UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **5054/41**

Paper 4 Alternative to Practical **October/November 2012**

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 a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **7** printed pages and **1** blank page.

1 A student investigates the behaviour of a vibrating spring.

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The spring is suspended from a horizontal rod. A mass is hung from the spring.

Fig. 1.1a shows the apparatus when it is not vibrating.

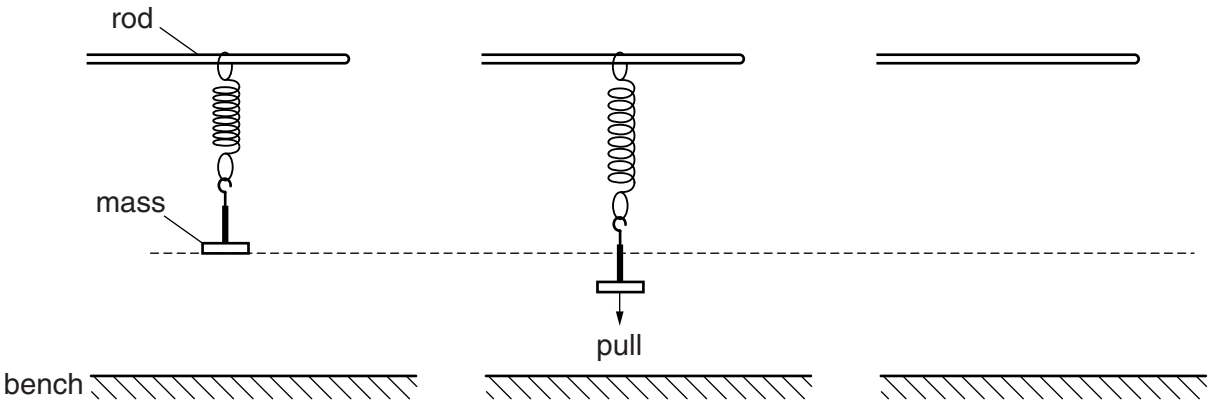

Fig. 1.1a **Fig. 1.1b** **Fig. 1.1c**

The mass is pulled down a small distance, as shown in Fig. 1.1b.
When released, the mass vibrates up and down about its original position. The student takes readings to obtain the time T for one complete vibration.

(a) On Fig. 1.1c,

(i) draw the mass at its highest position after release, [1]

(ii) mark the most suitable position for the student's eye when the student times the vibrations. [1]

(b) Explain why the mass is pulled down only a small distance before being released.

.....

..... [1]

(c) A student measures the time for the mass to complete 20 vibrations.
Suggest a reason why the student times twenty vibrations rather than one.

.....

..... [1]

(d) When the weight W of the mass is 1.0 N, the student times 20 vibrations. This is repeated four times. The following results are obtained.

8.10 s 8.02 s 7.96 s 8.05 s 7.99 s

Calculate the average value of T, the time for one complete vibration.

T = ... s [2]

(e) The experiment is repeated for a range of values of W. The results are recorded in Fig. 1.2.

