Electricity

Custom Class

Teacher Maggie - August 2022

Lesson Objective

I can recall facts about electricity.

Key terms:

- electricity
- electric charge
- elements
- particles
- atom (s)
- protons
- neutrons
- electrons
- lightning
- static electricity
- electric currents
- conductors
- insulators
- hypothesize
- hypothesis

Let's Review

POWER FOR OUR WORLD

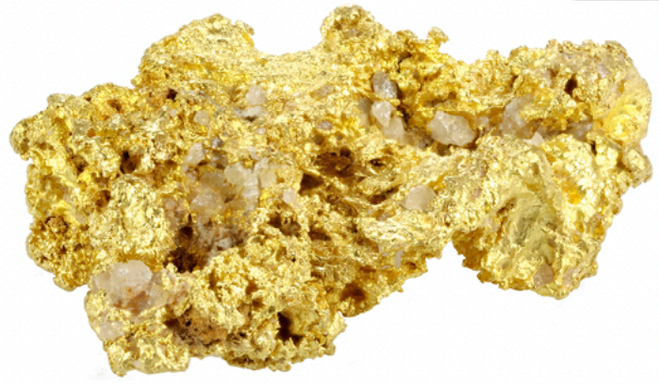
Have you ever watched a lightning bolt shoot out of a storm cloud? If so, you have some idea of the power of **electricity**. Where would we be without it? We depend on electricity to run lights, refrigerators, stoves, televisions, and computers. It powers heaters, fans, and air conditioners as well as clothes washers and dryers. But what exactly is electricity? How is it produced? How do we get it? In this book, you'll learn about these topics and more.

Electricity makes all these things work.

WHAT IS ELECTRICITY?

Electricity is a form of **energy**. It comes from tiny particles so small that we can't see them. These particles, called atoms, are the building blocks of all matter.

Atoms are the smallest particles of **chemical elements**, the **substances** that make up all matter. Elements can't be broken down into simpler substances. They are each made up of only one kind of atom. Each element's atoms are different from the atoms of other elements.



