

# Electricity and Circuits STEM Unit!

**Parts of an Atom:**  
Atoms are the building blocks that make up individual atoms have smaller particles. Label them below.

**Electric Current:**  
Electric current is generated when \_\_\_\_\_ move from \_\_\_\_\_ to \_\_\_\_\_.

**Conductors:**  
Electric current flows through some materials more easily than others. Conductors have atoms that move freely and can lose electrons easily. The most conductive material is \_\_\_\_\_.

**Insulators:**  
Some substances resist the flow of electric current. These materials hold electrons \_\_\_\_\_.

**Batteries:**  
Batteries have a positive and negative side. Electrons flow from the \_\_\_\_\_ side of the battery to the \_\_\_\_\_ side. Electrons are negatively charged, and are attracted to the positive end of a battery and repelled by the negative end.

**Electrical Symbols & Electronic Symbols Matching:**  
Match the symbols to the components: Fixed resistor, Wire, Load Speaker, Single Cell Battery, Switch, closed, Switch, open, Jointed wires, Wire crossing, not joined.

**Simple Circuits:**  
A simple circuit carries electricity from the power source (battery or socket) to the lamp (or appliance) through conducting wires.

**Electricity:**  
When electricity flows, electrons move through the wires. Electrons flow through a circuit only when they have somewhere to go (i.e. when there is a complete path).

**30-Page Electricity and Circuits Packet Hands-On Activities**

**Open and Closed Circuits:**  
An open circuit is an incomplete electrical path. We use \_\_\_\_\_ to open and close the circuit. Draw a schematic for an open circuit: \_\_\_\_\_.

**Parallel Circuits:**  
Parallel circuits allow current to flow along more than one path. If there is a break in a parallel circuit, the current can still travel through the circuit via other paths.

**LED Light:**  
LEDs are polarized - current flows only in one direction through the LED. The shorter leg is called the \_\_\_\_\_ and connects to the negative side of a battery.

**30-Page Packet**  
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**Resistor:**  
Resistors may be used to restrict current flow and may have a color code.

**Short Circuit:**  
If there is a short along the wiring in one part of your home, the fuse is tripped, and the power stops flowing to that area. But, the power continues to run in other rooms.

In this unit, I organized things into daily plans. **Each day has the worksheets, suggested hands-on activities and materials needed** as well as any books we used. Below is a picture of Day 1 (left) and Day 2, (right). There are 10 suggested days (though to be honest, sometimes we took a little longer than just one day.) There are **10 Days of suggested activities and worksheets.**

**Day 1:**

\*Read *What's Smaller Than a Pygmy Shrew?* ([affiliate link](#)) By Robert E. Wells to help kids really realize how small atoms, protons and electrons are.

\*Go over the parts of an atom. (page 5)

\*Talk about friction and static electricity. (page 5)

**Hands-On Activity**

Take a balloon and have the kids try to place it against a wall. It won't stick. Then have the kids rub the balloon on their hair. After several minutes of rubbing the balloon on their heads, have them try to place the balloon on the wall. There's a good chance it will stick!! Electrons can be exchanged between materials on contact as with the hair and the balloon!

Static electricity results from an imbalance between negative and positive charges in objects.

\*Read *Switch-On, Switch-Off* ([affiliate link](#)) by Melvin Berger

**Hands-On Activity** – Go outside and look at the power lines. Does your house have a pole-top transformer? The transformer converts the high 'primary' voltage of the overhead or underground distribution lines to the lower 'secondary' voltage of the distribution wires inside your house (or building).

Note: the electricity cable is the one at the top. The lower (thicker) cables are the cable wires.

Create your own generator (this is discussed in Switch On, Switch Off) with [wire](#), ([affiliate link](#)) a magnet and a compass.

**Create Your Own Generator**



Notice the compass arrow in the top picture and that it has moved in the picture to the right! As the magnet moves near the wire, the electrons in the wire move from atom to atom.

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**Day 2:**

Go over batteries, volts, electricity, electrical circuits. (page 6)

**Hands-On Activity**

Take a simple LED light and place it on a button battery. Press the two wires to the battery. The longer leg of the LED light should connect to the positive side, the shorter leg should connect to the negative side. (More about that a little later.) That is a simple circuit!


LED diodes      Lithium coin batteries




**Hands-On Activity**

Have the students make their own circuits with bulb (and bulb holder/optional), wire or alligator clips, battery

[Ajax Scientific Mini Type Bulb Holder](#)  
[Ajax Scientific Miniature Light Bulb, 2.5V, 0.3 Amp](#)



You can have [alligator clips](#) or [wire](#) available for the kids to work with.



