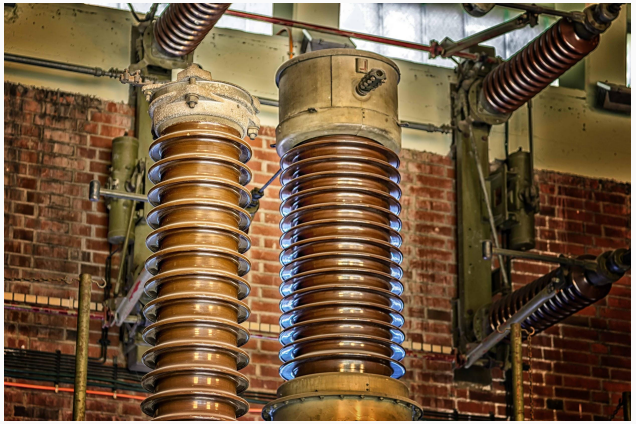
Crash Course in Power

Terminology

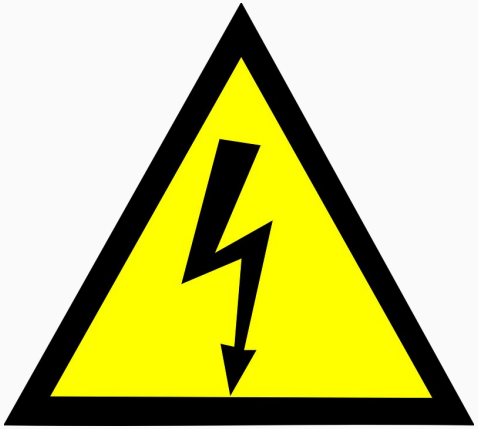
- Electricity is a flow of electrons through a circuit
- Electricity has several characteristics that can be measured
- Voltage (volts), amperage (amps) and watts (watts)



Electricity moves like water

- Electrons are the H2O molecules
- Electrons (H2O molecules) flow through copper cable (pipe) to fill empty buckets (batteries)
- Electrons follow the path of least resistance - like water following gravity.

Voltage

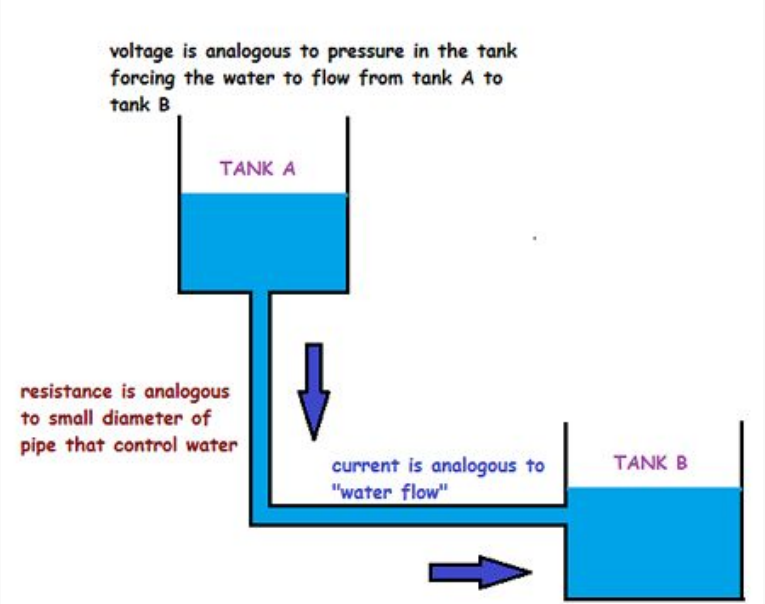


The voltage (V) measures the pressure with which electrons move through a circuit.

If a circuit has no voltage, then it has no flow of electricity.

