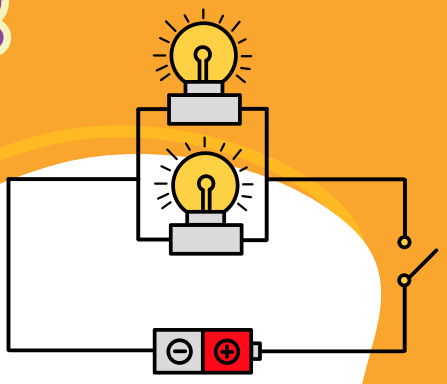
PARALLEL OR SERIAL?



Unite/Theme: Electrical Circuits

Pursope: To enable students to observe the differences in brightness in circuits where bulbs are connected in series and parallel, and to interpret the results.

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MEB Learning Outcomes

F.7.1.1.3.
Explains the relationship between technology and space exploration.

F.7.1.1.4.
Explains the structure of a telescope and its purpose.

F.7.1.1.5.
Makes inferences about the importance of the telescope in the development of astronomy.

F.7.1.1.6.
Prepares and presents a simple telescope model.

What Do You Know

- Is there always only one bulb in a circuit? ☐
- Do bulbs in each circuit light up with the same brightness? ☐

Explain what you know!

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Let's Spark Curiosity

Let's start exploring!

The bulbs we use in our homes sometimes shine very brightly, while other times they appear dimmer. Even when the same bulbs are used, the change in brightness may be related to how the bulbs are connected in the circuit. So, are bulbs always connected in the same way? How do series and parallel connections affect the brightness of bulbs? In this activity, we will set up circuits with bulbs connected in series and parallel, compare their brightness, and explore how the connection type affects brightness.

The activity video is watched by pausing at intervals. Before starting the activity, the contents of the set are checked. All steps for opening covers and packages are done simultaneously with the students.

Set Contents

- [ ] Wooden telescope template
- [ ] Two lenses
- [ ] "Nature's Wonders of Space" activity sheet
- [ ] "Nüzhet Gökdoğan" scientist card

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How Do We Do It

1. All parts are removed from the wooden telescope template.
2. The large and small wooden pieces are separated into two groups.
3. Three of the small wooden pieces are connected together, and the small lens is inserted into the scratched slot of the pieces.
4. The remaining third piece is attached, completing the observation tube.
5. The large wooden pieces are taken, and three of them are connected together.
6. The large lens is inserted into the scratched slot of the wooden pieces.
7. The observation tube is placed into the large body.
8. The remaining third piece is attached, completing the other part of the telescope, the objective part.
9. The model telescope is ready!
10. Move it back and forth, and discuss how the appearance of objects changes.

What Should Future Scientists Explore

The following questions are asked to the students:

- In what ways are bulbs connected in a circuit?
- Which type of connection might be used in the lighting in our homes?
- If one bulb in a series circuit burns out, will the other bulbs still work?

What Are Series and Parallel Connections?

In a simple electric circuit, components such as a battery, connecting wires, and bulbs are used. These components can be assembled in different ways depending on their purpose to create different types of circuits. In simple electric circuits, each component has two terminals. For example, a battery has two terminals: positive (+) and negative (—). Bulbs can be connected in two different ways in electric circuits: series connection and parallel connection.

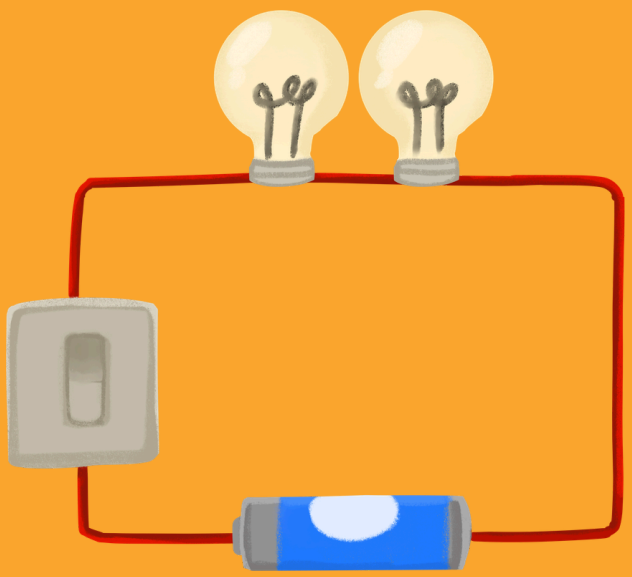
Series Connection

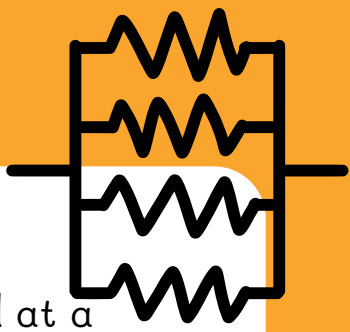
Connecting bulbs end-to-end on the same wire is called a series connection.

In series circuits, the energy from the power source is transferred through a single path. Bulbs connected in series emit light with equal brightness if they are identical.

As the number of bulbs in a series circuit increases, the brightness of each bulb decreases.

If any bulb in a series circuit is removed, all bulbs go out. Similarly, if one bulb burns out, the other bulbs also go out.





