Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0602334107

PHYSICS **5054/31**

Paper 3 Practical Test **October/November 2017**

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 **all** questions.
For each of the questions in Section A, you will be allowed to work with the apparatus for a maximum of 20 minutes. For the question in Section B, you will be allowed to work with the apparatus for a maximum of 1 hour.

You are expected to record all your observations as soon as these observations are made.
An account of the method of carrying out the experiments is **not** required.

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.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **11** printed pages and **1** blank page.

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CAMBRIDGE International Examinations

Answer **all** the questions in this section.

Section A

1 *In this experiment, you will investigate the oscillations of a mass connected to springs.*

You are provided with

- an arrangement of two springs that are connected in series,
- a single spring,
- a mass labelled M,
- a stand, boss and clamp from which to suspend the springs,
- a stopwatch,
- a second clamp and boss.

(a) Set up the apparatus as shown in Fig. 1.1, using the arrangement of the two springs that are connected in series.

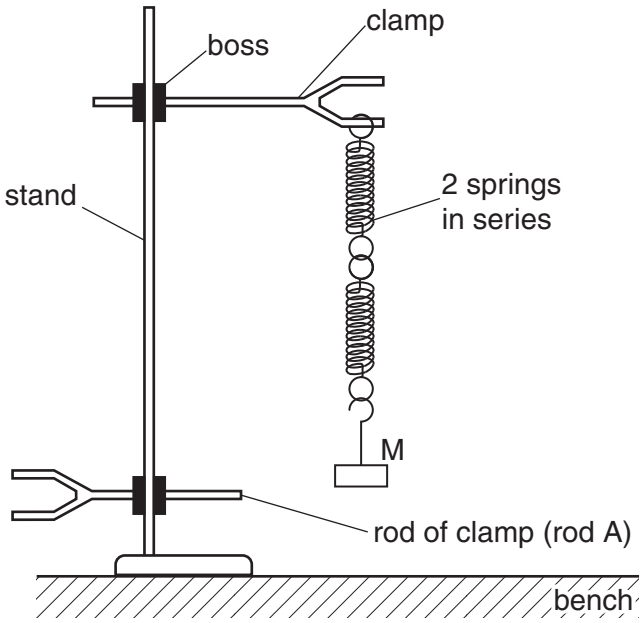


Fig. 1.1

(b) Pull the mass M down a short distance vertically and release it.

One oscillation of the mass occurs when the mass moves from its lowest position to its highest position and then back down to its lowest position.

Adjust the height of rod A to help you when counting the number of oscillations.

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(i) Describe how you use rod A to ensure that you count complete oscillations made by the mass. You may draw a diagram if you wish.

.....

.....

.....

.....

(ii) The time for 10 oscillations is t_1. Take measurements to determine an accurate value of t_1.

t_1 = ...

(iii) Calculate the time T_1 for one oscillation. Give your answer to an appropriate number of significant figures.

T_1 = ...
[3]

(c) Replace the double spring arrangement by the single spring. Suspend the mass M from the single spring.

Repeat **(b)(ii)** and **(b)(iii)** so that new values are obtained for the time t_2 for 10 oscillations and the time T_2 for one oscillation.

t_2 = ...

T_2 = ...
[1]

(d) Calculate $\frac{T_2}{T_1}$.

$\frac{T_2}{T_1}$ = ...[1]

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[Turn over

2 *In this experiment, you will investigate a circuit containing a light-dependent resistor.*

You are provided with

- a power supply,
- a switch,
- a light-dependent resistor,
- a resistor labelled R,
- a voltmeter,
- connecting leads,
- a 250 cm^3 glass beaker filled with water,
- a light source,
- a container labelled A containing a small amount of blue liquid,
- safety glasses or goggles,
- a 5 cm^3 plastic syringe,
- a stirrer,
- paper towels or cloths to mop up spillages.

When using the blue liquid:

- **If any liquid comes into contact with your skin wash off immediately with water.**
- **It is recommended that you wear safety goggles/glasses.**

The Supervisor has set up the apparatus as shown in Fig. 2.1. Do not alter the position of the light source or the position of the light-dependent resistor (LDR).

