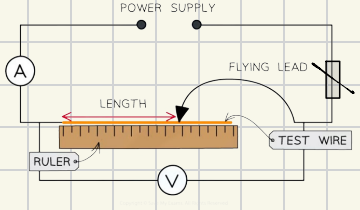
Resistance of a wire



Equipment	Purpose
Ammeter	To determine the current through the wire
Voltmeter	To determine the voltage across the wire
2.0 m of constantan wire (22–36 swg)	To calculate its resistivity
Flying lead	A wire with a crocodile clip at one end to allow connection at any point along the test wire
Metre ruler	To measure the length of the wire
Micrometer	To measure the diameter of the wire
Power supply	To provide the voltage through the wire
variable resistor	To provide base resistance

Aim:
To calculate the resistance of a wire

Variables:
Independent = Length of wire (m) ruler
Dependent = current (A) ammeter
Control = voltage, wire

	current mA	volts mV	Resistance
100	56.1	71.3	1.255
90	58.6	66.1	1.117
80	59.9	60.3	1.0066
70			
60	61.0	46.2	0.757
50	64.3	44.7	0.63
40	65.2	35.1	0.538
30	67.8	25.9	0.378
20	67.8	24.4	0.359
10	64.9	22.2	0.342
0			

V = I

Method:
1) measure diameter of wire
2) set up equipment as shown
3) attach flying lead to start and record V and I
4) vary distance and repeat – turn off before touching
5) repeat each length 2 more times for means

gradient = $^{R}/_{A}$ $\rho = \frac{RA}{L}$

so resistivity = gradient x cross sectional area

$= 4.9 \times 10^{-7}$ Ω m ← actual value (aim to get close to)

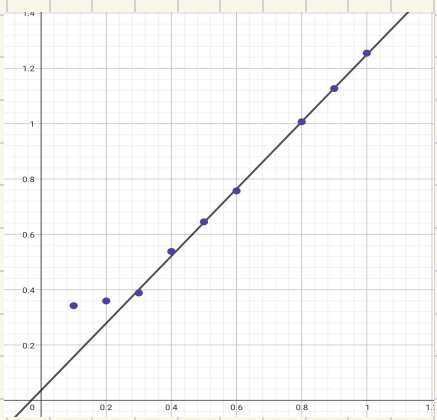
gradient = R/L

$R = V/I$ or $V = IR$

$\rho = \frac{RA}{L}$

$A = 3.97 \times 10^{-7}$

$\left(\frac{0.711}{2}\right)^2 \pi$



$g = \frac{x_1 + x_2 + x_3}{y_1 + y_2 + y_3}$

$= \frac{1.0066 + 0.63 + 1.117}{0.8 + 0.5 + 0.9}$

$g = 1.25$

$\rho = 1.25 \times 3.97 \times 10^{-7} = 4.96 \times 10^{-7}$

uncertainty $= \left(\frac{4.96}{4.9} - 1\right) \times 100\% = 1.22\%$ → acceptable result

Outliers:

The outliers would be due to the temperature of the wire as I used a thin wire it is able to heat up more easily and resistance increases the higher the temperature.

The practical went as expected with conclusion within the error range (10%) so the experiments outcome would be accepted.

Throughout the experiment there was places where it could be improved with accuracy and precision such as the outliers that were excluded in the line of best fit.

The setting up of the experiment came across some technical difficulties such as the multimeters not working and a faulty power supply unit (these were replaced with working ones). Next time I would test all the equipment before setting it up and carrying out the experiment.

This experiment could be easily replicated by anyone with the equipment and they should get similar results the only variation would be multimeter units and accuracy.