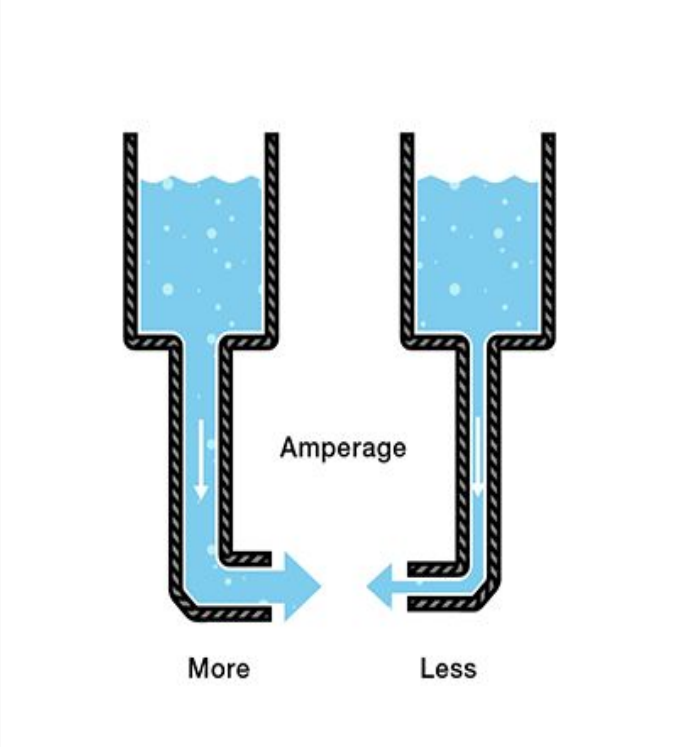
Picturing Voltage

- Imagine the flow of water from a full bucket to an empty one
- The water will rush from the full bucket to the empty bucket due to pressure
- The more pressure (voltage), the more water flow



electroconcepts.wordpress.com

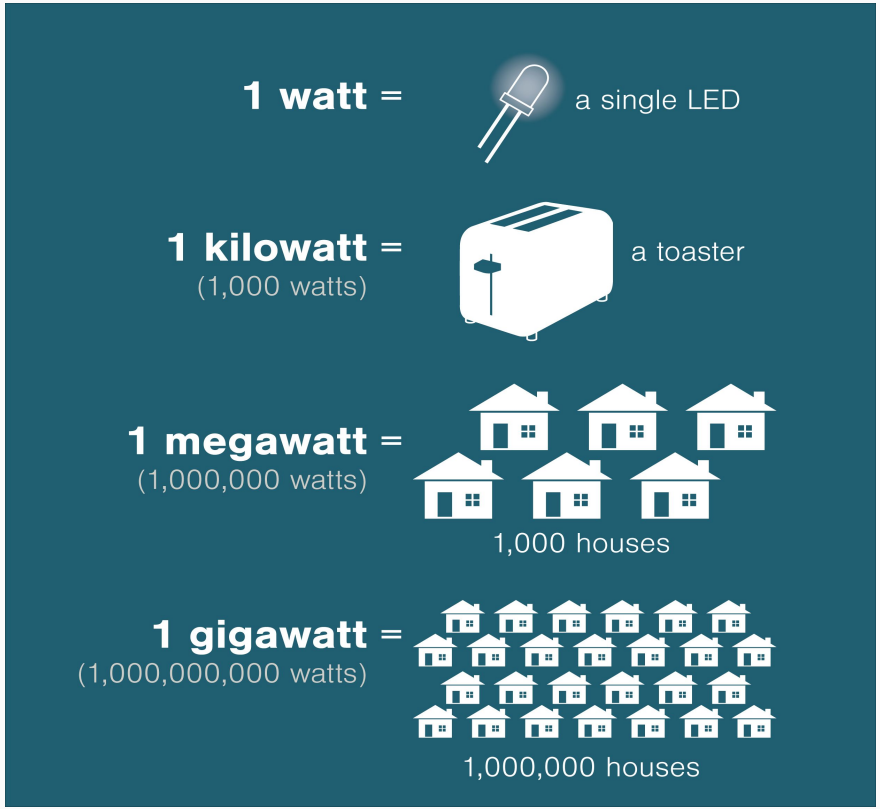
Amperage (Current)



The amperage (A) measures the rhythm of electrons with which electrons move in a circuit.

