

<b>Main Topic</b>	Energy
<b>Subtopic</b>	Heat Energy
<b>Learning Level</b>	Middle
<b>Technology Level</b>	Low
<b>Activity Type</b>	Student

Description: Place three different colored cans of water under a radiant heat source, and observe the results.

Required Equipment	Radiation Cans set (black, white, silver), 3 1-hole stoppers, 3 thermometers, heat lamp or 200W bulb, clock
Optional Equipment	

### Educational Objectives

- Place three different colored cans of water under a radiant heat source. Observe the results, and make conclusions about the effect of color on absorption of heat.

### Concept Overview

Radiant heat travels in the form of waves. No physical contact between objects is needed to transfer heat by radiation. (The word “radiation,” used in this context, has nothing to do with the radiation released by radioactive decay of atoms.)

The other two types of heat transfer are conduction, in which heat is transferred by direct contact between objects, and convection, in which heat is transferred by the flow of a fluid.

Students will fill black, white, and silver cans with water, and observe the temperature change in the water when the cans are placed under a bright lamp. The cans are being heated by radiation, and the color of the outer finish of the cans determines the efficiency with which they absorb the heat energy. The white and silver cans reflect most of the rays that strike them (visible and non-visible), so they will heat much more slowly than the black can.

### Lab Tips

A significant time is required for observations. Make sure students are well-prepared to set up this lab, so that it can be completed in one class period.

It is important to keep conditions consistent for all three cans. This may be difficult with a small light source. Caution students to make sure that the cans are equidistant from the bulb. They should also make their temperature observations as quickly as possible.

# Heat Transfer - Radiation

Name: \_\_\_\_\_

Class: \_\_\_\_\_

## Goal:

- Place three different colored cans of water under a radiant heat source. Observe the results, and make conclusions about the effect of color on absorption of heat.

## Materials:

- 500mL white can
- 500mL black can
- 500mL silver can
- Three 1-hole stoppers
- Three thermometers or temperature sensors
- Heat lamp or 200W light bulb
- Clock or Stopwatch

## Procedure:

1. Fill the cans with equal amounts of water.
2. Place a thermometer or temperature sensor in each can, making sure that the bulb is in the water.
3. Record the initial temperature of each sample in the data table (attached).
4. Place the cans at equal distances from the heat lamp and record the time (or start the stopwatch).
5. After 5 minutes, record the temperature of each can.
6. Repeat for at least 25 minutes, or longer if possible.
7. Evaluate the heat absorbed by each of the three cans.
8. On the back, write your conclusions about the effect of color on heat absorption.

**Record the temperature of the water in each can for each of the times indicated.**

	White	Silver	Black
0 minutes			
5 minutes			
10 minutes			
15 minutes			
20 minutes			
25 minutes			
30 minutes			
35 minutes			
40 minutes			
45 minutes			