

# ELECTRICITY

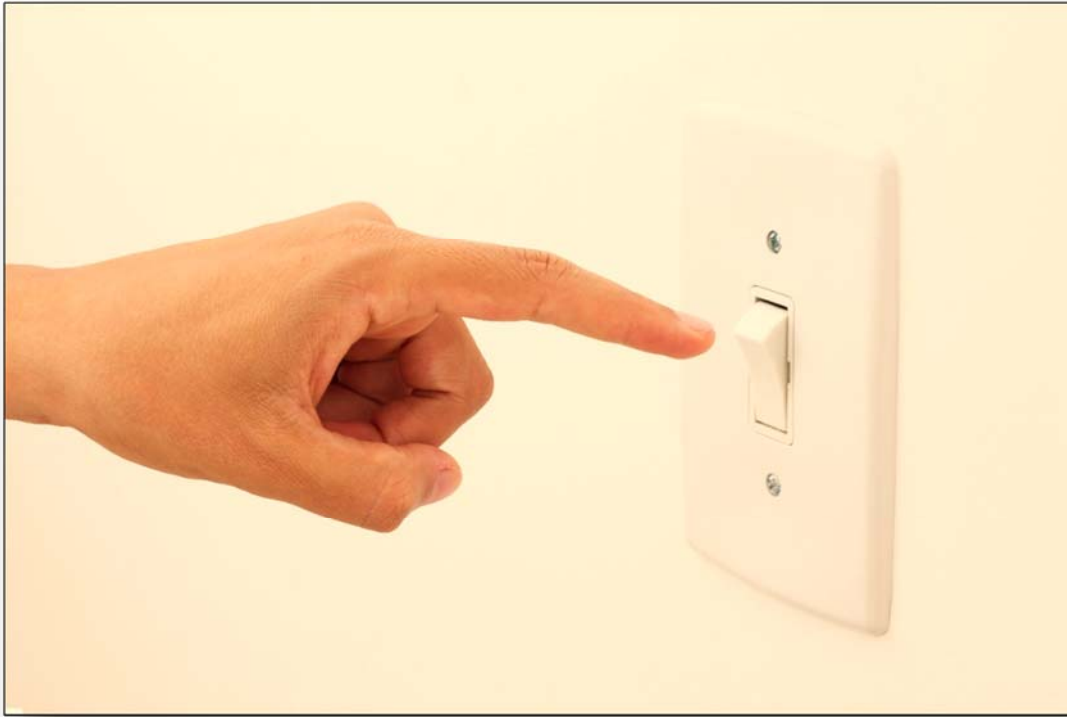


## Unit Overview

From lights to iPhones to microwaves, our everyday lives are made more convenient with the use of electricity. Electrical energy moves charged particles through wires to power countless devices. In this unit you will explore the fundamental concepts of electricity and electrical circuits.

