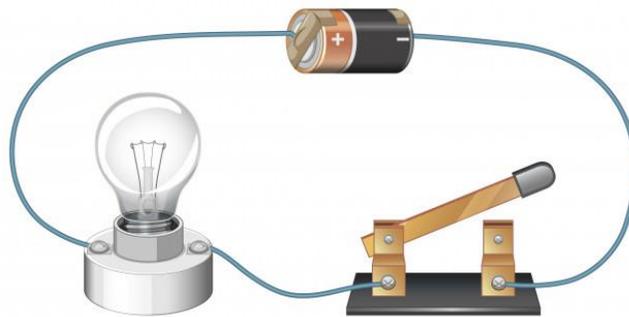


## ELECTRICITY AND CIRCUITS

Do you know how to make **electricity** work, to turn something on or make something move? Electricity is generated by the “flow” of electrons, which are the negatively charged particles of an **atom**. Atoms are the basic building blocks of all matter. Electrons are constantly in motion, and they can jump from one atom to another. If enough electrons move together at the same time and in the same direction, there is electricity.

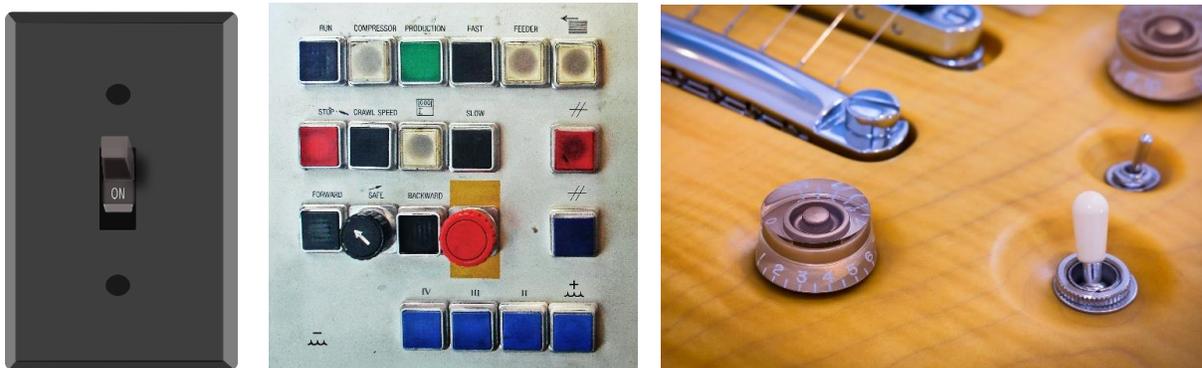
In order for electricity to do work, it has to travel in a circular path or closed loop called a **circuit**. There are two types of circuits: **series** and **parallel**. All parts of a **series circuit** are connected to one another and form a loop. The electric current moves at the same rate throughout the loop. If one part of the series circuit burns out, the entire circuit is broken. A **parallel circuit** has different pathways, dividing the electric current so only part of it flows through any path. Each pathway can be switched off or on separately from the others.

A circuit needs a source of electricity (like a battery), an electrical device (such as a light bulb), and wire or cable to act as a **conductor**. Conductors are types of materials, such as metals, that allow electricity to pass through them easily. They are used to link the positive and negative ends of a battery to create a circuit. Wires used in circuits can be made safe for us to handle when they are covered in a coat of plastic, which doesn't conduct electricity.



**A series circuit created from a battery, a switch, and a light bulb**

Circuits can use **switches** to control the electricity flowing through a circuit. They act like a gate, opening and closing electrical currents. Some common switches you might recognize are flipper-type (like those on a light switch) or push button. There are many other types, depending on their use. When you activate a switch by flipping or pushing it, you help complete the circuit.



**A few different types and styles of switches**



If there is a breakdown anywhere in the circuit, then the electricity can't flow. If the wire breaks or a switch is turned off, the system doesn't work. That's why a switch is sometimes called a **circuit breaker**.