Or, you can also use a [battery holder](#) like this that holds a AA battery or AAA battery: You might want to purchase a [double battery holder](#) for the Extension 2 activity.

**Fill out the page on Batteries (page 10)**

**Extension:** Have the students find some materials they think might be conductive. Add that to the circuit to see if the light bulb will still work.

**Extension 2:** After filling out the *Batteries* page (that follows) have the students try this: Have them the [same circuit](#) to make the LED bulb work with the AAA battery. (It won't work.) Have them

**Electricity and Circuits Unit  
Daily Plans - with worksheets, books,  
hands-on activity instruction, and  
materials needed**

Here is a small sampling of the worksheets in the Electricity and Circuits Unit.

**Parts of an Atom:**  
Atoms are the building blocks that make up individual atoms have smaller particles. Label them below.

The part in the middle of the atom is called the nucleus. Protons and neutrons have an electric charge. Protons have a positive charge and electrons have a negative charge. Protons attract electrons because they have opposite charges. Sometimes electrons move from one atom to another. When an electron moves to a different atom, it gives that atom a negative charge. The surface of an object and can be charged.

**Electric Current**  
Electric current is generated when \_\_\_\_\_ move from \_\_\_\_\_ to \_\_\_\_\_.

There are two main types of electric currents. They differ in the way the current travels along the circuit. \_\_\_\_\_ Current, abbreviated as \_\_\_\_\_, the flow of electric charge is always in one direction. The amount of current may change, but it always flows in the same direction. \_\_\_\_\_ Current, abbreviated as \_\_\_\_\_, flows in one direction for a short time. Then it reverses and the current changes directions over and over. Electric circuit wires \_\_\_\_\_.

A battery generates \_\_\_\_\_.

Power lines use \_\_\_\_\_.

DC or AC?  
\_\_\_\_\_ electronic games  
\_\_\_\_\_ television  
\_\_\_\_\_ cell phone  
\_\_\_\_\_ vacuum cleaner

**Conductors:**  
Electric current flows through some materials more easily than others. Conductors have atoms that move freely and can lose electrons easily. The most conductive material is \_\_\_\_\_.

Most wiring and circuits use \_\_\_\_\_ as a conductor because it is not as expensive.

What are some other examples of conductors?

**Insulators:**  
Some substances resist the flow of electric current. These materials hold electrons tightly. Give some examples of insulators: \_\_\_\_\_.

**Light Bulb:**  
When you flip on a light, the bulb brightens. Look closely at a lightbulb. Inside the bulb, you will see a small, thin wire. This is called the filament. \_\_\_\_\_.

**Simple Circuits**  
A simple circuit carries electricity from the power source (battery or socket) to the lamp (or appliance) through conducting wires. When a switch is turned on, the circuit is complete and closed so the lights turn on. When the switch is turned off, there is a gap in the circuit, so the light does not turn on.

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DC or AC?  
\_\_\_\_\_ electronic games  
\_\_\_\_\_ television  
\_\_\_\_\_ cell phone  
\_\_\_\_\_ vacuum cleaner

**Series Circuits**  
Draw a schematic for the series circuit with three lights:

What happens when one of the lights above goes out (think of a string of Christmas lights when one bulb burns out)?

**Parallel Circuits**  
Parallel circuits allow current to flow along more than one path. If there is a break in a parallel circuit, the current can still travel through the circuit using a different route. This means that the lights keep burning even when one goes out.

Draw schematic diagrams for parallel circuits:

Make a parallel circuit. How does a parallel circuit differ from a series circuit? As you add in more parallel lamps to the circuit, the bulbs should stay the same amount brightness. In each parallel loop the strength of the electrical current stays the same.

