

Practical 1 – Topic 5

The dependence of resistance on the diameter of a uniform wire

Criteria assessed

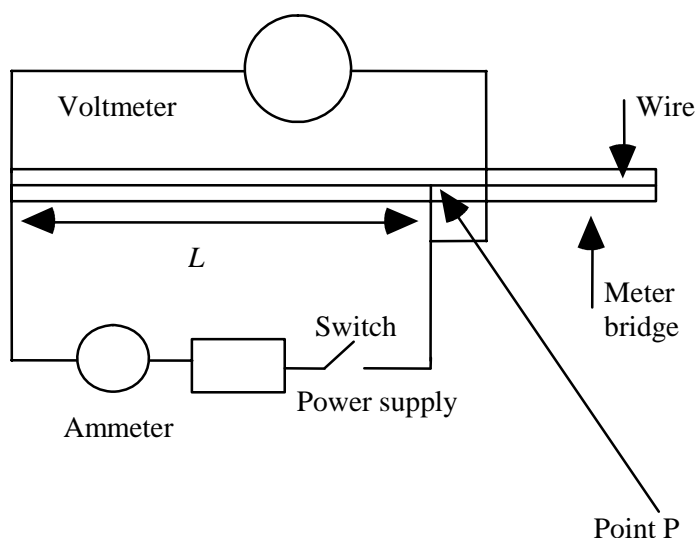
- DCP
- CE

Materials needed

- Power supply (0–12 V d.c.)
- Wires of the same material and length with various diameters (for example brass with diameters varying from 1.0 mm to 3.0 mm)
- Ammeter
- Voltmeter
- Micrometer

What to do

- Set up the following circuit.
- Measure the current (I) through a length L of the wire and record the voltage (V) across it.
- Open the switch after each measurement.
- The position of point P (see the diagram) can be varied. You simply touch the wire at that point and then repeat elsewhere on the wire.



- From your measurements, calculate the resistance of each wire.
- Measure the diameter of the wire. It is known that $R = \frac{\rho L}{A}$ where L is the length of the wire, A is its cross-sectional area and ρ is the resistivity of the metal.

Results

- Use your data to draw a graph that is a straight line.
- Do your data agree with the theoretical dependence of resistance on diameter?
- How can your graph be used to measure the resistivity of the metal?
- What value do you obtain for the resistivity?
- How does it compare with the literature value?

You may want to extend this experiment to investigate the dependence of resistance on the length of a wire for wires of fixed diameter.