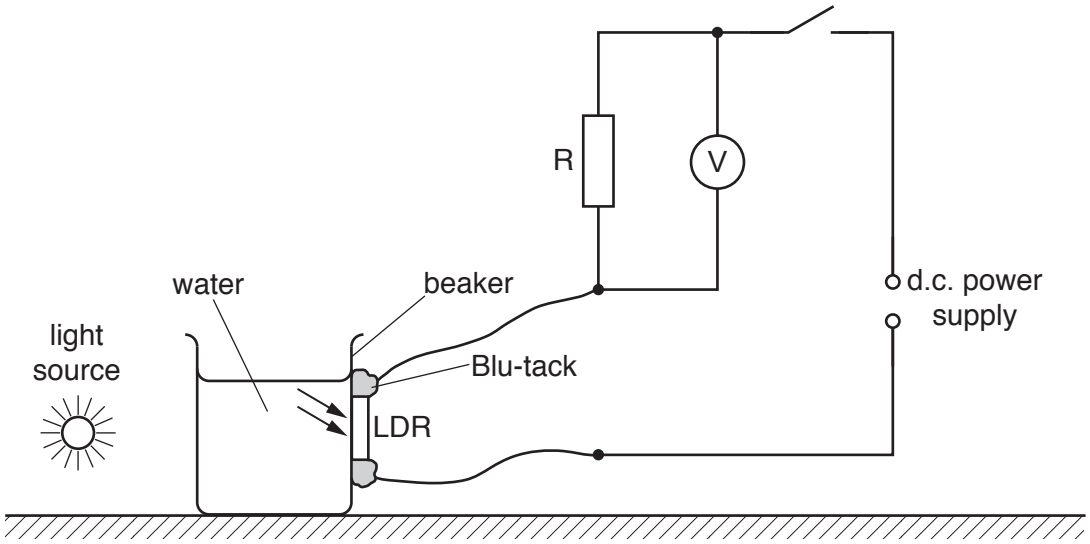


Fig. 2.1

(a) Switch on the light source and close the switch in the electrical circuit.

Record the voltmeter reading V_1.

V_1 = ...[1]

(b) (i) Use the syringe to add 1.0 cm^3 (1 ml) of the blue liquid from container A to the water in the glass beaker and stir.

Record the new voltmeter reading V_2.

V_2 = ...

(ii) Repeat **(b)(i)** to add a further 1.0 cm^3 of the blue liquid.

Record the new voltmeter reading V_3.

V_3 = ...
[1]

(c) (i) Use the grid of Fig. 2.2 to plot a graph of the voltmeter reading against the volume of blue liquid added.

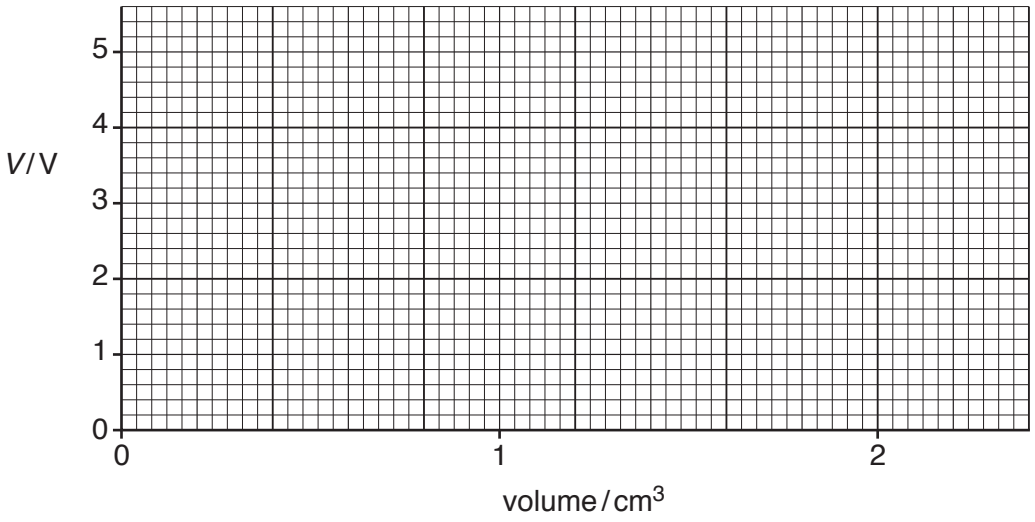


Fig. 2.2

(ii) Describe the trend shown by your graph.