gold

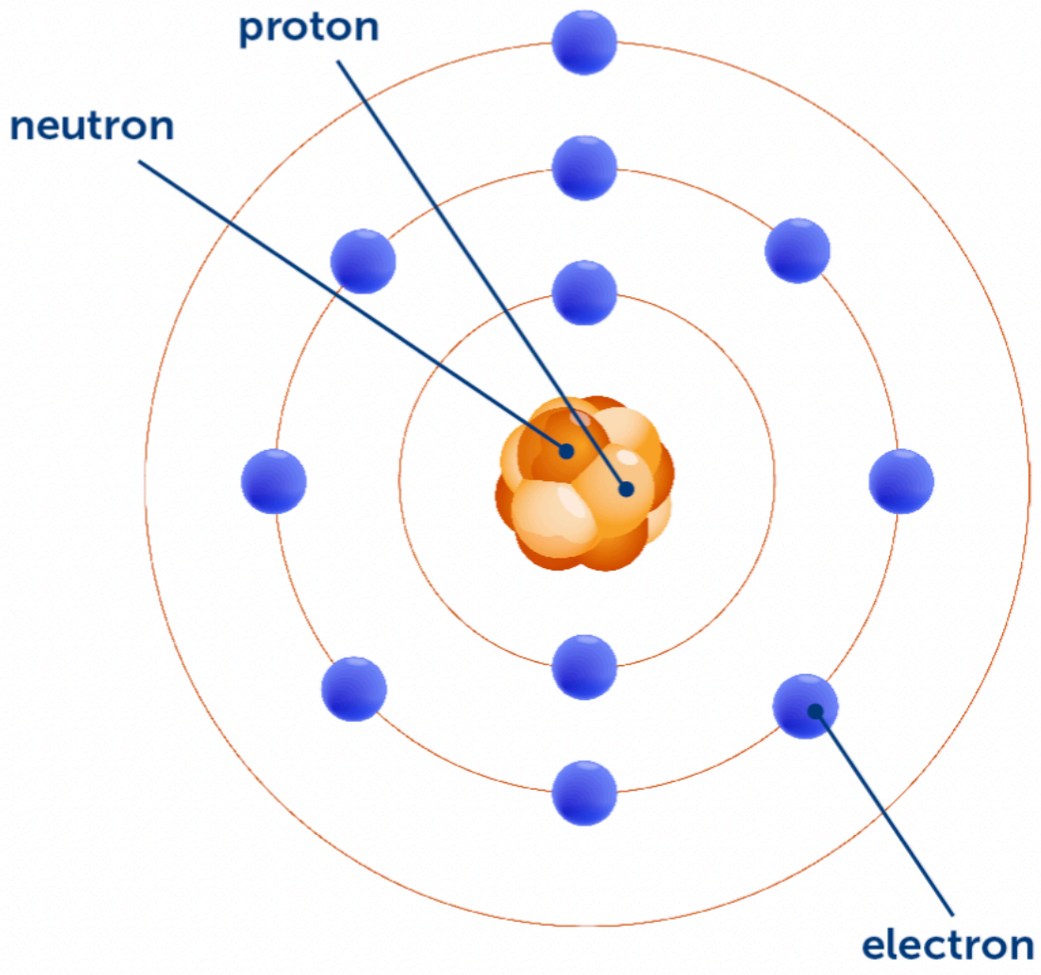
silver

iron

copper

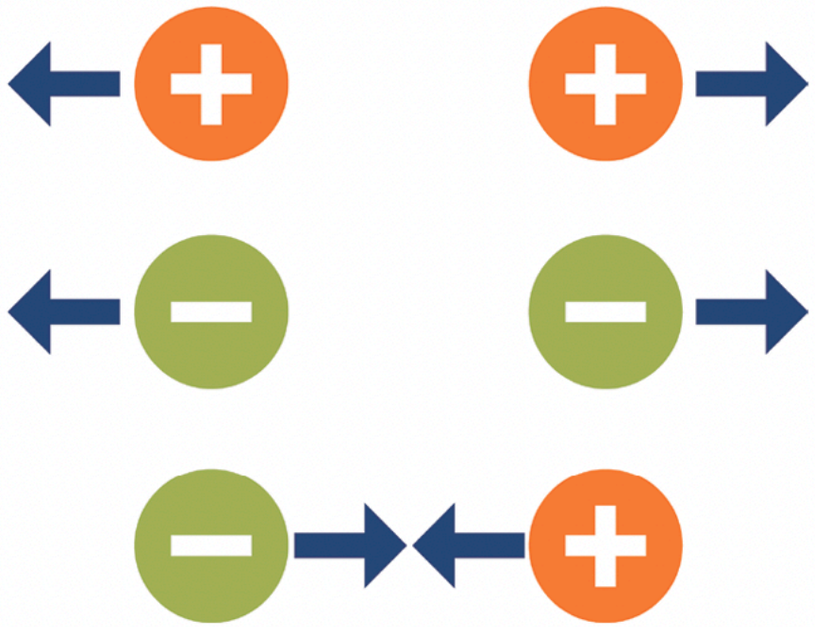
Atoms are very small, and they contain particles that are even smaller. Inside every atom is a nucleus, or center. The nucleus is made up of protons and neutrons. Protons have a positive electrical **charge**. Neutrons have a neutral charge, which means they do not have a charge. Electrons have a negative charge. They move around the nucleus very fast.

A Carbon Atom



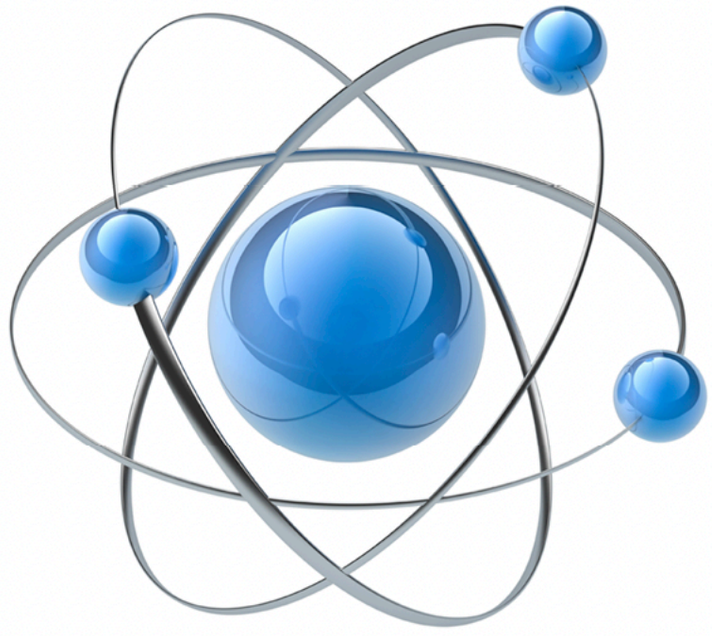
Drawings of atoms often show electrons moving in a circle. In fact, they stay close without following a clear path, like bees buzzing around a hive.

