

GAN ENG SENG SCHOOL

Preliminary Examination 2026



CANDIDATE
NAME

CLASS

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INDEX
NUMBER

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PHYSICS

Paper 3 Practical Test

6091/03

18 August 2026
1 hour 50 minutes

Sec 4 Express

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your class, index 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, correction fluid or highlighters.

Answer **all** questions.

All of your answers should be written in this Question Paper: scrap paper must not be used.

Graph paper is provided in this Question Paper. Additional sheets of graph paper should be used only if it is necessary to do so.

You will be allowed to work with the apparatus for a maximum of 55 minutes for each section.

You are expected to record all your observations as soon as they are made.

An account of the method of carrying out the experiments is **not** required.

The use of an approved scientific calculator is expected, where appropriate.

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	
Total	40

Section A

- 1 In this experiment, you will determine a value for the focal length of a thin convex lens.

You are provided with:

- a convex lens
- a lens holder
- illuminated cross wires (object)
- a lamp
- a screen
- a metre rule
- a piece of *Blu-tack*
- a stand, a boss and a clamp.

You will assemble the apparatus as shown in Fig. 1.1.

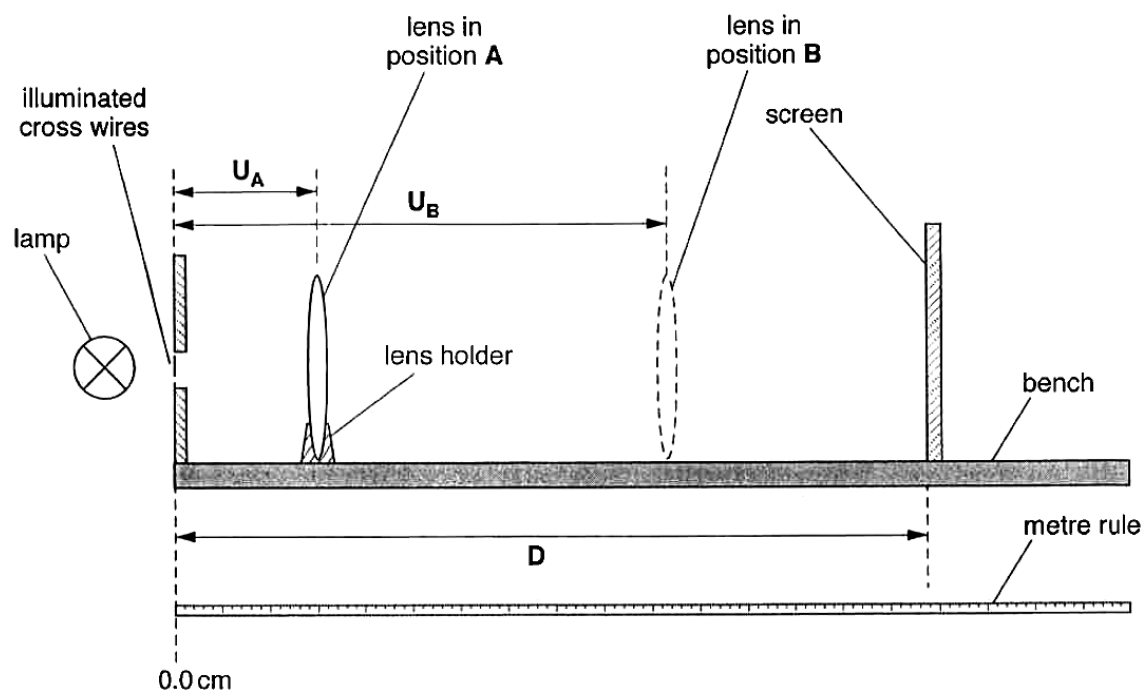


Fig. 1.1

(a) Setting up the apparatus

1. Secure the metre rule to the bench with two small pieces of *Blu-tack*. Place one small piece under each end of the rule and press the rule firmly onto the bench.
2. Place the cross wires, lens holder and screen **behind** the rule so that they **touch** it. It is important that you are able to read the position on the rule of each of them.
3. Place the cross wires at the 0.0 cm position on the rule. Once in this position, the cross wires **must not** be moved.

