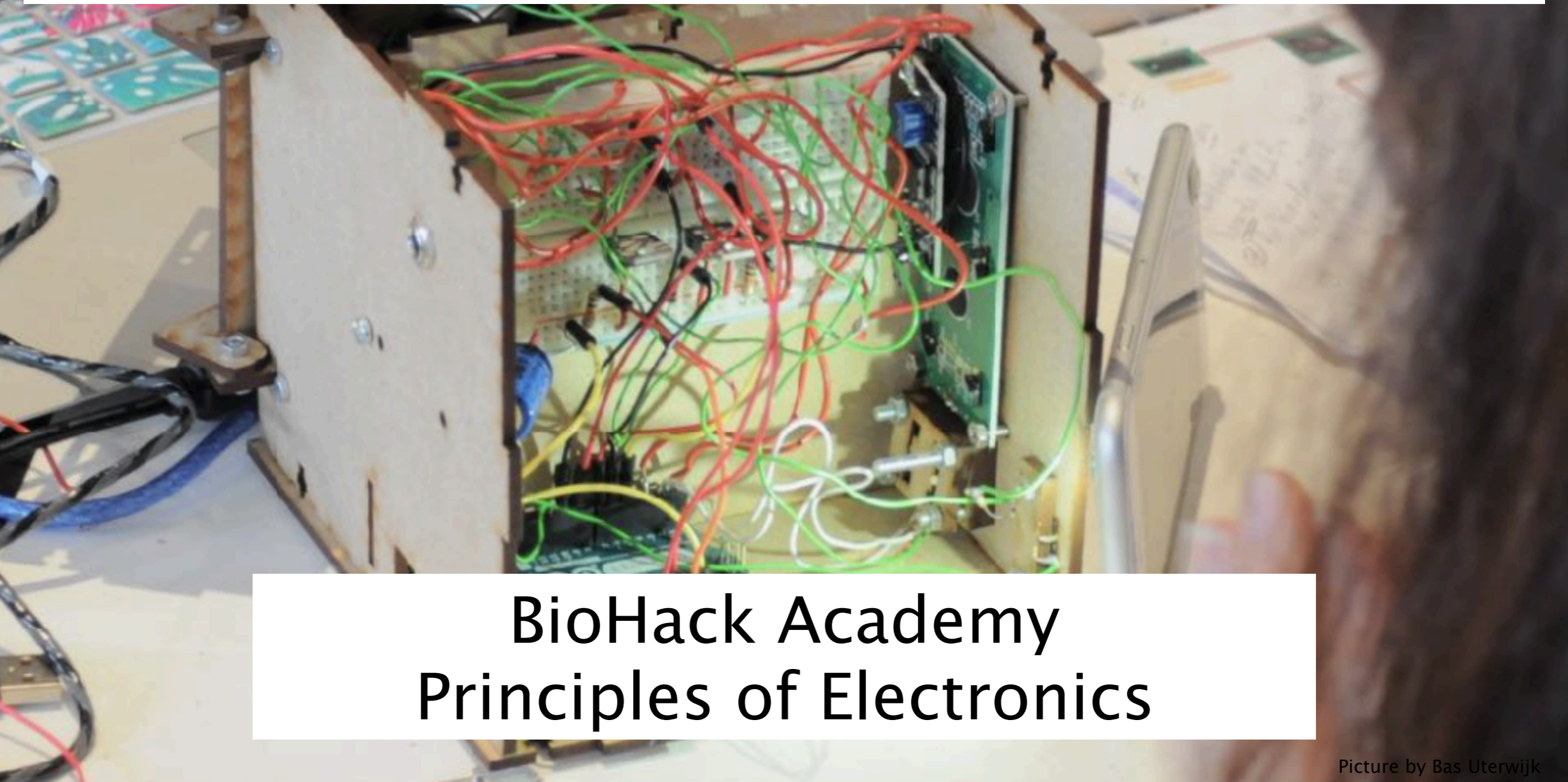


biohack academy
waag society



BioHack Academy
Principles of Electronics



A circuit

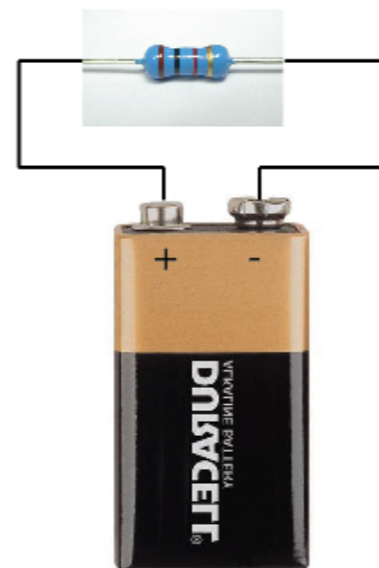
A circuit is a **CLOSED LOOP** in which electrons can flow.

Electrons flow = Current

How can I generate a Current?

By connecting two electrodes of a battery

For example: Battery + Resistor





Battery

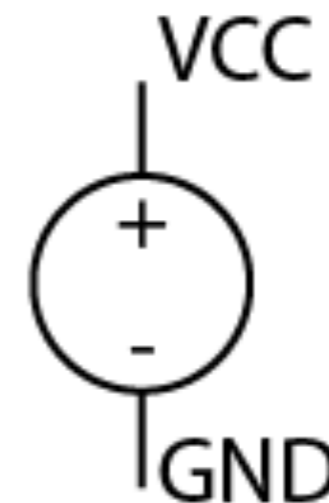
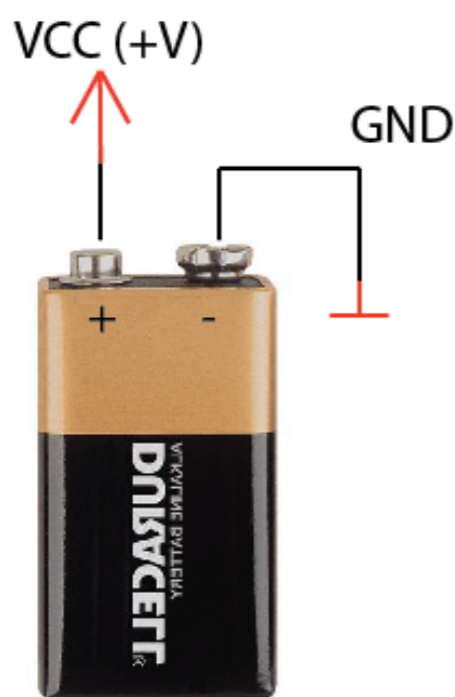
The battery is the power supply of our circuit.

