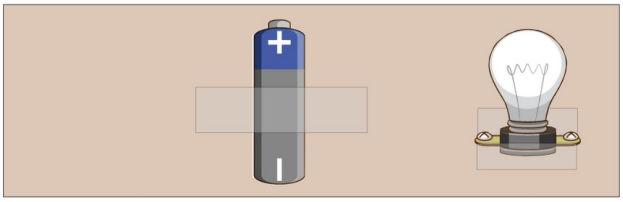
Electric Circuits: Lighting a Bulb with Electric Current

- Electric current always flows through a conducting material from one location that has a pile-up of positive charge to another location that has a pile-up of negative charge.
- Some materials are good conductors of electricity while others are insulators (do not let current flow)
- To keep the current flowing, you need a complete circuit from one side of a battery to another.
- Switches turn current on and off by connecting or breaking apart a circuit.

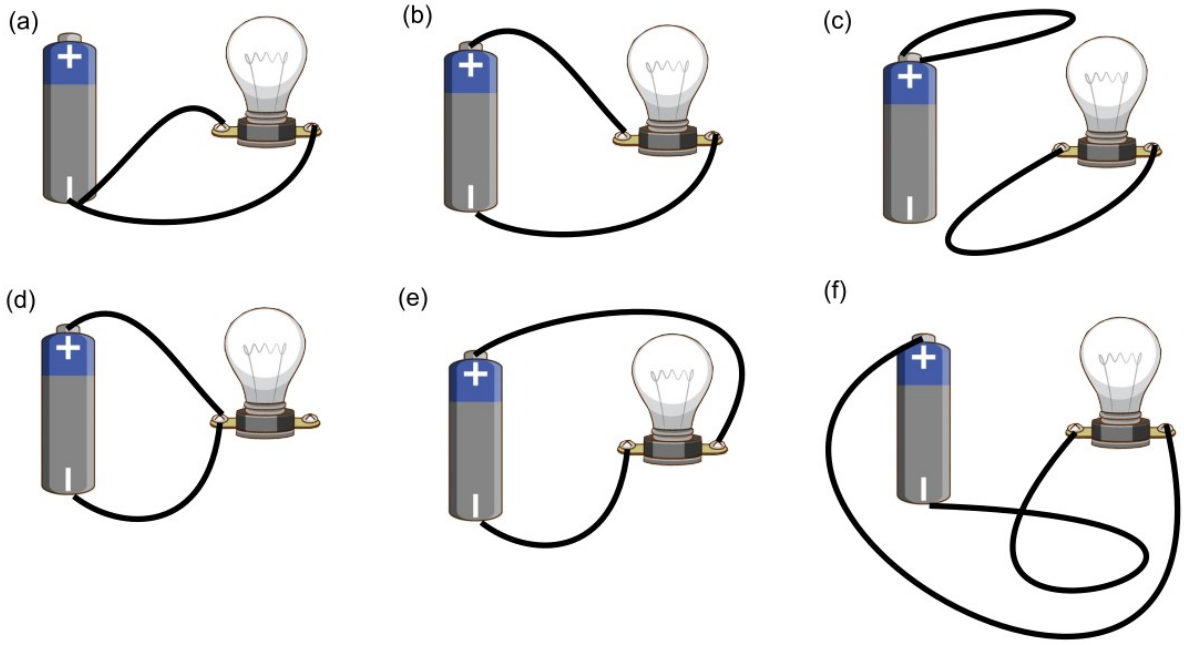
Part 1: Build an Electric Circuit

1. Tape down a lightbulb (in its holder) and a AA battery to a piece of cardboard about 2-3 inches apart.



2. Try different ways of connecting the bulb and battery together with 2 wires. Can you figure out how to place the wires so that the bulb lights up?

Circle which diagrams below will allow current to flow and the bulb to light up:



Discuss:

- What do the diagrams that work all have in common?
- For each of the diagrams that don't work, can you explain why not?
- Why do you need the battery?

Electric current is the flow of tiny particles called **electrons**. Electrons will flow if there is a complete circuit (circle) connecting one end of the **battery** to another. The battery pushes current around the circuit.