4. The lens holder with the lens, and the screen are to be positioned as described in the instructions given in parts **(b)(i)** and **(b)(ii)**.
 5. Turn on the lamp **close** to the left of the cross wires so that light passes through the cross wires and lens, and shines on the screen.
- (b) (i)**
1. Position the screen so that it is at the 90.0 cm mark on the metre rule. This is distance **D**.
 2. Start with the lens close to the cross wires. Move the lens towards the screen until a sharp image of the cross wires is observed on the screen. This is position **A**.
 3. The distance of the lens from the cross wires is **U_A**. Record **U_A**. Calculate $1/U_A$.

$$U_A = \dots\dots\dots$$

$$1/U_A = \dots\dots\dots$$

[1]

4. Without moving the cross wires or screen, move the lens closer to the screen until a second sharp image is observed. This is position **B**.
5. The distance of the lens from the cross wires is **U_B**. Record **U_B**. Calculate $1/U_B$.

$$U_B = \dots\dots\dots$$

$$1/U_B = \dots\dots\dots$$

[1]

- (ii)** Position the screen at 85.0 cm mark on the metre rule (**D** = 85.0 cm). Repeat the instructions **(b)(i)2** to **(b)(i)5** and record **U_A** and **U_B**. Calculate $1/U_A$ and $1/U_B$.

$$U_A = \dots\dots\dots$$

$$1/U_A = \dots\dots\dots$$

[1]

$$U_B = \dots\dots\dots$$

$$1/U_B = \dots\dots\dots$$

[1]

- (c) Determine gradient of the line passing through the coordinates ($1/U_B$, $1/U_A$) that you have obtained in (b)(i) and (b)(ii).

gradient = [2]

- (d) Use the magnitude of the gradient and the formula below to determine a value for the focal length, f , of your lens.

$$f = \frac{100}{(1.2 \times \text{magnitude of gradient}) + 5.72}$$

f = [2]

- (f) On Fig. 1.2, draw a ray diagram to show the formation of the image you obtained at position **A** in part (b)(i). The focal points of the lens are marked and labelled with **F** on the diagram. The diagram is **not** drawn to scale.

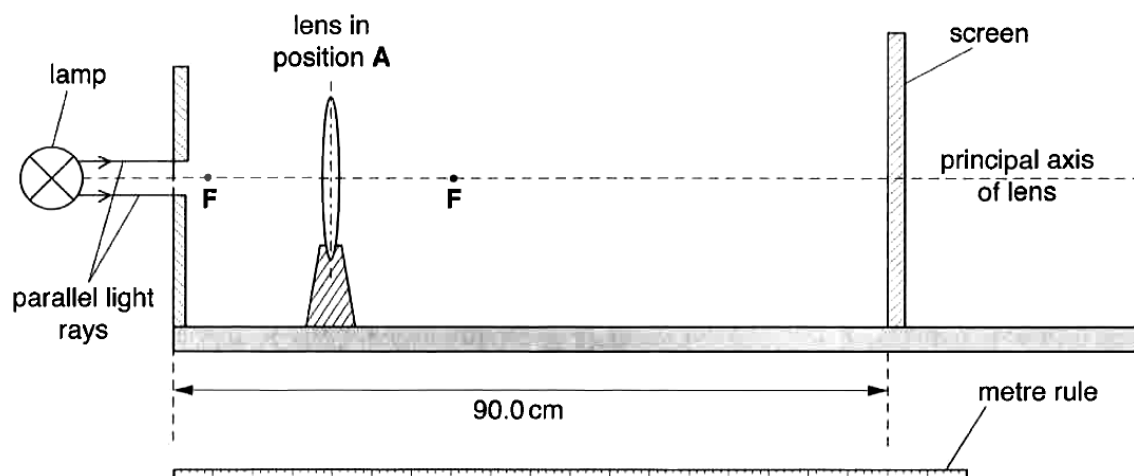


Fig. 1.2

[1]

- (f) Identify one possible source of error in this experiment. Suggest an improvement that would reduce this error.

source of error

.....

improvement

.....

..... [1]

[Total: 10]

2 In this experiment, you will investigate an electrical circuit.

You are provided with:

- two 1.5 V dry cells in holders
- a voltmeter
- a switch
- a resistor **R**
- a resistance wire attached to a metre rule
- seven connecting leads with crocodile clips at both ends
- a connecting lead labelled 'C'
- a digital micrometer.

(a) Set up the circuit as shown in Fig. 2.1.