It has two sides:

- + a.k.a. Plus, VCC, V+ or +V
- - a.k.a. Minus or GND

Unit of measure is Volt (V).

Voltage:
It's the difference in potential between two points





Batteries & Power Supplies

VCC = 9V



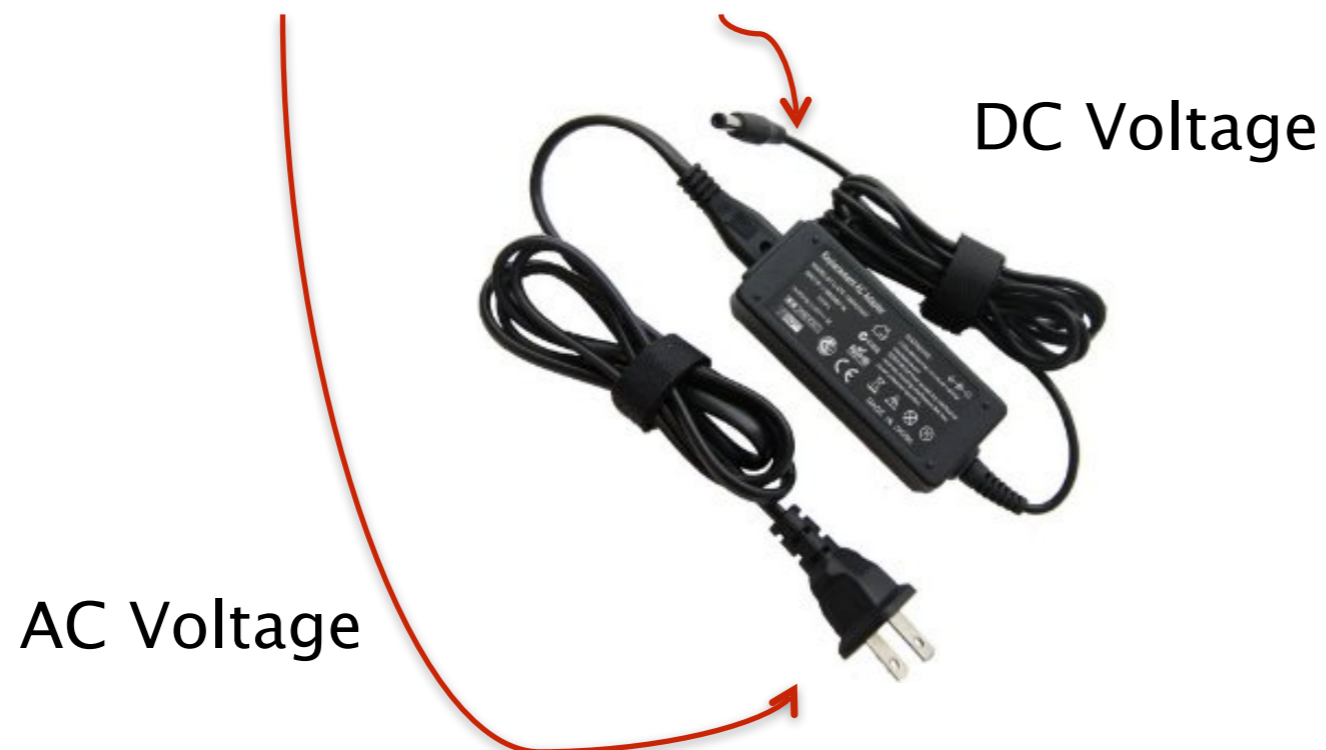
1.5V



3V



From the grid (220V) to 12V (the output that be different), VCC = 12V.





