Surname	Centre Number	Candidate Number
First name(s)		2

GCE A LEVEL

S24-1420U50-1E

1420U50-1E

FRIDAY, 26 APRIL 2024 – MORNING

PHYSICS – A2 unit 5
Practical Examination

Practical Analysis Task

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**20**	
Total	**25**	

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ADDITIONAL MATERIALS

A calculator and a **Data Booklet**.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.
Pencil may be used to draw tables and graphs.
Answer **all** questions.
Write your name, centre number and candidate number in the spaces at the top of this page.
Write your answers in the spaces provided in this booklet.

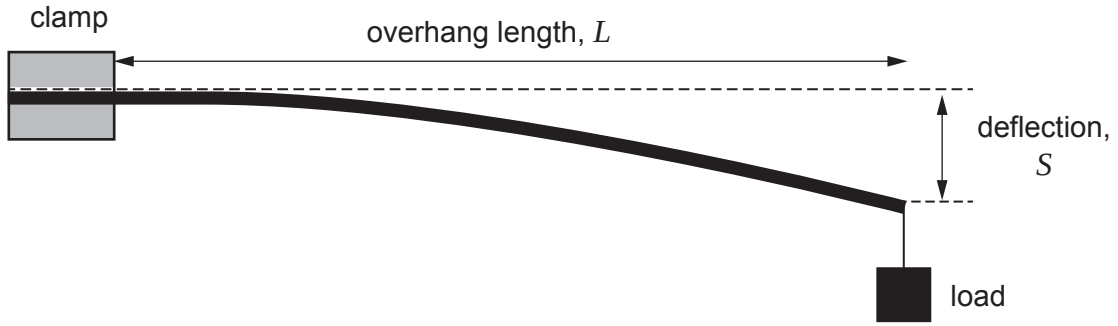
INFORMATION FOR CANDIDATES

The total number of marks available for this task is 25.
The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the necessity for good English and orderly presentation in your answers.

Examiner only

Answer **all** questions.

1. A cantilever is a beam clamped at one end with a load attached to the free end as shown below. Ieuan investigates how the deflection, S, varies with the length of overhang of the beam, L, for a constant load. He records the data in the table below.



Length of overhang, L/m	Deflection, S/cm			
	Reading 1	Reading 2	Reading 3	Mean
0.500	3.1	3.3	3.3	.....
0.700	9.0	8.9	9.0	.....
0.800	13.4	13.2	13.2	.....

(i) **Complete the column** for the mean deflection. [1]

(ii) Theory for the loaded cantilever suggests that S is directly proportional to L^3. Without drawing a graph, explain whether Ieuan's results support the theory. [3]

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Examiner only

(iii) State **one** way, other than taking more repeat readings, in which Ieuan could improve confidence in his results. [1]

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Examiner only

2. Delyth investigates the interference of laser light through a double slit using the following set-up.

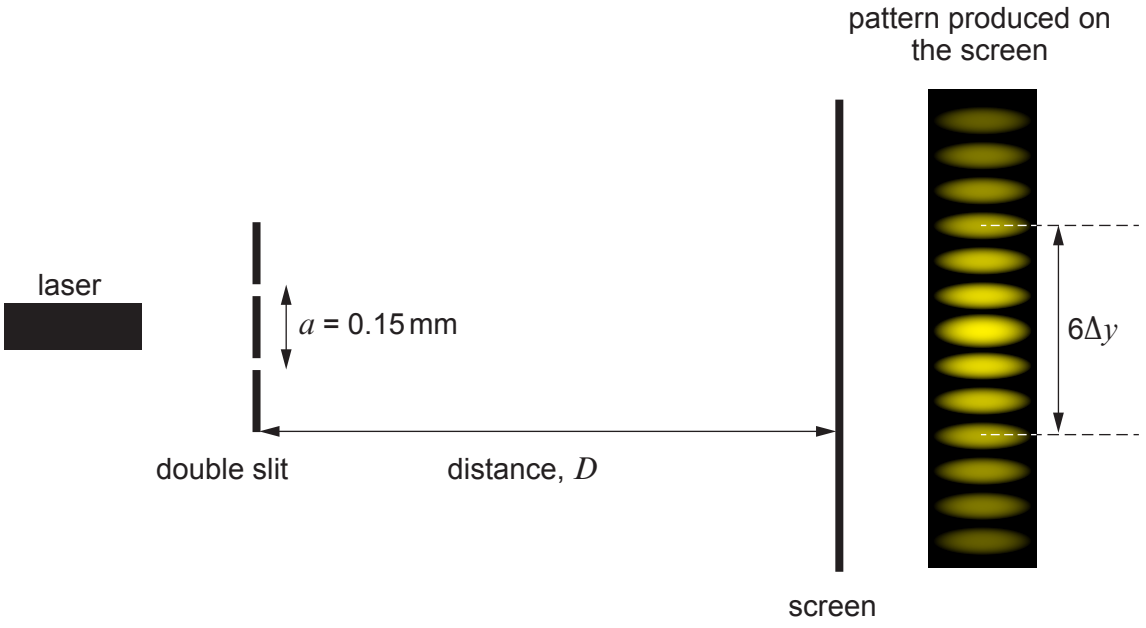


Diagram not drawn to scale

The distance from the double slit to the screen, D, is varied and the distance, $6\Delta y$, (see diagram) is recorded. Delyth's results are shown in the table below.