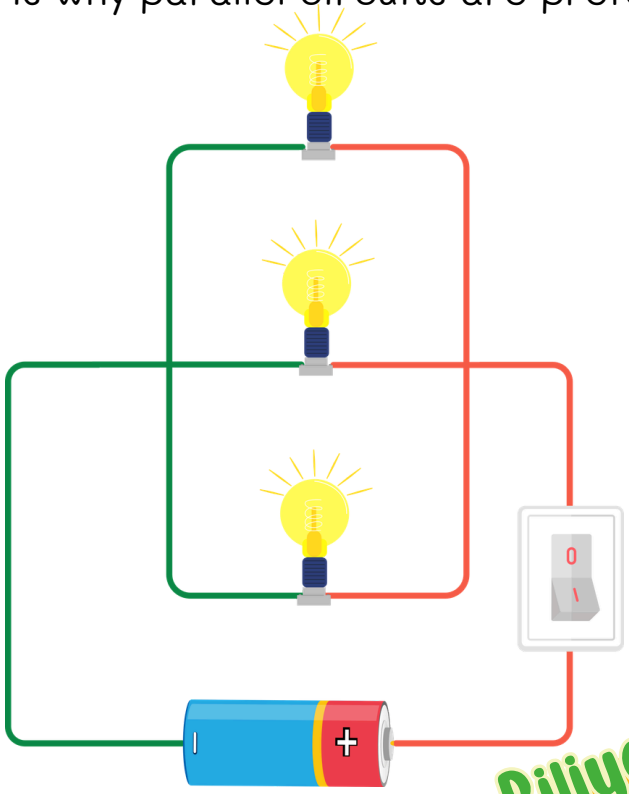
Parallel Connection

A connection in which one terminal of each bulb is joined at a common point, and the other terminals are also joined at another common point, is called a parallel connection.

In parallel circuits, identical bulbs connected to the circuit emit light with equal brightness. Unlike series circuits, increasing the number of bulbs in a parallel circuit does not affect their brightness.

If one bulb is removed (or burns out) in a parallel circuit, the other bulbs continue to shine.

In our homes, parallel circuits are generally preferred over series circuits because each lamp and device works independently. When a bulb fails or is turned off, the others continue to work. Additionally, in a parallel connection, every device receives the same voltage, so bulbs operate brighter and more evenly. This ensures ease of use and safety, which is why parallel circuits are preferred in households.



Biliyor Musun?

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A scientific explanation for the curious

Students are asked the following questions:

Where are series and parallel circuits used in daily life?

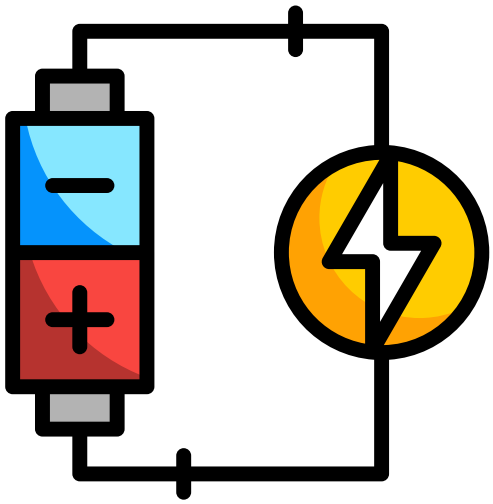
What is electric current? How is electric current provided in a circuit?

Parallel connection is common in living spaces such as homes and schools. Lighting systems, sockets, televisions, refrigerators, and washing machines in homes are connected in parallel. This way, when one device is turned off or breaks down, the others continue to operate, and all devices receive the same voltage.

Series connection is generally used in decorative and warning circuits. Christmas lights, some toys, flashlights, and simple battery-operated circuits are examples of series connections. In series circuits, when one bulb fails, the circuit is interrupted and all the bulbs go out.

ELECTRIC CURRENT

Electric current is the orderly movement of electric charges (electrons) through a conductor. For electric current to occur in a circuit, an energy source such as a battery, conductive wires, and a closed circuit are required. When the circuit is closed, the energy provided by the battery causes electrons to move, thus producing electric current.



Question of the Day

A device that measures the current in an electric circuit

What Did We Discover?

"Today, we learned with you how bulbs are connected in series and parallel in electric circuits and observed through experiments how these connections affect the brightness of the bulbs. So, how did you feel during this activity?"

What Else Can We Do?

Come on, you try it too!

Dear Teacher,

Together with your students, you explored and discovered how the brightness of bulbs changes depending on series and parallel connections by building electric circuits and observing them. You can conduct the activity "What Happens If We Remove a Bulb?"

Materials:

- 3 bulbs
- 2 batteries
- Connecting wires
- Bulb holder

Procedure:

1. Build a series circuit with three bulbs together with the students.
2. Turn on the circuit and observe the state of the bulbs.
3. Remove one bulb from the series circuit and observe what happens to the remaining bulbs.
4. Using the same bulbs, build a parallel circuit.
5. Remove one bulb from the parallel circuit and observe the state of the other bulbs.

Conclusion:

Students discover that in a series circuit, removing one bulb stops the entire circuit from working, whereas in a parallel circuit, the other bulbs continue to light.

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