Lascells Free Experiments - Resistance

This experiment looks at the relationship between the resistance of a wire and its length, at constant temperature.

We will conduct this investigation with the Lascells Resistance Wire Board, available from SLS Select Education. The circuit we will use is shown in Figure 9.

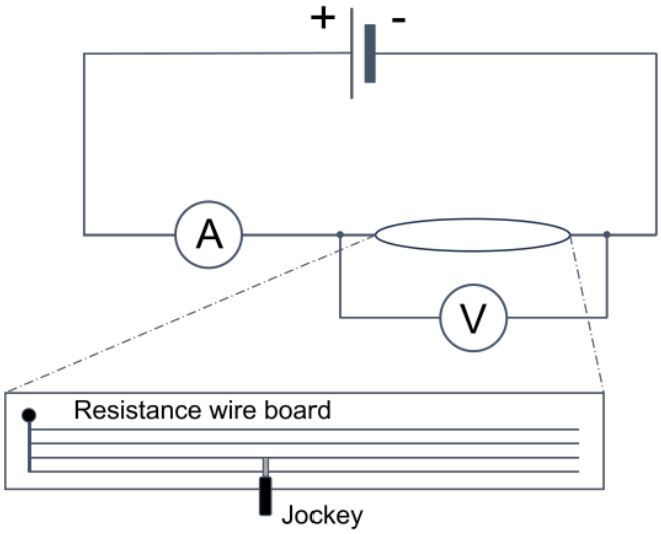

Figure 9: Circuit diagram for the resistance experiment.

In this experiment, we will take voltmeter and ammeter readings across different lengths of wire as we pass the same supply voltage through it. We will then use Ohm's Law:

$$V = IR$$

to determine the resistance (R) from the voltage (R) and current (I) readings.
Rearranging the Equation for R gives:

$$R = RI$$

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Safety:

The wires on the board can become hot when a current is being, or has been passed through it. Allow time for the wires to cool before touching.

Warning: wires can go red hot if a large current is passed through a small length of wire. It may be useful to limit the power supply using the limiter on the front of the unit to prevent high voltages (and currents) flowing through the circuit.

Equipment:

S100-905 Lascells Precision Variable Power Supply
LA10–150 Lascells Digital Ammeter
LA10-140 Lascells Digital Voltmeter
LA10-410 Resistance Wire Board
LA10-405 Lascells Jockey
Connecting Leads

Method:

1. Set up the circuit as shown in Figure 9. If you need help:
    a. Connect the positive terminal on the power supply to the positive terminal on the ammeter. Physics Required Practicals 14
    b. Connect the negative terminal on the ammeter to the terminal on the left hand side of the Resistance Wire Board.
    c. Connect the jockey to the negative terminal on the power supply unit. By touching the jockey to the Resistance Wire Board, you will complete the circuit. This will act as a switch in the circuit.
    d. Now connect your voltmeter in parallel:
        i. Connect the positive terminal on the voltmeter to the terminal on the left hand side of the Resistance Wire Board.
        ii. Connect the negative terminal on the voltmeter to the jockey.
2. Set the voltage on the power supply to 1 V. With the jockey not touching the wire board (i.e. switch open), turn the power supply on.
3. Momentarily touch the jockey to the 5 cm mark on the second thinnest wire (second one up from the bottom). Make a note of the reading on the voltmeter and ammeter.

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4. Repeat the above step in 5 cm increments across the full length of the wire. Record your results in a table, similar to that of Table 11.
5. Use Equation 21 to calculate the resistance in Ohms for each measurement.
6. Plot your data using Resistance on the y-axis, and Length of wire on the x, and determine the relationship between these quantities.

Length of wire (cm)	Voltage (V)	Current (A)	Resistance (Ω)
5	0.70	2.00	0.350
10	0.80	1.50	0.533
15	0.80	1.30	0.615
20	0.85	1.00	0.850
25	0.86	0.90	0.956
30	0.88	0.79	1.114
35	0.89	0.65	1.369
40	0.91	0.58	1.569
45	0.91	0.55	1.655
50	0.91	0.50	1.820

Table 11: Sample data taken for resistance experiment.

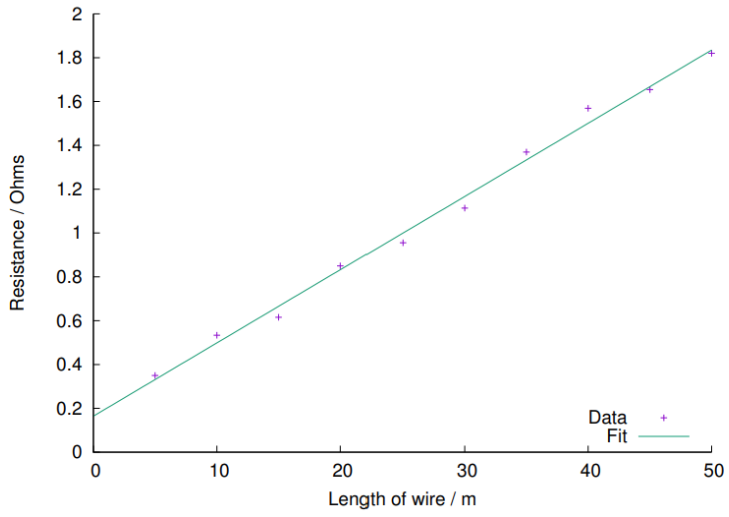

Figure 10: Plot of sample data collected for the resistance experiment. Data has been linearly fitted.

The suitability of this experiment for a particular learning activity is up to the end user to assess based on their knowledge of the participants and the equipment, resources and safety standards available. While every experiment has been tested, by undertaking the activity, the end user accepts any and all risk. It is recommended that a risk assessment be conducted prior to any experimental activity being undertaken.

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