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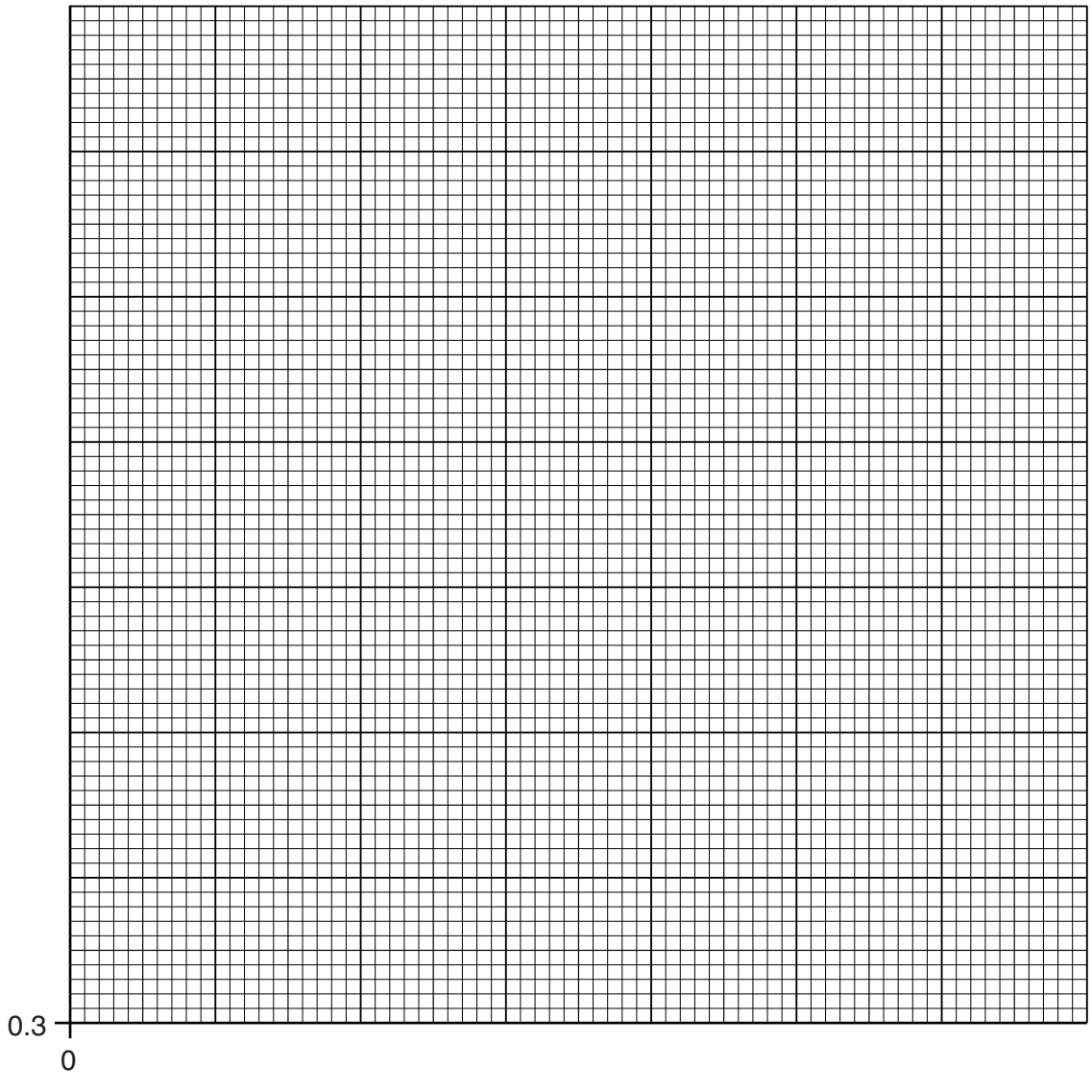
W/N	T/s
1.0	
2.0	0.573
3.0	0.693
4.0	0.790
5.0	0.882
6.0	0.961

Fig. 1.2

(i) On Fig. 1.2, write your value of T for $W = 1.0$ N. Use a suitable number of significant figures. [1]

(ii) On Fig. 1.3, plot a graph of T/s on the y-axis against W/N on the x-axis. Start your axes from $T = 0.3$ s and $W = 0$. Draw a smooth curve of best fit.



[4]

Fig. 1.3

(iii) Explain whether you expect the graph to pass through the origin.

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.....

..... [1]

(iv) Describe the relationship between T and W.

.....

..... [1]

2 A student investigates the effect of changing the length of a piece of resistance wire in a circuit containing a lamp. The resistance of the lamp is similar to the resistance of a 1 m length of the wire.
The circuit is set up as shown in Fig. 2.1.

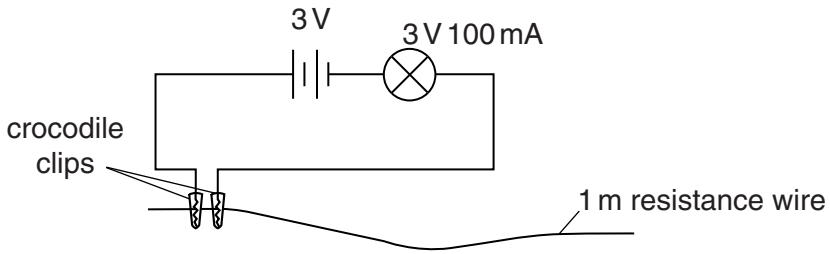

Fig. 2.1

(a) The student checks that the circuit is working by touching together the two crocodile clips.

