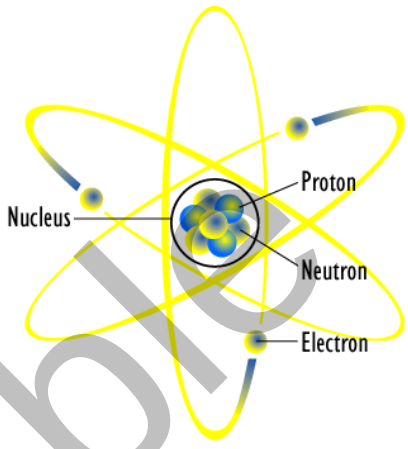
Room for notes

Everything is made up of atoms. Each one of them has three **particles** : protons, neutrons and electrons. Electrons **spin** around the center of an atom. They have a negative charge. Protons, which are in the center of atoms, have a positive **charge**.



Parts of an atom

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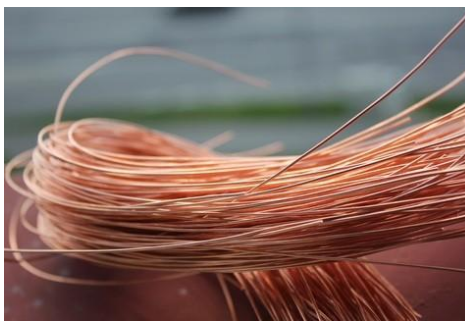
Normally, an atom has as many protons as it has electrons. It is stable or **balanced**. Carbon, for example, has six protons and six electrons.

Scientists can make electrons travel from one atom to another. An atom that loses electrons is positively charged, an atom that gets more electrons is negatively charged.

Electricity is created when electrons move between atoms. Positive atoms look for free negative electrons and **attract** them, so that they can be balanced.

Conductors and Insulators

Electricity can pass through some objects better than through others. Conductors are materials through which electrons can travel more freely. Copper, aluminum, **steel** and other metals are good conductors. So are some **liquids** like saltwater.



Copper wires are good conductors. They let electricity flow freely

Image: pxhere.com , Public Domain

Insulators are materials in which electrons cannot move around. They stay in place. Glass, rubber, plastic or dry wood are good insulators. They are important for your **safety**, because without them, you couldn't touch a hot pan or plug in a TV set.

Electric Currents and Circuits

When electrons move through a conductor an electric **current** is created. A current that always **flows** in one direction is called a direct current (DC). A battery for example produces a direct current. A current that flows **back and forth** is called an alternating current (AC).

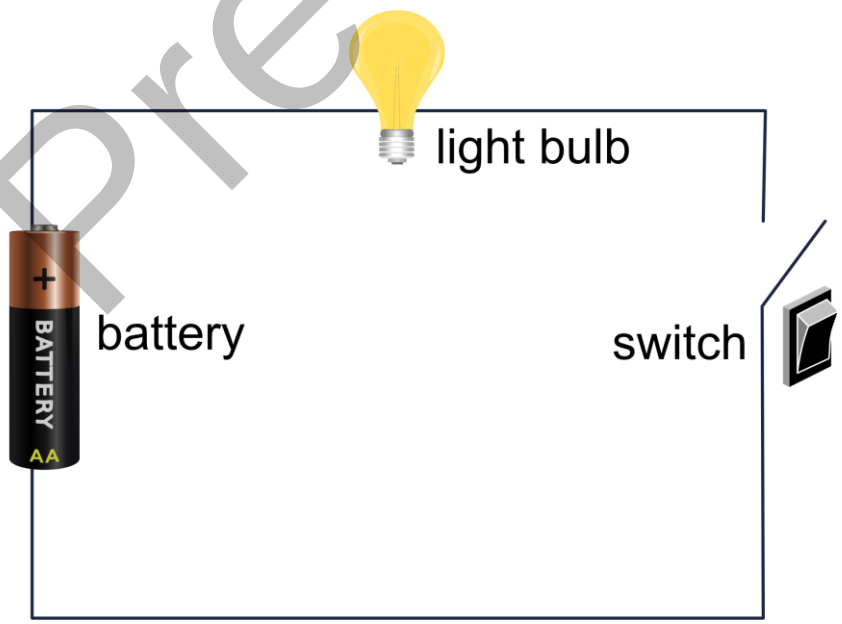
Electrons cannot jump freely through the air to a positively **charged** atom. They need a **circuit** to move. When a **source** of energy, like a battery, is **connected** to a **light bulb** the electrons can move from the battery to the light bulb and back again. We call this an electric circuit.

Sometimes there are many circuits in an electrical **device** that make it work. A TV set or a computer may have millions of parts that are connected to each other in different ways.

You can stop the current from flowing by putting a **switch** into the circuit. You can open the **circuit** and stop electrons from moving.

A piece of metal or **wire** can also be used to produce heat. When an electrical current **passes through** such metal it can be slowed down by **resistance**. This causes **friction** and makes the wires hot. That's why you can toast your bread in a toaster or dry your hair with warm air from a hairdryer.

