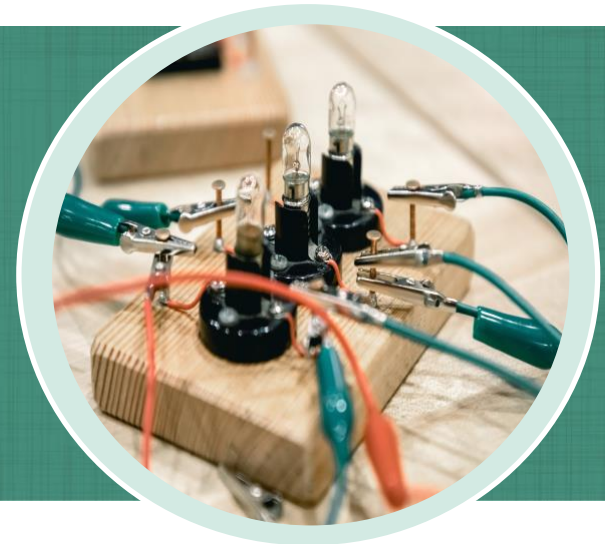


Virtual Circuits



Electricity All Around Us
Learner Activity Instructions
Grade Level: 5-8

What you will learn:

In this activity, you will learn the effects of connecting batteries in different combinations. What are the effects on the power supply and the life of the battery? You will complete this activity on the Internet and will have immediate feedback on the effects of the various battery combinations you choose. You'll know the reason why some battery-operated devices need more batteries and the best way for the batteries to be connected.

What you will need:

For this activity, you will need to print the learner worksheet (or ask your educator to print it for you).

Background

Electrical Circuits: Electrons Get A Round Trip Ticket

The word "circuit" means "loop". For electrons to flow, they need to be able to travel in an unbroken loop. They need to be able to move freely through conductors from their source, to the appliance, and back. A circuit where electrons are free to flow in this way is said to be "closed", meaning the electrons are moving in a closed loop. If anything breaks this path, the flow of electrons stops. When the flow of electrons is interrupted, the circuit is said to be "open".

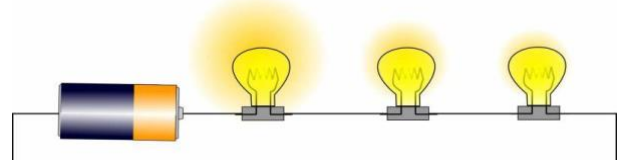
Usually, electricity is used to do some kind of work, such as making light, heating food, blowing air, or other things. The appliance that does the work needs a supply of electricity so it can function. Many

appliances used in our homes tap into the electrical supply of the house with a two or three-pronged plug that fits into an electrical receptacle on the wall. When it is turned on, the appliance uses as much electricity as it needs to do its work.

Series Circuits

In the following diagram, three lamps have been connected in a series. In a series circuit, the electrons must all flow from one appliance to the next. Each lamp in the series causes the electrons to slow down so that the lamps do not all light up with the same brightness. The last lamp in the series is the dimmest because the electrons moving through it are moving more slowly than in the first lamp. You can also connect batteries in series. Batteries in a series do the exact opposite of lamps. Each battery adds more electrons to the flow so that the voltage in the circuit is increased. Two batteries increase the voltage to 3 volts, and 3 batteries would raise the voltage to 4.5 volts. The greater the voltage, the brighter the lamp.

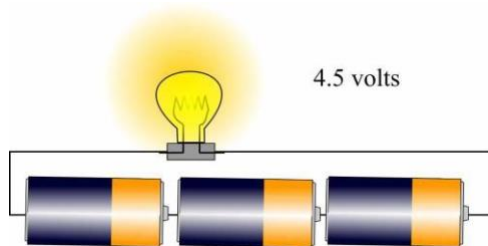
Many battery-powered appliances have batteries that are connected in series in order to increase the voltage. Try opening a flashlight. You will find that the batteries are arranged in series. Most contain two batteries and produce 3 volts in order to make the lamp shine more brightly.



Parallel Circuits

Parallel circuits are used extensively in homes, computers, automobiles, and other electrical devices. In three lamps connected in parallel, electrons flow at the same speed through all three lamps. The result is that all three lamps will shine at the same brightness. The circuits that provide electricity to the outlets and appliances in your home are all parallel circuits. A single circuit may have 3 or more appliances or outlets connected to it. All the appliances on that circuit must share the electricity equally.

You can connect batteries in parallel as well. In this case, the voltage of the circuit is not increased, but more electrons are available to the appliances on the circuit. The appliance can run for much longer because there is a larger supply of electrons. Connecting several batteries in parallel allows the batteries to last much longer than if they were connected in series.



How to do it

1. Connect to the animation web page found here: <http://science5.greenlearning.ca/D-activity1.php>.
2. The web page allows you to choose different options for a power supply. You can choose one battery, two batteries and different methods for the battery connections. Once you make your choice, click the "on/off" switch to see the effects on the voltmeter, the motor and the battery life.
3. Once you've had a chance to explore all of the options on the web page, answer the questions on the worksheet. Be prepared to discuss the answers in class with your educator.

As you explore and complete this activity think about these questions:

1. Why do some battery-operated devices require more batteries?
2. What does the number of batteries required to operate a device tell you?
3. Are all battery-operated devices connected in the same method? Why?