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Physics
Higher level
Paper 1B

28 April 2026

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

Session number

2 hours [Paper 1A and Paper 1B]

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Instructions to students

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- A clean copy of the **physics data booklet** is required for this paper.
- The maximum mark for paper 1B is **[20 marks]**.
- The maximum mark for paper 1A and paper 1B is **[60 marks]**.



Please **do not** write on this page.

Answers written on this page
will not be marked.

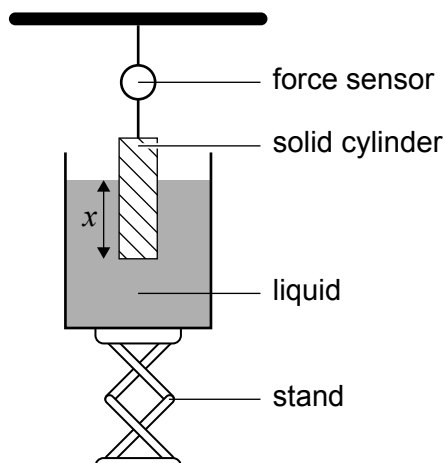


Answer **all** questions. Answers must be written within the answer boxes provided.

1. A student investigates the density of a type of wood and the density of a liquid.

The student suspends a solid cylinder made of the wood from a force sensor so that part of the cylinder is submerged in the liquid.

diagram not to scale



When a length x of the cylinder is in the liquid, the force indicated by the sensor is F .

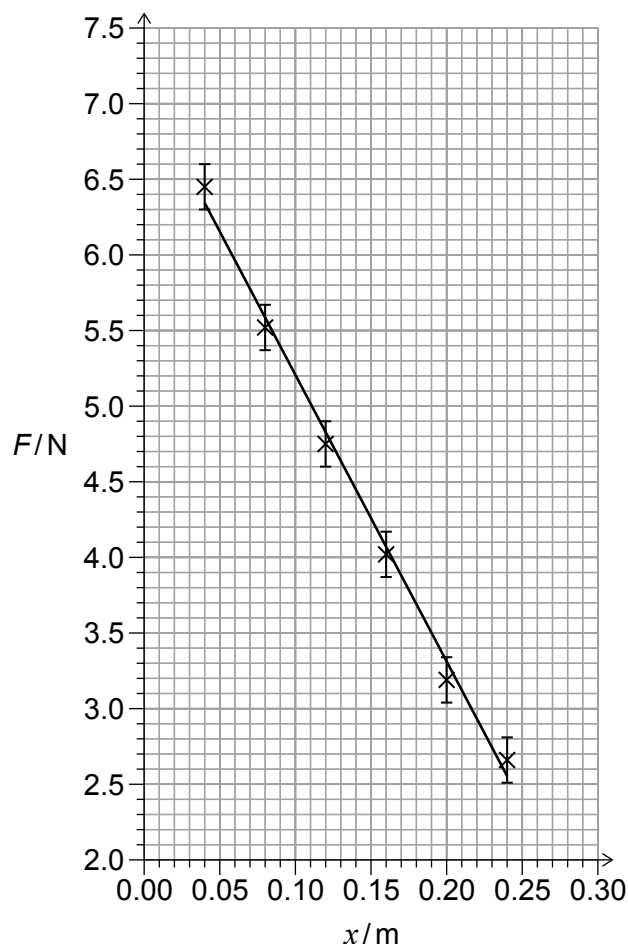
The student varies x using a stand. The height of this stand can be adjusted.

(This question continues on the following page)



(Question 1 continued)

The student records F for each value of x . The graph shows how F varies with x .



The relationship between F and x is

$$F = F_0 - \rho_l Agx$$

where F_0 is the weight of the cylinder, ρ_l is the density of the liquid, and A is the cross-sectional area of the cylinder.

- (a) Suggest, with reference to the gradient and an intercept, how the graph supports this relationship.

[2]

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(Question 1 continued)

- (b) Calculate the gradient of the line.

[2]

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The radius of the cylinder is 0.028 m. The length of the cylinder is 0.30 m.

- (c) Calculate ρ_l in kg m^{-3} .

[2]

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- (d) The density of the wood is ρ_w . Determine $\frac{\rho_w}{\rho_l}$.

[3]

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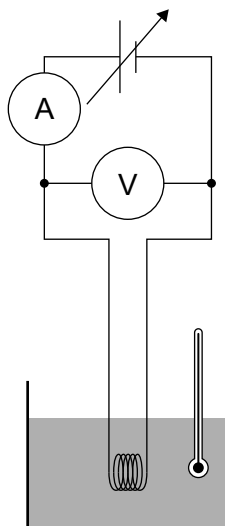


2. A group of students investigate how the resistance R of a metal wire varies with temperature T .

The students make an insulated wire of the metal into a coil. The coil is placed in hot water and connected to the circuit shown.

