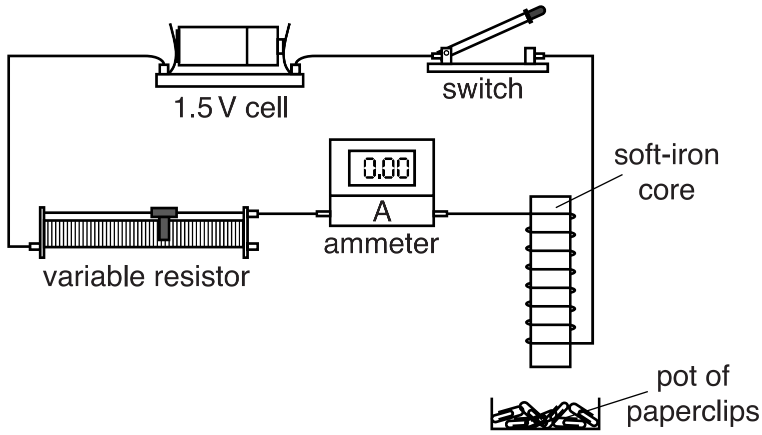


Fig. 1.1

(a) Suggest two changes to the apparatus that increase the current.

1. ....

2. ....
[2]

(b)

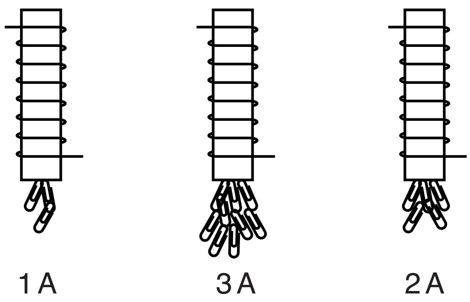


Fig. 1.2

Fig. 1.2 shows the paperclips that stay on the soft iron for three different currents. In the space below, draw a table to show the results of this experiment.

[3]

2 A student makes a pendulum using paperclips.

He joins 14 identical paperclips together, end to end. He suspends them vertically from a pin attached securely to a bench, as shown in Fig. 2.1.

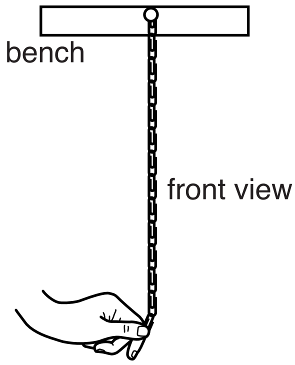


Fig. 2.1 (not to scale)

He moves the bottom paperclip to the side and releases it. The paperclip pendulum swings freely from side to side. Using a stopwatch, he measures the time t taken for 10 complete swings of the pendulum.

(a) The student repeats the experiment and obtains the following three values for t, measured in seconds.

10.62 10.84 10.75

(i) Calculate t_{av}, the average value of t. Give your answer to 1 decimal place.

t_{av} = ... [2]

(ii) The time taken for one complete swing is called the period T. Calculate T.

T = ... [1]

(iii) The student has a reaction time of about 0.2 s. Explain why the student measures the time for ten swings rather than the time for one swing.

....

....

.... [2]

(b) The student reduces the number of paperclips N and repeats the experiment to find T for each value of N. Fig. 2.2 shows the student's results.

N	T/s
2	0.38
4	0.58
6	0.73
8	0.82
10	0.91
12	0.98
14	

Fig. 2.2

(i) Complete the table with your answer for **(a)(ii)**.

(ii) On Fig. 2.3, on page 5, plot the graph of T/s on the y-axis against N on the x-axis. Start your axes from (0,0). Draw a smooth curve of best fit.

(iii) Describe the relationship between T and N.

....

.... [1]

