Name: _____ Class: _____ Date: _____

What's the Resistance?

Learner Outcomes:

- Apply Ohm's law to calculate resistance, voltage and current in simple circuits.

Key Terms:

Resistance	Ohm's law	Galvanometer
Voltage	Voltmeter	Multi-meter
Current	Ammeter	Rheostat

Background Information: Resistance is a measure of how difficult it is for electrons to flow through a substance. Resistance is measured in Ohms. According to Ohm's law, as long as temperature stays the same:

1. The resistance of a conductor stays constant
2. The current is directly proportional to the voltage applied.

$$V = I \times R$$

Measure	symbol	Unit	Measured With
voltage	V	Volts	voltmeter
current	A	Amperes	Ammeter
resistance	Ω	Ohms	ohmeter

Research Question: What factors influence the resistance in an electrical circuit?

Hypothesis:

Materials:

D cell battery pack	10 cm rubber tubing	Ruler
10 cm copper wire	10 cm other materials	Calculator
10 cm nichrome wire	Connecting wires	
10 cm graphite	Multi-meter	

Procedure:

1. Use the connecting wires to create a circuit that includes a D- cell battery connected to the two terminals on the multi - meter. Record the voltage, current and resistance.
2. Use two additional connecting wires to insert a 10 cm length of copper wire into your circuit. Be sure everything is securely connected and the length of

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Mah K, Martha J, McClelland L, et al. *Science in Action 9*. Toronto, ON: Addison Wesley.

copper between the two connecting wires is exactly 10 cm. Record the voltage, current and resistance.

3. Move one end of the connecting wire so that there is only 1 cm of copper wire connected in the circuit. Record the voltage, current and resistance.
4. Repeat steps 2 and 3 with Nichrome wire, a piece of solid graphite (pencil lead), a length of rubber tubing and any other materials you wish to try.

Observations:

"Resistor" substances	Voltage	Length Connected	Current	Resistance (measured)	Resistance (calculated)
No Wire					
Copper		10 cm			
		1 cm			
Nichrome		10 cm			
		1 cm			
Graphite		10 cm			
		1 cm			
Rubber Tubing		10 cm			
		1 cm			
		10 cm			
		1 cm			
		10 cm			
		1 cm			
		10 cm			
		1 cm			

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Analysis:

1. Use Ohm's Law to calculate the resistance of each current recorded in your table. Do your calculations match up with your meter measurements?

2. Which substance had the greatest resistance? Explain any patterns you see in the types of materials that are good resistors or poor resistors.

3. What was the effect of moving the connecting wires so that the current travelled through a shorter length of the conductor? Why do you think this occurs?

4. How precise were your measurements? Were there any sources of error that could affect the accuracy of your results?

Conclusion:

Write a summary that answers the question: Do different material have different values of electrical resistance? Use your data to support your answer.

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Extension:

1. Select and investigate at least two devices that have variable resistance and explain why variable resistance is needed and how it is created in the device.

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