

PHYSICS
Paper III

1. In this experiment, you will determine the resistivity (specific resistance, ρ) of a wire

You are provided with the following apparatus:

- 30 cm length of resistance wire
- battery eliminator
- ammeter
- voltmeter
- resistance box
- switch (key)
- connecting wires and sand paper.

- a. Set up the apparatus as shown in Fig. 1.1.

Do not disturb the setup of the battery eliminator.

The switch should be open (off).

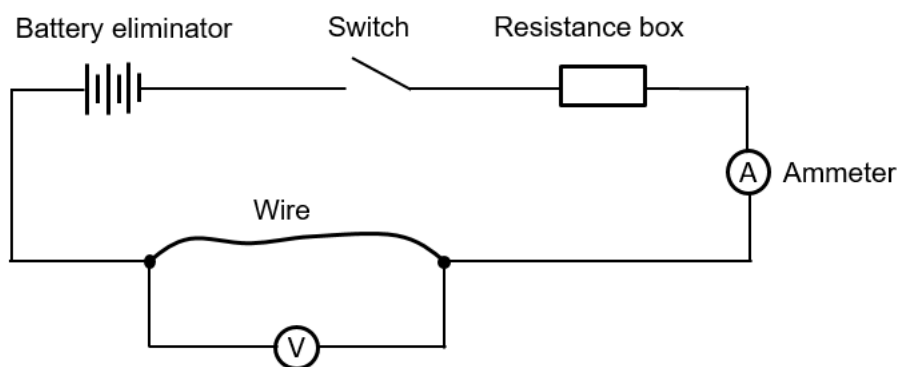


Fig. 1.1

- i. Set the resistance box to $2\ \Omega$, close the switch, and record the readings of voltmeter V and ammeter I in Table 1.1. Open the switch after you have made your measurements.

Repeat for four different values of resistance P in the resistance box. These should all be greater than $2\ \Omega$.

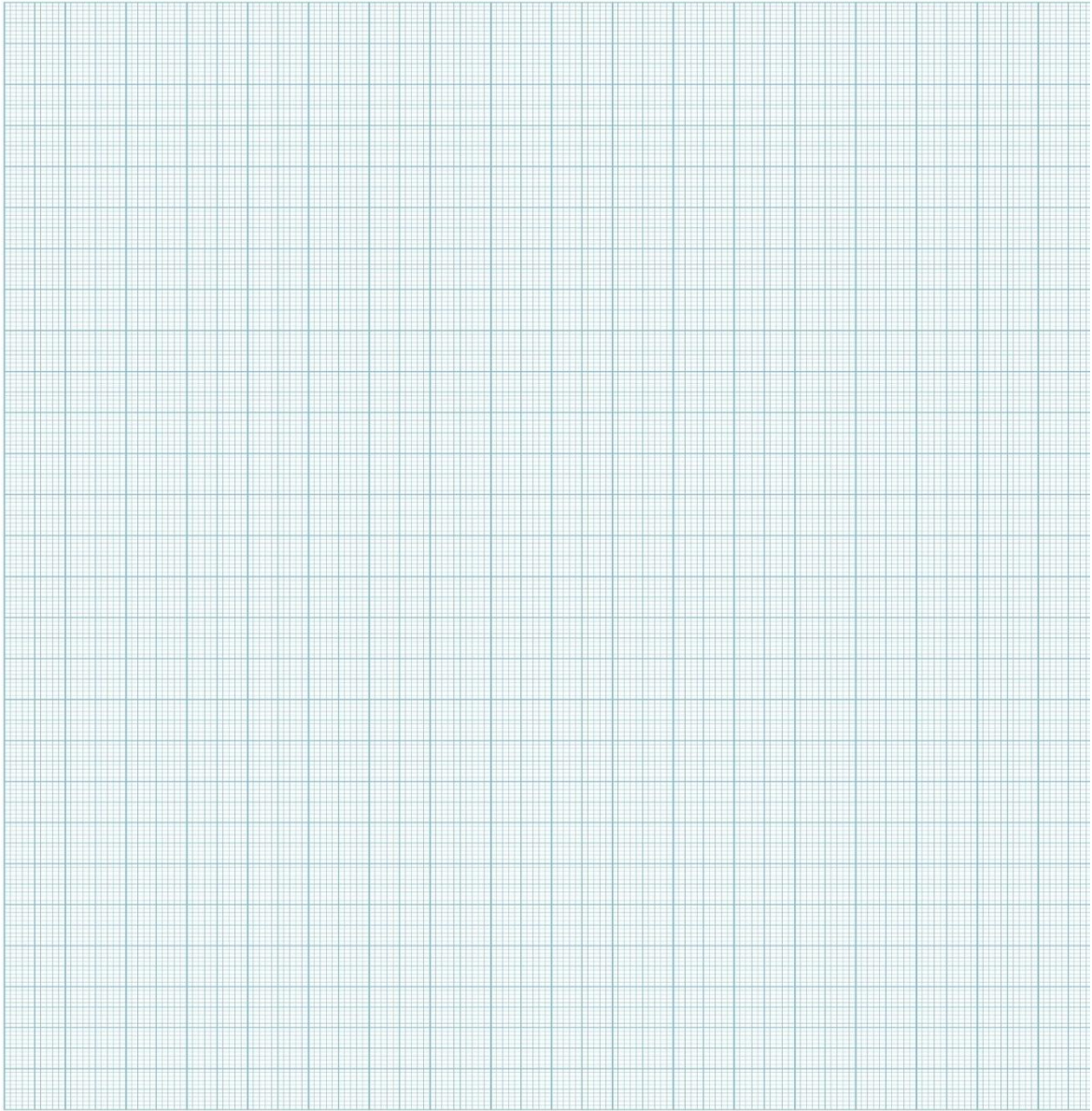
Record your measurements in Table 1.1. and include calculated values of resistance R of the resistance wire.