Resistor

It has two sides

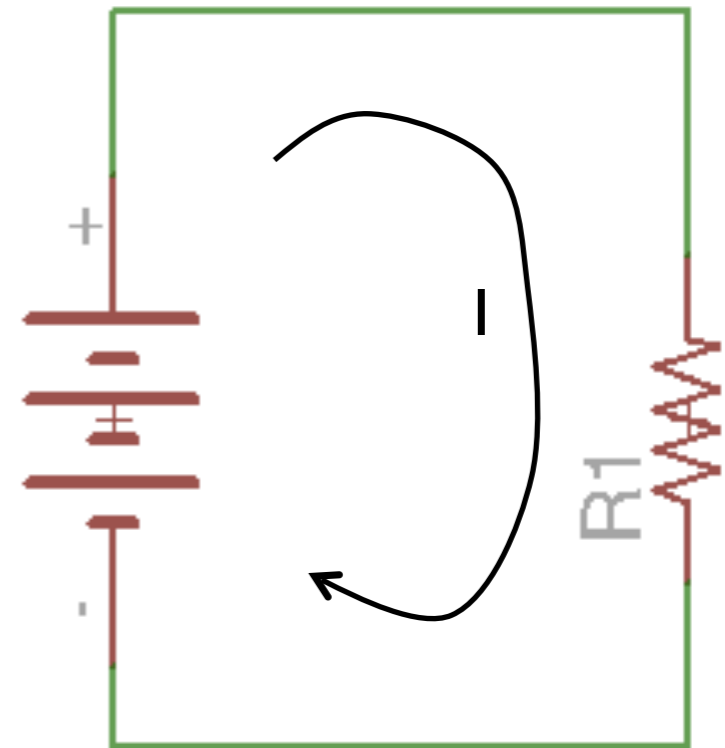
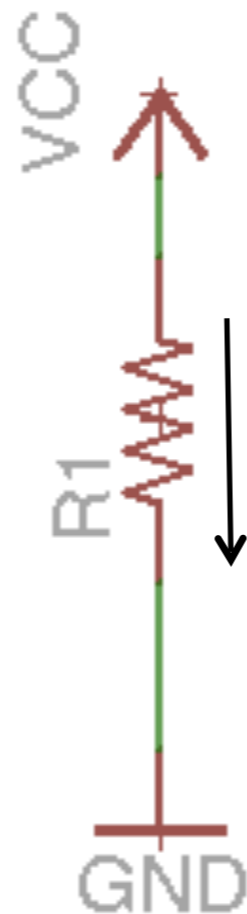
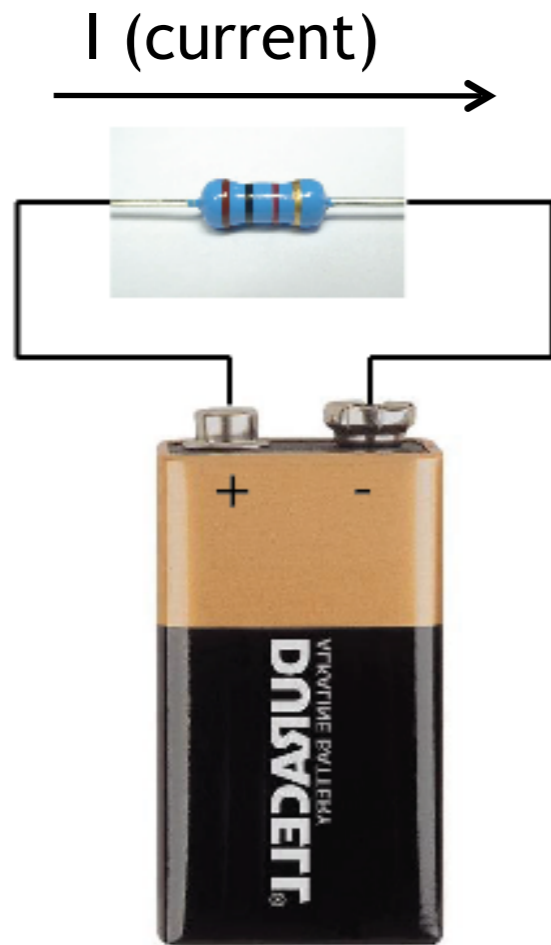
The orientation is irrelevant

Unit of measure is Ohm (Ω)





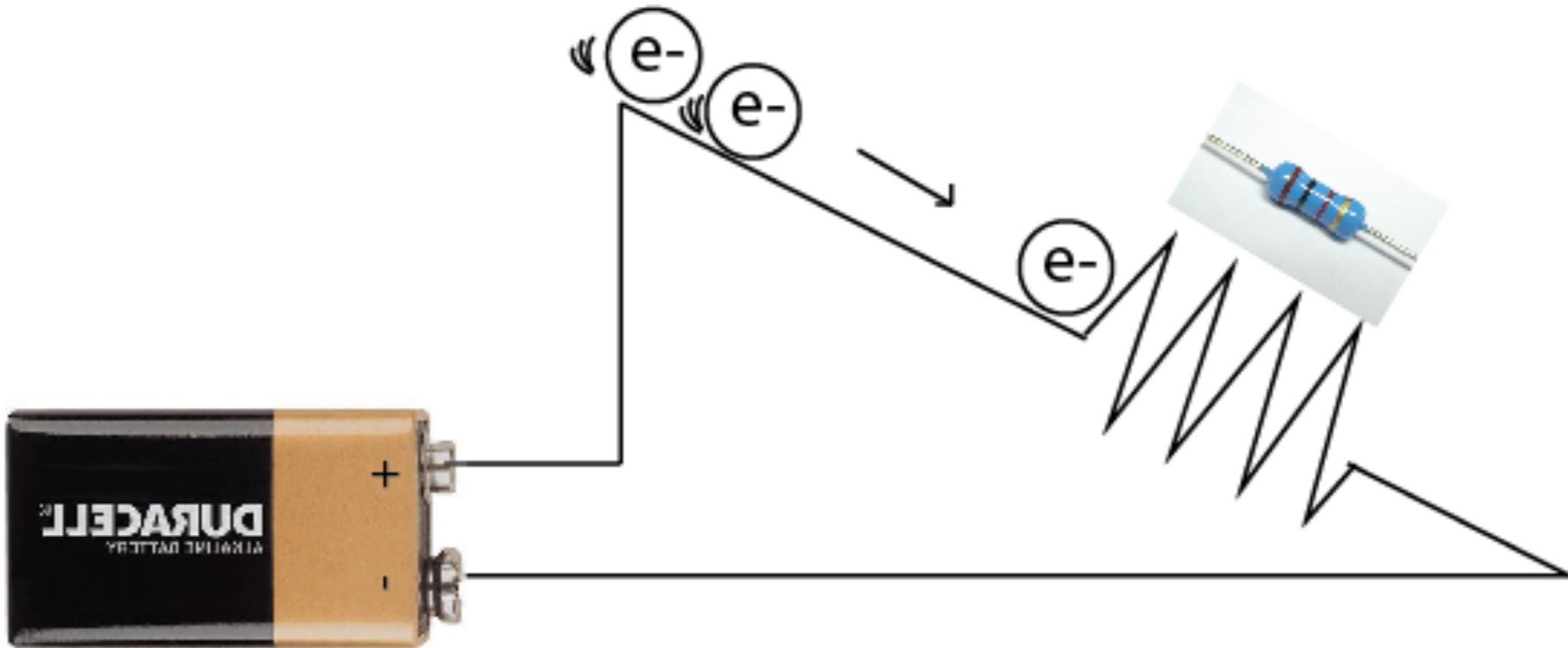
A basic circuit



- **Voltage:** is the difference in potential between two points
- **Current:** is the rate at which charge is flowing
- **Resistance:** is a material's tendency to resist the flow of electrons / current

