ELECTRICITY

Charged Particles

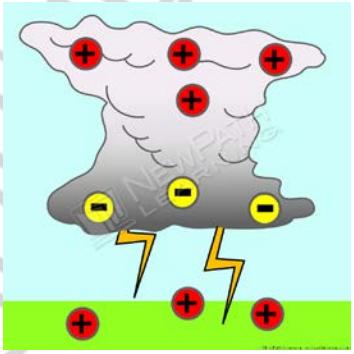
Electric charges are either positive (+) or negative (-). The **protons** in an atom have a positive charge and the **electrons** around the atom have a negative charge.

If two particles have similar charges, they repel each other, but, if they have opposite charges, they attract each other. This explains why an atom holds together. The positively charged protons in the nucleus exert a strong attraction for the negatively charged electrons that surround it.

LESSON CHECKPOINT: What is the interaction between charged particles?

States o

When elec , this is called **stat** **lightning**. As the pict arges builds up c arges builds up i ween the negatively charged cloud and the positively charged earth gets so great that static electricity turns into an electrical **current**. The actual bolt of lightning is a discharge of electrons traveling at the speed of light toward the positive charges.



LESSON CHECKPOINT: What is the difference between an electrical current and electricity?

Charged Particles in Motion

This flow of electrons from one place to another is called **electricity**, an **electrical current** or **electrical energy**. In order for this flow to occur, there has to be an electrical **circuit** or pathway. As long as the circuit is complete, electricity flows, but when the circuit is broken, the current stops.

The strength of an electric current is measured by the number of electrons t **peres** or **amps**. Th the number of

The potent The greater the ts of the circuit, the rrent to flow, and t ured in units called **volts**.

There is always some resistance to an electric current. This resistance is measured in units called **ohms**. When resistance increases, it makes it more difficult for the current to flow. **Conductors**, like wire, have much less resistance than **insulators** like wood.

LESSON CHECKPOINT:
What are the terms for electric potential, electric current and electrical resistance?

Ohm's Law

The mathematical relationship between volts, amps, and ohms is called **Ohm's Law**. The formula for this law is shown below:

I=E/R or *amperage equals voltage divided by resistance*.

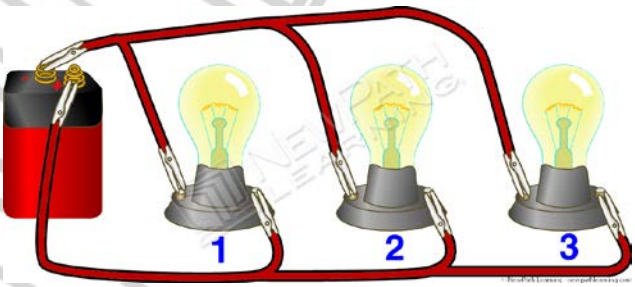
Notice how this law confirms what we were just saying about electrical resistance. If the resistance increases and the potential does not change, the result is a decrease in amperage.

Types of Circuits

The two types of electrical circuits are **series** and **parallel**. The diagram below shows both types.

Notice that in a series circuit, if a break occurs anywhere in the circuit, no electricity will flow. If bulb 1 was taken out, bulbs 2, 3 and 4 would not light.

On the other hand, in the parallel circuit, a break in one place does not necessarily mean that the current would stop. For example, if light bulb 1 were taken out, electricity would still be able to flow through bulbs 2 and3.



LESSON CHECKPOINT:

What is the difference between a series and a parallel circuit?

Electrical Power

Electrical **power** is measured in units called **watts**.

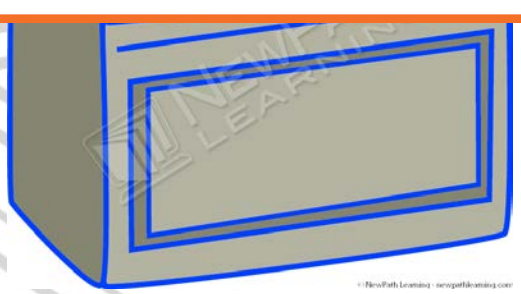
The formula for calculating wattage is shown below:

Power = voltage x current OR P= V x I

The formula tells us that by increasing either the potential or the actual amount of current, we will increase the wattage.

Batteries

Batteries are **electrochemical** cells. In an electrochemical cell, chemical energy is converted to electrical energy. In the dry cell battery shown below, an **electrolyte** causes a chemical reaction with the electrodes, zinc, and carbon. This reaction causes electrical potential to build up and a current to flow through the electrolyte. So when you connect a battery to an appliance or tool that uses batteries, you provid rate electrical p k this electrolyte



LESSON CHECKPOINT:
How does a dry cell battery work?

Safety Reminders

While working with electricity, safety should always be kept in mind. Many people are killed every year, especially in Florida, by lightning.

- To avoid being struck by lightning, remember to stay away from tall trees and other tall structures if you are outside during a storm.

If you are inside a home, you are normally safe from lightning but you still could be hurt by electric shocks or short circuits.

- Since water conducts electricity, using dry hands while using electrical appliances is important.
- Make sure your home is equipped with **fuses** and **circuit breakers** that break the electrical circuit if too much current starts to flow.

LESSON CHECKPOINT:
Why should you make sure your hands are not wet when using an electrical appliance such as a hair dryer?