

ELECTRICITY AND MAGNETISM

STUDY GUIDE

All matter is made of atoms. Atoms are made up of three small particles. Two of these particles have a charge. Electrons have a negative charge (-) and protons have a positive charge (+). Electricity is the movement of these charged particles—usually electrons.

STATIC ELECTRICITY

Static electricity occurs when there is a difference in charge between two objects. Most objects are neutral because they have the same number of protons and electrons. Sometimes objects get **charged**.

Static electricity can cause objects to attract (stick together). A negatively charged object will attract a positively charged object. A charged object can also attract a neutral object.

Static electricity can cause objects to repel (move away from each other). Two negatively charged objects will repel each other. Two positively charged objects will also repel each other.

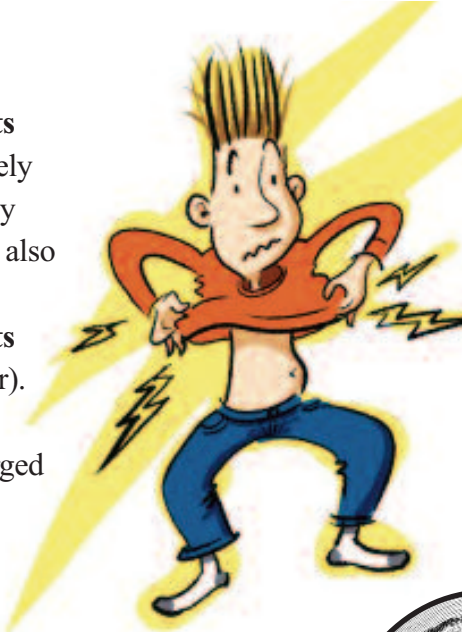
- Rub a balloon on your hair. Electrons move from your hair to the balloon.
- The balloon now has a negative charge. Your hair now has a positive charge.
- Your hair attracts the balloon because opposites attract.
- Each hair repels other hairs because like charges repel.

A positive charge-

If an object loses an electron, it has more protons, so it is positively charged.

A negative charge-

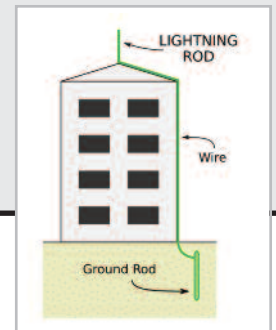
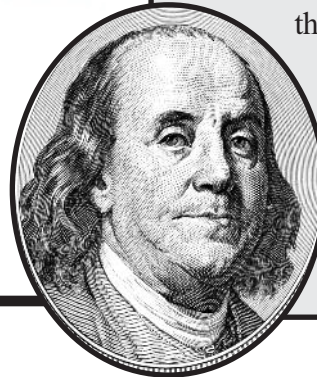
If an object gains an electron, it has more electrons, so it is negatively charged.



BEN FRANKLIN

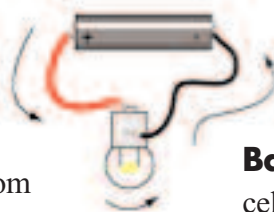
Franklin discovered that lightning is really static electricity. The electrons near the bottom of a cloud jump to the positive part of a cloud, or to a positively charged object on the ground, to create lightning.

Franklin knew that lightning could be dangerous, so he invented the lightning rod. Lightning that is about to strike a building is attracted to the rod and then travels through a conductor to the ground safely.



CURRENT ELECTRICITY

Current electricity – is different from static electricity. In current electricity, electrons flow along a pathway in a **circuit**. Electrons must be able to travel through every part of the circuit for it to be complete.



Batteries – are also called dry cells. They get electrons moving so they can flow through a circuit. Batteries have a positive end and a negative end.



Electrical energy can be transformed into light, motion, and heat.

- Lamps and computers transform energy from electricity into light.
- Blenders, motors, and fans transform energy from electricity into motion.
- Hair dryers and toasters produce heat from electricity.

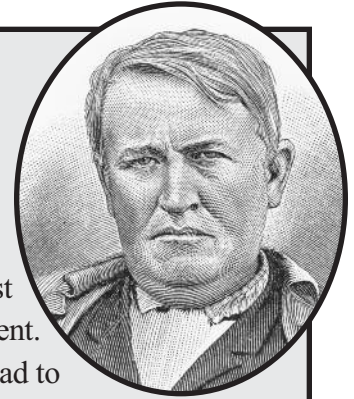
Conductors – Materials that allow electrons to move through easily. Metals such as aluminum, copper, and steel are conductors. Wires made from these materials are good conductors.

Insulators – Materials that do NOT allow electrons to move through easily. Cotton, glass, paper, and plastic are insulators.

- Conductors like wires, are often coated with an insulator, like plastic, to keep electrons flowing on the circuit path and not to other places.

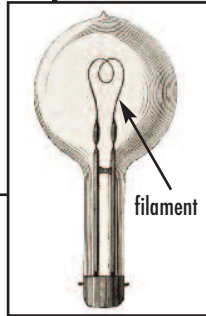
THOMAS EDISON

Edison made hundreds of inventions, including an improved light bulb. He experimented to find the best material to use for the filament.