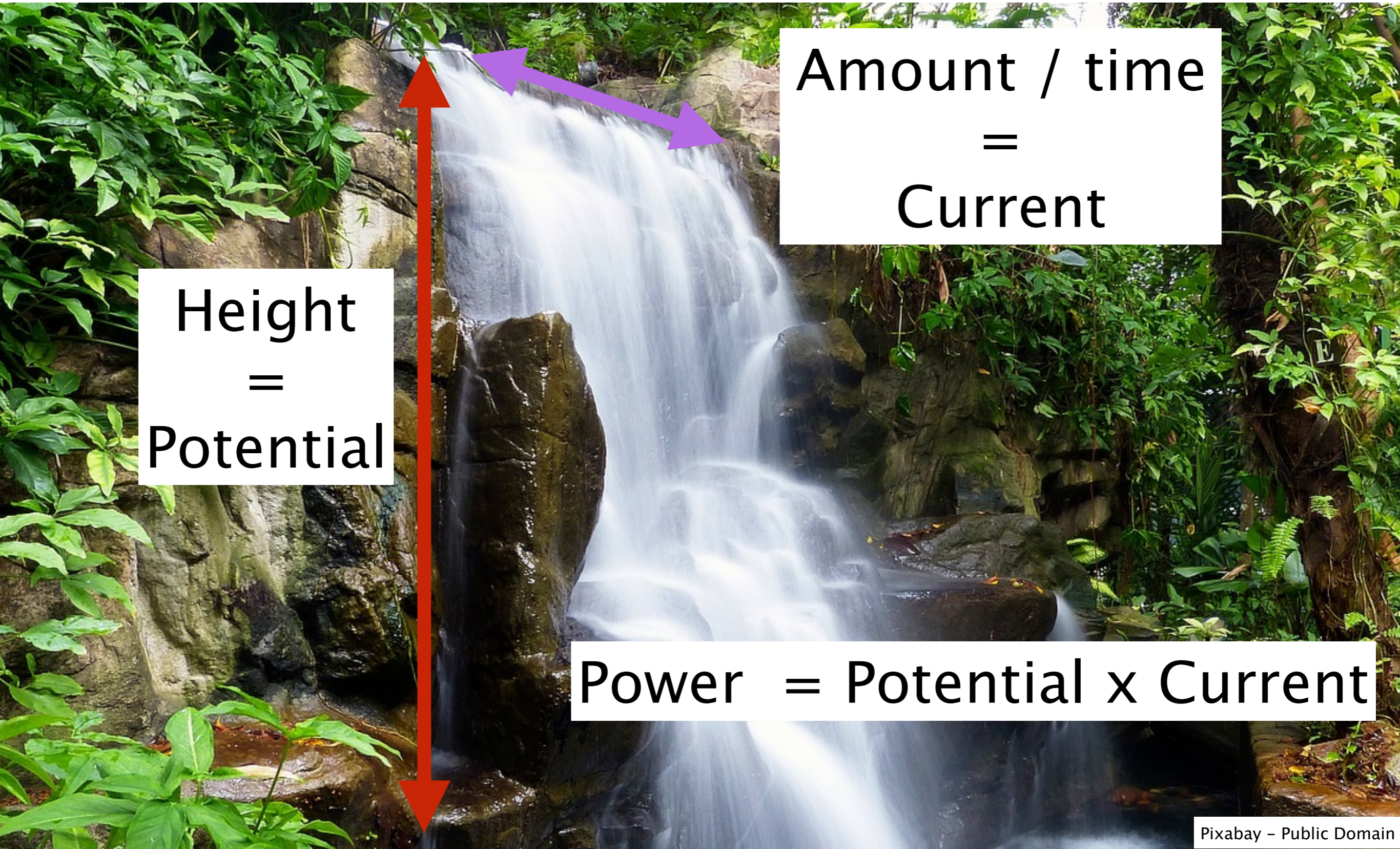


A basic circuit





Electricity vs Waterfall



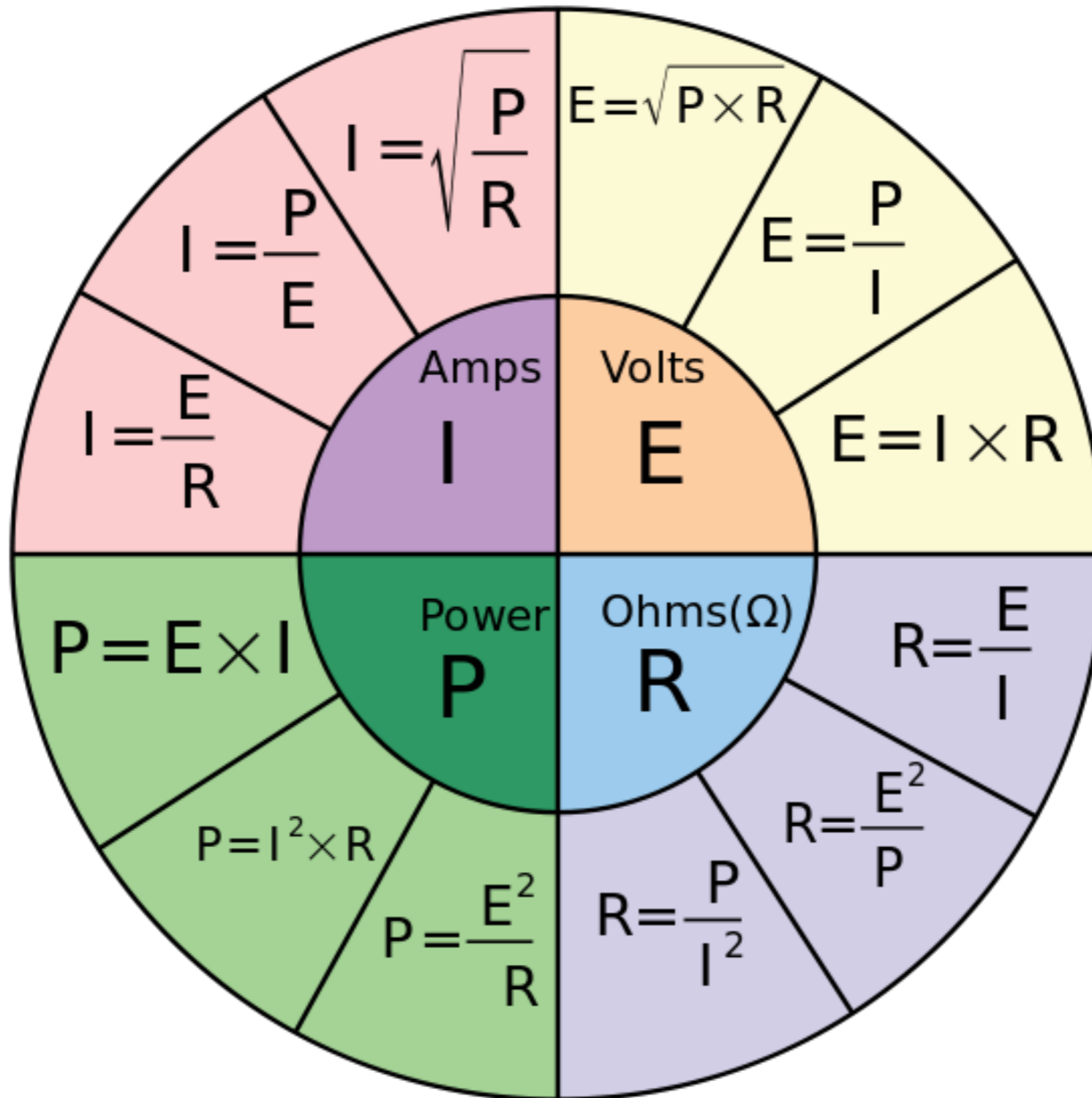
Amount / time
=
Current

Height
=
Potential

