

COMPARING LIGHT BULB OUTPUTS

*Taken from the Green Schools Tool Kit Manual to be used in conjunction with the tool kit

Objective: Students will use a light meter and a watt meter to compare the energy use and light output of an incandescent light bulb and a compact fluorescent bulb.

Time: 1 class period

Suggested Grade Level: Can be modified for grades 2 – 9

Equipment:

- Light meter*
- Watt meter*
- Desk lamp with standard light bulb socket
- 1 incandescent light bulb of 60-100 watts
- 1 compact fluorescent light (CFL) bulb of 15-23 watts*

* From Green Schools Tool Kit

BACKGROUND INFORMATION

A typical incandescent bulb may seem cheaper than a compact fluorescent light (CFL) bulb because it costs \$1.00 or less compared to \$5.00 to \$10.00 for a CFL bulb. However, if you compare the life cycle cost, CFLs are more economical than incandescent bulbs.

CFLs are much more energy efficient and last much longer than incandescents. Incandescent bulbs waste 90 percent of the energy they consume as heat and generally last only 750 to 1,000 hours, compared to 10,000 hours for CFLs. That means that you will need 10 incandescent bulbs to equal the life of one CFL. If you include in the life cycle cost the costs to manufacture, package, transport, stock, sell, and dispose of 10 incandescent bulbs compared to 1 CFL, the savings are even greater.

Incandescent bulbs and CFLs also differ in terms of the light they emit. Incandescents emit large amounts of light in the yellow/orange spectrum, but almost none in the blue range. CFLs, by contrast, use a mixture of phosphors to ensure that a broader spectrum of the color spectrum is emitted and most CFLs emit the full spectrum of light. However, when asked which provides better quality light, people will offer different opinions. Some prefer the warm yellow of the incandescent and others prefer the clear white of the CFL.

Note: CFLs should be recycled and not put in the landfill or incinerator.

ADVANCED PREPARATION

You may choose to do this investigation in conjunction with the Comparing Light Bulb Temperatures activity, p. 85.

LEADING THE INVESTIGATION

1. Introduce the investigation by sharing with students some of the information presented in the Background Information section.
2. Follow the procedure described on the student page, conducting this investigation as a class demonstration or as a lab station set up for students.

FOLLOW UP

- Have students compare the life cycle cost of the two light bulbs. First, find out the cost of each type of light bulb. Next, have students calculate how many kilowatt hours of electricity each type of light bulb will consume over 10,000 hours (the rated life of a CFL). For example, 75 watts x 10,000 hours = 750,000 watt hours = 750 kWh. Then, students use your local electrical rates to determine the cost of operating each light bulb over 10,000 hours. Discuss any additional cost of purchasing and replacing 10 of the incandescent light bulbs for each CFL. Students add up all the costs and determine which is a better buy.

Comparing Light Bulb Outputs

Question

How does the energy usage and light output of an incandescent light bulb compare to that of a compact fluorescent?

Your prediction:

Equipment

- Light meter
- Watt meter
- Desk lamp
- 1 incandescent light bulb
- 2 compact fluorescent light (CFL) bulbs
- Safety gloves

Procedure

1. Plug the watt meter into the wall outlet.
2. Put the incandescent light bulb into the lamp socket. Plug the lamp into the watt meter and turn on the lamp.
3. With the watt meter in the wattage mode, record the wattage being consumed by the light.
4. Use the light meter to measure the output of the light bulb.
5. Turn off the lamp and, using gloves; carefully remove the incandescent light bulb from it.
6. Repeat the procedure using the compact fluorescent light bulb (CFL) in the lamp socket. Wait 1 or 2 minutes for the bulb to warm up before measuring the wattage and the light output.

Data

	Incandescent Bulb	Compact Fluorescent Bulb
Measured Wattage		
Light Output		

Analyzing the Data

How did the light bulbs compare in terms of measured light?

How did the light bulbs compare in terms of measured wattage?