

# 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

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

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## Voltage

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

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## Power

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

$$P = IV$$

What are we missing?

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## 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** ( $\Omega$ ).

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## 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!

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## 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?