Power = Potential x Current

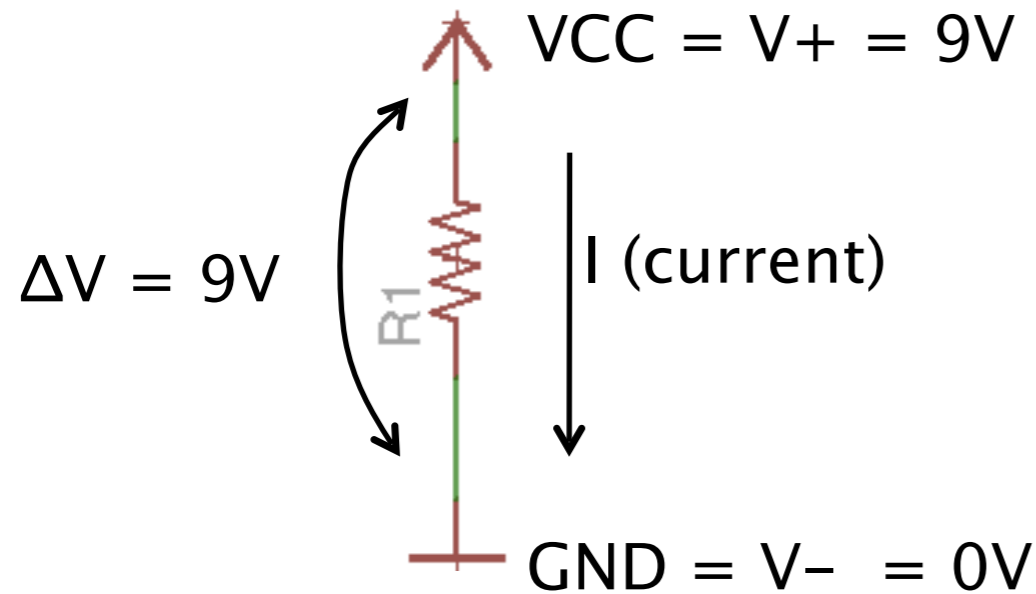


Ohm's Law





Using Ohm's Law



Ohm's Law

$$\Delta V = (V+) - (V-) = R * I$$

$$V = RI$$

$$I = V/R$$

$$R = V/I$$

