I FINALLY SEE THE LIGHT

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.

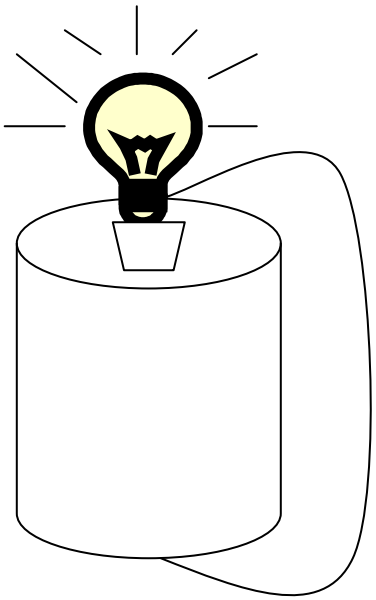
KEY QUESTION

How can you light a bulb?

BACKGROUND INFORMATION

A battery has a positively charged terminal and a negatively charged terminal. In a closed circuit, electric charges are repelled by one terminal and attracted to the other terminal. This attraction and repulsion provides the push that keeps the electric charges moving.

In order for current to flow through a bulb, the bulb must be connected to the circuit at two points, the tip contact (the metal button at the bottom of the bulb) and the base contact (the metal side of the bulb's base). Students will discover this through exploration with the materials. To make the bulb light with the materials in the following activity, either the base contact or the tip contact of the bulb must touch one terminal of the D-cell. The paper clip or wire must connect the cell's other terminal to the remaining contact. (One way to do this is shown in the illustration below. Students will discover other ways.)



A light bulb contains a wire called a filament. When current passes through the filament, electric energy is converted into thermal energy. Eventually, the filament gets so hot that it starts to glow, giving off light.

MATERIALS

Teacher

The Way Things Work by David Macaulay

Per pair of students

(Part 1)

bag containing:
- 1 D-cell
- 1 flashlight bulb
- 10-15 cm wire
- *I Finally See the Light* activity sheet
- wire strippers (if needed)

(**Part 2)**

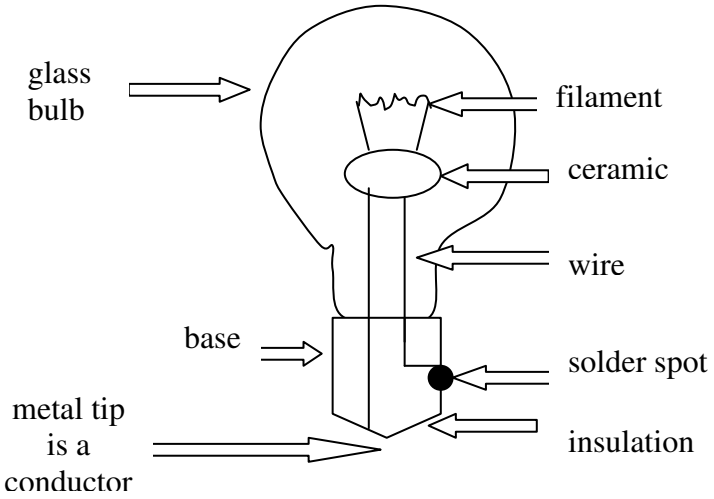
additional wire
Will I See the Light? activity sheet

TEACHING TIPS

1. Test bulbs and cells beforehand to be sure they are working.
2. Part 1: The D-cells, bulbs and wire should be placed in baggies ahead of time. Each pair receives one bag.
3. Although D-cells work best for this activity, C- or AA-cells can also be used.
4. About 2-3 cm of insulation should be stripped from the ends of the wires so that a good connection can be made. (A good substitute for wire is narrow strips of aluminum foil backed with masking tape and folded in half lengthwise with the masking tape on the inside.)
5. Part 2: Reserve the additional wire to distribute during this part.

ENGAGE

1. Using David Macaulay's book, *The Way Things Work,* examine the components of a light bulb and discuss how they work.
2. Show students a cross section of a light bulb. Have students sketch the bulb and label the parts.



3. Show students a flashlight bulb. Ask: *How can I light this bulb?* Record students' responses.

EXPLORE (Part 1)

1. Distribute a plastic bag of materials and the *I Finally See the Light* activity sheet to each pair of students. Challenge students to light the bulb using only the materials in the bag.
2. After students have succeeded at lighting the bulb, encourage them to continue their exploration using the same materials to discover other ways to light the bulb.
3. Have students record their results on the *I Finally See the Light* activity sheet.

EXPLAIN Part 1)

1. Ask:
   What were some ways you were able to light the bulb? (Choose different student pairs to draw their ideas on the board.)
   How many different ways were you able to light the bulb with these materials? (Direct students' attention to the drawings on the board and count the number of different ways to light the bulb.)
   When examining the different ways in which you were able to light the bulb, what were the similarities among the systems that worked?
2. Discuss the concept that in order for the bulb to light, either the base contact or the tip of the bulb must touch one terminal of the D-cell. The wire must connect the cell's other terminal to the remaining contact, which is on the side of the bulb.
3. Introduce the term *complete circuit*. Explain that any system that caused the bulb to light is a complete circuit.

EXPLORE (Part 2)

1. Distribute *Will I See the Light?* activity sheets and the extra wire to each pair of students.
2. Have students predict which of the pictured systems will light. Students should write *yes* or *no* in the prediction box provided.
3. Instruct students to build each system pictured and observe whether or not it lights the bulb. Students should record *yes* or *no* in the actual box. (Note: Systems 1, 2, 3, 6 and 8 show complete circuits.)
4. When groups have finished testing all the systems, have them compare their predictions to the actual results.

EXPLAIN (Part 2)

Which systems did not light the bulb? (4, 5, 7)
Why did these systems not work? (They were not complete circuits.)

EXTEND/APPLY

Show students some burned-out light bulbs. Try to determine where the complete circuit was broken. It is usually the filament. (Note: Students should not handle broken bulbs.)

EXTENSION

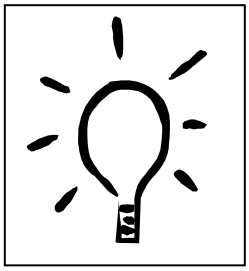
Have students use a battery (two or more cells linked together) as a part of the circuit and notice any difference in the brightness of the bulb. (Note: Don't let students use more than two cells or bulbs may be burned out quickly.)

ASSESSMENT

Ask students to respond to this question in their journals: *Why is filament important in a light bulb and what would happen if it were broken?*

Names _____

I FINALLY SEE THE LIGHT!



Draw pictures to represent all the ways you were able to light the bulb.

WILL I SEE THE LIGHT?

Names _____

Write Yes or No

	Prediction	Actual
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.