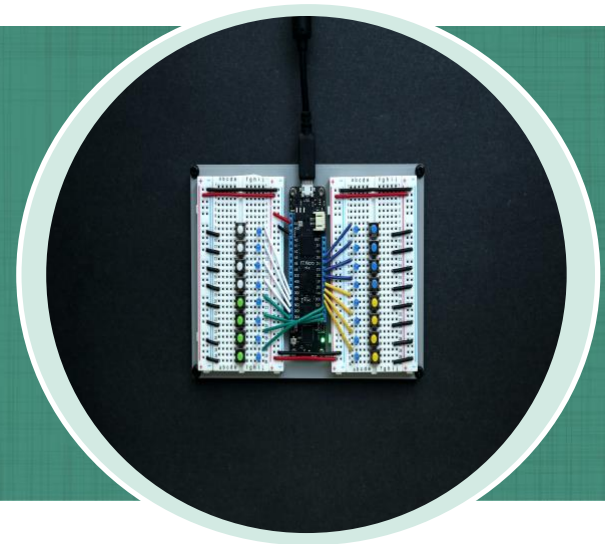


Building Parallel and Series Circuits

Electricity All Around Us
Activity
Grade Level: 5-8



Main Objectives

This is a hands-on activity designed to reinforce the notion of parallel and series circuits. Learners will find the idea of series and parallel circuits much easier to understand if they can manipulate real materials and can be rewarded by building successful circuits.

Learning Outcomes

By the end of this activity, learners will:

- Demonstrate a parallel and series circuit
- Identify the differences between parallel and series circuit
- Understand that bulbs in a series will light up dimly
- Understand that bulbs in parallel will light up brighter

Length of Activity

1.5 hours

Materials List

Building Parallel and Series Circuits Learner Activity Instructions
Building Parallel and Series Circuits Learner Worksheet

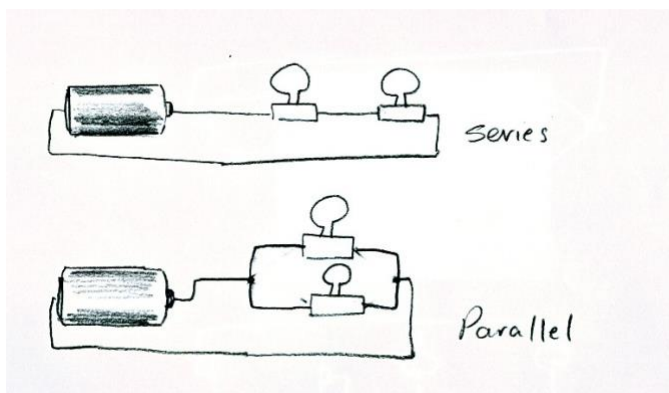
For each learner group:

- 2 Bulb holders
- 1 Battery
- 1 Battery holder
- 2 Bulbs

6 Insulated copper wires (each piece 10 to 20 cm long, ends stripped OR insulated copper wires with alligator clips on the ends, these can be purchased at Radio Shack in packs and are reasonably priced)

Background

A series circuit is defined as a circuit where the electrons move from one load or resistance (e.g. a light bulb) to another in succession. Each electron must pass through every load in the series. As electricity passes through each load, the resistance increases, reducing the flow of electricity. As a consequence, each light bulb in the series is dimmer than the previous one. Also, any break in the circuit will interrupt the flow to all the loads. Some Christmas tree lights are built as series circuits. When one bulb burns out, the entire string turns off. A parallel circuit is one where two or more similar loads share a common connection to their supply of electricity. The flow of electrons splits at the point of the common connection and electrons can move with equal ease through each load in the circuit. For this reason, two or more light bulbs connected in parallel will be equally bright. Removing one of the lights will not affect the flow of electricity to the other lights. In homes, a single wire to a power supply can connect several outlets. Because they are wired in parallel, all the appliances receive the same amount of electricity, and all will work, regardless of appliances being "on" or "off" or not working.



Bring in two strings of Christmas tree lights. One in series the other in parallel. Demonstrate what happens to each string when one bulb is removed.

If your science lab has a variable direct current power supply, you can demonstrate the effect of having several bulbs in series. Connect a series of 10 or more three-volt flashlight lamps in bulb holders, and connect them to the power supply. At lower settings, only the first two or three bulbs will light up. By turning the dial, more and more of the bulbs will light up. Try this in a darkened room for dramatic effect!

Substitute small electric motors (available at a minimal cost from Radio Shack) for light bulbs.

Comprehension

You may wish to test learners' comprehension of the basics of parallel/series circuits using the following questions:

- Can you think of other examples of series and parallel circuits that we might use in our homes or at school?
- Ask the learners to describe the difference between a series and a parallel system.
- What are the advantages of having household appliances connected in parallel rather than in series circuits?

Procedure

1. Explain to the learners that they will be doing an experiment that illustrates the differences between series and parallel systems.
2. Print and distribute the learner worksheet.
3. Have learners review the background information on their worksheet.
4. Review the concept of parallel and series circuits.
5. Divide the learners into small groups.
6. Distribute the materials.
7. Have the learners build their series and parallel circuits. Remind learners to complete their drawings and questions as they build their circuits.
8. Assign alternate groups to build a series and parallel circuit. Have the learners compare the two circuits side by side. **Note:** the main difference will be less light emitted from the second light bulb in the series circuit compared to the two light bulbs in the parallel circuit.
9. Have the learners complete the rest of the questions on their worksheet.
10. At the end of the class take a few minutes to debrief the activity. Ask learners some reflective questions:
 - a. What did you notice?
 - b. What made the activity work successfully?

Tips and Extensions

At home, have learners test their Christmas lights to determine if they are series or parallel circuits.