(i) State what the student observes if the circuit is working correctly.

..... [1]

(ii) Describe one possible fault that prevents the circuit working correctly.

.....

..... [1]

(b) When the circuit is working correctly, the student connects the two crocodile clips close together on the wire, as shown in Fig. 2.1.

(i) Describe what the student observes as the crocodile clips are slowly moved further apart on the wire.

.....

..... [1]

(ii) A circuit component is based on changing the length of the wire between two contacts.

1. State the name of this component.

..... [1]

2. Draw its circuit symbol.

[1]

3. The component contains a long length of wire. Explain how the component is made small.

.....

..... [1]

[Turn over

3 A teacher demonstrates a property of sound.

The teacher hangs an electric bell inside a glass bell-jar, as shown in Fig. 3.1.

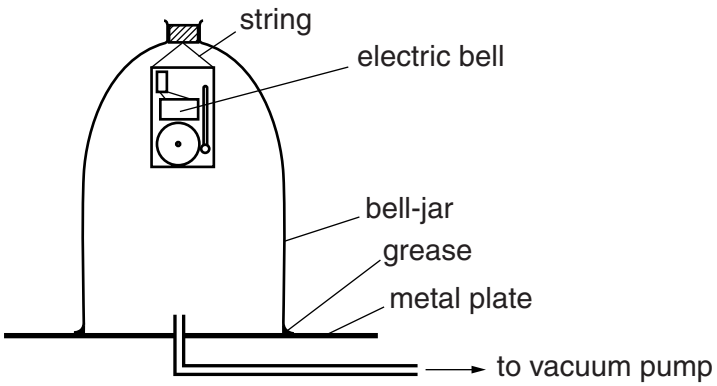

Fig. 3.1

The bell is ringing when the bell-jar is placed on the metal plate. The air can then be removed from the bell-jar using a vacuum pump.

(a) Explain why the bell-jar must have thick walls.

.....

..... [1]

(b) Explain why the teacher puts a layer of grease between the bell-jar and the metal plate.

.....

..... [1]

(c) The students can see the bell vibrating and can hear it ringing.

(i) Describe and explain what the students hear as the air is removed.

.....

.....

..... [2]

(ii) When the air is removed, the students can still see the bell vibrating.

State what this experiment demonstrates about light.

..... [1]

(d) Explain why the teacher hangs the bell from string inside the bell-jar rather than standing the bell on the metal plate.

.....

..... [1]

4 Two students decide to compare their running shoes to see which has the better grip.

They place one shoe on a board. One end of the board is lifted slowly until the shoe starts to slide, as shown in Fig. 4.1.

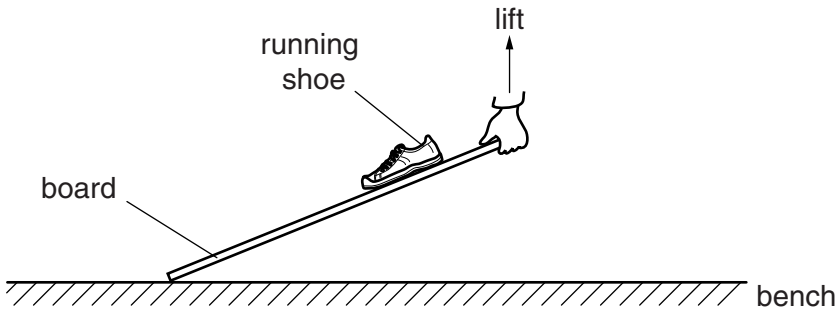

Fig. 4.1 (to scale)

This is repeated with a shoe from the other student.

(a) Explain why the student lifts the end of the board **slowly**.

.....

..... [1]

(b) Using Fig. 4.1, measure the angle between the board and the bench.

angle = ... [1]

(c) One of the students measures the angle between the board and the bench with a protractor.

(i) Suggest one practical difficulty that the student has in taking this measurement.

.....

..... [1]

(ii) The other student does not have a protractor.

Suggest how he can take measurements to determine the angle.

.....

.....

..... [1]

(d) Describe how the students determine which shoe has the better grip.

.....

..... [1]

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