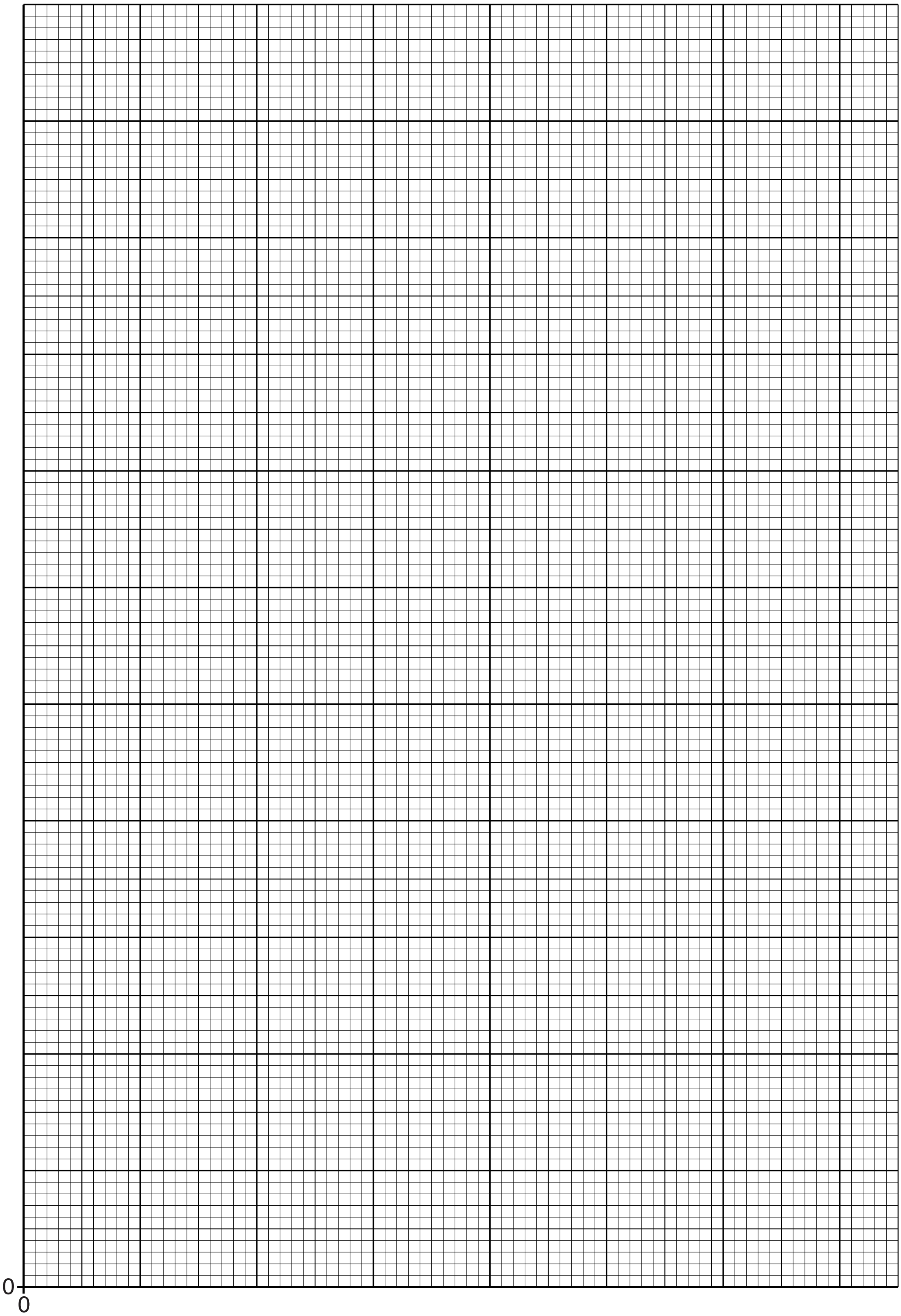
(iv) Use your graph to estimate the value of T when 5 paperclips are used. Show on your graph how you obtain your answer.

T = ... [1]

(c) Suggest one effect of using paperclips that are not identical.

....

.... [1]



[4]

Fig. 2.3

3 A student investigates the density of different liquids.

Fig. 3.1 shows a table of her results.

liquid	volume / cm^3	mass / g	density $\frac{}{g/cm^3}$
water	10	10	1.0
oil	34	31	0.9
liquid P	19		1.2
liquid Q	30	21	0.7
liquid R	10	8	0.8

Fig. 3.1

(a) The student has lost her measurement for the mass of liquid P. Calculate the mass of liquid P used in the experiment. Give your answer correct to 2 significant figures.

mass = ... [2]

(b) The student has two identical beakers A and B. She puts 100 cm^3 of water into each of A and B.

(i) State the name of the measuring instrument used to measure the volume of water accurately.

.... [1]

(ii) She then adds 100 cm^3 of oil to beaker A. The oil floats on top of the water.

She also adds 100 cm^3 of one of the other liquids to beaker B. The liquids do not mix.

Fig. 3.2 shows the two beakers after the liquids have settled.

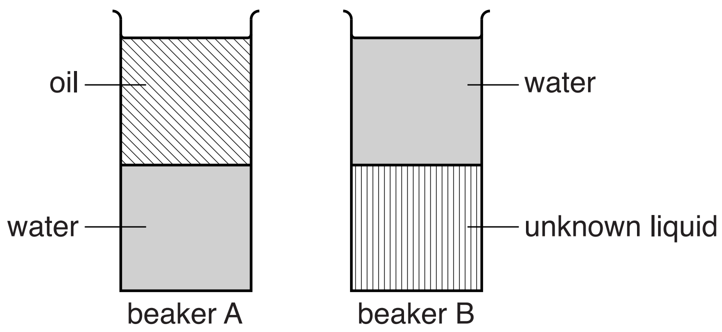


Fig. 3.2

1. State and explain which liquid P, Q or R, is the unknown liquid.

....

....

.... [2]

2. State and explain which beaker and contents have the greater mass.

....

.... [1]

(c) The student then adds a small block of wood to beaker A, as shown in Fig. 3.3.

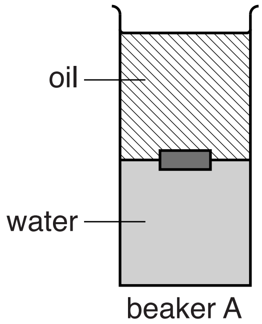


Fig. 3.3

State what the position of the block of wood tells you about the density of the wood.

....

.... [1]

4 A student investigates whether black surfaces or silver surfaces are better at emitting infra-red radiation. The student is given two identical test tubes, one with a silver surface and one with a black surface, and a supply of hot water.

(a) State **one** other piece of apparatus that is required to carry out this investigation.

.... [1]

(b) Describe how she carries out the investigation. You may include a diagram to help your description. State the readings she takes.

....

....

....

....

....

....

....

.... [3]

(c) State two quantities that the student keeps constant during the experiment you have described in **(b)**.

1. ....

....

2. ....

....

[2]