3 Resistivity of a wire

1. (a) Using the micrometers, measure the diameter of the wire at three different points, and calculate d, the average diameter

d_1/mm	d_1/mm	d_1/mm	d/mm

(b) Calculate the average cross-sectional area of the wire, A, in m^2.

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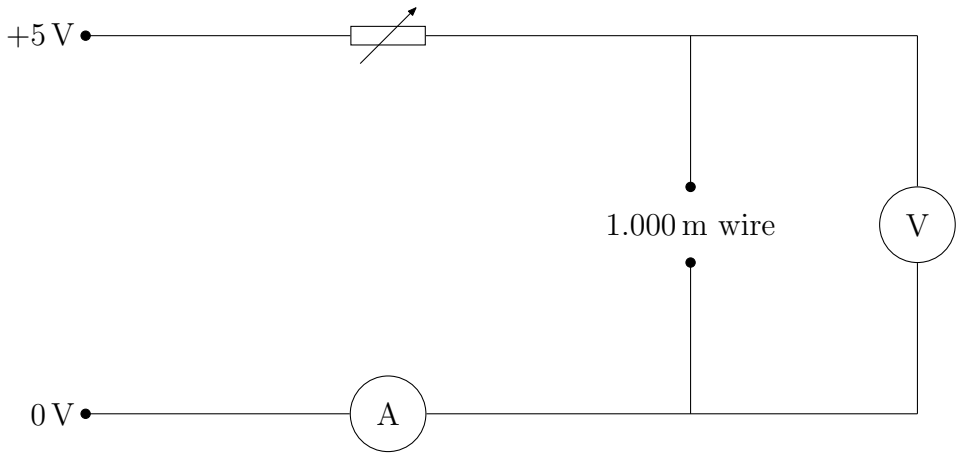
2. Set up the circuit as shown below, noting the following points:

- Set the length of the wire between the crocodile clips, l, to be 1.000 m. Make the wire as straight as possible. It may be convenient to tape the wire to the desk.
- Set the power supply voltage to about 5 V d.c.
- The ammeter should be on the 10 A scale.
- Adjust the ammeter so that the current, I, reads 0.20 A.



(a) Record V, the voltage on the voltmeter

(a) _____

(b) Calculate R, the resistance of the wire

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3. Repeat this proceduce for **five** more lengths of wire. *If necessary, adjust the variable resistor so that the current through the wire remains at* 0.20 A.
   Record the results into the table below, including the result from the previous page.

l/m	V/V	R/Ω
1.000		

4. Theory tells us that

$$R = \frac{\rho l}{A},$$

   where ρ is the resistivity of the wire.

   Therefore a graph of R against l should be a straight line of gradient $\frac{\rho}{A}$.

   (a) *Plot a graph of R against l.*

   (b) Calculate and record below G, the gradient of the line.

   (c) Use the above information to calculate a value for ρ, the resistivity of the wire.

5. (a) Explain why the current through the wire should be kept constant.

(b) What would be the effect on the graph if the current were to increase as the length of the wire is decreased?

(c) What is the uncertainty in the measurement of the length of the wire?

(d) What is the percentage uncertainty in the measurement of the length of the wire at

i. 1.000 m?

i. _____

ii. 0.500 m?

ii. _____

(e) Discuss the advantages and disadvantages of using a longer wire in making the experiment more reliable.