3. Is it possible to make a working circuit that lights up the bulb using a single wire?
Discuss: Why or why not?

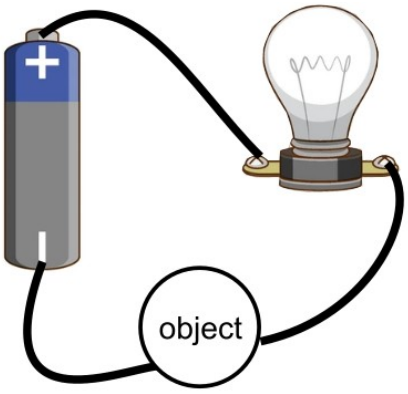
When electrons have multiple paths to choose from, most of them pick the easiest path. A path that consists of just wire from one end of the battery to another is called a **short circuit**.
Discuss: Why are short circuits potentially dangerous? What happens to a battery when it is short-circuited?

Part 2: Conductors and Insulators

Not all materials can conduct electric current. Materials that let electric current flow through are called **conductors**. Those that to not allow current to flow are called **insulators**. We will explore which materials make good conductors.

1. Start with a circuit that works and insert different objects so that current has to flow through the object to complete the circuit.

2. Using the supplies provided (or anything else around the room), find objects made of the materials listed below. Use these objects to complete the circuit and fill in the table below.



Object	Material	Light-bulb on / off ?	Conductor or insulator?
	steel		
	soft plastic		
	hard plastic		
	rubber		
	copper		
	fabric		
	wood		
	glass		
	aluminum		
	paper		

Which general types of material tend to be good conductors?

Metals wood & paper cloth plastic

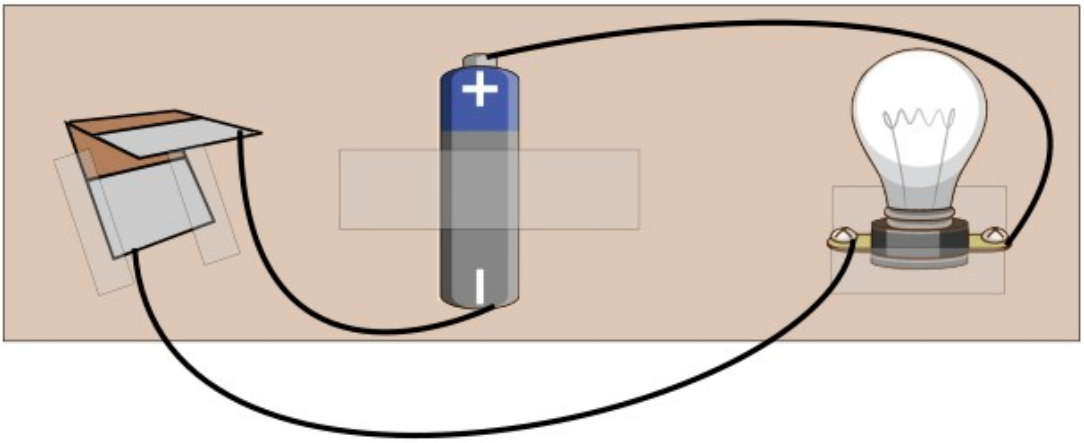
Discuss: Why do you think electrical power cables and wires are usually wrapped with a plastic coating?

Part 3: Electric Switches

A switch turns electrical current on and off by completing or breaking a complete circuit. Here you will build a homemade switch for your simple circuit.

1. Wrap two separate pieces of aluminum foil around the two ends of a small cardboard strip, leaving a gap in the middle.

2. Fold the cardboard strip in half. Use tape to attach the bottom half on the big piece of cardboard. Make sure most of the foil on the inside surface is not covered by tape.



2. Attach a wire to each piece of aluminum foil, connecting it to the battery and light-bulb as shown in the diagram above. Your folded piece of cardboard is now a switch! Try pressing it down so that the aluminum pieces touch each other.

When does the lightbulb turn on?

always never when the switch is open when the switch is closed

Discuss:

- Why does the lightbulb not turn on when the switch is open?
- Why does it turn on when the switch is closed?
- Why is the aluminum foil on the switch necessary and why is it important that the inside surface not be covered by tape?
- Where have you seen electrical switches in everyday life?