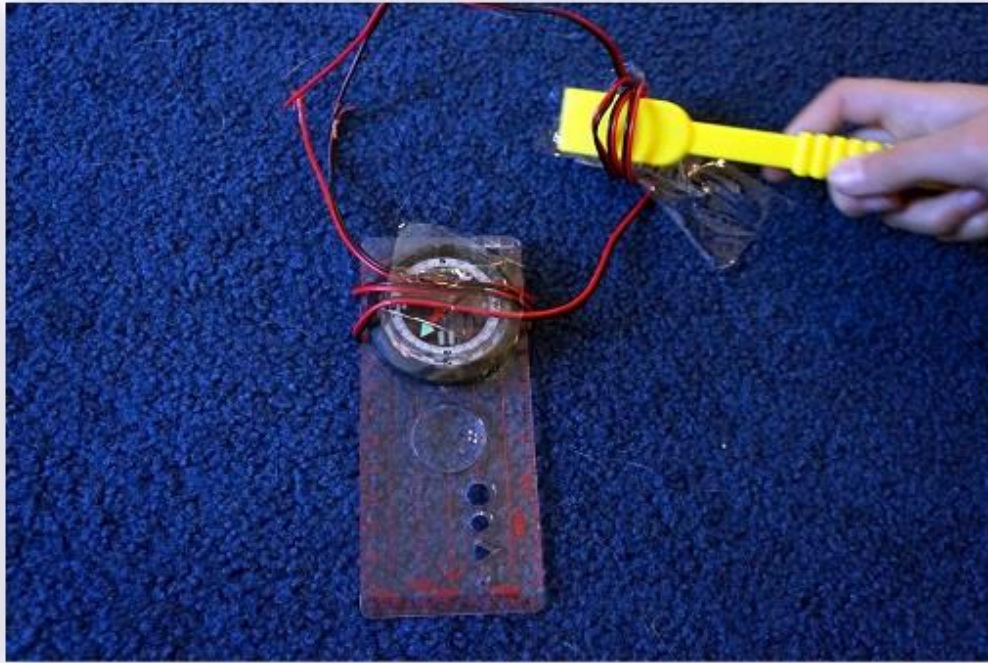
**Electrical Symbols & Electronic Symbols Matching**

Motor		Fixed resistor
Bulb		Wire
Switch, open		Load Speaker
		Single Cell Battery
		Switch, closed
		Outlet

Topics in this 30-page Unit

- The parts of an atom
- Electric currents
- Conductors and insulators
- Parts of a light bulb
- Batteries
- Volts, amps, ohms
- Electrical circuits: Power source, load, conductor
- Simple Circuits
- Direct and Alternating Current (DC and AC)
- Resistance, Resistors and How they work.
- Anode, cathode
- Electrical Symbols
- Open and closed circuits
- Short circuits
- How to draw basic electrical schematics
- Series circuits
- Parallel circuits
- Motors
- Circuit breakers and the power grid

## Create Your Own Generator



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[LED diodes](#)

[Lithium coin batteries](#)



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Electricity and Circuits Unit - Hands On Projects!



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and  
Circuits Packet**

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## Electricity and Circuits Unit: Making Simple Circuits





# Electricity and Circuits Unit

## Hands-On Activities



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### Friction:

Sometimes friction causes things to lose electrons.  
When an electron leaves it is a negative charge. **+**  
protons give it a positive charge. **-**  
build up on the surface of an object.



# Hands-On Activities in our Electricity and Circuits Unit

speculate why. Then have them try to make the battery work with a battery holder that uses 2 AAA batteries. What happens now?

We started our unit with [What is a Circuit?](#) By Ethan Weingarten It's simple, but goes over a lot of terms we'll be learning in this unit.

The next day, we read the first couple of pages of [What are Electrical Circuits](#) by Ronald Monroe.

I gave each of the kids a pile of materials and had them try to make their own electrical circuits. My older two were able to figure out the bulb and battery pretty quickly. For my younger one, I opened to pages 6 and 7 of [What are Electrical Circuits](#) and had her figure out to do with the diagram provided (rather than explaining it for her.)

I had them make both the light bulb with bulb holder work and the button battery/LED light.

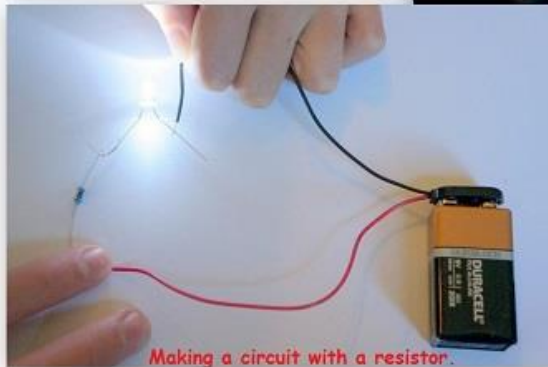
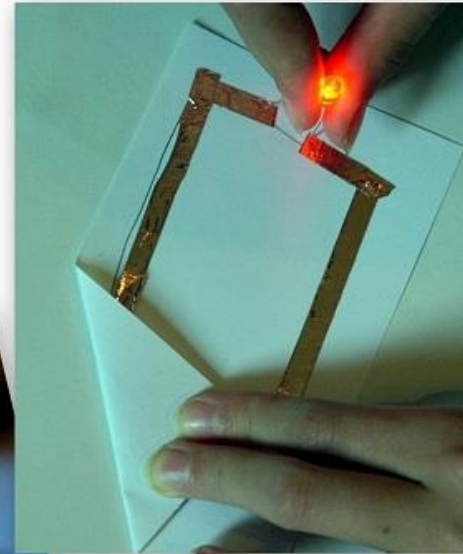
The I had them unscrew the bulb from the bulb holder and try to make the lightbulb work with just wires. It took them a little while to figure out just where to place the wires!



