**PHYS 102    Resistance** Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Partner(s):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

A. Introduction of electricity and resistance using a digital multimeter.

Apparatus: Digital multimeter (DMM), 9-volt battery, carbon-film resistors (3), banana plug wires (2), one long (nichrome) wire, connector box, and meter stick.

Theory:

1. Background information about digital multimeter is available on this [digital multimeter](http://www.physics.smu.edu/~scalise/apparatus/multimeter/) website.

2. Electricity comes in two types. Name these two types.

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3. Name a few quantities and their units used in electricity.

|  |  |
| --- | --- |
| **Terms in Electricity** | |
| **Physical Quantity** | **Unit (unit abbreviation)** |
|  |  |
|  |  |
|  |  |
|  |  |

4. Name a few electrical appliances where resistance is the primary component.

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5. Measure the voltage of a 9-volt battery.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. Measure the resistance values of unknown resistances and complete the following table

|  |  |  |  |
| --- | --- | --- | --- |
|  | R1 | R2 | R3 |
| From [the resistor color code.](http://www.ealnet.com/m-eal/resistor/resistor.htm) |  |  |  |
| Using the digital multi-meter |  |  |  |
| Tolerance |  |  |  |

Procedure:

1. Set the DMM to measure resistances and connect two banana-plug wires from it to the connector box.

2. Connect one end of the long metal wire to one of the terminals of the connector box.

3. Measure 10 cm length of wire, (do not cut the wire) and connect it to the other terminal so that there is exactly 10 cm of wire between the terminals.

4. Create an Excel data table, first column for length, L and second for resistance, R.

5. Record the length and resistance data and repeat procedure-3 for other lengths, 9 more times.

6. Plot a graph R versus length, determine its slope, and print a hard-copy of your data table and graph.

  Slope of R versus L, graph:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. Now that you have seen what happens to the resistance as the length increases, can you predict what will happen to the resistance as the diameter increases?

PREDICTION:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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8. Check your prediction for the effect of diameter, by doing the following investigation:

1. Cut the wire into 5 equal pieces, about 20 cm each.
2. Measure the resistance of one piece, two pieces (together), three pieces, four pieces, and five pieces.
3. Tabulate your data, plot an appropriate graph, and see what happens.
4. Print a hard copy of your data table and graph.

EXPLAIN YOUR RESULTS:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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9. Electricity is transported across states using power lines with thick wires. Explain why?

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