Fun Fact:
One Ampere is 6 billion billion electrons per second!

Watts



https://www.hakaimagazine.com/features/watts-water/

Watts (W) measure system power.

Watt-Hour

Watt-Hours (Wh) measure average power over time

To calculate the watt hours, two things must be known:

- The power demand in watts of the device at any given time.
- The total time the device uses power.

https://solarenergy.com/solar-resources/kw-and-kwh-explained

Review

- Volts are pressure
- Amps are current
- Watts are power
- Watt-Hours are power over time

Equations:

Watts = Amps x Volts
- W = A x V

Watt-Hours = Watts x Hours
- Wh = W x h
- 1000 Wh = 1 kilowatt-hour (kWh)

Amp-Hours = Amps x Hours
- Ah = A x h

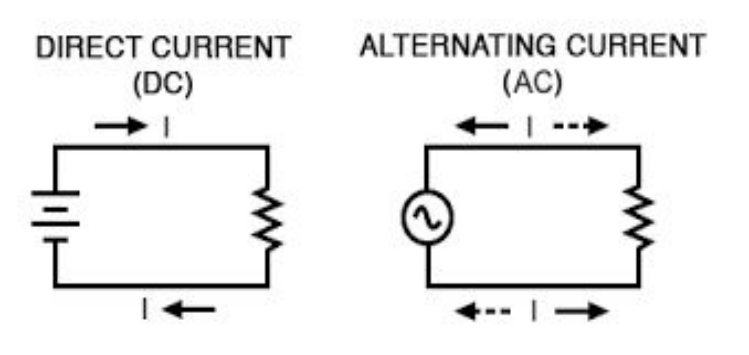
Terminology

There are two different types of currents:

- Alternating current (AC)
- Direct current (DC)

Current Basics

- Current can flow in two ways
  - Direct Current
  - Alternating current
- DC flows in one direction
  - Batteries and solar panels naturally flow in DC
- AC flows rapidly back and forth



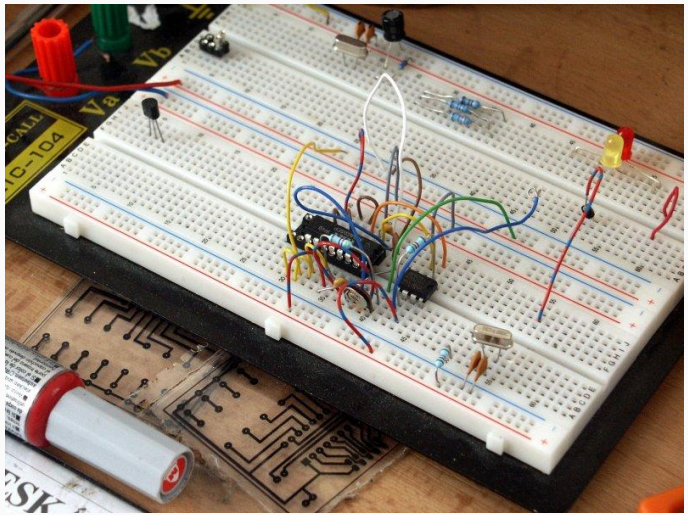
Device coupling

When choosing the devices to be used with a solar system there are two rules:

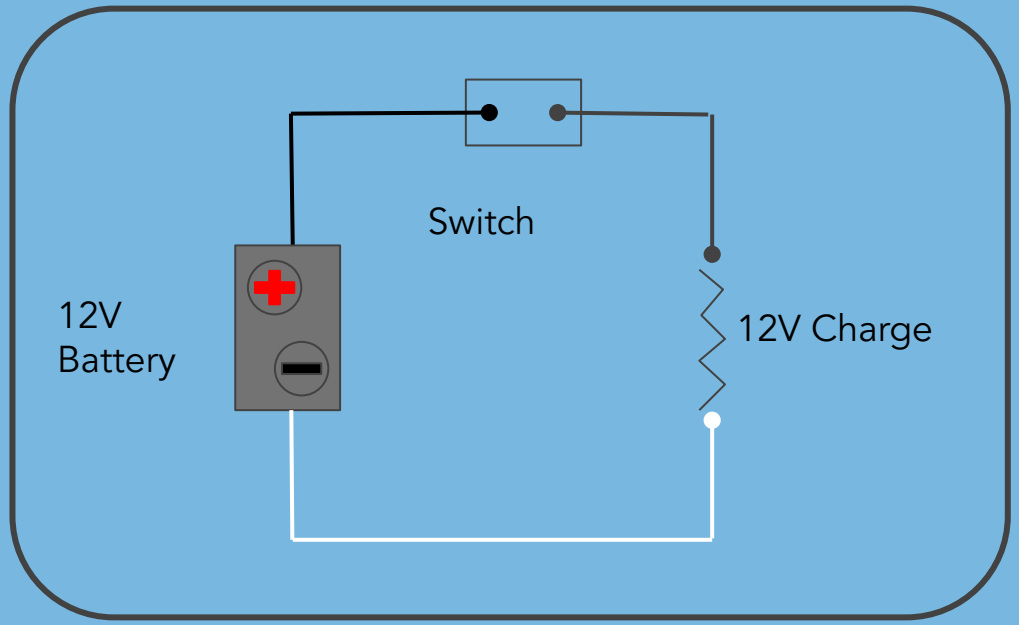
- The voltage of the appliance must match the voltage supplied to it from the solar system.
- The electrical appliance must operate with the type of current supplied to it, AC or DC.

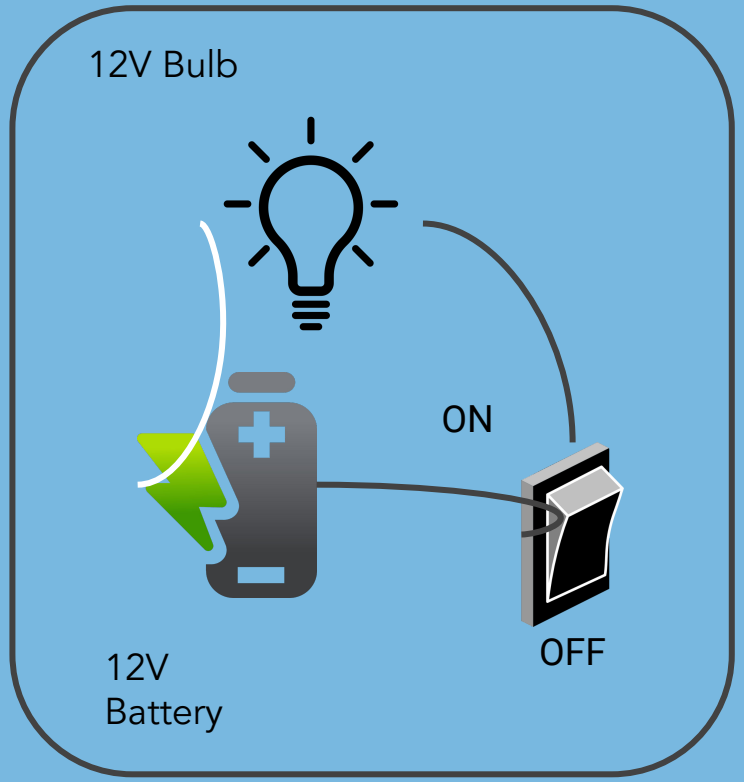
Electrical circuits

In an electrical circuit there is uninterrupted flow of electrons from a voltage source, such as a battery or solar system, through a conductor, and back to the source.



