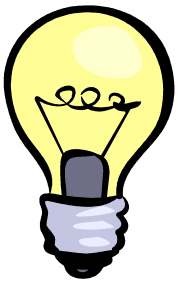
PRELIMINARY ACTIVITY FOR

Energy Conversions

Energy conversion is the process of transforming energy in one form into another. Sometimes called energy transformation, energy of fossil fuels, solar radiation, or nuclear fuels can be converted into other energy forms such as electrical, propulsive, or heating that are more useful to us. For example, a light bulb converts electrical energy into heat and light energy.



Light bulbs are usually sold according to the electrical power they consume. A more useful measurement may be the amount of light a bulb puts out. A 75 W incandescent bulb has an output of 1200 lumens of light while a 20 W compact fluorescent light bulb has the same output but consumes much less energy.

In this experiment you will investigate the relationship between the power rating of a light bulb and the amount of light that it produces.

In the Preliminary Activity, you will learn how to position equipment for data collection, learn how to measure illuminance, and gain experience using a Light Sensor.

After completing the Preliminary Activity, you will first use reference sources to find out more about energy conversions before you choose and investigate a researchable question. Some topics to consider in your reference search are:

- illuminance
- irradiance
- compact fluorescent bulbs
- incandescent bulbs
- LED
- kilowatt-hours
- forms of energy
- efficiency
- second law of thermodynamics
- electricity cost

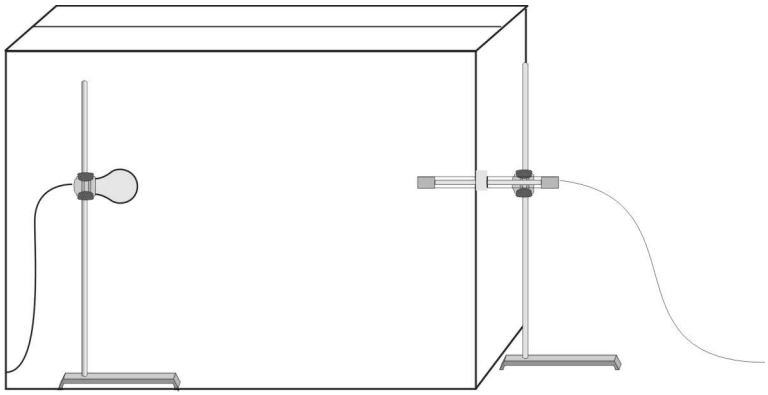


Figure 1

PROCEDURE

1. Prepare for data collection.
   a. Clamp a lamp fitted with a 60 W incandescent bulb to one ring stand using a utility clamp.
   b. Place the light bulb and ring stand into a large box.
   c. Insert the Light Sensor in a hole directly opposite the light bulb.
   d. Clamp the Light Sensor to the other ring stand using a second utility clamp.
2. Set the switch on the Light Sensor to 0–6000 lux. Connect the Light Sensor to the data-collection interface.
3. Open the data-collection program.
4. Turn on the lamp.
5. Start data collection and collect data for 10 seconds. Use the Statistics function to determine the mean illumination. Record the illumination value (in lux).
6. Turn off the lamp and allow the bulb to cool. ***Caution: The bulb will be very hot.***
7. Once the bulb is cool to the touch, replace the bulb with the 75 W bulb.
8. Repeat Steps 4–6 with the 75 W and 100 W bulbs.

QUESTIONS

1. What were the three illumination values that you obtained in the Preliminary Activity?

2. If electricity costs $0.15 per kilowatt-hour (kWh), calculate the total cost of electricity to use a 75 W incandescent light bulb continuously for 30 days.

3. How much money would you save each month if the 75 W incandescent bulb were replaced with a 20 W compact fluorescent bulb?

4. List at least one researchable question for this experiment.