An electrical charge is a property of protons and electrons. It controls how they behave around each other. Two charges that are alike—either two positives or two negatives—push each other away, or *repel* each other. Opposite charges—one positive and one negative—draw each other close, or *attract* each other.



Electrical Charges

Atoms normally have no charge—they are neutral. Since the number of protons and electrons is equal, they cancel each other out. However, when atoms are in contact with other atoms, they can gain or lose electrons. (Electrons are held less tightly in an atom, so they can move around more easily.) Atoms that gain electrons have more electrons than protons, so they have a negative charge. When atoms lose electrons, they have a positive charge.



Atom

It's a fact

When an atom has a charge, it is called an *ion*.

If it has a negative charge, it is a *negative ion*.

If it has a positive charge, it is a *positive ion*.

STATIC ELECTRICITY

Did you ever rub a balloon on your hair and make it stick to your head? If so, you have experienced static electricity. You have also experienced this kind of electricity if you've rubbed your feet on a carpet and been shocked when you touch a doorknob. This kind of electricity builds up on an object's surface.

Word Tip

The word *static* means "not moving."
Static electricity builds up in one place.
The other kind of electricity—*current* electricity—moves from place to place. A *current* is a flow or movement of something.

You learned that electrons can move from one atom to another. When you rub certain objects together, electrons move from the surface of one to the surface of the other. The surface that gains electrons becomes negatively charged. The surface that loses electrons becomes positively charged. Since opposite charges attract each other, the two surfaces stick together.

Static electricity can make hair stand on end, even if you take away the balloon. Each hair has a positive charge, so they repel each other.

So why do you get a shock when you touch a doorknob? When you rub your feet on a carpet, the atoms on your skin become negatively charged because they've picked up extra electrons. When you touch something with a positive or neutral charge, such as a doorknob, the extra electrons leave your skin. When this happens, you see a spark and get a little shock.

The most powerful example of static electricity is lightning. Strong winds cause ice particles inside a storm cloud to bump up against each other. When this happens, many electrons are knocked off these particles. As a result, the storm cloud contains many positive ions and free electrons. The positive ions collect at the top of the cloud, and the free electrons collect at the bottom. When the positive and negative charges build up to a certain point, they quickly flow back together. *Zap!*

It's a Fact

There are three main kinds of lightning:

- inside a cloud
- between clouds
- from a cloud to the ground

Static electricity can be useful in certain ways. Copy machines use it to make **toner** particles stick to paper. It's also used in machines called scrubbers. They pull particles of dirt from smoke inside some smokestacks. As a result, the air that leaves is clean. Some car manufacturers use static electricity to paint new cars. They charge paint and then spray it into a booth with the car. The paint particles are attracted to the car and stick to it.