The air temperature in the laboratory is 20°C .

diagram not to scale



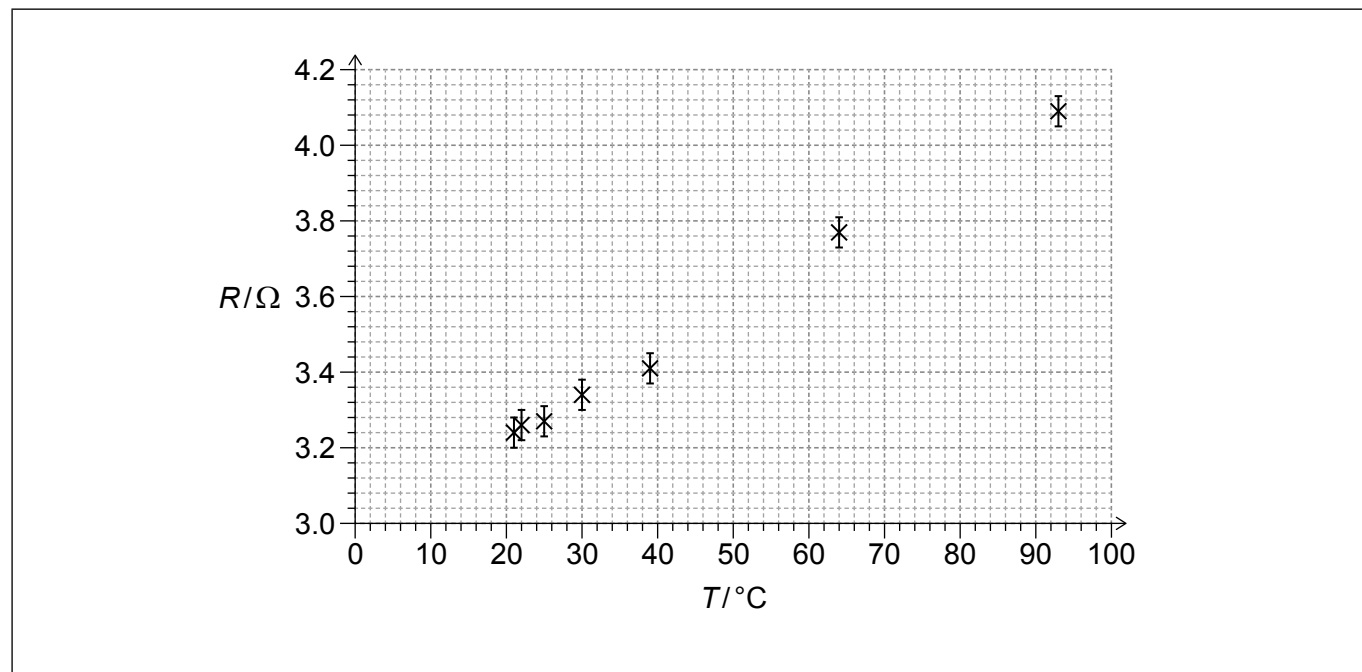
As the water and coil cool, the students measure the temperature T of the water and calculate the resistance R of the coil.

(This question continues on the following page)



(Question 2 continued)

The students plot a graph to show how R varies with T . Error bars for each value of R are $\pm 0.04\ \Omega$.



One data point is missing from the graph.

When T was $54.0\ ^\circ\text{C}$, the potential difference across the coil was $0.950\ \text{V}$ and the current in the coil was $263\ \text{mA}$.

- (a) (i) Calculate the value of R for the missing data point. [1]

- (ii) Draw the missing point and the best-fit line for the data. [1]

(This question continues on the following page)



(Question 2 continued)

- (b) The students waited for five minutes between taking each reading. This produces unequal spacing between points on the graph.

Suggest:

- (i) what this implies about the rate of heat loss from the liquid and the coil. [1]

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- (ii) **one** way to modify the experiment that will improve the graph. [1]

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(This question continues on the following page)



(Question 2 continued)

- (c) The students measured the dimensions of the wire after the experiment.

The length l of the wire in the coil was $(2.50 \pm 0.01)\text{m}$.

The cross-sectional area A of the wire was calculated to be $(1.43 \pm 0.01) \times 10^{-8}\text{m}^2$.

Assume that these values do not change over the temperature range used in this experiment.

The students calculated the resistivity ρ of the metal. The resistance R of the metal wire is given by $R = \rho \frac{l}{A}$.

For the temperature of 50.0°C ,

- (i) calculate the resistivity of the metal. [1]

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- (ii) determine the fractional uncertainty in the resistivity of the metal. [2]

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- (iii) state the resistivity of the metal together with its absolute uncertainty and an appropriate SI unit. [2]

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(Question 2 continued)

- (d) When the students finished their experiment, they checked the thermometer by placing it in a stirred mixture of ice and water. The thermometer showed a reading of -0.6°C .

The students then drew a corrected graph of R against T .

- (i) State the type of error in the thermometer readings. [1]

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- (ii) Suggest how the original graph compares with the corrected graph. [1]

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