



30 minutes



Grades
6–8, 9–12

Make a Lightbulb

Construct a lightbulb and see how long you can get it to glow!

Instructions

Students construct a lightbulb and see how long they can get the filament to glow.

Safety note: **This activity requires adult supervision.** Filaments will get very hot before they burn out. Make sure that students wear gloves and safety glasses and handle filaments with care—and that they don't touch filaments that are hot. Caution students to never play with wall sockets or household electric current.

ACTIVITY:

- 1** See if students know who invented the lightbulb. Explain that Thomas Edison worked with a team of inventors to create the first practical working lightbulb. Ask students to take a guess at how many tries it took before they succeeded. Reveal that they tried hundreds of times, with a wide range of materials—from cardboard to palm leaves to bamboo and hemp. Today is their chance to find out what it might have been like to finally achieve some success at getting a lightbulb to work.
- 2** Divide students into small teams. Teams need to designate one member as the timekeeper.

Materials

PER TEAM:

- Small jar
- Cork stopper for a jar lid
- 1" nail
- Hammer or blunt object for drilling nail through cork
- 3 feet of shielded copper wire
- Wire strippers
- 1 six-volt lantern battery
- Thin iron wire (best source is unraveled picture-hanging wire)
- Paper or small notebook
- Pencil

ACTIVITY (CONTINUED):

- 3** Distribute materials to each team. Emphasize safety practices students must follow before providing the following instructions:
 - Cut the copper wire into 18" lengths. Strip an inch of plastic coating off each end of each strand of wire.
 - Use the nail to drill two holes from the top of the cork through to the bottom of the cork.
 - Push the stripped ends of each piece of wire through one of the holes so that you can see about 2" of each wire on the other side of the cork.
 - Wrap the ends of the copper wires halfway around the pencil to make hooks. You need the hooks so that you can twist strands of iron wire around them to make a filament.
 - If you are using picture-hanging wire, unwind it so that you can use individual fine strands of iron wire.
 - Twist two strands of the thin iron wire together. Stretch the strands across the gap between the two copper hooks to form the filament. Twist each end of the strand around a copper hook to hold it in place.
 - Put the cork stopper with the filament inside the jar.

- 4** The timekeeper needs to be ready to start keeping time now. Instruct students to carefully hook up both ends of the copper wire to the battery. Use a small piece of electrical tape to attach one end of the wire to the positive end of the battery and the other to the negative end of the battery. The lightbulb will light up! Tell the timekeeper to start the stopwatch and time how long it glows before it burns out. Take notes of how long it glowed.

- 5** After the filament has stopped glowing, tell students to unhook the ends of the wire from the battery.

- 6** Students should wait 2 minutes before pulling the cork out of the jar. Wearing safety gloves, they should remove the filament, let it cool, and throw it away.

- 7** Ask the teams: Think about how to make a filament that might glow for a longer time. Test it, using a stopwatch, and record each time. Try this a few times with variations on the filament.

MATERIALS (CONTINUED):

- Wire snippers
- Electrical tape
- Ruler or measuring tape
- Stopwatch

PER STUDENT:

- Safety glasses
- Gloves



Engineering & Science Connections

- Electrical current is the flow of electrons, usually from the positive terminal of the battery to the negative terminal. In an electric lightbulb, the electrons flow from the battery, through the filament and back to the battery. When the electrons pass through the filament, they produce heat and make the filament glow.
- Edison's first filament was made from carbon, but he soon replaced it with a bamboo filament that stayed lit for up to 1200 hours. After trying different metals, most light bulb companies settled on tungsten. Scientists also discovered that coiled filaments last longer than straight ones.
- Engineers and scientists continue to develop new types of lightbulbs. Fluorescent lightbulbs produce light by passing an electrical current through a long glass tube filled with gas. Light Emitting Diodes (LED) bulbs use a semiconductor, a solid substance that conducts electricity more slowly than metal, to turn electricity into light. LEDs are the most efficient bulbs today. They can last up to 50,000 hours.

Guiding Questions ?

Would twisting more pieces of iron wire together make a longer-lasting filament?

What would happen if you made the filament have little coils in it before you attached it to the copper wire hooks?

What do you think would happen if you used a different voltage of battery?

Do you think a bigger jar would make any difference in how long the filament lasts?

This activity provided by Lemelson Center for the Study of Invention and Innovation, Smithsonian Institution.