

## Activity 2

# Light Bulb Challenge

### PUT THE LIGHT BULBS IN YOUR HOUSE TO THE TEST.

Ever wonder if those funny looking compact fluorescent light (CFL) bulbs are really worth it? Traditionally, incandescent bulbs have been used to light our homes and schools, but they are not very energy efficient. Why? Some of the electricity used is lost to heat. Let your girls see firsthand the difference between the two types of bulbs (see below) and encourage them to make the switch!

**SMART START:** Set up three stations ahead of time. Either post instructions at the stations, or explain to the girls what to do.

#### Here's how:

**1. Question.** Ask your girls to break into small groups,<sup>1</sup> and deliver the **SciGirls Challenge:** Are incandescent or compact fluorescent light bulbs more energy efficient? Brainstorm ways to test this before rotating through each station.<sup>3</sup> The activities can be done in any order.

### You'll Need:

#### For Station 1:

- ◆ incandescent bulb, any wattage
- ◆ 1 desk lamp, shade included
- ◆ 1 tbsp. cooking oil
- ◆ 1 dropper
- ◆ half-sheets of plain paper (1 per small group)
- ◆ ruler
- ◆ 2 books of equal thickness
- ◆ stopwatch or clock
- ◆ paper and pencils
- ◆ optional: thermometer

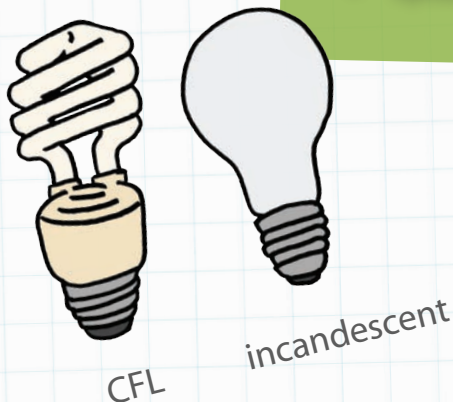


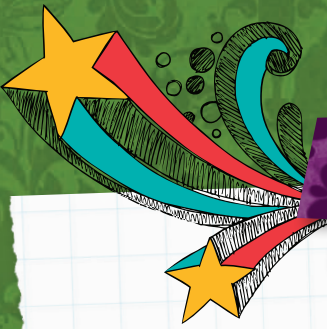
#### For Station 2:

Same items as Station 1, but substitute a compact fluorescent light (CFL) bulb for the incandescent bulb. Be sure to choose two bulbs with equivalent light outputs. (For example, a 15-watt CFL is equivalent to a 60-watt incandescent.)

#### For Station 3:

- ◆ paper and pencils
- ◆ optional: calculator



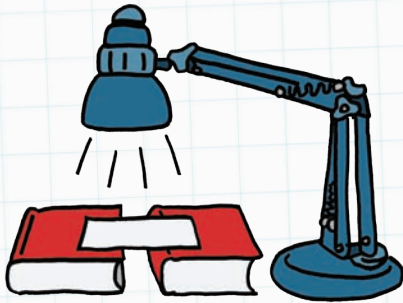


# Light Bulb Challenge continued

**Station 1: Measure the heat output of an incandescent bulb.** Have girls perform these steps:

- ★ Make a bridge with a half-sheet of paper and books and place the lamp about 6 in. from the paper. (See below.)
- ★ Carefully place 1 small drop of oil on the paper and *quickly* measure the initial diameter of the oil circle.
- ★ Turn on the lamp and observe for 5 min.
- ★ Measure the diameter again (quickly!), record the results, and calculate the difference.

**Station 2: Measure the heat output of a CFL bulb.** Have the girls repeat the experiment in Station 1, but substitute a CFL for the incandescent bulb.



**POINTER:** To better understand the heat output from each bulb and its effects on the oil, have girls hold a thermometer about 1 in. from each bulb for 1 min. and record the temperatures. Or girls can hold their hand under the bulb for a few seconds and talk about what they felt. <sup>6</sup>

**Station 3: Calculate the amount of energy used.**

Present the following word problem: "When your neighbors go on vacation, they set a timer to turn on a lamp at 9 p.m. each night and turn it off at 6 a.m. each morning. How much energy would this light use in two weeks if it used an incandescent bulb? If it used a CFL bulb?" <sup>2</sup>

$$\text{hours of use} \times \frac{\text{wattage of bulb}}{1000} = \text{energy used (kilowatt-hours [kWh])}$$

First, find the total hours the light is on during the two-week period.

$$9 \text{ hours/day} \times 14 \text{ days} = 126 \text{ hours}$$

Then, find the energy used by each bulb.

Incandescent bulb:

$$126 \text{ hours} \times \frac{60 \text{ Watts}}{1000} = 8 \text{ kWh}$$

CFL bulb:

$$126 \text{ hours} \times \frac{15 \text{ Watts}}{1000} = 2 \text{ kWh}$$

- Share.** Reconvene the entire group to discuss results. How do the findings from each station compare? (Incandescent bulbs give off more heat than CFLs, causing the oil to spread farther. They also require more energy because some of the energy is lost to heat.)

Adapted from: Little, Diane "Investigating CFLs and Incandescent Light Bulbs." Sustainable and Renewable Energy Fund, PA. 2008.