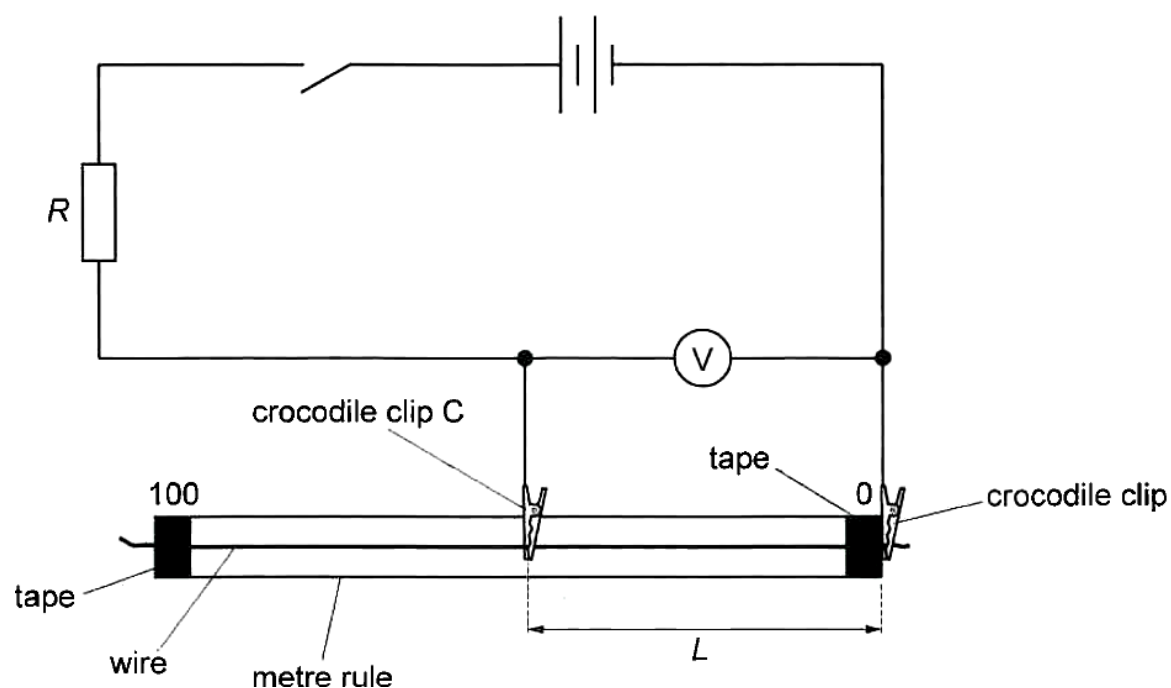


Fig. 2.1

The distance between the two crocodile clips is L .

Adjust the position of the crocodile clip C so that L is about 0.60 m.
Close the switch.

Measure and record L and the voltmeter reading V .
Open the switch.

$L = \dots\dots\dots$

$V = \dots\dots\dots$

[1]

- (b) Determine an accurate value for the thickness d of the resistance wire.

$$d = \dots\dots\dots [2]$$

- (c) Calculate the cross-sectional area A of the resistance wire where $A = \frac{1}{4} \pi d^2$.

$$A = \dots\dots\dots [1]$$

- (d) A student claims that $\frac{V}{L} = \left(-\frac{\rho}{AR}\right)V + b$, where b is a constant and V is the voltmeter reading.

Plan an experiment to investigate the student's claim.

In your plan, you should:

- explain briefly how to do the experiment
- state **one** key variable to control
- draw a table, with column headings, to show how to display the range of readings
- explain how to determine R and b if the student's claim is correct, given ρ is a constant with a value of $1.5 \times 10^{-6} \Omega \text{ m}$.

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Section B

- 3 In this experiment, you will investigate the extension of two springs connected in parallel.

You are provided with:

- a stand, boss and clamp
- two springs
- two wooden rods
- 100 g mass hanger
- two 50 g masses
- two 100 g mass
- a string loop
- a metre rule.

- (a) You are provided with two springs. The length of each **unstretched** spring between the centres of the loops is l , as shown in Fig. 3.1.

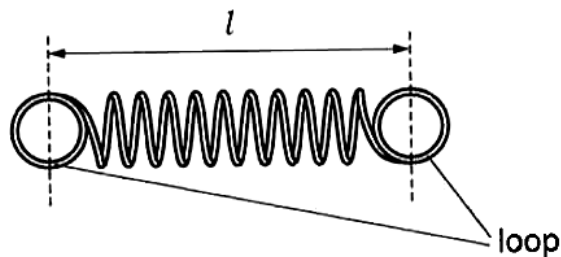


Fig. 3.1

Measure and record l for each of the provided springs.

l for first spring =

l for second spring =

[1]

Determine the mean length L of the two springs.