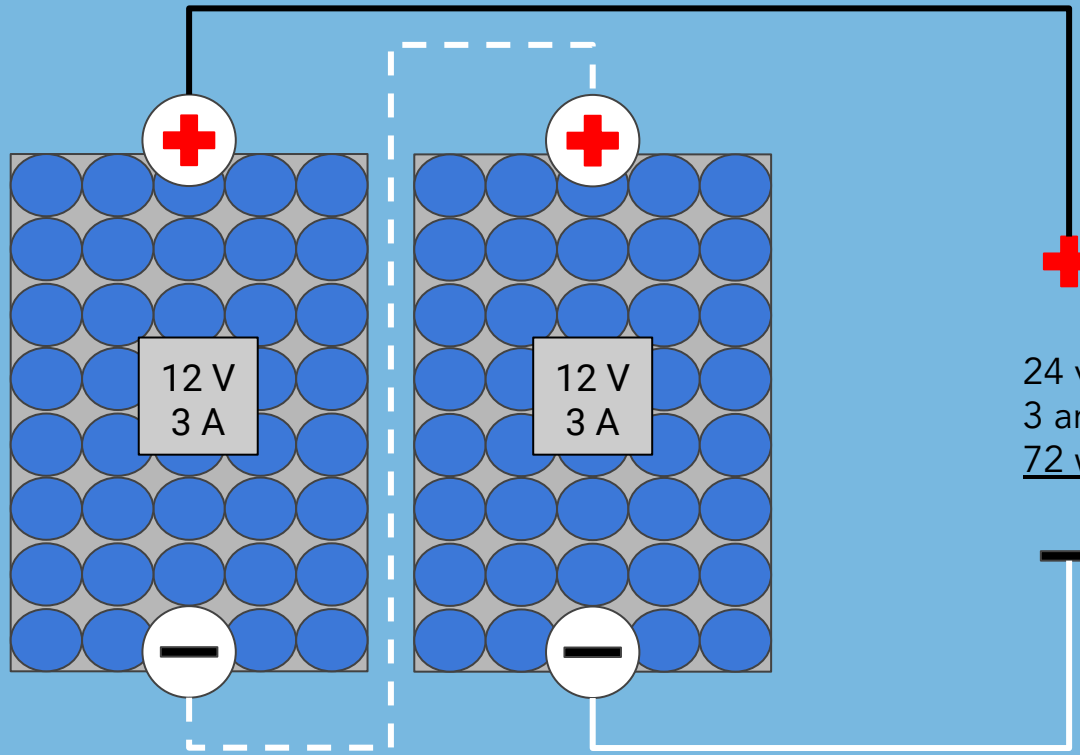
Basic electrical circuit





Circuit connected in series

The volts are added and the amperage is kept constant

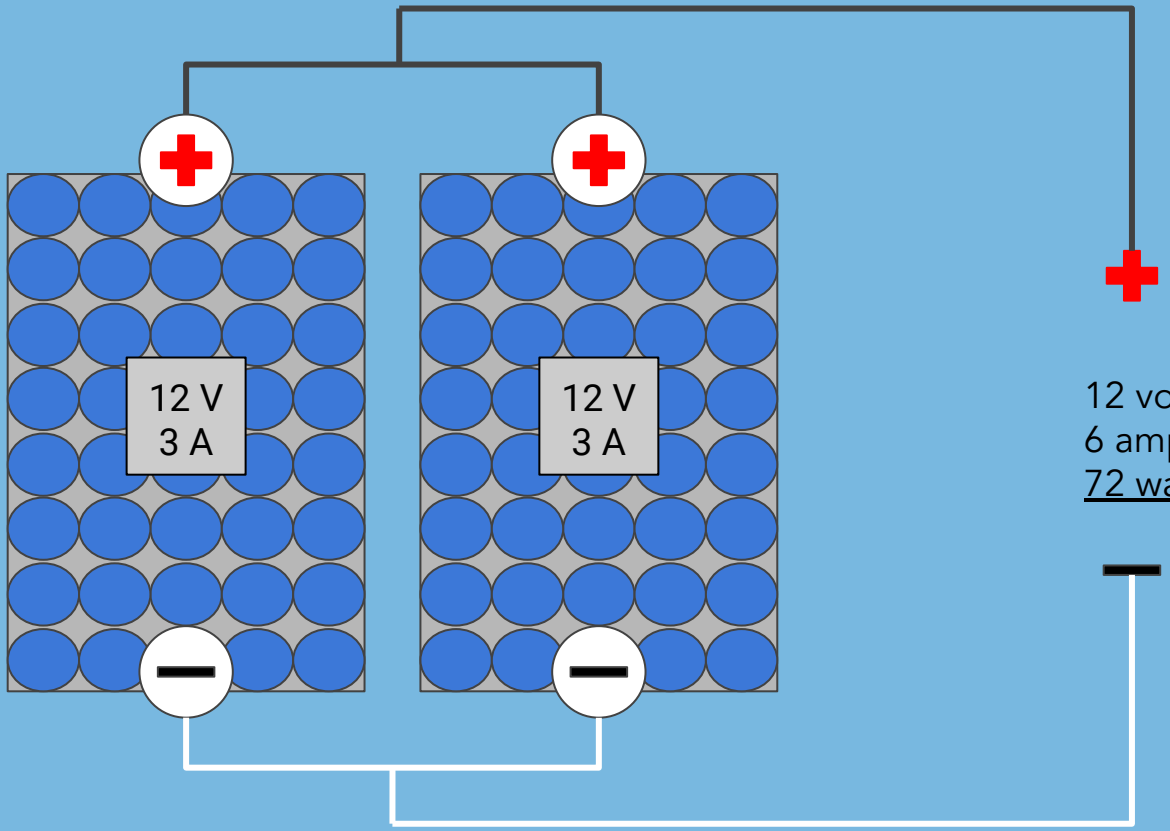


24 volts