Electricity and Circuits Unit: Making Simple Circuits



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Making a circuit with a resistor.

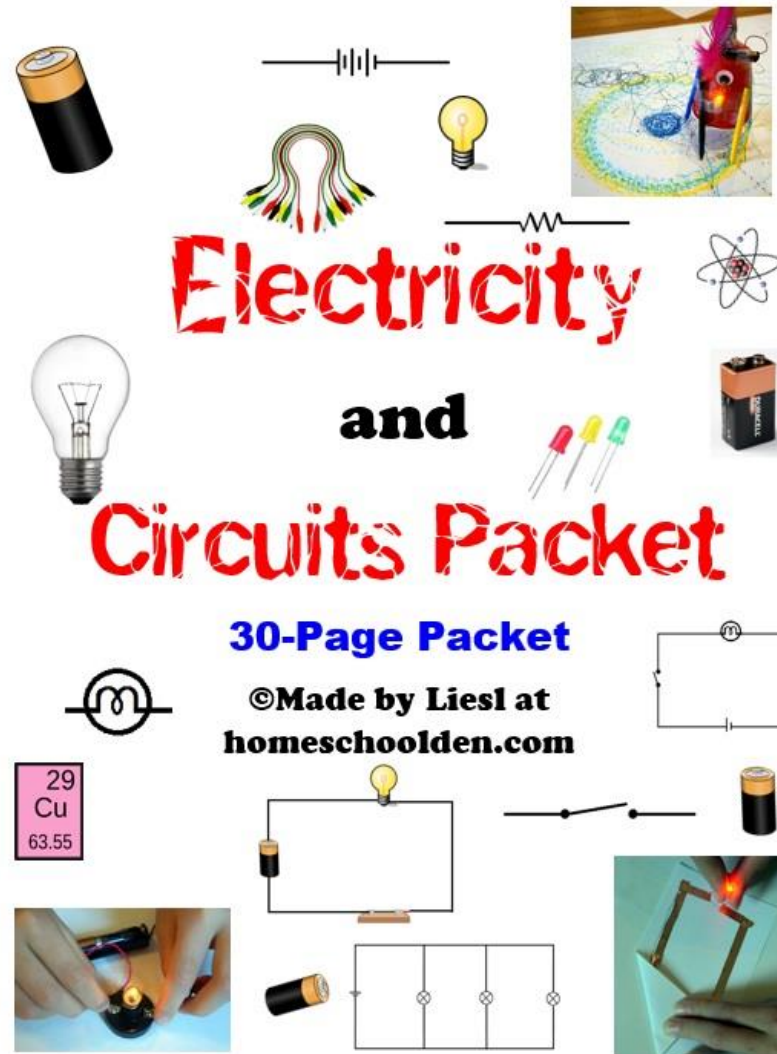


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Some of the topics and terms we talked about included:

- . The parts of an atom
- . Electric currents
- . Conductors and insulators
- . Parts of a light bulb
- . Batteries
- . Volts, amps, ohms
- . Electrical circuits: Power source, load, conductor
- . Simple Circuits
- . Direct and Alternating Current (DC and AC)
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- . Open and closed circuits
- . Short circuits
- . How to draw basic electrical schematics
- . Series circuits
- . Parallel circuits
- . Motors
- . Circuit breakers and the power grid

# My kids loved this unit because it was so hands-on!!



The collage features various electrical symbols and photographs. Symbols include a battery, a light bulb, a resistor, a capacitor, a coil, a switch, and a circuit diagram with a light bulb. Photographs show a child's project with a red robot-like figure, a hand holding a battery and light bulb, and a hand holding a glowing circuit board. A pink box contains the text '29 Cu 63.55'. The text 'Electricity and Circuits Packet' is written in red, '30-Page Packet' in blue, and '©Made by Liesl at homeschoolden.com' in black.

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**and**  
**Circuits Packet**

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