[5]

Trials	P (Ω)	V (V)	I (A)	R (Ω)
1	2			
2				
3				
4				
5				

- ii. Plot a graph of I against V with I on the y-axis and V on the x-axis. Use the grid provided. below.

[4]



iii. Draw a line of best fit.

[2]

Resistance R is defined by the equation:

$$R = \frac{V}{I}$$

- iv. Use your graph to determine the resistance of the resistance wire. Show your working on in the space below.

[3]

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- b. Disconnect the wire from the circuit.

Measure and record the diameter d of the wire. Show your working in the space below.

[2]

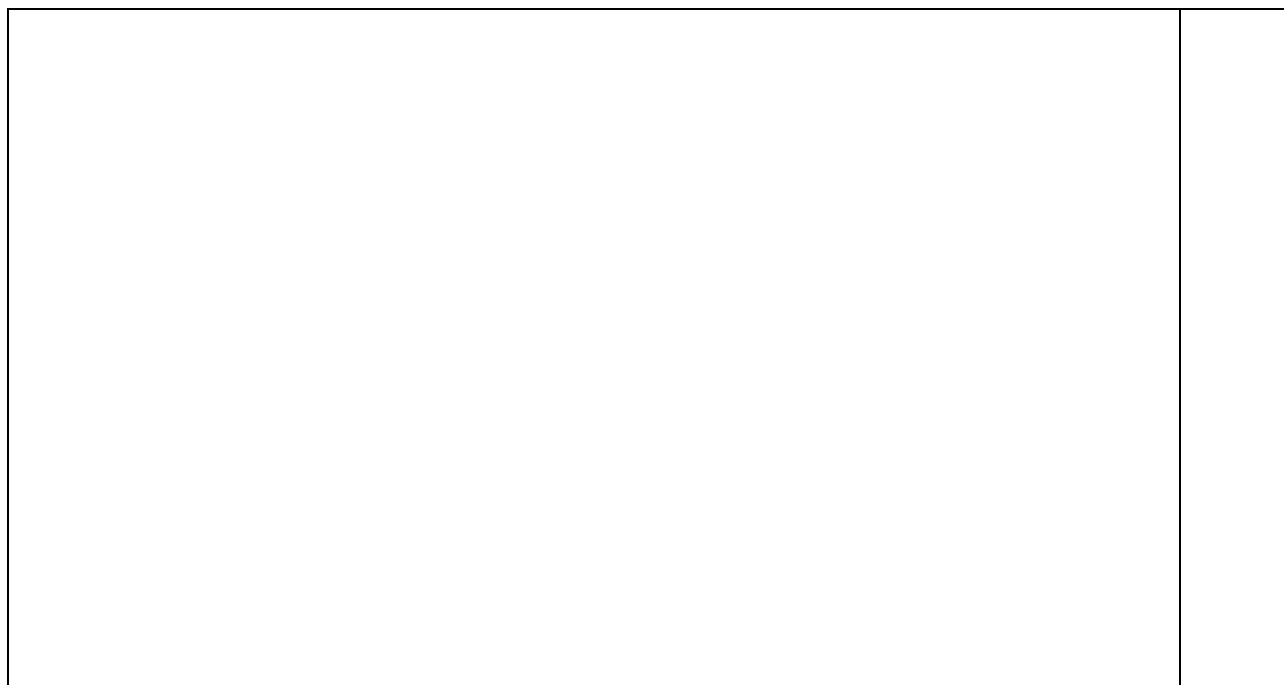
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- c. The resistivity (specific resistance ρ) of the resistor is given by the formula:

$$R = \rho \frac{L}{A}$$

Use your results from a(iv) and b and additional measurements to determine the specific resistance of the wire used in this experiment. Show your working in the space below. Include an appropriate S.I. unit.

[4]



2. In this experiment, you will investigate the force constant of a spring which is also known as spring constant.

You are provided with the following materials:

- Hooke's apparatus
- digital watch and slotted masses

Set up the apparatus as shown in Fig. 2.1 using the 50.0 g mass hanger.

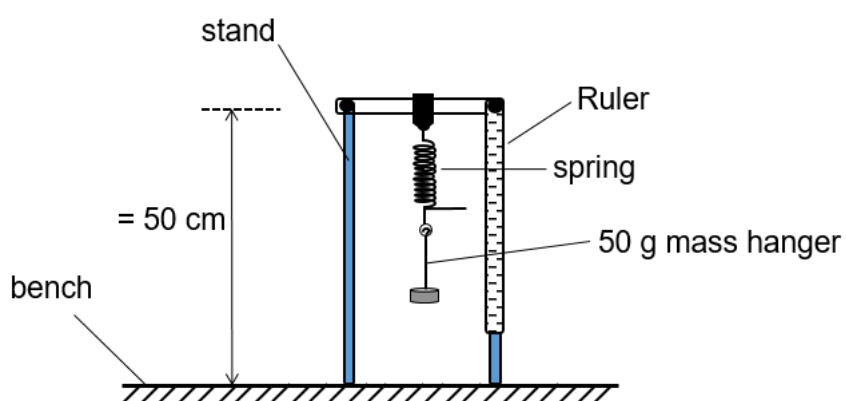


Fig. 2.1

Load 150 g slotted masses to the 50 g mass hanger.

- a. Pull the mass hanger down approximately 4 cm. Release it so that it undergoes vertical oscillations with no swinging motion.

- i. Take measurements to determine the time period T_1 of these oscillations. [2]

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- ii. Estimate the absolute uncertainty in your value for T_1 . Explain your method. [2]

- b. Repeat (a)(i) with a total mass of 250.0 g suspended from the spring.
Determine the new time period T_2 for vertical oscillations with a mass of 250

- g. [1]

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- c. It is suggested that the ratio $\frac{m}{T^2}$ is a constant independent of mass m .
- i. Use your results from (a) and (b) to calculate two values for $\frac{m}{T^2}$. Include an appropriate unit.

[2]

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- ii. Justify the number of significant figures you have used for your **first** value of $\frac{m}{T^2}$.

[1]

- iii. Use your answers in (a)(ii) and (c)(i) to calculate the percentage uncertainty in your first value of $\frac{m}{T^2}$.

The absolute uncertainty in m is 0.1 g.

[2]

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iv. Explain whether your results in (c)(i) support the suggestion. [2]

v. Describe four sources of uncertainty in this experiment. [4]

vi. Describe four improvements that could be made to this experiment. You may suggest the use of other apparatus or different procedures. [4]