Ex 1: Calculate the Current

$$V = 9V$$

$$R1 = 1k\Omega = 1000\Omega$$

$$I = V/R = (VCC - GND) / I = (9V - 0V)/1k\Omega = 9mA = 0.009 A$$

Ex 2: Calculate Resistance

$$V = 3V$$

$$I = 20mA$$

$$R = V/I = 3V/20mA = 150\Omega$$

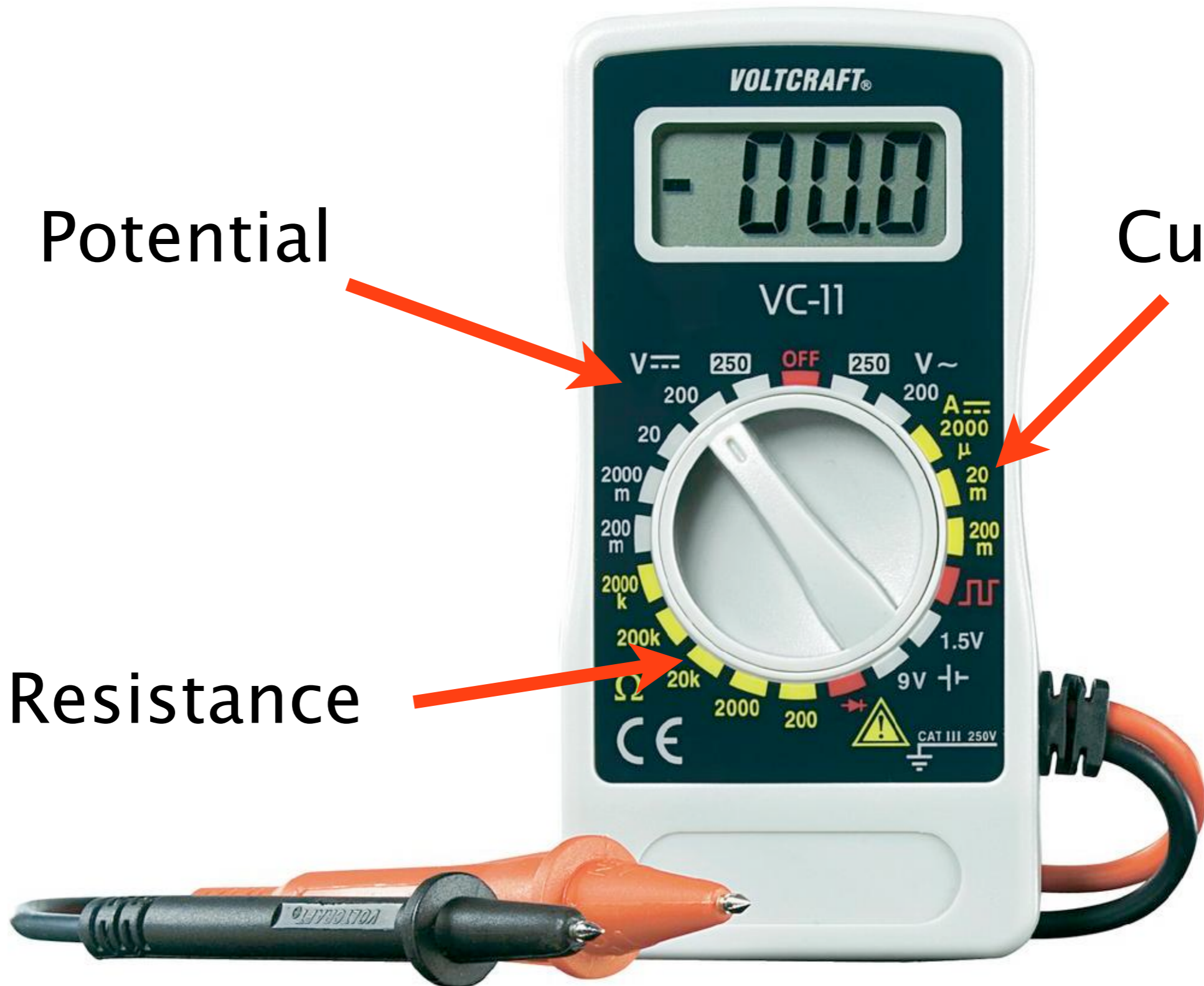


Measuring

Potential

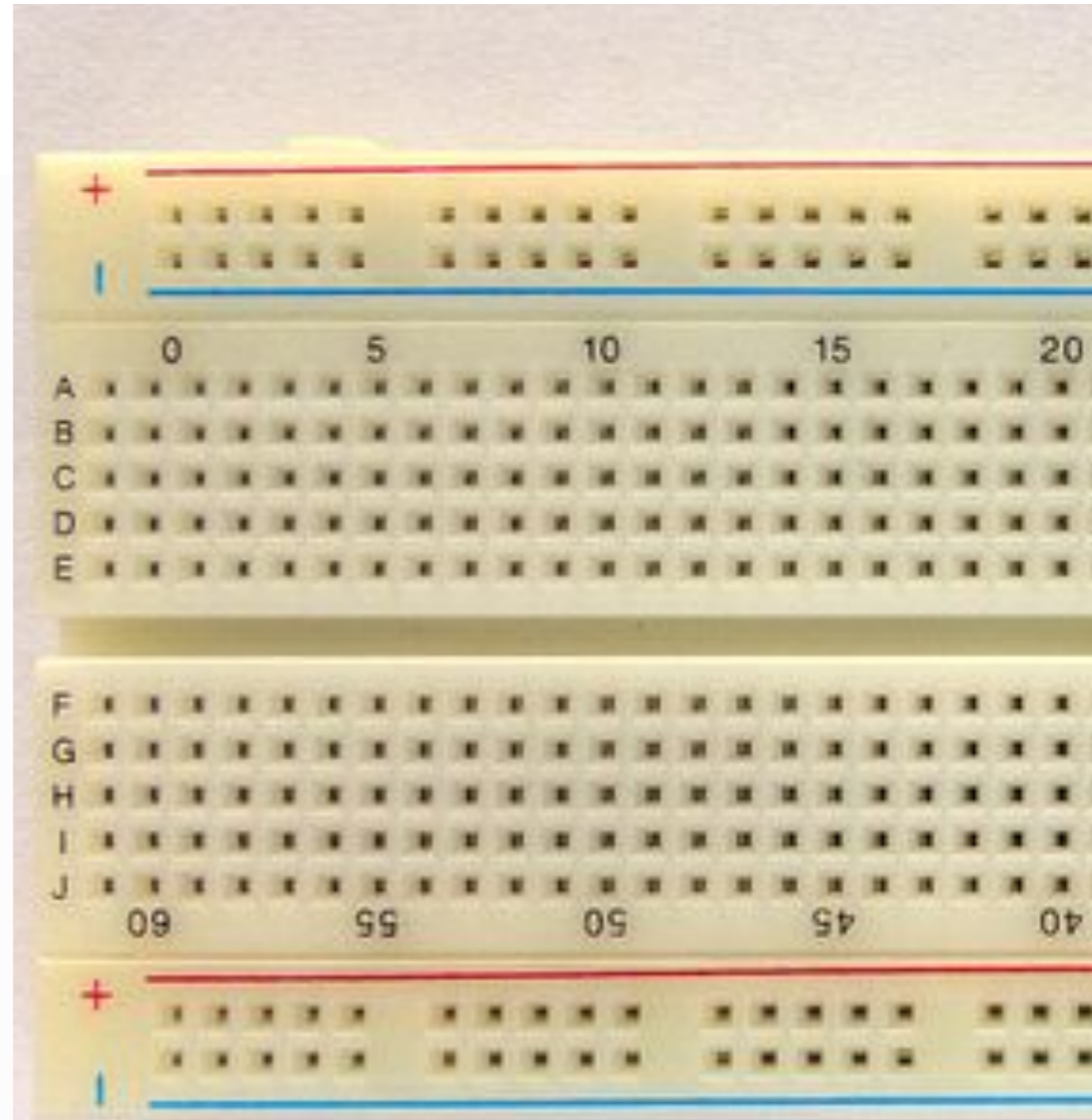
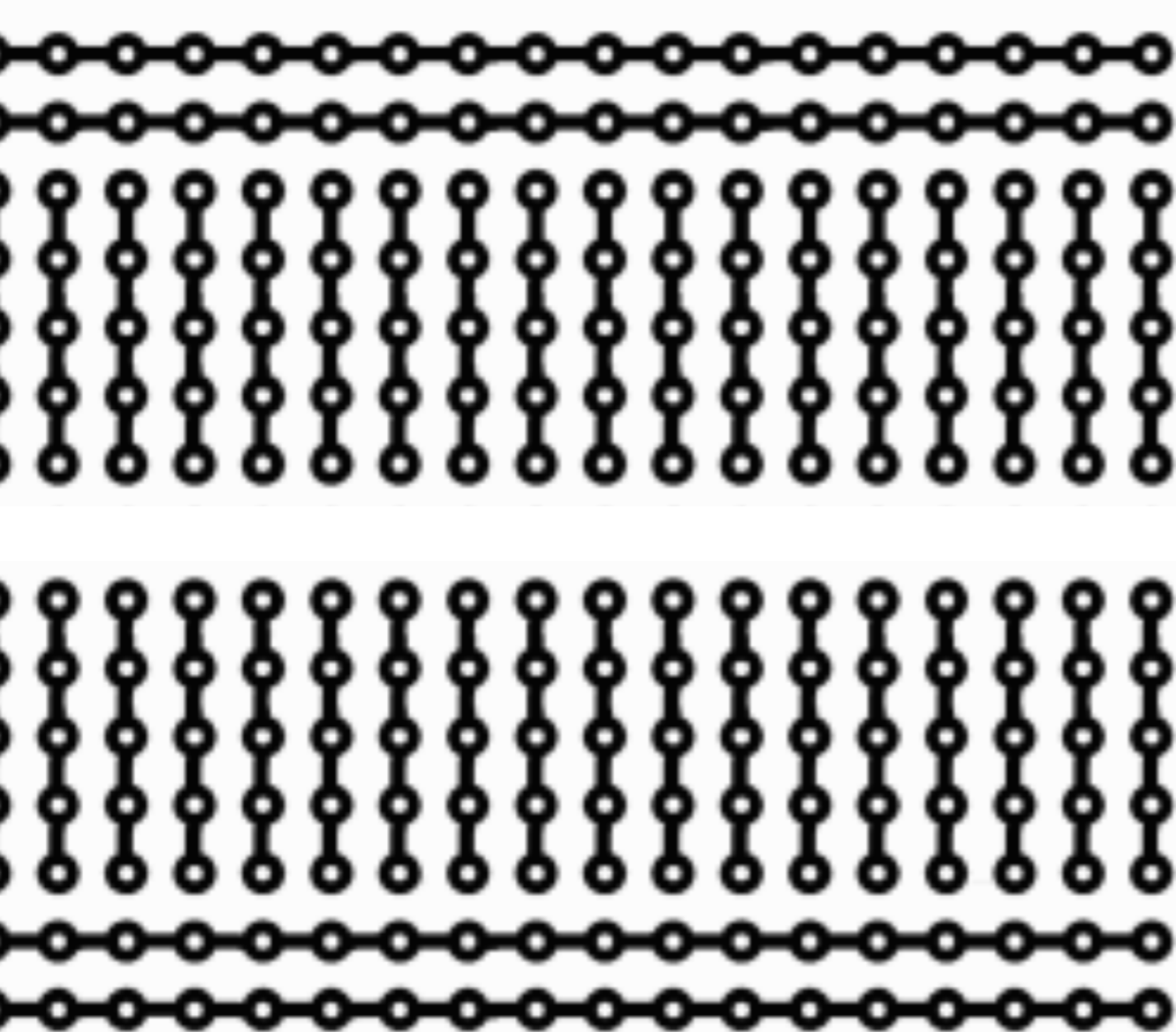
Current

