

Lesson 6
Resistance and Ohm's Law

The amount of energy transferred to any useful device depends on two things:

1. The potential difference of the power supply.
2. The nature of the pathway through the loads that are using the energy.

A pathway that allows more current to pass through the load offers less opposition to current flow.

Resistance:

A measure of opposition to current flow through a circuit.

A circuit element with high resistance lets little current through, while one with low resistance lets much current through.

A resistor is a circuit element or device which causes resistance to the flow of current. A filament in a light bulb or a heating element in a toaster are both resistors.

Symbol:



Unit: ohm (Ω) named after Georg Simon Ohm (1787-1854)

Ohm's law lab

Ohm's Law

$$R = \frac{V}{I}$$

or

$$V = IR$$

Where:

R = resistance (Ω)

V = voltage (V)

I = current (A)

Thus, $1 \Omega = 1 \text{ V/A}$

The amount of current flowing through a resistor varies directly as the amount of potential difference applied across the resistor as long as other variables such as temperature are controlled.

Example:

A heating coil on an electric stove draws 25 A of current from a 240 V circuit. What is the coil's resistance?

Note: Ohm's law is only true for certain materials. Materials that obey Ohm's law are called ohmic, those which do not are non-ohmic.

A resistor is considered to be a linear circuit element (ohmic) since a graph of V vs. I results in a straight line with constant slope R (resistance). R is a constant, independent of V for metal conductors. A light bulb however would be considered a non-linear (non-ohmic) circuit element since the graph of V vs I would not be straight line (see handout).