.....

.....

.....
[3]

3 *In this experiment, you will investigate the distance travelled by a table tennis ball that has dropped onto a ramp.*

You are provided with

- a tray containing sand,
- a ramp,
- two metre rules,
- a set square,
- a stand, boss and clamp to support the metre rule vertically,
- a table tennis ball,
- a piece of card to smooth the surface of the sand.

The Supervisor has set up the apparatus as shown in Fig. 3.1.

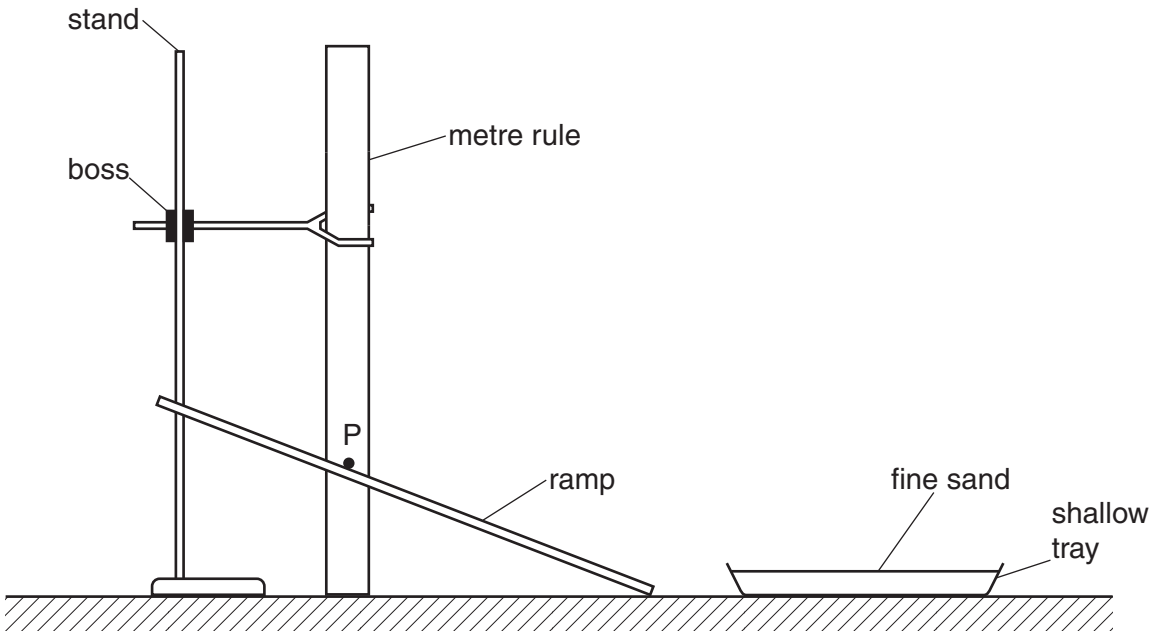


Fig. 3.1

(a) Check that the metre rule clamped behind the ramp is vertical and adjust, if necessary, to make it vertical.

Describe how you checked that the metre rule was vertical. You may add to Fig. 3.1 if you wish.

.....

.....

.....[1]

(b) A point P is marked on the top face of the ramp. Drop the ball from a height h = 30.0 cm vertically above P onto the ramp. The ball will bounce on the ramp and should land in the sand tray. If this does not occur the sand tray should be moved towards or away from the bottom of the ramp so that the ball does land in the tray.

Use the piece of card to smooth the sand. Drop the ball from h = 30.0 cm and observe that it lands in the sand. Carefully remove the ball from the tray without disturbing the sand and note that an indentation has been formed in the sand.

