Activity Title: Electrical Circuits

Recommended Grades

Kindergarten, Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6
Could be expanded to older grades, e.g., Matter and Chemical Change (Gr 8), Electrical Principles and Technologies (Gr 9)

Curriculum Connections

Matter
- 2 – materials used to make objects, properties can be tested
- 5 – particle model of matter

Energy
- 2 – sources of light
- 4 – magnetic forces could be related to electricity
- 5 – energy resources
- 6 – how energy resources are used

Earth Systems
- 3 – human activities can change the Earth's surface, could link to electricity generation
- 6 – could relate to climate changing

Living Systems
- 2 – human behaviour negatively affecting environment (related to resource use)

Computer Science
- K – instructions to be followed, have steps
- 1 – instructions to be followed, have steps
- 6 – this experiment creates a light switch which is an abstraction

Scientific Methods
- 1 – carry out an investigation, make predictions
- 2 – methods and processes used in investigation, observations
- 3 – record observations to explore questions asked
- 4 – how can evidence advance knowledge in science, data types
- 5 – phenomena to be observed, variables can be controlled or changed
- 6 – science must be testable, evidence used to support or contradict hypothesis

Time

10-25 minutes

Skills Focused On

• Critical Thinking • Hypothesizing	• Problem-solving • Observation

Materials Needed

- Battery - generally a 9V battery (though this can cause the light bulb to burn out), other options (such as a watch battery) work too
- Tinfoil
- Light bulb with wires exposed
- Metal paperclip
- Thumb tack
- Tape

Background Information

We all know that electricity is important in our lives, from charging our phones to flipping on the lights. This is all made possible by electrical circuits.

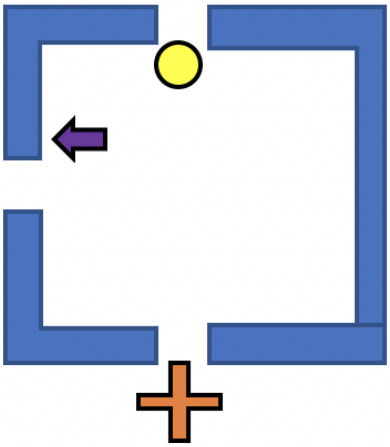
Electricity is a form of energy that involves the flow of electrons; this free movement of electrons is called an electrical current. A circuit is a pathway for electrons to flow continuously.

A circuit can be closed or open, but only when it's closed can the electrical current flow. When it is open, there is a break somewhere in the circuit - this is useful because we want to be able to turn off the flow of electrons when we don't need it.

A simple circuit has 4 parts:

1. Power source - e.g., a battery
2. Conductors - wires that the electrons flow along
3. Load - e.g., a light or buzzer
4. Switch - opens or closes the circuit

You can build your own circuit with a few simple materials.



Experimental Steps

1. Fold tinfoil into strips.
2. Create a square with the strips (see image to the right. Ignore the arrow, circle, and + for now).
3. Tape down the square of foil.
4. Place the light bulb at the top (yellow circle). Tape the wire to the tinfoil on both sides.

5. Place the battery at the bottom (orange +). Make sure the positive and negative terminals are connected on opposite sides of the tinfoil.
6. What happens to the light when the battery is in place?
7. To create a switch, place your paperclip on the left (purple arrow) and secure with the pushpin (put the pushpin upside down to create a pivot point for the paperclip). Move it to different positions.
8. What happens to the light when the battery is in place with the paperclip in different positions? What do you think is going on?

Discussion/Experimental Extensions

Why did the lightbulb not turn on when the paper clip is not touching both pieces of tinfoil?
You can try to make a more complicated circuit with multiple lights and switches.
How does an electrical circuit relate to an electric grid?

Try to build your circuit using a material that is an insulator rather than a conductor. What happens? Why?

Additional Resources

Electrical Circuits experimental video produced by Future Energy Systems - provides background information and instructions for experiment: https://youtu.be/QYz688Qf5XA?si=l_ug-P8JOaJPczxc.

Learn more about Future Energy Systems (https://www.futureenergysystems.ca/) and access more learning content, including storytimes, lab tours, ask an experts and more (https://www.futureenergysystems.ca/engage/learning https://www.youtube.com/channel/UCJr8N9KyFJ6d-t36TPtUlwg).