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# Circuits



*Begin with a basic exploration of electricity with your students by having them make a series circuit. Expand by testing conductivity of materials.*

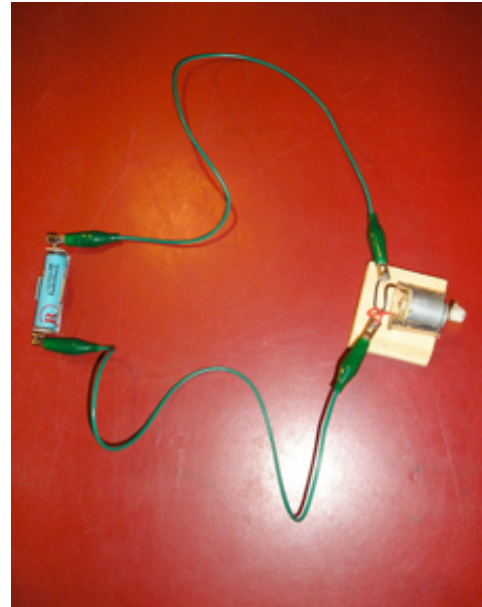
**Safety notes:** Give general warning about experimenting with electricity. Experimenting with an AA battery is ok, but is not ok to experiment with electricity from an outlet or car battery. In case of an electrical short or an object getting hot, disconnect immediately.

## Materials:

- Wires and alligator clips
- Small motors
- AA batteries
- Battery holders
- Paper and pencils

## Procedure:

1. Have students look at a battery. Can they find the “+” and “-“? Are they important? The battery is a source of power. When a circuit is made, electrons travel from the negative terminal to the positive terminal.
2. As a group or individually, draw a battery and show where the wires and motor attach to create a complete circuit. Make sure that everyone sees the proper set-up.
3. Set up a circuit using the batteries, battery holders, wires and motors. Have students trace the route of the current.



Alternatively you can do this activity with light bulbs. The advantage of using motors, however, is that they don't break as easily, the connection points are more obvious, and you can see the difference when you switch the polarity.

## Questions to Ask:

What happens if you disconnect a wire?

What happens if you switch the direction of the battery? What do you notice about the direction of the motor?

## Science Content:

Circuits are paths that allow for the flow of electricity or electrons. A circuit must form a complete path from the energy source, which can be light, heat, pressure, or in the case of a battery, chemicals. If there is a break in the circuit you will not have a current.

The power source has a certain potential of electrical force to move electrons around the circuit (measured in volts). The amount of electricity that is flowing through the circuit is the current (measured in amperes). The part of the circuit that is doing work (such as the motor, in this case) has a resistance (measured in Ohms) that affects the current. These

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three factors are all related and are defined by Ohm's Law which states that the potential (volts) is equal to the current flowing (amps) times the resistance (ohms).



**Extensions:**

*Explore what is conductive.* What can you use instead of a wire? Try some of the following: paper clip, aluminum foil, pencil, water, water with salt, jewelry, carrot, string, etc. What sort of materials allow for the flow of electrons?

*Explore types of circuits.* Add a second motor or light bulb into your circuit. Explore the difference between a series and parallel circuit.