Physics Honors: Ohm's Law

Resistance

The measure of how strongly an object or materials impedes current produced by a potential difference is called **resistance (R)**. Resistance is measured in Ohms (Ω). One ohm of resistance is the resistance premitting 1A to flow when a potential difference of 1V is applied

Factor	How Resistance Changes	Example
Length	Resistance increases as length increases.	L ₁ R ₁ >R ₂
Cross-sectional area	Resistance increases as the cross-sectional area decreases.	$A_1 \qquad A_2 \qquad \qquad R_{A_1} > R_{A_2}$
Temperature	Resistance usually increases as temperature increases.	<i>T</i> ₁ <i>T</i> ₂ <i>R</i> ₁₁ > <i>R</i> ₁₂ <i>R</i> ₁₁ > <i>R</i> ₁₂
Material	Keeping length, cross-sectional area, and temperature constant, resistance varies with the material used.	silver, copper, gold, aluminum, iron, platinum

Resistors

Resistors are devices that are designed to have a specific resistance.

Resistors are can made of carbon, semiconductors, or wires that are long and thin.

Resistors that are used in modern circuits look like those to the right - they are color coded to tell you how much resistance each resistor has



Ohm's Law

Ohm's Law states that the current through a wire is directly proportional to the potential difference between it's ends.

$\Delta V = IR$

 ΔV = Electric Potential (Volts)

I = Current (Amperes)

R = Resistance (Ω)

Ohm's Law Practice

A 30 V battery is connected to a 10 Ω resistor. What is the current in the system?

A lamp draws a current of 0.5 A when it is connected to a 120V source. What is the resistance of the lamp? What is the power consumption of the lamp?

Ohmic vs Non Ohmic Conductors

Most conductors strictly follow Ohm's law. These are called Ohmic conductors.

However, some conductors, like semiconductors or electrolytes, don't follow Ohm's laws at all times. These are called non-ohmic conductors



Definition of Circuits

Any closed loop or conducting path that allows electric charge to flow is called a circuit



Diagramming Circuits





