

LET IT FLOW, LET IT FLOW, LET IT FLOW

BENCHMARKS and TASK

SC.B.1.2.1 The student knows how to trace the flow of energy in a system (e.g., as in an ecosystem).

SC.B.1.2.2 The student recognizes various forms of energy (e.g., heat, light, and electricity).

- The student designs a complete circuit to convert electric potential energy to light energy.

KEY QUESTION

What is the difference between the flow of electricity in a series circuit and a parallel circuit?

BACKGROUND INFORMATION

There are two basic types of electric circuits – series and parallel. In both types of circuits, a complete path beginning and ending with the power source (the D-cell) is necessary before current can flow and provide energy to the power users (the bulbs). Any break in the path stops the movement of charges. In a series circuit, there is only one pathway for the current and a break in the circuit will stop the current. In a parallel circuit, there may be several pathways. If there is a break in one pathway, the current will pass through the other pathways. The current will stop only if all of the pathways have breaks.

Resistance is also a factor in electric circuits. Resistance is any thing that hinders the flow of electricity. The amount of resistance is determined by the material, length, thickness, etc. of the conductor; the number of electrical devices, such as motors, bulbs, etc. that are part of the circuit; and the type of circuit – series or parallel.

MATERIALS

Teacher

string of Christmas lights

Per group

2 D-cells

3 flashlight bulbs and holders or
miniature Christmas lights (optional)

7 pieces of wire (15-20 cm)

2 pieces of wire (30-40 cm)

Let It Flow, Let It Flow, Let It Flow sheet

wire strippers

TEACHING TIPS

1. Strip 3 cm of insulation from the ends of the wire or substitute aluminum foil strips backed with masking tape for the wire.
2. Miniature Christmas tree lights can be cut apart and substituted for the flashlight bulbs and bulb holders.

ENGAGE

Display a string of Christmas tree lights. Plug the lights into the outlet. Explain that many years ago all Christmas tree lights were connected in such a way that if one light burned out, the whole string of lights would go out. Someone would have to check each bulb to find the one that was burned out.

Today newer strands may have an alternate path for electricity to flow through if a bulb burns out. Tell students that they are going to explore both types of circuits.

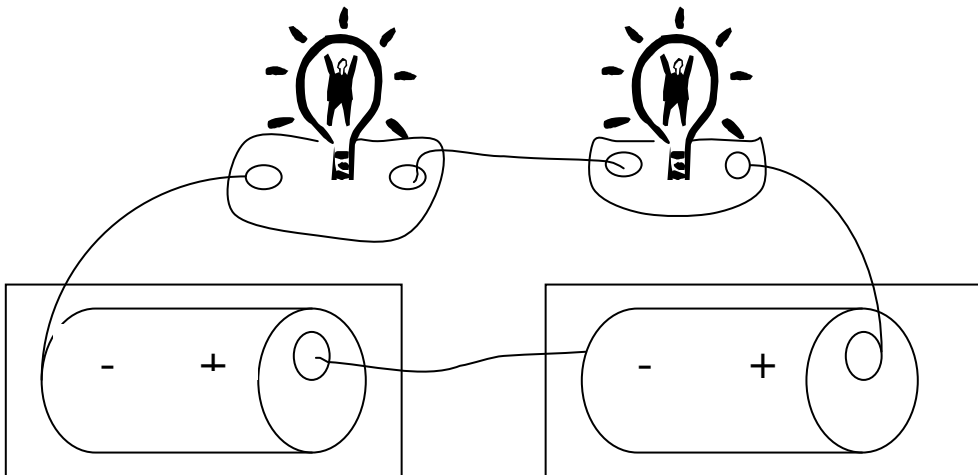
EXPLORE

Distribute materials to each group.

1. Pose the following questions:
How can you make two light bulbs...
 - a. *light in such a way that when you unscrew one, the other one goes out?*
 - b. *light in such a way that when you unscrew one, the other one stays lit?*
2. Allow ample time for students to explore their ideas. If a group finishes early, encourage them to continue exploring ways to answer the question.
3. Remind students to draw their results on the activity sheet.
4. Ask students to compare the brightness of the bulbs in each of the types of circuits they construct.
5. Tell students to record their observations on the activity sheet.

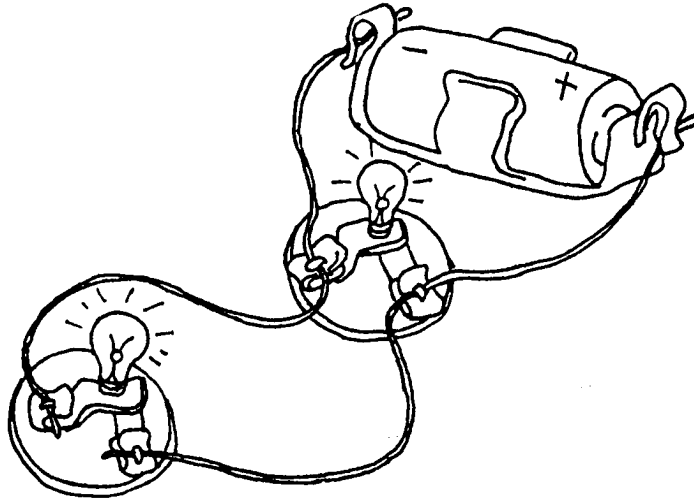
EXPLAIN

1. Ask: *How did you make two bulbs light so that when you unscrewed one the other one also went out?* Ask volunteers to present examples of this type of circuit to the class. (Note: They may either build it or draw it.)
2. Introduce the term series circuit. In a series circuit, there is only one path for the current and a break in the circuit stops the current. One example is shown below.



3. Ask:
Why did the second bulb in the series circuit go out when one bulb was removed?
How did you make two bulbs light so that when you unscrewed one, the other one stayed lit?
4. Encourage volunteers to present examples of this type of circuit to the class by drawing or building circuits.

5. Introduce the term parallel circuit. In a parallel circuit, there are multiple pathways or branches. If there is a break in any branch, the current will still go through the other branches. One example is shown below.



6. Ask:
Why did the other bulbs in the parallel circuit stay lit when one bulb was removed?
In which circuit were the bulbs brighter – series or parallel?
What do you think is the most common household circuit used - series or parallel? Why would that type circuit be better?

EXTEND/APPLY

1. Say: *Remember the Christmas tree lights that I showed you earlier - where all the bulbs would go out when only one bulb burned out? Do you think they were connected in a series or a parallel circuit? Why?*
2. Ask students to think about why a plug on an electrical device has at least two prongs. (A circuit must provide a complete, unbroken path before charges can move from the power source through the power user and back to the power source. The two prongs provide a way for the current to come into the appliance that uses the electricity and also to return to the power source.)

EXTENSIONS

1. Add switches to the circuits.
2. Try three or more bulbs in the circuits. Have students predict what will happen.

ASSESSMENT

Divide a piece of drawing paper in half. On the left side of the paper, draw and label a picture of a series circuit. On the right side of the paper, draw and label a picture of a parallel circuit.

Compare and contrast the two types of circuits.

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1. Our circuit looked like this when ...
2 bulbs were lit, we unscrewed one, and the other one went out.
(Draw the circuit.)

This is an example of a _____ circuit.

2. Our circuit looked like this when ...
2 bulbs were lit, we unscrewed one, and the other one stayed lit.
(Draw the circuit.)

This is an example of a _____ circuit.

3. _____ circuits are brighter because _____
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