3 amps
72 watts

Charge

Circuit connected in parallel

Volts remain constant and amperage is added

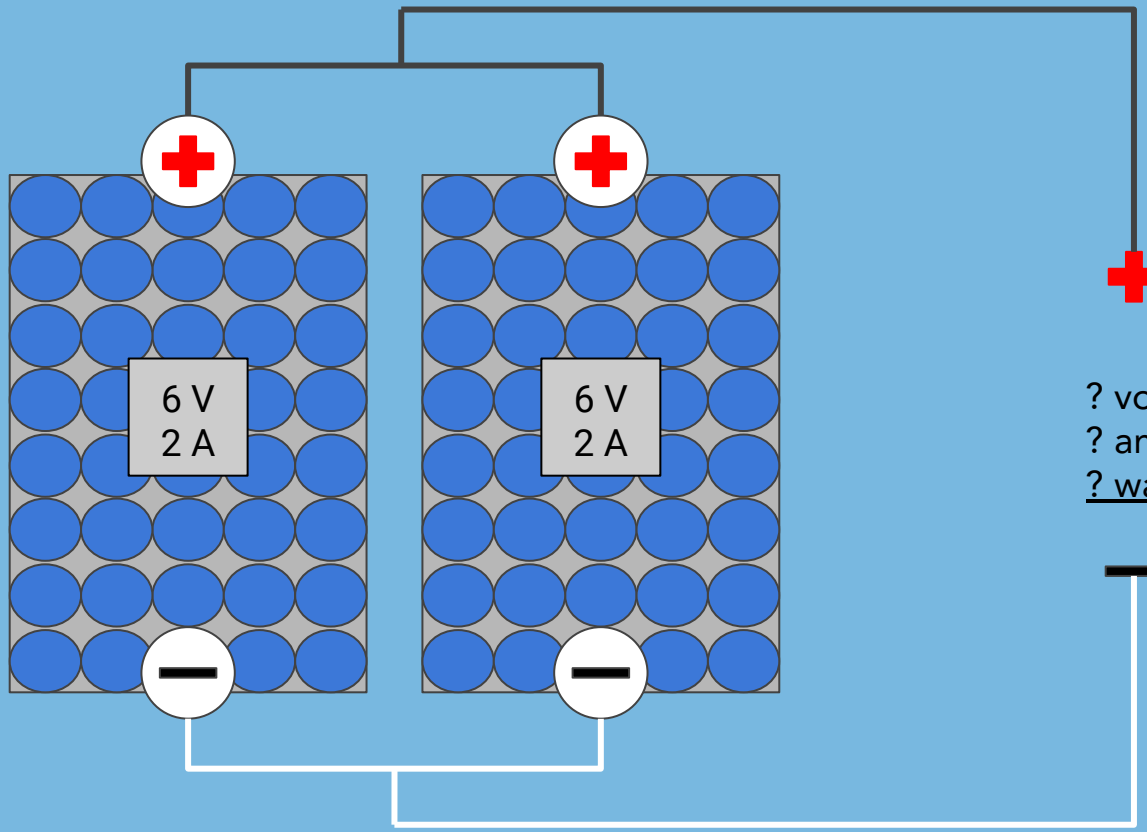


12 volts
6 amps
72 watts

Charge

Circuit connected in parallel

