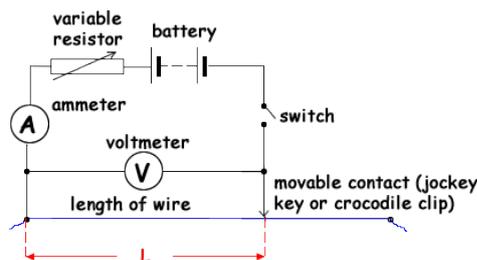# Edexcel Physics A Level

Core Practical 2

Determine the Electrical Resistivity of a Material

Method

- At various points along the wire measure the diameter, d, repeat at 90° angles at the same point, get about 6 readings and find average - check for zero error on micrometre
- Find cross-sectional area, A, of wire as:

$$A = \frac{\pi d^2}{4}$$

- Connect circuit as shown above
- At 10cm intervals from crocodile clip, touch wire with probe, record voltage, v, and current, I, readings on voltmeter and ammeter respectively
- Calculate Resistance R, as $\frac{V}{I}$
- Measure length of wire, L, from one crocodile clip to the other, using a ruler
- Vary L by changing position of the crocodile clips along the wire, and record corresponding values of R
- Plot R (y axis) against L and draw line of best fit with equation:

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

- Calculate resistivity:

$$\rho = \text{ gradient } \times A$$

Safety
- Small voltage used so little danger of electric shock
- Wire may get warm so don't touch unless with probe

Evaluation
- Highly varying voltage/current readings: remove power supply, voltmeter, ammeter and replace with ohm-meter (connect crocodile clip/probe directly to it)
- Uncertainty from micrometre is doubled as radius gets squared
- Crocodile clip is not directly in contact with the exact end of the wire due to windings on the end of the ruler
- Poor connection between crocodile clips and wire/ dirty crocodile clips creates will mean a higher resistance is measured
- Constant does not change resistivity at high temps – this is not a source of error
- Use ohm-meter to achieve resistance directly, reduce the wire heating (uses a very low current)
- Avoid pressure hard on wire, as deformation affects cross sectional area, and resistance
- Ensure wire straight so length measurement accurate