(i) Measure the horizontal distance x from P to the centre of the indentation.

x = ...

(ii) Fig. 3.2 shows the ball as it hits the ramp at point P.

Draw the ball at its initial position and mark the height h.

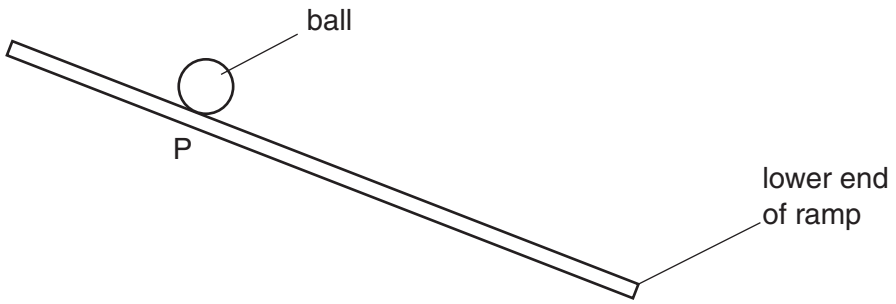


Fig. 3.2

(iii) Explain how you removed the ball from the tray without disturbing the sand.

.....

.....

.....

(iv) Take measurements to determine an average value for x.

x = ...
[4]

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Section B

4 *In this experiment, you will investigate the upward force on a cylinder of modelling clay partially submerged in water.*

You are provided with

- a 100 cm^3 measuring cylinder,
- two springs connected in series,
- a stand, boss and clamp to support the springs,
- an S-hook,
- a cylinder of modelling clay rolled around a string with a loop at one end,
- a 30 cm ruler,
- a beaker of water,
- paper towels or cloths to mop up spillages.

(a) Measure the length x_0 of the cylinder of modelling clay.

x_0 = ...[1]

(b) Set up the apparatus as shown in Fig. 4.1. The spring arrangement is suspended vertically, with the S-hook at the end. The S-hook is just above the measuring cylinder which contains the clay cylinder. The loop on the clay cylinder is passed over the S-hook.

