<u>Suggested Markscheme</u> (**Total = 15 marks**)

Record of measurements and calculations   [3]
- Headings with units with at least 6 sets of readings for *l*, **I**, **V, R**
- Acceptable values and correct d.p for *l,* **I**, **V**
- correctly calculated and correct s.f. for **R**
- Wide range (at least 70 cm) and fairly well spread values of length *l*

Record of diameter
- Acceptable values and correct d.p for d_1, d_2, d_3 : 0.39 mm = 0.039 cm   [1]
- Accurate calculation and correct d.p. for <d>   (2 d.p.)   (3 d.p.)   [1]

Graph (printed and attached to this practical): correct labelling of axes   [4]

Gradient **G** = within 20% of teachers' value
              = 0.10 ± 0.02 (Ω/cm) or 10 ± 2 (Ω/m)   [1]

Resistivity
- Accurate substitution of values into formula   [1]
- ρ = 1.2 x 10^{-6} Ω m or   1.2 x 10^{-4} Ω cm   [1]

Conclusion
R is directly proportional to *l*.   [start graph from origin!]   [1]
(straight line passes through/close to origin)

Precautions taken (any one)   [1]
- The circuit was closed only when readings were taken. This prevented the resistance wire from heating up, which could raise its resistance and cause inaccurate results.

- All connections were tightened
  - to prevent the readings from fluctuating due to poor connections OR
  - so that the total resistance of the circuit was not affected (hence affecting the current).

- It was checked that the resistance wire was mounted tautly across the ruler so that the length *l* used corresponds exactly to the measured valued.

- The jockey was held perpendicularly to make a light contact with the resistance wire, to avoid changing its cross-sectional area (and hence its resistance).

Possible source of error (any one) [1]

- The internal resistance of the plug switch / ammeter / accumulator / connecting wires is not negligible (any one object) Hence, the total resistance of the circuit was affected.

- The internal resistance of the voltmeter was not infinite. A small current could flow through the voltmeter. Hence the current measured by the ammeter was not the current flowing through the resistance wire.

- The resistance wire had kinks (bends) along its length.
  - Its effective length measured is not accurate OR
  - Its cross-sectional area is not uniform, affecting its resistance.