### **ACTIVITY: Create a circuit and light up a design**

#### **Materials**

- Stiff paper, such as cardstock or construction paper
- AA battery or coin battery
- Crayons, colored pencils, and/or markers
- Old string of holiday lights that can be cut up
- Scissors
- Electrical, masking, or duct tape
- Cellophane or double-stick tape
- Optional: Additional art supplies like stickers, decals, or rubber stamping materials

**(NOTE: You will need a grown-up to cut up a the holiday lights)**

1. Fold the paper in half.
2. Draw a simple design on the front that would look nice with a small light shining through. You can also add stickers or use rubber stamps to add more interest, if you'd like.
3. Make a small hole in the paper where you want the bulb to shine in your design.



**Step 2**



**Step 3**

4. Ask a grown-up to cut the wire on either side of one holiday light bulb, as close to the neighboring bulbs as possible and leaving a long piece of wire attached to both ends of the bulb you will be using for your card. Your grown-up should then use the scissors to gently strip the ends of the wire by removing the rubber casing and exposing the wire strands inside. Be careful not to cut through the copper wiring inside. Those wires can be very thin and delicate.



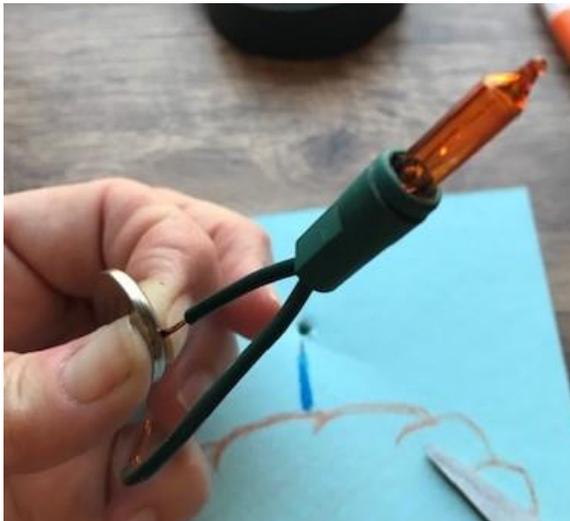


**Step 4**



**Step 4**

5. Place one exposed wire on one side of an AA or coin battery, and place the other wire on the opposite side of the battery. The bulb should light up! If it doesn't, then reverse the wires so they touch the opposite sides of the battery. Once the bulb is lit, tape the wires to the battery with electrical tape and place inside the folded paper.
6. Poke the bulb through your design from the back side of the design, then position the bulb right where you want it to shine. Secure the wiring and battery on the back side of the card with tape.



**Step 5**



**Step 6**

7. Tape the side edges of the car together with the cellophane or double-stick tape so that the battery is hidden and secured.

Hooray! You've just made a circuit and created a well-lit, original design to enjoy. The light in your design should continue to shine until the battery runs out or the wiring comes loose from the battery. If that happens, you can replace the battery or retape the wiring.



## **ADDITIONAL RESOURCES**

### **Books available from the Washoe County Library System:**

*Circuits* by Theodore Buchanan

*Electricity* by Hugh Westrup

*Electricity* by Steve Parker

*Explore Electricity!: With 25 Great Projects* by Carmella Van Vleet

*The Manga Guide to Electricity* by Kazuhiro Fujitaki

*Squishy Circuits* by Kristin Fontichiaro and AnnMarie P. Thomas

### **Videos:**

Children's Museum Houston, "Simple Circuits" <https://youtu.be/4XzKe30TWks>

PBS, Adventures in Learning, "Electric Play Dough and Circuits for Kids"  
<https://www.pbs.org/video/adventures-learning-electric-dough/>

SciShow Kids, "The Power of Circuits" <https://youtu.be/HOFp8bHTN30>

### **Websites:**

DK findout!, Electricity <https://www.dkfindout.com/us/science/electricity/>

U.S. Energy Information Administration, Energy Kids, Electricity: Science of Electricity  
<https://www.eia.gov/kids/energy-sources/electricity/science-of-electricity.php>