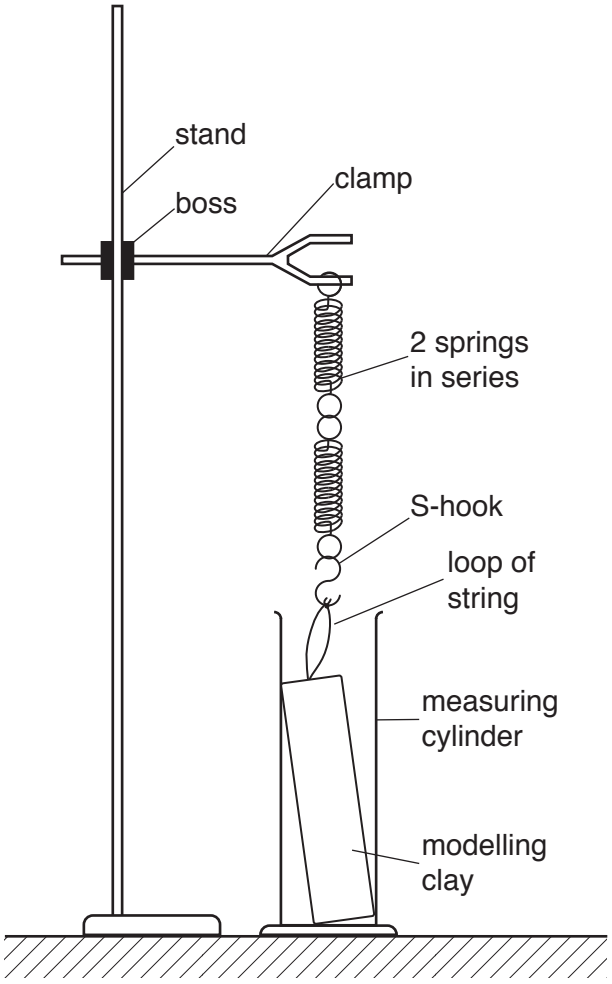


Fig. 4.1

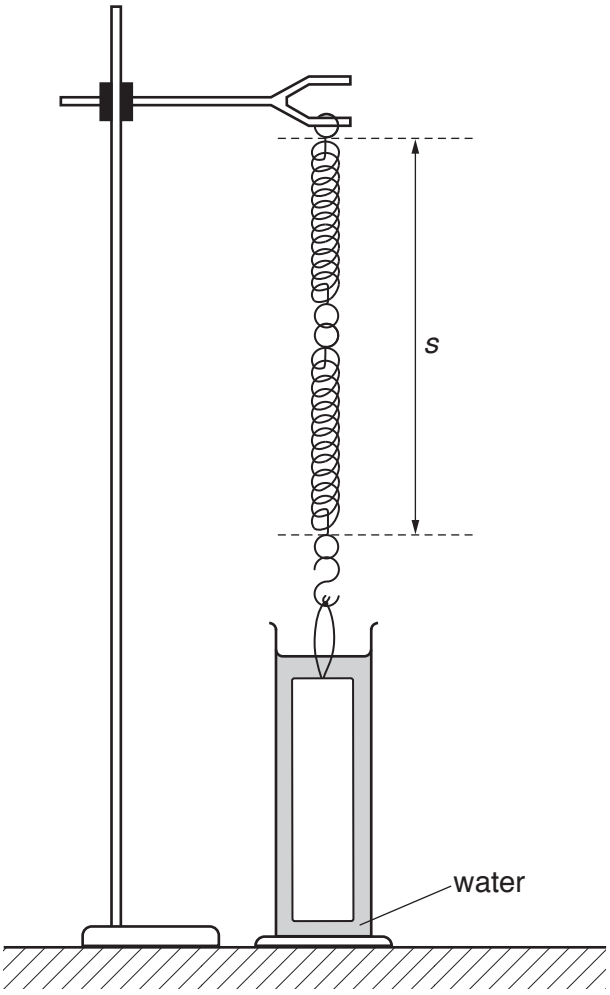


Fig. 4.2

Note that in this experiment you will **not** be using the scale on the measuring cylinder.

(c) Pour water into the measuring cylinder until the clay cylinder is fully submerged and there is a depth of approximately 2 cm of water above the cylinder. Raise the boss until the base of the clay cylinder is about 1 cm above the bottom of the measuring cylinder, and the clay cylinder is fully submerged. Make minor adjustments to the apparatus to make sure that the clay cylinder does not touch the measuring cylinder and is still submerged in the water. The apparatus should be as shown in Fig. 4.2.

Explain how you checked that the clay cylinder was not touching the sides of the measuring cylinder.

.....

.....

.....[1]

(d) Measure the length *s* between the upper and lower loops on the spring, as shown in Fig. 4.2.

s = ...[1]

(e) Raise the boss so that about 2 cm of the clay cylinder is above the surface of the water. Ensure that the clay cylinder does still not touch the measuring cylinder.

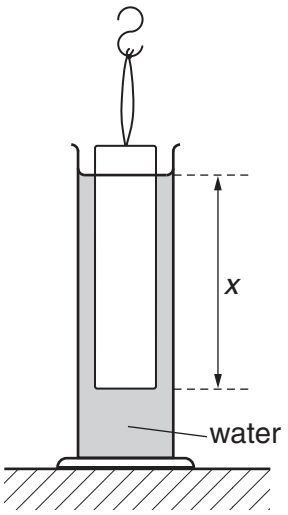


Fig. 4.3

Measure a new value for *s* and the length *x* of the clay cylinder that is submerged in the water, as shown in Fig. 4.3.

s = ...

x = ...
[2]

(f) Continue to raise the boss to obtain a series of values of s and x.

Record your results in the table of Fig. 4.4.

Include units in the headings of the table and your results from **(a)**, **(d)** and **(e)**.

Fig. 4.4

[4]

(g) Using the grid opposite, plot a graph of s/cm (y-axis) against x/cm (x-axis).

