

## Charge, Current, and Amps

**What is matter?** Anything that is made up of atoms is matter.

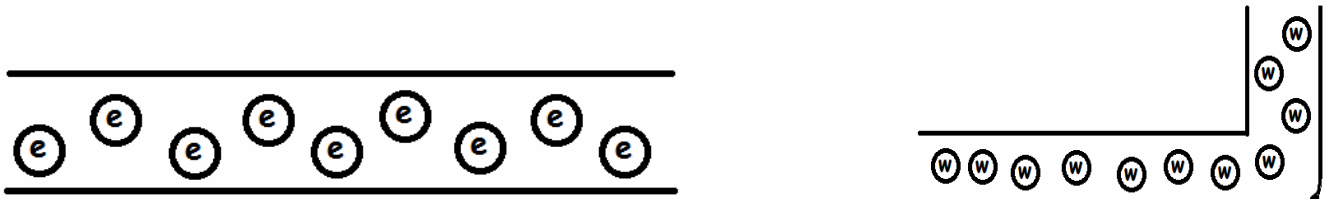
**All matter has charge.** Everything has charge, because everything is made of atoms!

**What flows in wires?** Electrons

**What is charge?** Objects can be positively charged (more protons than electrons), negatively charged (more electrons than protons) or neutrally charged (equal number of protons and electrons).

Usually matter is neutrally charged, meaning that it has an equal number of protons and electrons.

A hunk of metal is like a tank full of water, and the "water" is the movable electric charge inside it.



Wire

Water Pipe

The movable electrons within metals gives them their shiny appearance.

The charge inside of metals is neutral because each electron has a corresponding proton nearby, and the fields from the opposite charges cancel out.

However, in metals we can make the electrons flow past the protons.

Metal and rubber both have charge. The difference between them is that in metal you can make the electrons flow past the protons and in rubber it is very difficult to make the electrons flow past the protons.

Remember: Metals cannot hold static electricity.

**How do we measure charge?**

Charge is measured in coulombs. Just like weight is measured in grams.

One coulomb is equal to about  $6.25 \times 10^{18}$  electrons.

One coulomb = 6, 250,000,000,000,000,000 electrons.

### **What is an ampere?**

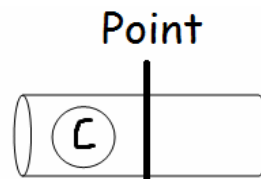
An ampere is the measure of the flow of charges.

An ampere means the same thing as one coulomb of charge flowing in one second.

How many amperes is 5 coulombs of charge flowing past a point in one second?

So an amp is the same thing as 6, 250,000,000,000,000,000 electrons.

flowing past a point in one second.



### **What is electric current?**

When electrons in the metal are forced to flow, electric currents are created.

We measure the currents in terms of amps.

The faster the electrons move, the higher the amps. Also, the MORE electrons that flow (through a bigger wire) the higher the amps. A fast flow of electrons through a narrow wire can be the same current as a slow flow of electrons through a bigger one.

Important note: electrons flow extremely slowly through wires, slower than centimeters per minute.

If 300 C of charge pass a point in a circuit in 10 minutes, what is the current through that point in the conductor?