Ohm's Law

Georg Ohm codified the relation ship between Voltage, Resistance, and Amperage published in 1827

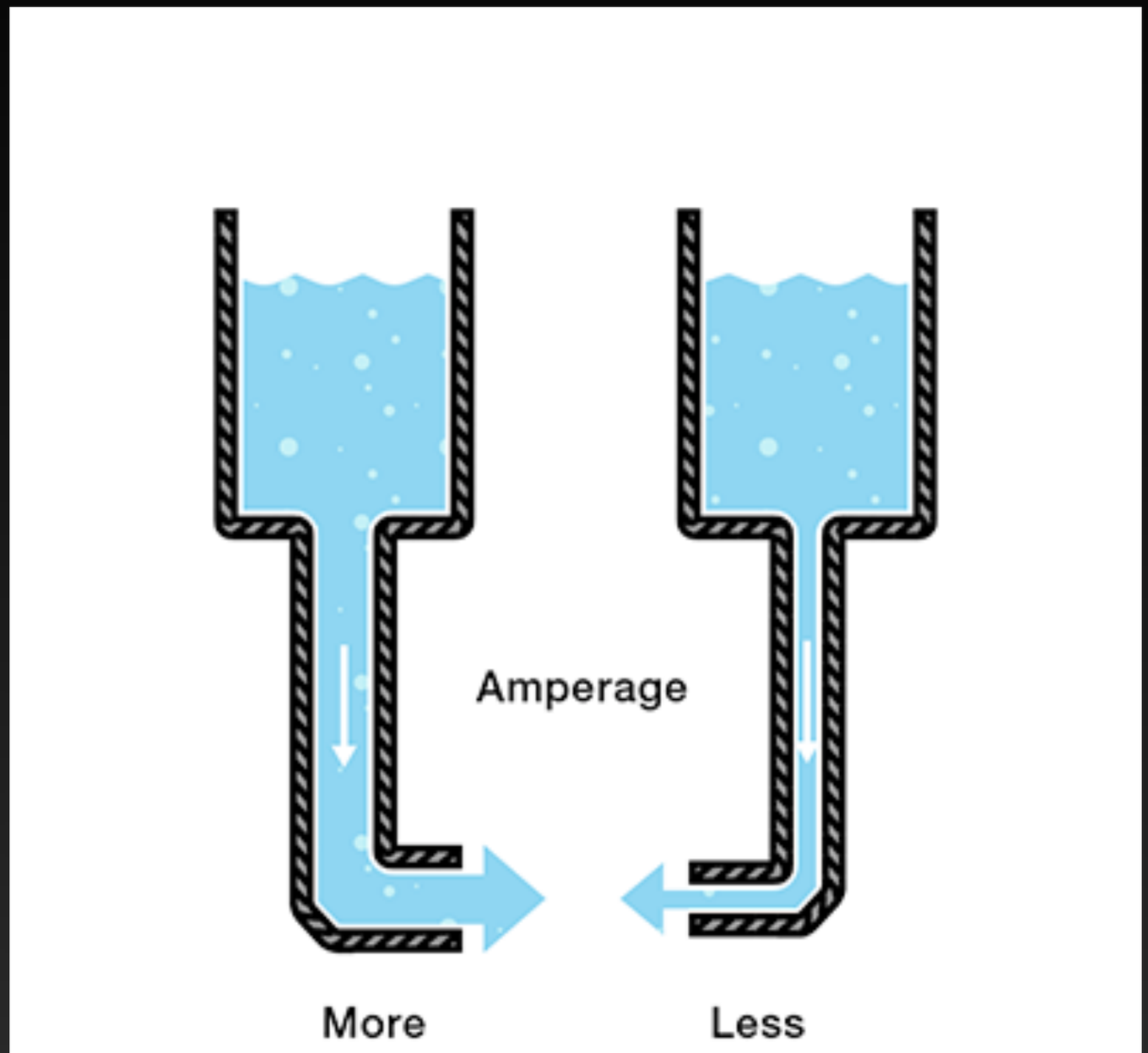
- the trinity
  - Voltage is the difference in charge between two points.
  - Current is the rate at which charge is flowing.
  - Resistance is a material's tendency to resist the flow of charge (current)

three basic principles an be explained using electrons (or the charge they create):

- Voltage is the difference in charge between two points.
- Current is the rate at which charge is flowing.
- Resistance is a material's tendency to resist the flow of charge (current).