L =

[1]

- (b) Add one 50 g mass and one 100 g mass to the 100 g mass hanger.

Set up the apparatus as shown in Fig. 3.2.

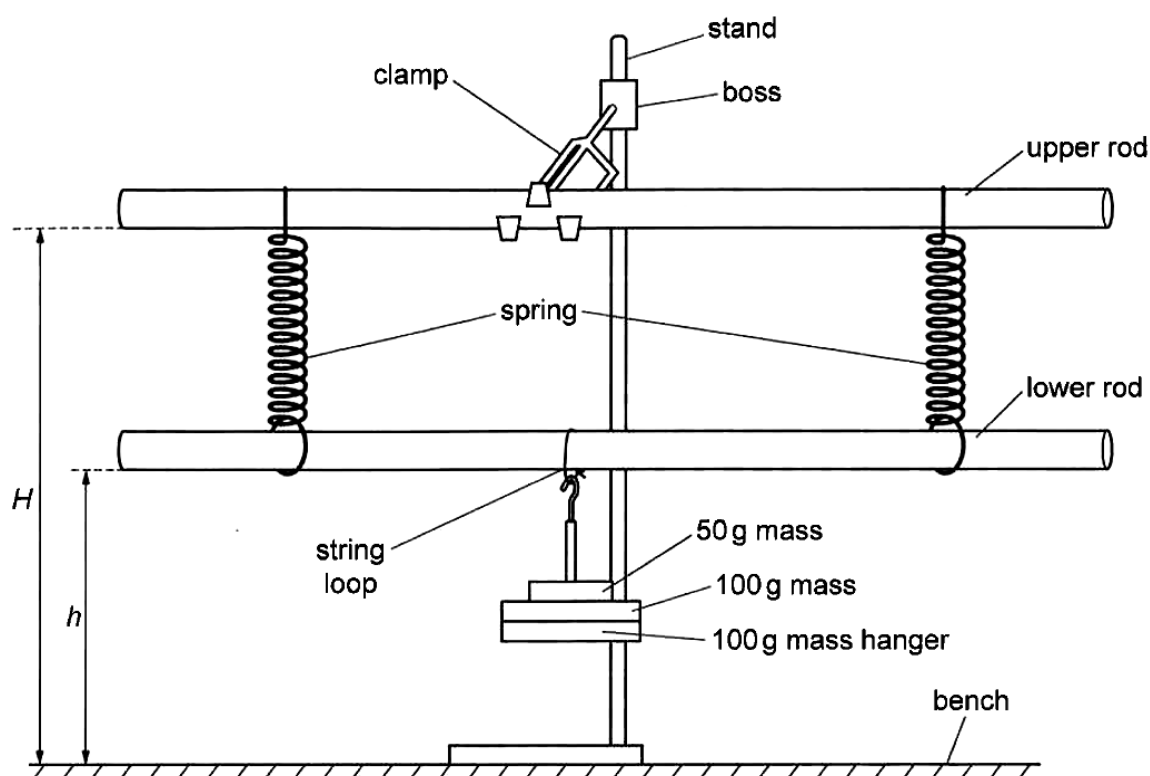


Fig. 3.2

The upper rod should be **horizontal** and the springs should be **vertical**.

The height of the upper rod above the bench is H , as shown in Fig. 3.2.

Adjust the apparatus so that H is approximately 54 cm.

- (i) Measure and record H .

$H = \dots\dots\dots$ [1]

Do not change the position of the upper rod during the experiment.

- (ii) The total mass of the mass hanger and any added masses is m .

Use the stated values on each mass and the mass hanger to determine the value of m .

$$m = \dots\dots\dots$$

Adjust the position of the mass hanger so that the lower rod is **horizontal**.

You may also need to adjust the position of the springs so that the springs are still vertical.

The height of the lower rod above the bench is h , as shown in Fig. 3.2.