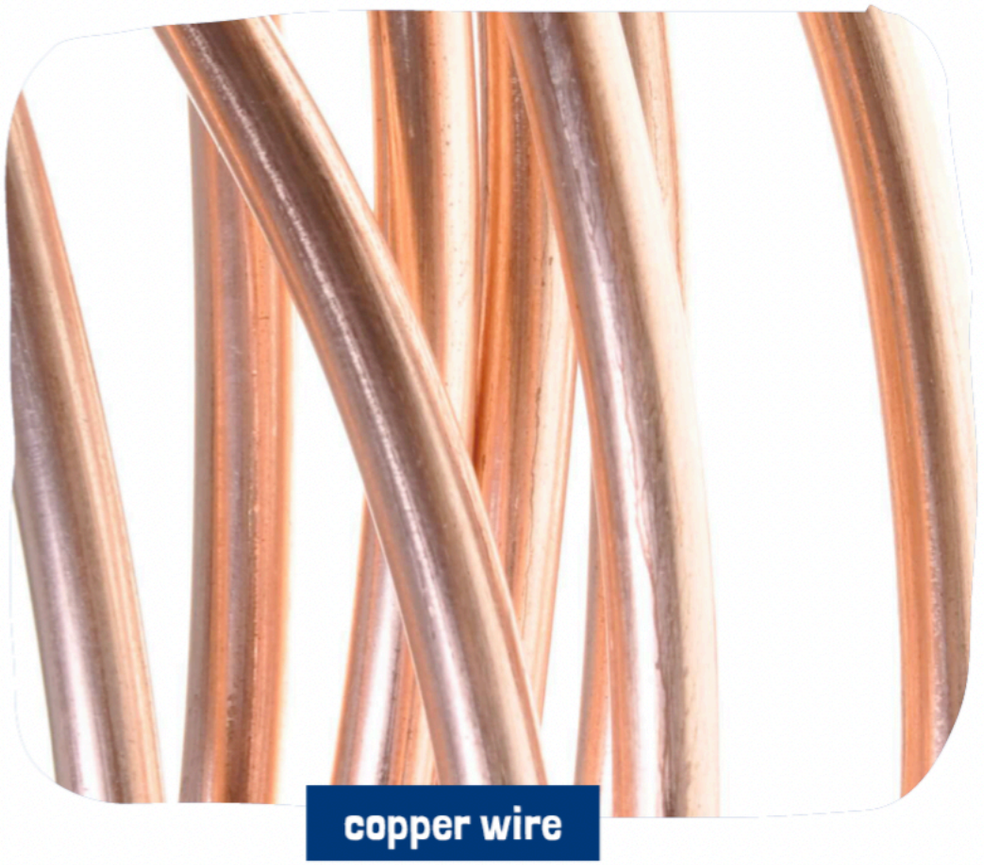
Static electricity has a few uses.

ELECTRIC CURRENT

Static electricity is interesting, and it can help us understand how electricity works. It's hard to control, however, so it doesn't have many uses. That's where current electricity comes in. Electric current is a stream of electrons that move through matter. Electrons on the move carry electrical energy to different places. Electric current provides power to homes, schools, and businesses. It also gives power to objects that use batteries.

Current electricity has many uses.

Electric current travels through **conductors**. These are **materials** that allow electrons to move from one atom to another very well. Metals are very good conductors, and some metals are better conductors than others. Copper is a very good conductor, meaning that electrons flow through it easily. For this reason, copper wire is used in many household electrical appliances.



copper wire

Electricity Worksheet: Atoms and Electrical Charges Name: _____

1. What causes an atom to have a positive charge?

2. What causes an atom to have a negative charge?

3. What happens when an atom has too many electrons?

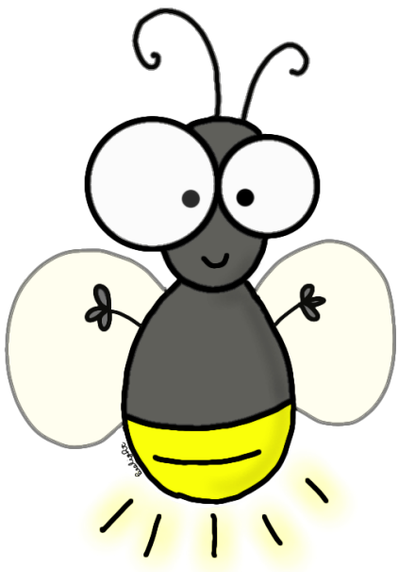
4. What is an atom called when it has a negative charge?

5. What is an atom called when it has a positive charge?

6. What is a powerful example of static electricity?

7. How does lightning make a flash?

8. What makes an object neutral?



Name: _____

Conducting Electricity

Item		Prediction YES / NO	Actual YES / NO
1.	Tissue Paper		
2.	Foil		
3.	Plastic		
4.	Paper		
5.	Rubber		
6.	Coin		
7.	Cork		
8.	Cardboard		
9.	Paper Clip		
10.	Pencil (lead exposed on both ends)		

CONDUCTORS & INSULATORS

Fill in the missing words with words provided

conductor	rubber	electricity	allows
water	energy	insulator	stops

1. An electrical _____ is a material that allows _____ to pass through it.

2. An electrical _____ is a material that does not allow electricity to pass through it.

3. An electrical insulator _____ the flow of electrical _____ in a circuit.

4. An electrical conductor _____the flow of electricity in a circuit.

5. _____ is an example of an electrical insulator.

6. _____ is an example of an electrical conductor.

Have an
electrifying day!