

## Activity: Lights On!



Christmas Lights

### Summary

Students in this activity will build simple circuits using a battery, wires, and light bulbs. This activity allows students to examine how electricity is conducted through a light bulb using a battery as a power source. Students will also be able to observe the differences between a series circuit and parallel circuit by building each type of circuit.

### Engineering Connection

The introduction to circuits is actually an introduction to electrical engineering. Every electrical device has a circuit designed by an electrical engineer.

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**Grade Level:** 4 (3-5)

**Time Required:** 1 hour

Expendable Cost Per Group : US\$ 20

**Keywords:** Circuit, Conductor, Current, Electricity, Energy

Related Curriculum :

subject areas    [Physical Science](#)  
                          [Science and Technology](#)

**Group Size:** 2

Activity Dependency : [Electrifying the World](#)

lessons Electrifying the World

Educational Standards

- North Carolina Science
- 3.03 Design and test an electric circuit as a closed pathway including an energy source, energy conductor, and an energy receiver. (Grade 4) [2004]
- 3.08 Observe and investigate the ability of electric circuits to produce light, heat, sound, and magnetic effects. (Grade 4) [2004]
- 3.06 Describe and identify materials that are conductors and nonconductors of electricity. (Grade 4) [2004]
- 3.07 Observe and investigate that parallel and series circuits have different characteristics. (Grade 4) [2004]
- 3.09 Recognize lightning as an electrical discharge and show proper safety behavior when lightning occurs. (Grade 4) [2004]

Learning Objectives ([Return to Contents](#))

At the end of the activity, the students should be able to distinguish the difference between a parallel circuit and a series circuit.

Materials List

- One set of Christmas lights
- One alkaline lantern battery per group (6 Volts)
- 6 alligator clips or wires
- 2 to 3 light bulbs per group (whatever size will fit into the light bulb holder)
- 1 light bulb holder per light bulb (can be found on the following website: [www.hometrainingtools.com](http://www.hometrainingtools.com))

Introduction/Motivation ([Return to Contents](#))

- Plug the Christmas lights into an outlet and explain how electrical current flows through the circuit to make the lights work. Refer to the lesson for help with this.
- Have students each take out a light bulb from the string of lights to see how current flows to the light bulb through the metal wires on the side of the light.

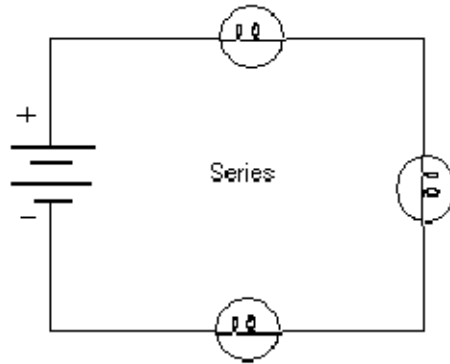
Vocabulary/Definitions ([Return to Contents](#))

*Circuit* : A path through which electrical current can flow.  
*Circuit Diagram* : An illustrative picture used to explain the paths through which electricity can flow.  
*Conductor*: A material that allows for electrical current to flow.  
*Current*: The flow of electrons through a conductor.  
*Electricity*: A source of power generated from the flow of electrical current.  
*Electron*: A small, atomic particle with a negative charge.  
*Energy* : The ability to do work.

Procedure

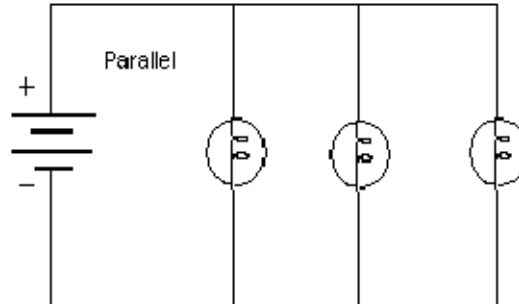
- Screw the light bulbs into the light bulb holders.
  - Build a simple circuit using one battery, two alligator clips, and a light bulb.
1. Attach one end of an alligator clip to the positive terminal of a battery.
  2. Then, take the other end of the clip and attach it to one side of the light bulb holder's conducting

- material (typically this is another piece of metal).
3. Take another alligator clip and attach one end to the other side of the light bulb holder's conducting material.
  4. Finally, attach the free end of the second alligator clip to the negative terminal of the battery to complete the circuit.
- Now using the picture below as a guide, build a series circuit.



Series Circuit

- Now, using the picture below, try to build a parallel circuit.



Parallel Circuit

### Safety Issues

- Make sure the Christmas lights are not plugged into an outlet while the students are trying to remove the bulbs from the circuit.

### Troubleshooting Tips

- Make sure the batteries are new.
- Make sure that none of the lights are broken.
- Make sure that all the wires are securely attached to each connection point to avoid gaps in the connections (short circuits).

Investigating Questions ([Return to Contents](#))

- Ask students what would happen if the battery were turned around in the circuit? Have them explain why they think this is so.
- Ask students if they think light bulbs in series would be brighter or light bulbs in parallel? Why?
- Allow students to re-examine the string of lights and ask what happens when they remove certain light bulbs along the string of lights. Have them explain what they see in terms of circuit type.

#### Assessment ([Return to Contents](#))

- Have the students briefly describe the differences between a parallel and a series circuit.
- Have them draw a simple sketch of a parallel and a series circuit.

#### Activity Extensions ([Return to Contents](#))

- Ask students when buying Christmas lights, what kind of lights would be the best to buy in terms of circuit set up.

#### Activity Scaling

- For students who have a good understanding of how to build a circuit, have them build a combination series and parallel circuit.

#### References ([Return to Contents](#))

##### How light bulbs work

How light bulbs work, <http://science.howstuffworks.com/light-bulb.htm>, 6/15/04. [How light bulbs work.](#) - This website describes how a light bulb works.

##### Comparing Parallel and Series Circuits

Comparing Parallel and Series Circuits,

[http://www.msnuceus.org/membership/html/k-6/as/technology/4/ast4\\_3a.html](http://www.msnuceus.org/membership/html/k-6/as/technology/4/ast4_3a.html), 6/15/04. [Comparing Parallel and Series Circuits](#) - This website offers a post lab in circuits.

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#### Supporting Program ([Return to Contents](#))

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