Measure and record h .

$$h = \dots\dots\dots$$

Calculate $(H - h)$.

$$(H - h) = \dots\dots\dots$$

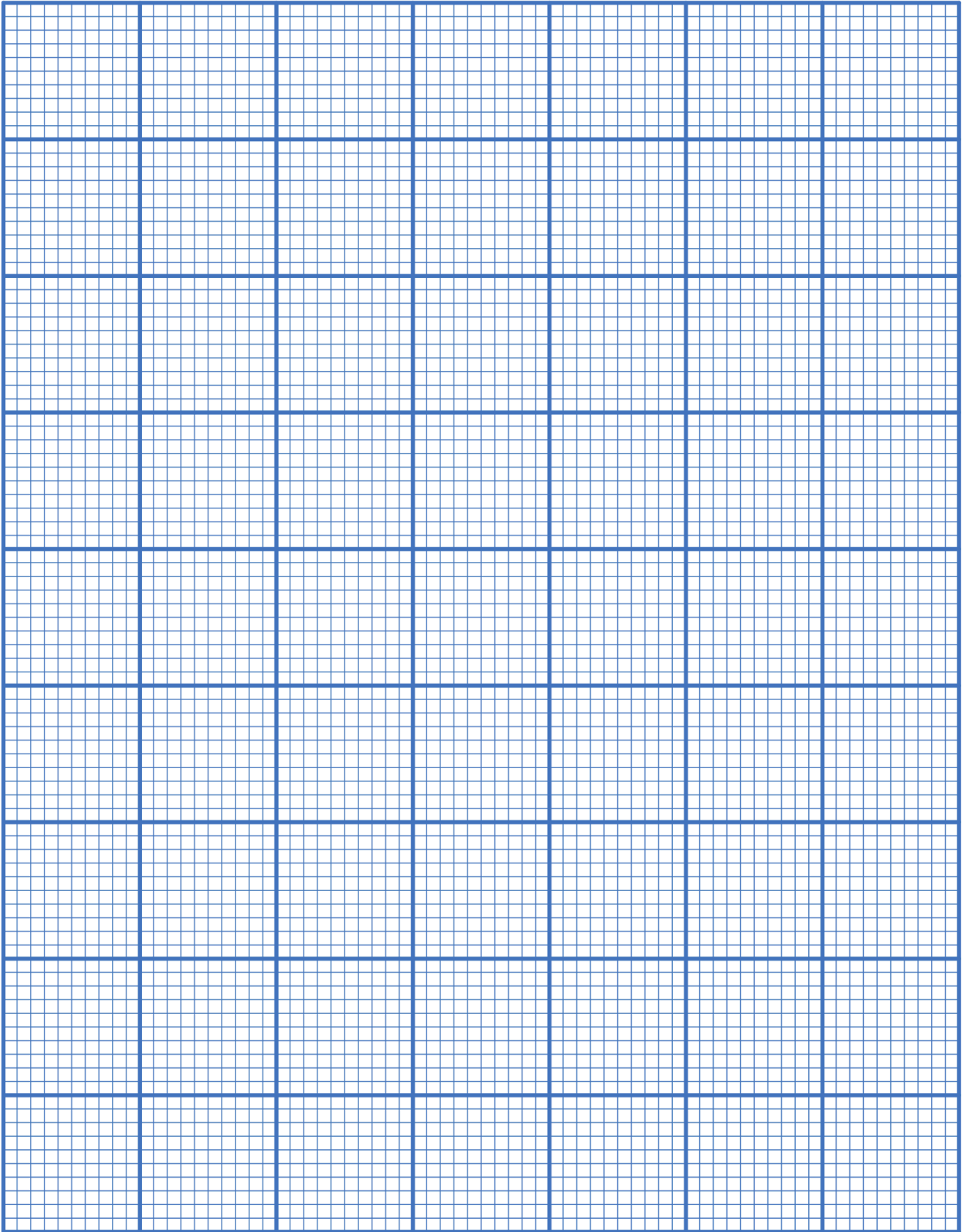
[1]

- (iii) Repeat the procedure in (b)(ii) using different values of m .

Record all measurements and calculations in a suitable table.

[4]

(c) On the grid provided, plot a graph of $(H - h)$ against m . Draw the line of best fit.



[4]

- (d) (i) Determine the gradient of your line, showing clearly on your graph how you did this.

gradient = [2]

- (ii) Determine the y-intercept of the line of best fit.

y-intercept = [1]

- (iii) The mass M of the lower rod is given by the equation:

$$M = \frac{\text{magnitude of (y-intercept - } L)}{\text{gradient}}$$

Using this equation and your answers in (a), (d)(i) and (d)(ii) to determine a value for M .

$M =$ [2]

- (e) Suggest how to use calipers to improve the measurements of l .

.....

 [1]

- (f) Describe how you ensure the upper rod is **horizontal** and the springs are **vertical**.

.....

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.....

.....

..... [2]

[Total: 20]

END OF PAPER