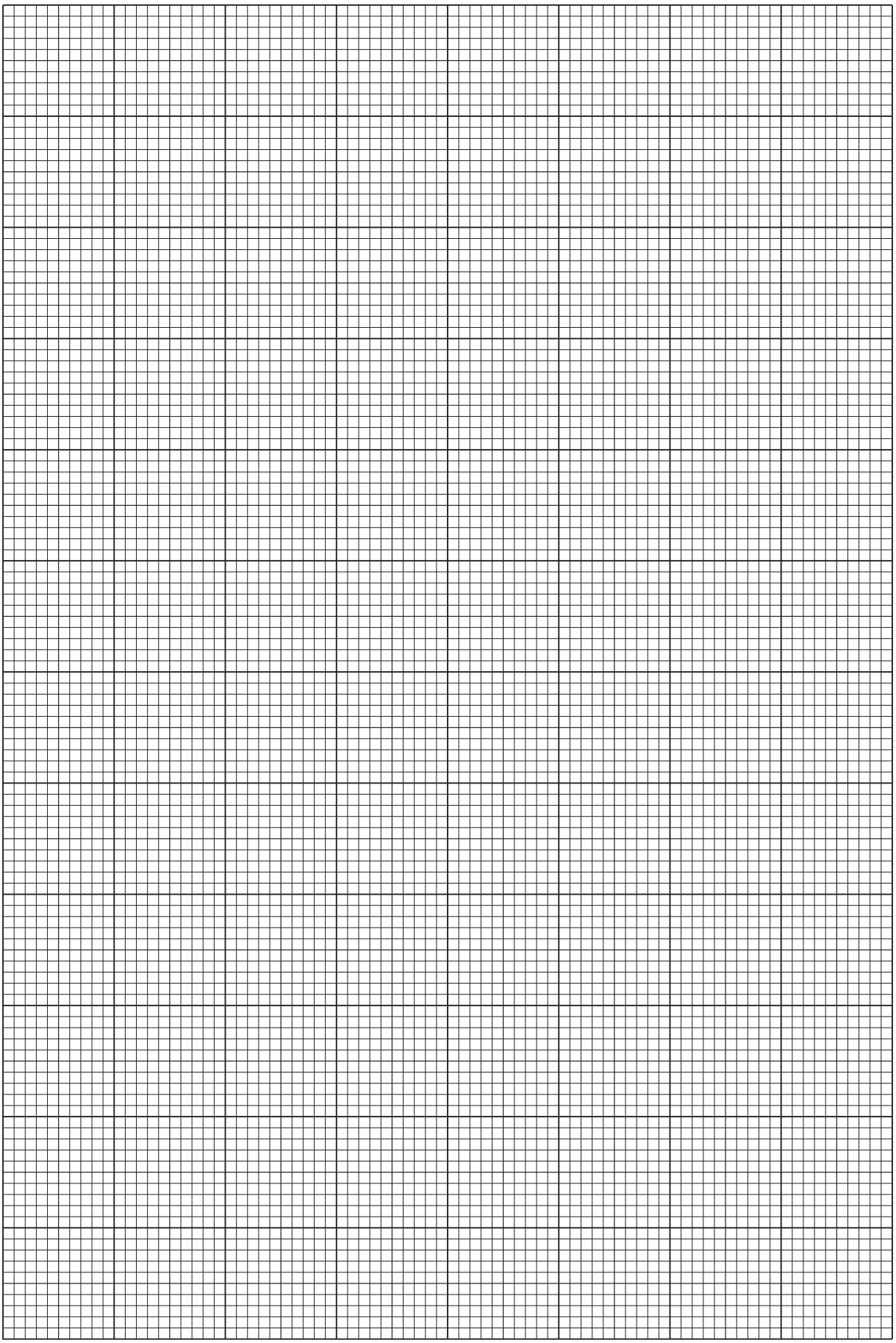
Draw the straight line of best fit. [4]

(h) Determine the gradient G of your graph.

Give your answer to an appropriate number of significant figures.

G = ...[2]

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