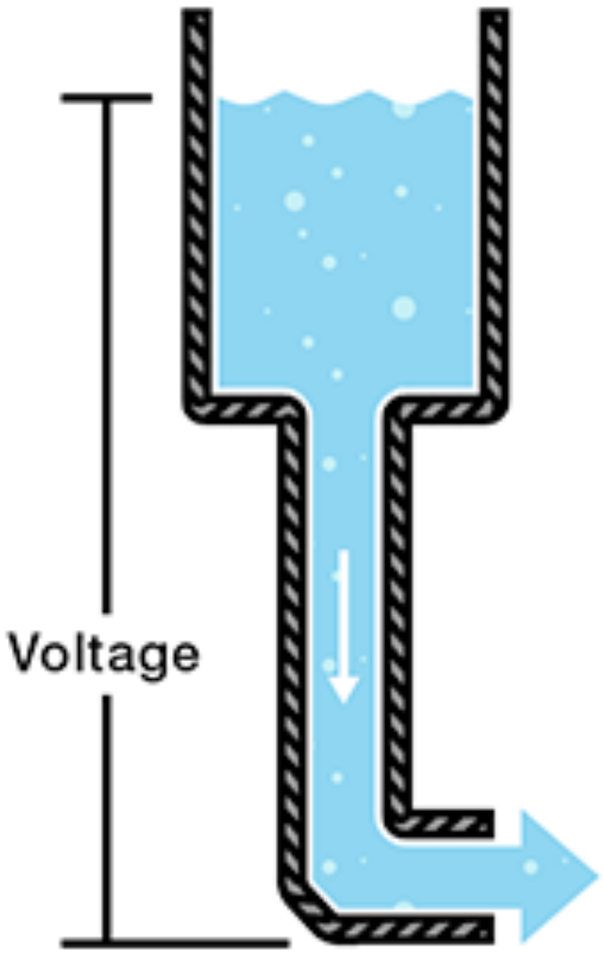
Current is measured in Amperes (aka "Amps") the number of particles passing a point per second

Amps are represented in equations by the letter “I”



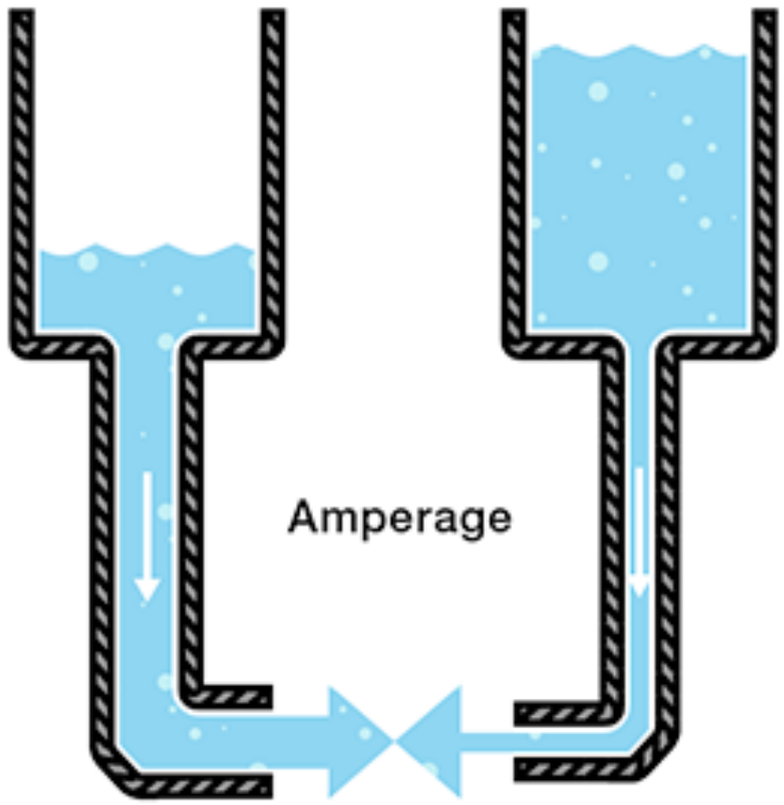
1 Amp = 6,241,507,648,655,549,400 e^- per second!!

analogy: think of the amount of water flowing through the hose as current. higher the pressure, the higher the flow, & vice-versa. With electricity, we measure charge flowing through the circuit over time. Current is measured in Amperes (“Amps”). An ampere is $6.241*10^{18}$ electrons per second. Amps are represented in equations by the letter “I”