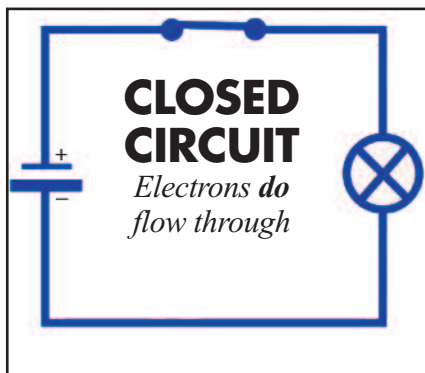
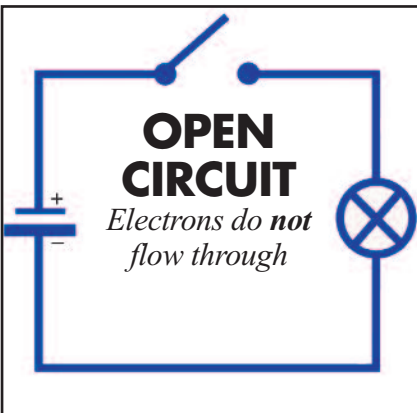


The material had to be a conductor that gave off light but did not burn up when electrons passed through.

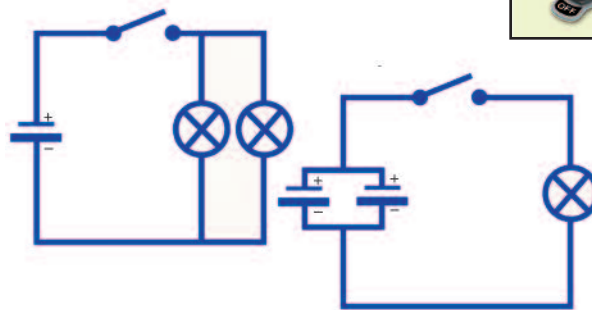
Edison also created a lighting system so electricity could be made in one building and sent out to other buildings to use for lighting rooms.



CIRCUITS

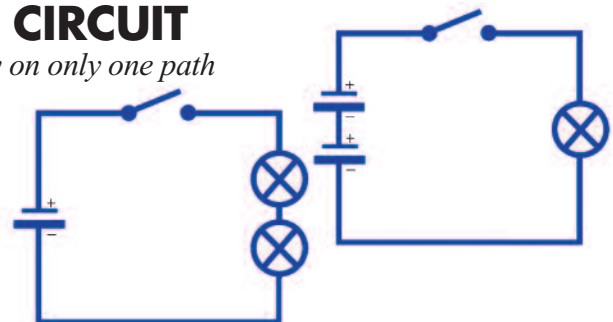


Switch – a device that opens or closes a circuit. A switch must be a conductor.



PARALLEL CIRCUIT
Electrons flow on more than one path

SERIES CIRCUIT
Electrons flow on only one path



A KEY FOR DRAWING CIRCUITS

Looks like this	→	Draw it like this
	↔	Bulb
	↔	Dry cell
	↔	Switch

MICHAEL FARADAY

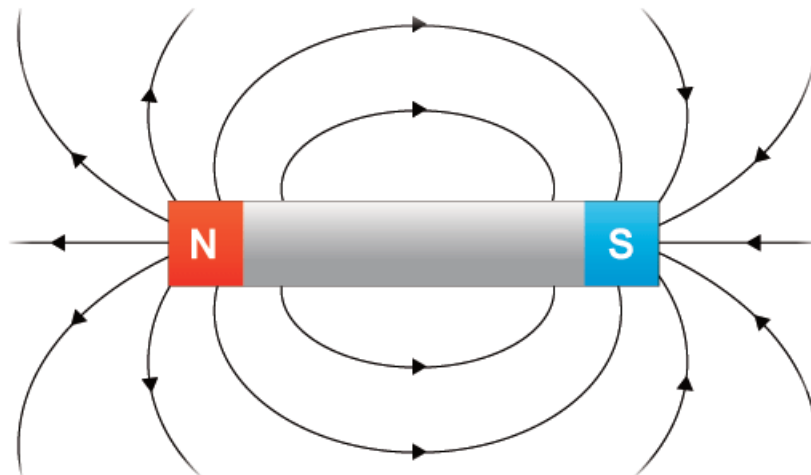
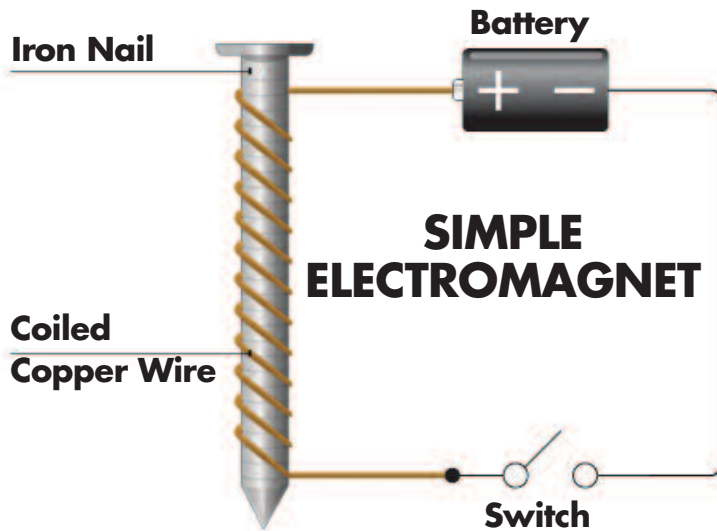
Faraday experimented with electricity and magnetism. He discovered that a moving magnetic field could create an electric current. His investigations led to the invention of the generator and the electric motor.



ELECTRICITY AND MAGNETISM

Electricity and magnetism can work together.

- Current flowing through a wire can generate a magnetic field.
- Spinning a magnet near a coiled wire can generate electricity.



MAGNETIC FIELD