Resistance





Breadboard





waag society

institute for art, science and technology

Soldering



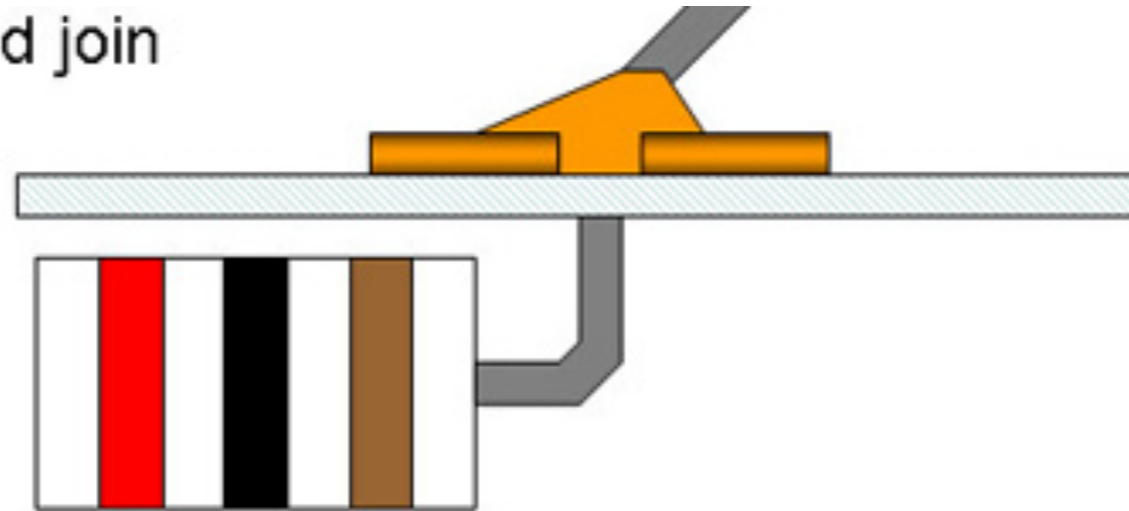
Soldering Iron – 350 C



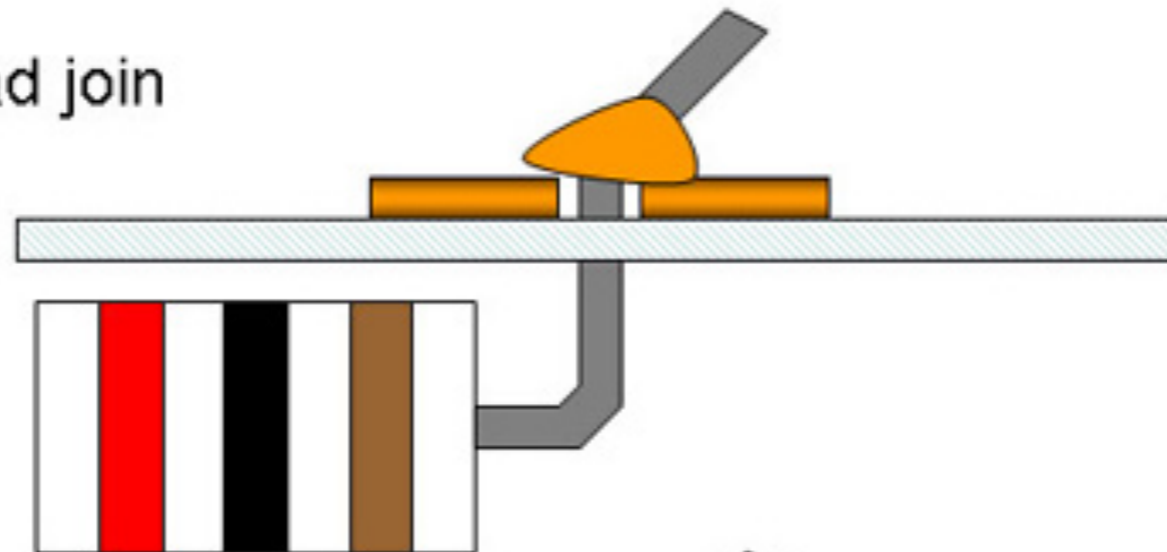


Soldering is easy

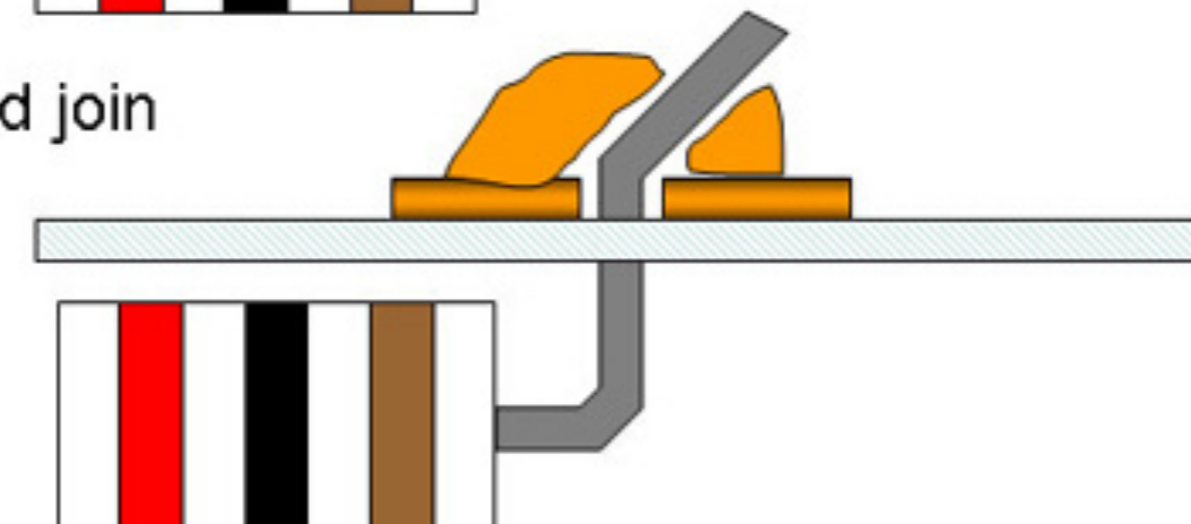
Good join



Bad join



Bad join





waag society

institute for art, science and technology

Electrical Safety



Remember what your parents told you

DANGER

220 VOLTS



Dangers:

- High voltage
- Low resistance
=
- High Current
- Make use of isolation!
- Better safe than sorry!





**some
rights
reserved**