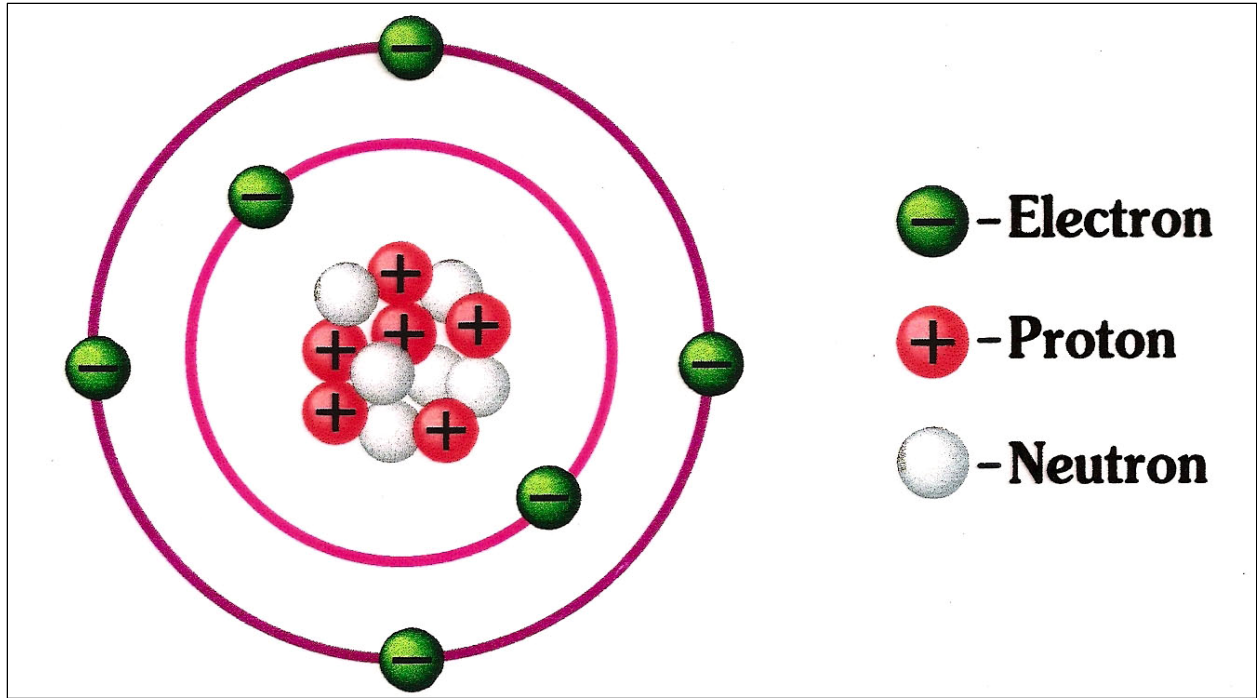
## Activity: Power Up

Spend one entire day making notes of all the ways you use electricity. Then reflect on how your life would be different without electricity. Record this information for question #1 in the assessment portion of the unit.



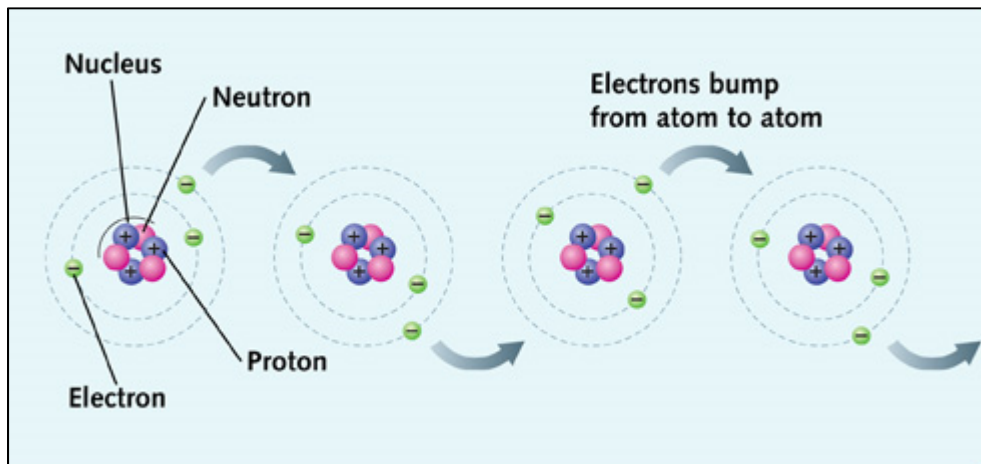
## **What is Electricity?**

All matter is made up of atoms as the most basic unit. Atoms have three types of subatomic particles—protons, neutrons, and electrons. The protons (positive charge) and neutrons (neutral charge) are found in the nucleus, or the very center of the atom. Electrons (negative charge) are very tiny particles that orbit around the outside of the nucleus. The negative charge of the electrons is attracted to the positive charge of the protons, which keeps the electrons in orbit. Sometimes, due to their high energy, electrons move from one atom to another. When that happens, electricity is created.



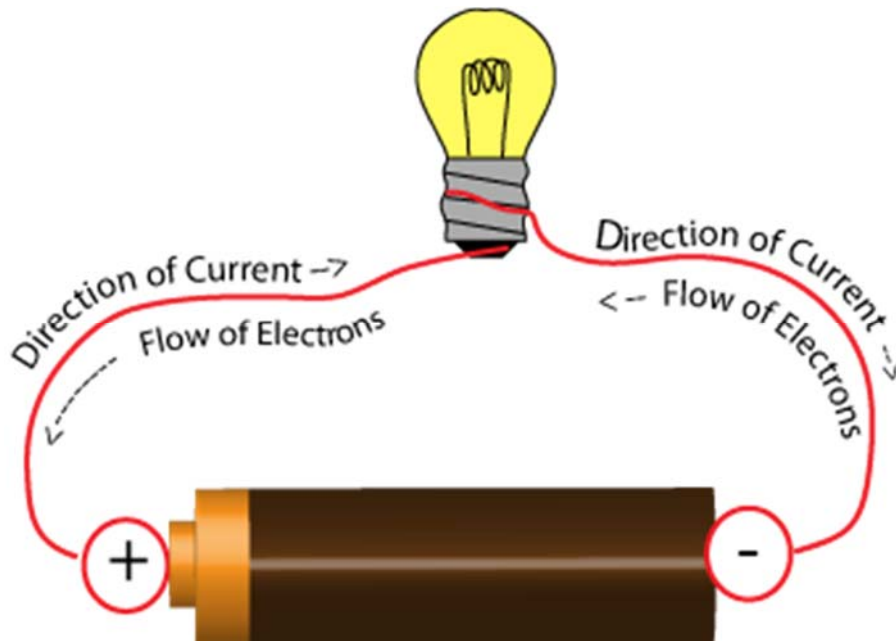
## How Electricity Works

*Current electricity* is when electrons are freely flowing end-to-end through a wire.



In order to better understand electrical terms and quantities, let's take a look at it applies to circuits.

A **circuit** is a closed loop through which electrons are able to travel. A circuit has two requirements—a closed conducting path, and a supply of energy.