Volts remain constant and amperage is added

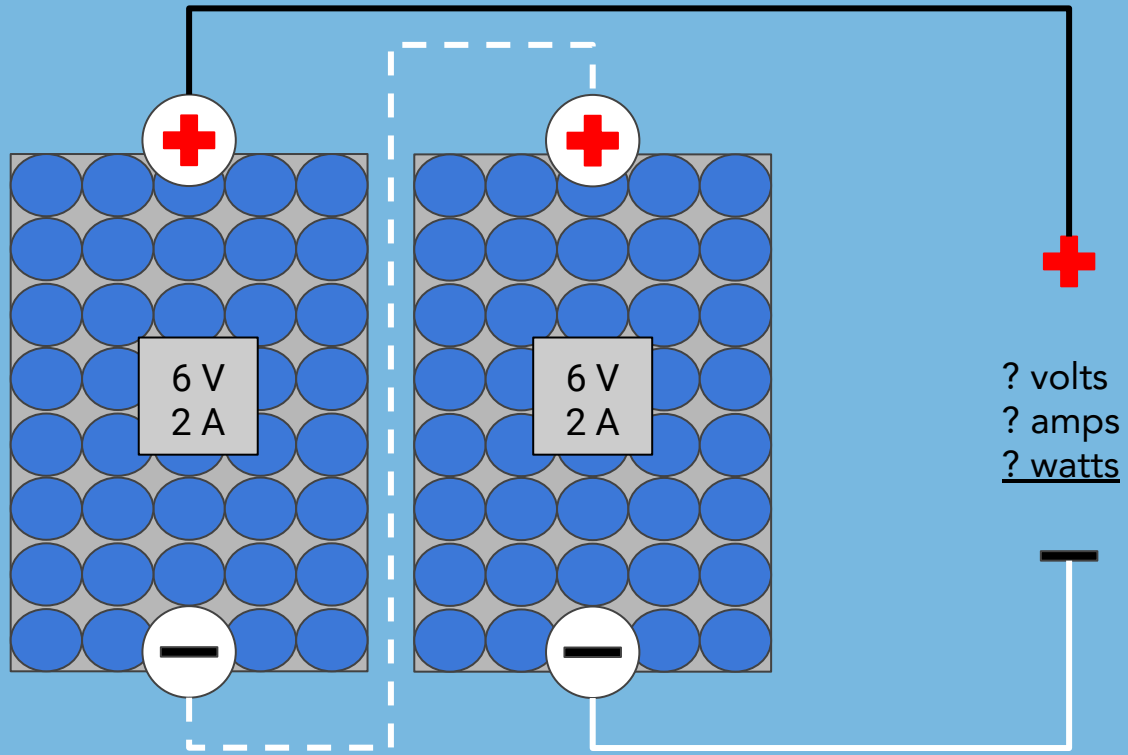


? volts
? amps
? watts

Charge

Circuit connected in series

The volts are added and the amperage is kept constant



Charge