Distance, D / ± 0.005 m	$6\Delta y$ / mm	Δy / ± 0.4 mm
0.500	13	.....
1.000	24	.....
1.500	39	.....
2.000	50	.....
2.500	65	.....
3.000	75	.....
3.500	90	.....

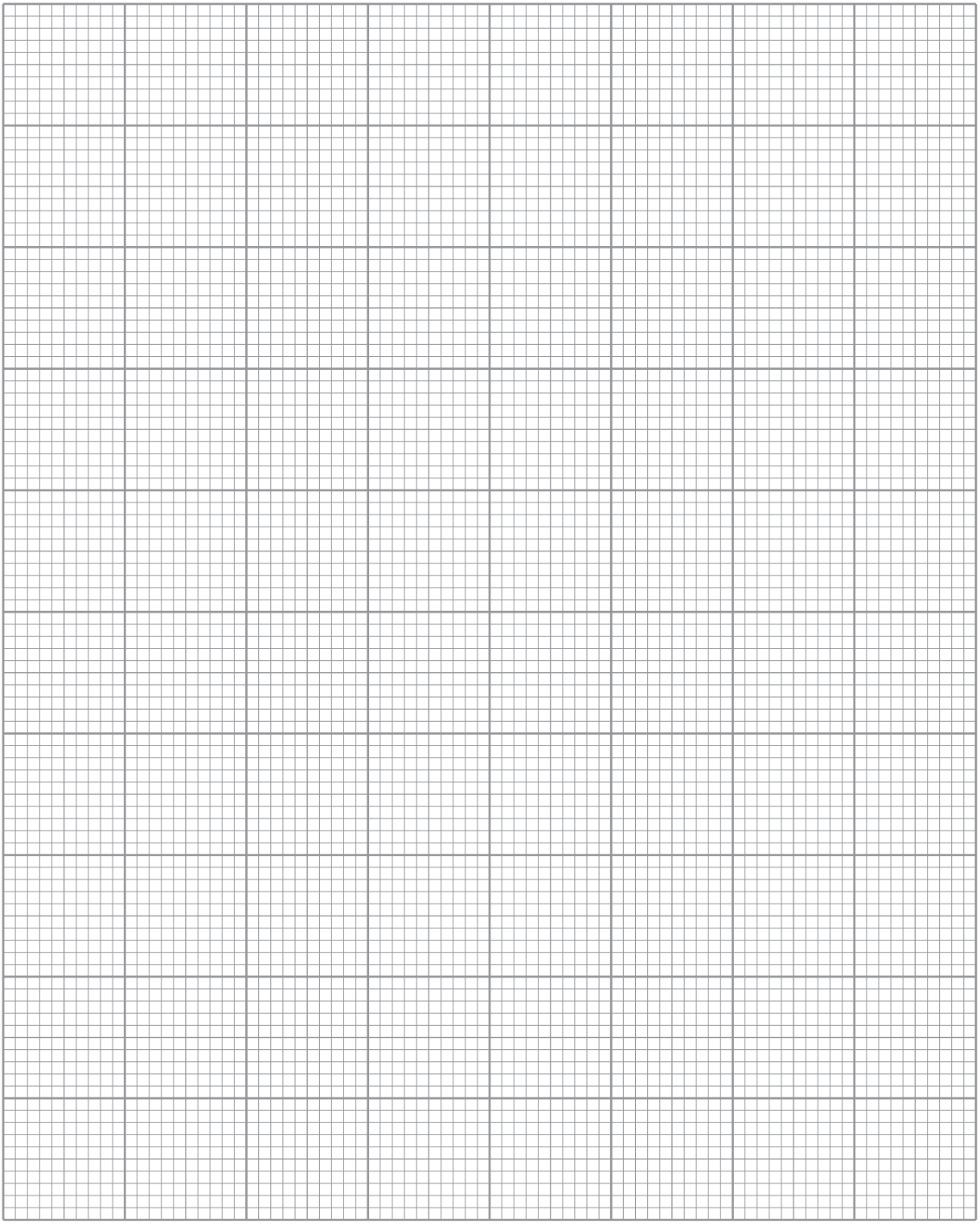
(a) **Complete the last column in the table above** to determine the fringe separation, Δy. [2]

(b) The relationship between the fringe separation, Δy, the distance to the screen, D, and the slit separation, a, is given by the equation:

$$\Delta y = \frac{\lambda D}{a}$$

Examiner only

Using Delyth's results plot a graph of Δy (on the y-axis) against D (on the x-axis). Include error bars where possible and draw a line of maximum gradient and a line of minimum gradient. [5]



Examiner only

(c) (i) Explain to what extent your graph is consistent with $\Delta y \propto D$. [3]

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(ii) Calculate the maximum and minimum gradients for your graph. [3]

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(iii) Hence, determine the mean gradient and its **percentage** uncertainty. [2]

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Examiner only

(d) (i) The slit separation, a, is 0.15 ± 0.01 mm. Determine the wavelength of the laser along with its **absolute** uncertainty. [3]

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(ii) Explain how the wavelength could be determined from a graph of $6\Delta y$ against D. [2]

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END OF PAPER

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