In this simple circuit, the battery provides chemical energy which is transformed to electrical energy to move along the wires. The battery's electrical potential is measured in volts (V). The **voltage** is a measure of energy carried through a circuit. The electrons flow in one direction, which moves away from the negative battery terminal and toward the positive terminal. The current, on the other hand, flows from positive to negative. **Electric current** is the rate at which electric charge passes a point in a circuit. Current is measured in amperes, or amps (A).

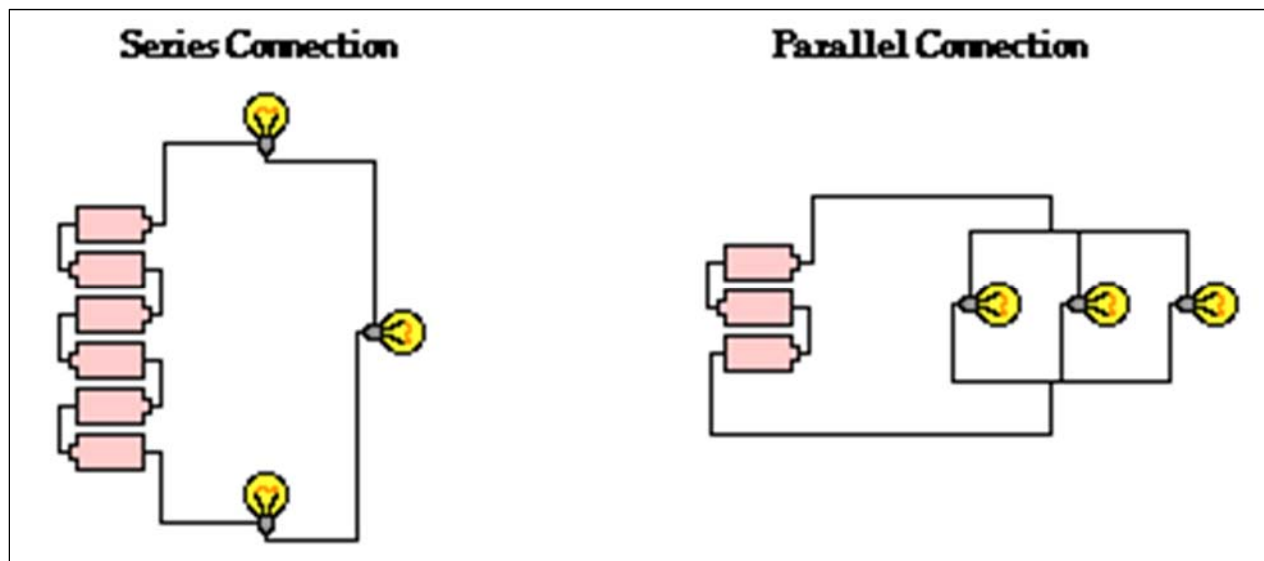
Matter can be classified in three possible ways when it comes to its ability to transfer electrical energy. **Conductors** have an excellent ability to let electricity pass through them. **Semiconductors** allow energy to pass through under certain

conditions. **Insulators** are materials through which electrical energy cannot pass. Most metals, such as silver and copper, are good conductors of electricity. Silicon is a common semiconductor and is used in many electronics. Wood and glass are examples of insulators.

In a circuit, the conductor can meet **resistance**, which is a reduction of the electric current flow through the circuit. It is measured in ohms. Resistance can be thought of as friction in electric circuits.

## Types of Electrical Circuits

There are two basic types of circuits. One type is a series circuit and the other type is a parallel circuit. A **series circuit** is designed so that an individual charge will pass consecutively through multiple resistors connected in a row. A **parallel circuit** places resistors along individual branch lines, and the charge will pass through only one branch line going to and from the power source. The way a circuit is constructed will have an impact on the total current flowing through it.

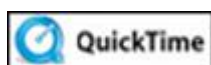


Read on to learn more about circuits:

<http://www.physicsclassroom.com/class/circuits/Lesson-4/Two-Types-of-Connections>

## **Video Clips: Batteries and Circuits**

Watch segments 1 and 4 from the following video. Segment 1 provides more information on voltage, current, and resistance. Segment 4 describes the workings of a parallel circuit. Complete the guided notes as you watch the video clips.



Batteries and Circuits

[Printable Student Copy](#)

## **Basic Electrical Quantities: Current, Voltage, Power**

Read the following article from Khan Academy. You are required to know the content; however, you do not need to learn the formulas. Click on the icon below.



## **Measuring Voltage and Current**

There are instruments which are commonly used to measure voltage and current. A voltmeter is used to measure voltage in an electrical circuit. Voltmeters have a positive lead and a negative lead which are connected in parallel within a circuit to the element you are analyzing. An ammeter is used to measure the circuit's electric current. Ammeters must be hooked up in series within the circuit.

Watch the following video clip to learn more about how voltmeters and ammeters are used to quantify voltage and current.

## Quizlet Vocabulary

<https://quizlet.com/33r1sp>



Now, answer questions 1-18.