

Resistance & Ohm's Law

12PHYS - Electricity

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Starter

Give the definition, symbol, unit and formula for the following:

1. Electric Field
 2. Electric Potential Energy
 3. Current
 4. Voltage
 5. Power
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Recall that a circuit is an energy delivery system!

Current

$$\text{current} = \frac{\text{charge}}{\text{time}}$$
$$I = \frac{q}{t}$$

Voltage

$$\text{voltage} = \frac{\text{Electric field strength}}{\text{charge}}$$
$$V = \frac{E}{q}$$

Power

$$\text{power} = \text{current} \times \text{voltage}$$

$$P = IV$$

What are we missing?

Resistance

- What carries the charge in a circuit?
 - Why are they able to flow in metals?
 - **Resistance** is the measure of how much electrons are impeded in a circuit. How much they are *slowed down*.
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Symbol & Units

Resistance has symbol **R** in equations and has the unit **Ohms** (Ω).

Resistance & Heat

When current moves through a material with resistance the electrons *bump* into the nuclei. This causes energy to be transferred in the form of vibrations (**heat**)!

The higher the resistance, the more heat produced!

Ohm's Law

$$V = IR$$

$$\text{voltage} = \text{current} \times \text{resistance}$$

- Voltage is measured in..
 - Current is measured in..
 - Resistance is measured in..
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Examples

1. The resistance of a light bulb is $1.5k\Omega$. Calculate the current through the bulb when it is connected across a $12V$ power supply.
2. When $9V$ is applied to a resistor, $0.03mA$ of current flows through it. Calculate the resistance of the resistor.
3. How much voltage is required to produce $180\mu A$ of current flowing through a $0.6M\Omega$ resistor?