

Reflectivity of Light

Light is reflected differently from various surfaces and colors. An understanding of these differences is useful in choosing colors and materials for clothing, in choosing colors for cars, and in city planning. Astronomers use reflectivity differences to help determine characteristics of planets. In this experiment, you will be measuring the percent reflectivity (*albedo*) of various colors. You will measure reflection values from paper of various colors using a computer-interfaced Light Sensor and then compare these values to the reflection value of aluminum foil. The aluminum foil will arbitrarily be assigned a reflectivity of 100 percent. You will then calculate percent reflectivity using the relationship

$$\% \text{ Reflectivity} = \frac{\text{value for paper}}{\text{value for aluminum}} \times 100$$

OBJECTIVES

In this experiment, you will

- Use a computer-interfaced Light Sensor to measure reflected light.
- Calculate percent reflectivity of various colors.
- Make conclusions using the results of the experiment.

MATERIALS

computer
Vernier computer interface
LoggerPro
Vernier Light Sensor
white paper

black paper
2 other pieces of colored paper
aluminum foil
ring stand and utility clamp

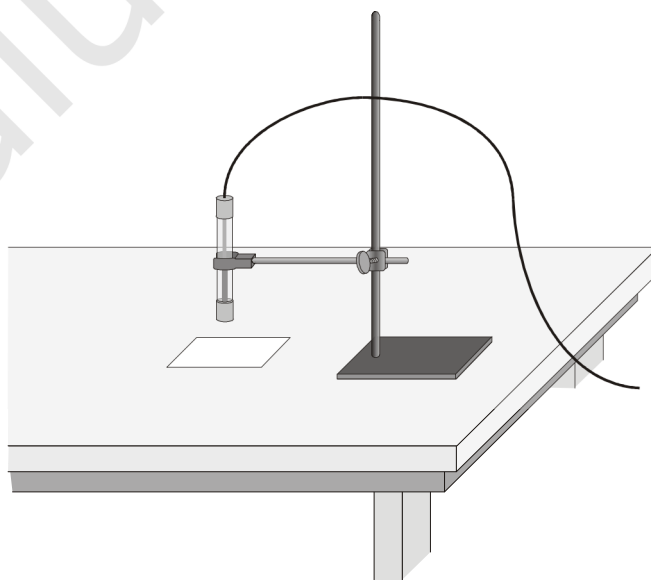


Figure 1

PROCEDURE

1. Use a utility clamp and ring stand to fasten a Light Sensor 5 cm from and perpendicular to a piece of colored paper as shown in Figure 1. The Light Sensor should be set on the 0–6000 lux position. The classroom lights should be on.
2. Connect the Light Sensor to the computer interface. Prepare the computer for data collection by opening the file “23 Reflectivity of Light” from the *Physical Science w Vernier* folder.
3. When the reading stabilizes, record the color and the reflected light value (in lux). The lux is the SI unit for light illumination.
4. Make and record readings for aluminum, black, white, and two other colors.

DATA

Color	Aluminum	Black	White	_____	_____
Reflection	_____	_____	_____	_____	_____
Value (lux)					

PROCESSING THE DATA

1. Calculate the percent reflectivity (albedo) of each color using the formula given in the introduction. Show your work and record the results in the table below.

Color	Aluminum	Black	White	_____	_____
Percent	<u>100%</u>	_____	_____	_____	_____
Reflectivity					

2. Which color, other than aluminum, has the highest reflectivity?
3. Which color has the lowest reflectivity?
4. What materials might give a city or planet a high reflectivity or albedo? Explain.
5. Does the planet Earth have high reflectivity? Why?

EXTENSIONS

1. Design an experiment to test the reflectivity of sand, soil, water, and other materials.
2. Design an experiment to determine if there is a relationship between reflected light and heat absorbed by various colors or materials.