voltage is electrical pressure

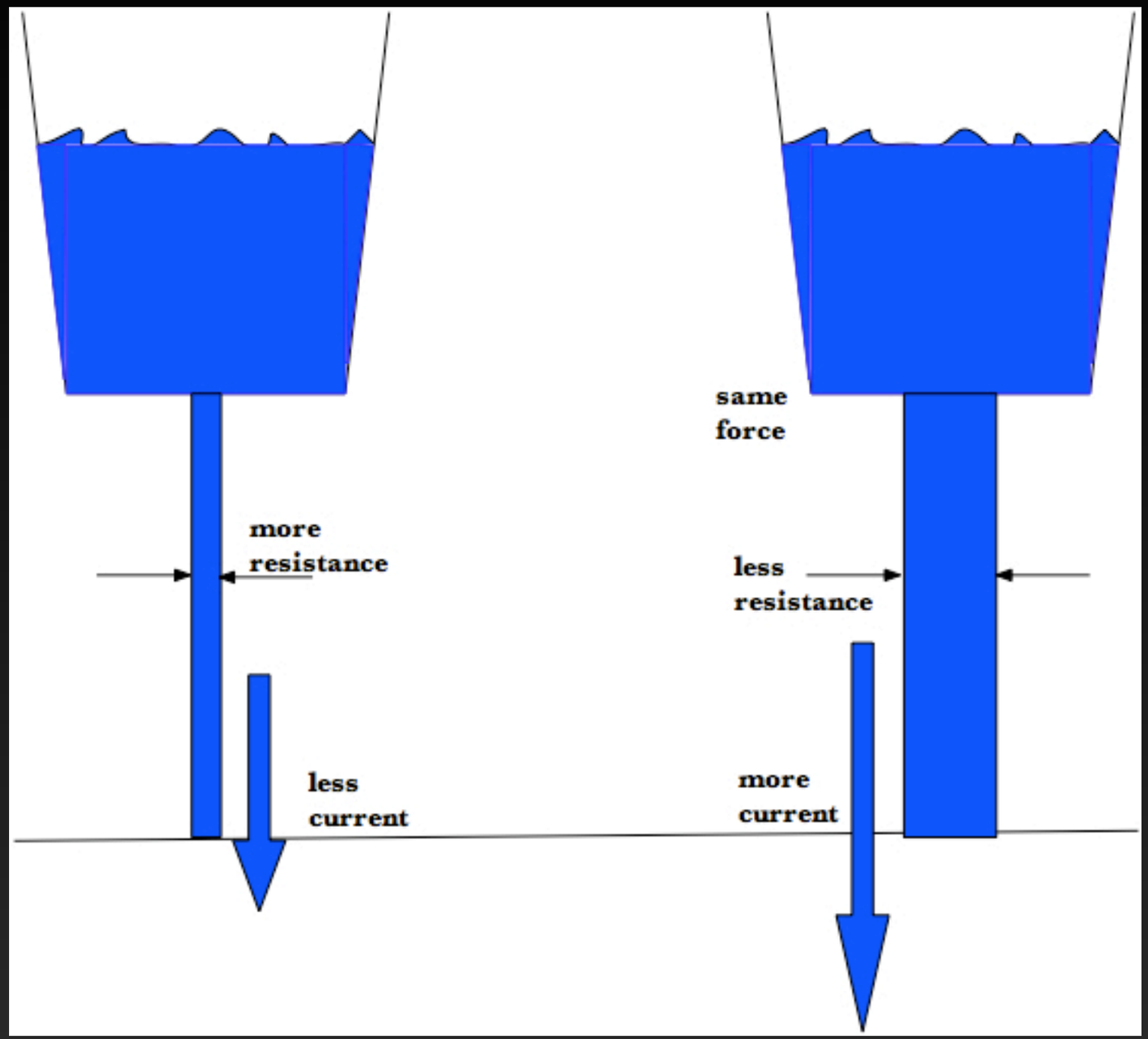
water analogy again. Voltage is electrical pressure. The more potential that wants to flow to the ground. The more water in the tank, the higher the charge, the more pressure is measured at the outlet.



relationships: you can output the same amount of Current by increasing the pressure(voltage) on a system

so you may anticipate the other way you could effect this

you might notice the relationship



Resistance is measured in Ohm's represented in schematics with the greek letter "Ω"

Resistance can be placed into a system to control current by using a component called a resistor

Resistance is a material's tendency to resist the flow of charge (current). if we have similar values for voltage but different resistance the current value will change

- Ohm's Law
  - V = I * R
  - I = V / R
  - R = V / I
  - note that when using these formulae V will be measured in Volts, I (amperage) in Amperes, and R(resistance) in Ohms

Ohm's Law(s) the interdependent nature of Amperage (I), Resistance(R), and Voltage(V) allowed for a set of algebraic equations to be codified. Why? Because there will be times when you need to know one of these factors in order not to burn out a part.

- an example of application:

  You choose to add an LED that can only handle 30mA (milliamps) of current to your project so you can tell the battery is on. You know the source is a 9v battery. What value resistor should you choose to keep the LED from turning into slag heap?

Simple example

- V = 9volts, R = 30 milliAmps (.030)
- V = I * R (wooo!)
- I = V / R = 9/.03
- that value will keep the 9 volt battery to a 30 mA current

Simple example continued
since 30mA is the limit you might want to choose something a little higher to protect the LED or run the calculation at 20-25mA

V

I x R

This is a common mnemonic to help remember the equation. From the triangle it suggests that I = V/R, R= V/I, and V=I*R