

Which Gets Hotter: Light or Dark Surfaces?

Background

Do you ever walk barefoot on warm, sunny summer days? If so, are there surfaces that you avoid so you won't burn your feet? On days like this, is it better to wear light or dark colored clothing? Which type of clothing is best to wear on cold, sunny winter days if you want to get warm quickly? You probably have answered some of these questions before. In this activity, you will learn the reason behind those answers.

Procedure

1. Slide the thermometers through the slits in the insulated lids so that the bulb of each will be about half-way down in the cup, as shown in Figure 1. *Caution: Do not force the thermometers into the slits.* If they will not go in, make the slits slightly larger.
2. Place the lids on the cups.
3. Place the cups side-by-side so that each is about 10 cm from the lamp as shown in Figure 1. Keep the lamp turned off for now.

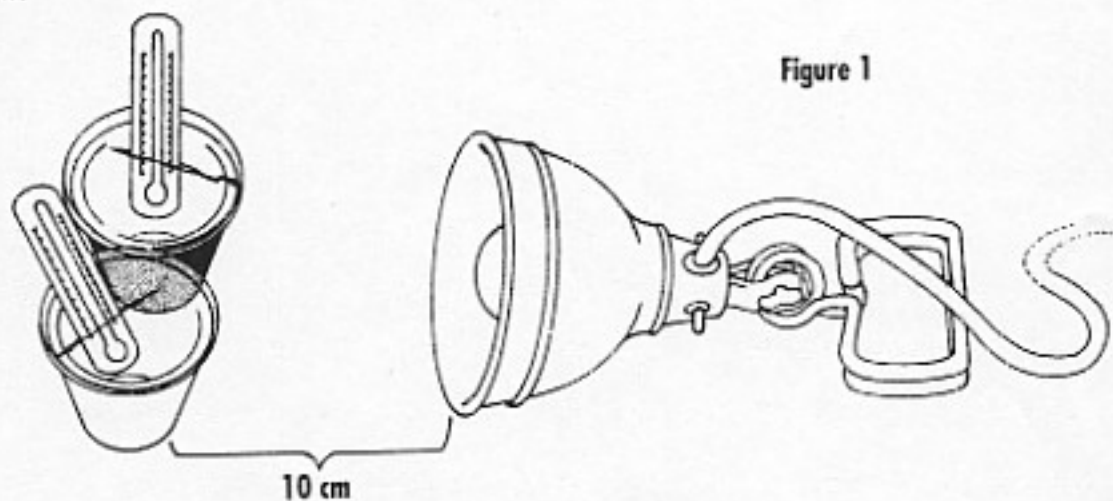


Figure 1

Objective

The objective of this activity is to investigate the rates at which different colors of the same surface heat.

Materials

For each group of students:

- ◊ reflector lamp with 100 watt bulb
- ◊ 1 black metal cup or can
- ◊ 1 white metal cup or can
- ◊ two insulated lids with slits
- ◊ two thermometers
- ◊ ruler or meter stick

4. Record the initial temperature of each cup in the Data Table under the "0 minutes" column. In the box marked "Prediction" suggest what will happen to the temperature in each cup when the light is turned on, and explain your prediction. Will there be any differences between the cups?

5. Turn on the light and record temperatures every minute for 5 minutes. While the light is on, do not touch, move, or disturb the cups in any way.
6. Graph your results on the graph paper provided.

Questions/Conclusions

1. What did you notice about the temperatures of the two cups? How did this compare with what you predicted in step 4?
2. From your observations, what color surface heats most quickly? Why?
3. On a hot, sunny summer day, which would you rather wear outdoors—a white shirt or a black shirt? (Assume they are made of the same material.) Why?
4. A glider is a kind of airplane, one without an engine. In order to stay in the air, glider pilots sometimes look for large, paved areas (or fields that have been plowed recently) to fly over. Why do they do this?
5. How could a large, light-colored area of land and a nearby, dark-colored area of land create wind on a bright, sunny day?
6. What color roof would you want in a cold climate? In a hot climate? Why?

PREDICTION

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DATA TABLE

Time (min.)	0	1	2	3	4	5
Black cup temperature ($^{\circ}\text{C}$)						
White cup temperature ($^{\circ}\text{C}$)						

