Surname	Centre Number	Candidate Number
First name(s)		2

GCE A LEVEL

1420U50-1E

S25-1420U50-1E

FRIDAY, 4 APRIL 2025 – MORNING

PHYSICS – A2 unit 5
Practical Examination
Practical Analysis Task

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**19**	
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 the page.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

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.

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Answer **all** questions.

1. Catrin carries out an experiment to determine the specific heat capacity, c, of copper in the form of a block of mass, $m = 250 \pm 1\,\text{g}$.
She uses a heater of voltage, $V = 12.0 \pm 0.1\,\text{V}$ and current, $I = 0.20 \pm 0.01\,\text{A}$.
When the block is heated for a time, t of $600 \pm 1\,\text{s}$ the temperature change, $\Delta\theta$ is $15 \pm 1\,°\text{C}$.
The heat energy, $Q = mc\Delta\theta$ and the electrical energy input, $W = IVt$

(a) Determine the specific heat capacity of copper along with its **absolute** uncertainty. [5]

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(b) State how Catrin could reduce the uncertainty in her final result. [1]

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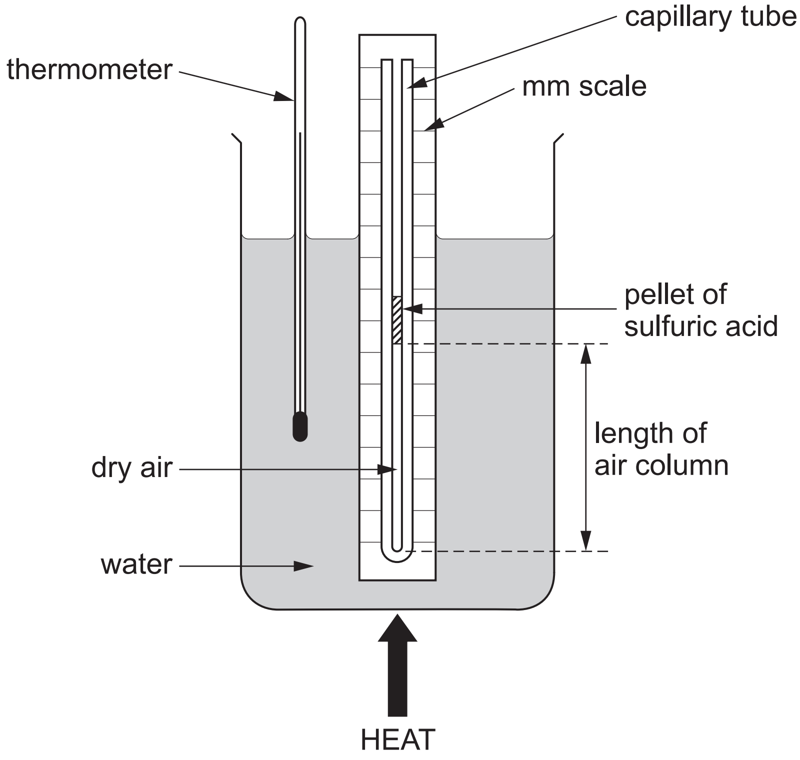
2. Paul used the following apparatus to investigate the relationship between the volume and temperature for trapped air in a capillary tube. Paul determined the volume of air by measuring the length of the trapped air column and multiplying it by the inner cross-sectional area of the capillary tube (given by the manufacturer).



Paul carried out the experiment twice and obtained the following results.

Temperature / **± 2 °C**	Volume / $10^{-9}\,m^3$			
	Trial 1	Trial 2	Mean	Absolute uncertainty
16	7.0	7.2	7.1	0.1
41	7.7	7.6	....	0.05
67	8.2	8.1	....	....
80	8.6	8.4	8.5	....
88	8.8	8.6	....	....

(a) **Complete the above table.** [3]
Space for calculations.

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(b) Plot a suitable graph of volume (on the y-axis) against temperature in °C (on the x-axis) to determine the relationship between volume and temperature. **Include** error bars on your graph where possible. Draw a line of maximum gradient and a line of minimum gradient. [4]

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

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

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(d) Paul's friend Nigela states that the graph shows that the volume is directly proportional to the temperature in °C. Explain why Nigela is incorrect. [1]

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(e) (i) Paul uses his results to calculate a value for the ideal gas constant, R, using the equation:

$$pV = nRT$$

The atmospheric pressure is 1.01×10^5 Pa and 2.60×10^{-7} moles of gas are present.

Use your graph to determine a value for the ideal gas constant along with its **absolute** uncertainty. [4]

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(ii) Suggest **two** ways in which Paul could improve his results. [2]

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END OF PAPER

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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