Electrical Properties 1

1. A resistor passes a current of 68 ± 5 mA when subjected to a potential difference of 5 ± 0.1 V. Calculate the resistor's resistance quoting the uncertainty.
2. The heating element of an electric toaster is typically made of nichrome wire (an alloy of nickel and chromium). As current passes through the wires, the wires heat up, thus toasting the toast. Estimate the overall resistance of a heating element which is 220 cm long and consists of nichrome wire with a diameter of 0.56 mm. The resistivity of nichrome is 110x10-8 Ω m.
3. The resistance of the ohm is very approximately that of a column of mercury 1.06 m long and of uniform cross-section of one hundredth of a cm2. Find the resistivity of mercury.
4. A piece of titanium wire is measured as 15 ± 0.1 m long with a diameter of 1.3 ± 0.2 mm.
   1. Express the value of the uncertainties in the length and diameter of the wire as percentages.
   2. Calculate the area of the wire and estimate the percentage uncertainty.
   3. The resistivity of titanium is quoted as 4.20x10-7 Ω m ± 5%. Calculate the resistance of the wire and estimate the uncertainty in this value.
5. The resistance of an aluminium wire of diameter 0.34 mm is measured at a number of different lengths. The results are shown below.

* l / cm
* R / mΩ
* 10
* 34
* 20
* 59
* 30
* 101
* 40
* 115
* 50
* 155
* 60
* 195
* 70
* 217
  1. Plot a graph of this data in standard units, either by hand or using Excel.
  2. Measure the gradient of the graph. What are the units of this gradient?
  3. The equation for resistivity as:
  4. By considering what the gradient represents, use the value of gradient and the area above to calculate the resistivity of the wire.

1. A wire of uniform cross-section has a resistance of *R* Ω. If it is drawn to three times the length, but the volume remains constant, what will be its resistance?