**Ohm’s Law PhET Simulation**

When talking about circuitry and flowing electricity, there are 3 variables that govern how electricity works:

**Voltage (V):** How much “push” electrons get. Any change in voltage results in motion of charged particles. Voltage is sometimes referred to as “Potential” due to the fact there is a potential for the charge to flow if there is a voltage difference.

**Current (I):** The flow of charge. How much charge passes a point per second

**Resistance (R):** The level of how much a material resists the flow of electricity through it. This is due to the molecular structure of the material as well as other factor (see other side of page).

These three variables are related to each other through the **Ohm’s Law** equation:

$∆V=IR$ or $I=\frac{∆V}{R}$

1. Select a value for the resistance. Now increase the potential across the resistor. How does the current change?
2. Select a value for the potential difference. Now decrease the resistance. How does the current change?
3. If a battery of 9 volts is connected across a resistor of 1000 Ω (symbol for ohms), what will be the resulting current flowing through it?
4. For a resistor of 10 Ω, apply 5 difference potentials and measure the current through the resistor.

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| --- | --- | --- | --- | --- | --- |
| Voltage (V) | 1 | 3 | 5 | 6 | 8 |
| Current (A) |  |  |  |  |  |

1. Plot the data below with V on y and Current on x.
2. Draw a trend line through it and measure the slope. What does the slope of the V vs I graph tell you?

Practice Problems:

1. An electrical heater carries a current of 13.5 A when operating at a voltage of 120 V. What is the resistance of the heater?
2. A person notices a mild shock if the current along a path through the thumb and index finger exceeds 80 μA. At what voltage will a person feel the shock across the thumb and finger if they have dry skin resistance of 400,000 Ω or wet skin resistance of 2,000Ω.

**Resistance in a Wire PhET Simulation**

Nothing likes to have electricity flow through. The nature of the universe is to resist change. When electrons are flowing through a substance, the molecules of that substance will slow down the electrons and fight the flow. The result of this is Electrical Resistance. Using this simulation, you will determine what factors can affect the resistance of a current carrying wire.

1. What are the 3 factors that affect Electrical Resistance?
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1. Vary the factors. What do you think resistivity represents?

1. Describe how you can make a wire with the **SMALLEST** resistance.
2. Describe how you can make a wire with the **LARGEST** resistance.

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| --- | --- |
| Metal | Resistivity (Ω\*m) |
| Silver | 1.59\*10-8 |
| Copper | 1.7\*10-8 |
| Gold | 2.44\*10-8 |
| Aluminum | 2.82\*10-8 |
| Tungsten | 5.6\*10-8 |
| Iron | 10.0\*10-8 |
| Platinum | 11\*10-8 |

Practice Problem.

1. A wire 50 m long and 2 mm in diameter is connected to a source with a potential difference of 9.11 V, and a current if found to be 36 A. Identify what metal the wire is made of.
2. I have a copper wire with length L and diameter d, which has a resistance of Ro. A new copper wire has a length of 3 L and a diameter of 2d. What is the resistance of the new wire in terms of Ro?