In some cases, wires can become too hot if too many electrons flow through them. Special switches ,called **fuses**, protect the **wiring** in many buildings .



simple electric current

Image: Klaus Rosmanitz

Kinds of electricity

Static Electricity	Current electricity
• happens when there is a **build-up** of electrons • it stays in one place and then jumps to an object • it does not need a closed **circuit** to flow • it is the kind of electricity you feel when you rub your pullover against an object or when you **drag** your feet over a carpet. • **lightning** is a form of static electricity	• happens when electrons flow freely between objects • it needs a conductor - something in which it can flow through, like a **wire**. • current electricity needs a closed circuit • it is in many electrical **appliances** in our homes - toasters, TV sets , computers. • a battery is a form of current electricity
	
Lightning as a form of static electricity Image: Benjamin Stäudinger, CC BY 2.0, via Wikimedia Commons	**A toaster as a form of current electricity** Image: "Dualit toaster" by SimonTrew is licensed under CC BY-SA 3.0.

How batteries work

A battery has **liquid** or **paste** in it that helps it produce electric **charges**. The flat end of the battery has a negative charge and the end with the **bump** has a positive charge.

When you link a **wire** between both ends a **current** flows. When the current passes through a **light bulb** electric energy is **converted** into light.

The chemicals in the battery keep the ends charged and the battery going. As time passes, the chemical becomes weaker and weaker, and the battery cannot produce any more energy.

How electricity is produced

Generators are used to **transform** mechanical energy into electrical energy. A magnet **rotates** inside a **coil** of **wire**. When the magnet moves, an electric **current** is produced in the wire.

Most power stations use **turbines** to make the **generator** rotate. Water is heated to make **steam** , which pushes the **blades** of the turbine. Gas, oil or coal can be used to heat the water. Some countries build power stations on rivers, where the moving water pushes the turbine blades.

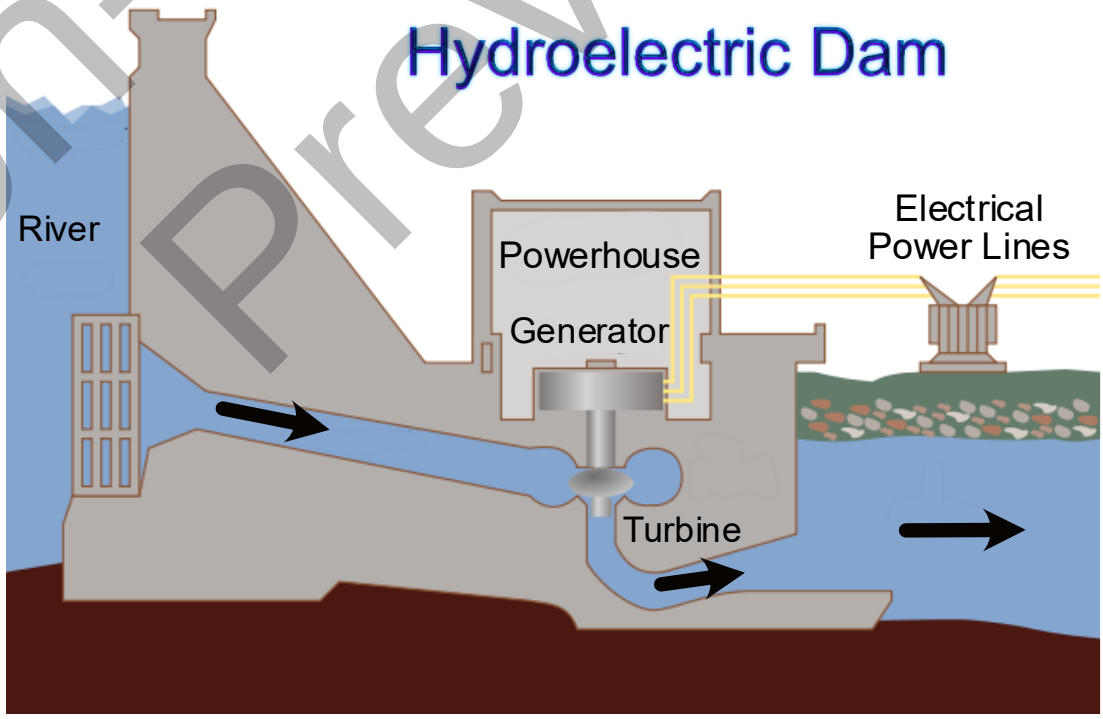


Image : Tennessee Valley Authority; SVG version by Tomia, CC BY-SA 3.0, via Wikimedia Commons – modified by Klaus Rosmanitz

How electricity is measured

Electricity is **measured** in watts, named after James Watt, who **invented** the **steam engine**. It would take about 750 watts to **equal** one horsepower.

A kilowatt-hour is the energy of 1,000 watts that work for one hour. If, for example, you use a 100-watt **light bulb** for 10 hours you have used 1 kilowatt of electricity.

How electricity is transported

The electricity produced by a generator travels along cables to a **transformer** that changes the **voltage** of electricity. **Power lines** carry **high-voltage** electricity over very long distances. When it reachses your hometown, another transformer lowers the voltage and smaller power lines bring it to homes, offices and factories.

Electrical safety

It is important to understand why and how you can protect yourself from electrical **injuries**.

Electric shock **occurs** when an electric **current** passes through your body. It can **lead** to **heart failure** and can damage other parts of your body. It can also burn your skin and other body **tissues**.

A very weak electrical object, like a battery, cannot do any harm to you, but inside the house you have **devices** and machines that use 220 volts.

Most machines in your house have **safety features** to protect you. If something goes wrong, a special **wire** leads the electricity to the ground where nothing can happen.

There are also electrical dangers outside your house. Trees that touch **power lines** can be dangerous. **Lightning** has more than enough electricity to kill a person. If you get caught in a thunderstorm stay away from open fields and high places. One of the safest places is your car, because lightning will only hit the outside metal of the car.