Electrical Conductors

Activity Guide - Foundation

Safety:

- Attach the wire samples for testing to a ruler so the ends cannot flick into your eyes

Use the micrometer screw gauge to **measure the diameter of the wire**

Diameter _____ mm Calculate the radius (r) _____ mm

Convert radius to metres _____ m

Calculate the cross section area (A) _____ m^2

White boxes are measured values

Grey boxes are calculated values

Use a ruler to **measure the length** (l) _____ m

Use a multimeter to measure the Resistance (R) _____ Ω

Calculate the coefficient of resistivity for your wire _____ Ωm

Try measuring the resistance of your wire at different lengths.

How does changing the length of wire affect resistance?

Compare your results with other students. Which material has the lowest coefficient of resistivity?

Taking all the properties into account, which material will make the best electrical connectors and which will make the best wires in a Greenpower car?

Electrical Conductors

Activity Guide – In Depth

Safety:

- Attach the wire samples for testing to a ruler so the ends cannot flick into your eyes

Equipment:

Micrometer screw gauge to measure the diameter of the wire (± 0.005mm or ± 5×10^{-6}m)

Multimeter to measure the resistance (± 0.01Ω)

Ruler to measure the length (± 1mm or ± 1×10^{-3}m)

Shaded columns require measurements, plain columns require calculations

Material	Diameter (mm)	Diameter (m)	Radius (m)	Resistance (Ω)	Length (m)	Coefficient of resistivity (Ωm)

Select one wire and try measuring the resistance of your wire at different lengths.

Length (m)	Resistance (Ω)

How does changing the length of wire affect resistance?

How could the car be designed to reduce electrical resistance?

Taking all the properties into account, which material will make the best electrical connectors and which will make the best wires in a Greenpower car?

Electrical Conductors

Activity Guide - Advanced

Safety:

- Attach the wire samples for testing to a ruler so the ends cannot flick into your eyes

Equipment:

Micrometer screw gauge to measure the diameter of the wire (± 0.005mm or ± 5×10^{-6}m)

Multimeter to measure the resistance (± 0.01Ω)

Ruler to measure the length (± 1mm or ± 1×10^{-3}m)

Shaded columns require measurements, plain columns require calculations

Material	Diameter (mm)	Diameter (m)	Radius (m)	Area (m^2)	Resistance (Ω)	Length (m)	Coefficient of resistivity (Ωm)

Select stainless steel wire and try measuring the resistance of your wire at different lengths.

Length (m)	Resistance (Ω)

How does changing the length of wire affect resistance?

By considering the equation $R = \frac{\rho l}{A}$, what graph could you plot to allow you to determine the coefficient of resistivity? How would this give more reliable results than calculating a value from individual measurements?

How could the car be designed to reduce electrical resistance?

Taking all the properties into account, which material will make the best electrical connectors and which will make the best wires in a Greenpower car?