

# Energy Absorption and Reflection

When solar energy reaches Earth's surface, the energy is either reflected or absorbed by the material that the surface is made of. The properties of the material affect whether the material absorbs or reflects energy, and the amount of energy that is reflected or absorbed. These properties include the material's composition, its color, and its texture. They also include how transparent the material is, the mass and volume of the material, and the specific heat of the material. In this lab, you will study these properties to find which material is best suited for use as roofing material.

## OBJECTIVES

Determine which material will keep the inside of a house the coolest.

Explain which properties of this material determine whether it is a conductor or an insulator.

## MATERIALS

- cardboard, 4 cm × 4 cm × 1 cm, 4 pieces
- metal, 4 cm × 4 cm × 1 cm
- paint: black, white, and light blue tempera
- rubber, beige or tan, 4 cm × 4 cm × 1 cm
- sandpaper, 4 cm × 4 cm × 1 cm
- thermometers, Celsius, 4
- watch or clock
- wood, beige or tan, 4 cm × 4 cm × 1 cm

## SAFETY



## ASK A QUESTION

1. Which material will keep the interior of a house the coolest?

## FORM A HYPOTHESIS

2. Name the material that you think will keep the inside of a house the coolest.

The material that will keep the inside of a house the coolest is

- What properties of the material made you pick it?

**Energy Absorption and Reflection *continued*****TEST THE HYPOTHESIS**

3. Brainstorm with a partner or with a small group of classmates.

- Design a procedure that will help you decide which materials absorb the most energy and which materials keep the surface below them the coolest. You do not have to test all the materials if you can explain why you think those materials would not be the coolest.
- Write down the steps of your experiment.

---

---

---

---

---

4. Have your teacher approve the steps you plan to follow.

5. Record the data you collect in the table below as you do your experiment.

Material	Color	Temperature of surface (°C)	Temperature below material (°C)
Cardboard	white		
Rubber	beige		
Sandpaper	beige		

6. Follow the steps of your experiment.

- Measure the temperature of each material.
- Record the temperature in the table.
- Measure the temperature of the surface below each material.
- Record the temperature in the table.

**Energy Absorption and Reflection** *continued***ANALYZE THE RESULTS**

1. **Graphing Data** Use the data you collected to create a bar graph.

- Label the *x*-axis with the materials you tested.
- Label the *y*-axis with a range of temperatures.



2. **Analyzing Data** Which material reached the highest temperature on its surface?

- 
- Which material let the surface below it reach the highest temperature?
- 

3. **Analyzing Data** Which material stayed the lowest temperature at its surface?

- 
- Which material kept the temperature of the surface below it lowest?
- 

4. **Evaluating Results** Did the color of the materials affect whether they absorbed or reflected solar energy? Explain your answer. (Hint: When energy is absorbed, the temperature of the material goes up.)

Light colors helped the materials to \_\_\_\_\_ solar energy.

Dark colors helped the materials to \_\_\_\_\_ solar energy.

**Energy Absorption and Reflection *continued*****DRAW CONCLUSIONS**

5. **Drawing Conclusions** Based on your results, which material would you use for the roof of a house?

---

---

- Did your experimental results support your original hypothesis?

6. **Inferring Relationships** What properties of the material that you named in question 5 do you think make it best to use for a roof? Explain your answer.

---

---

7. **Making Predictions** Do you think the material you chose would keep the inside of a house warm in cold weather? Explain your answer.

---

---

8. **Analyzing Methods** Name two changes you would make in your experimental design if you were going to repeat the experiment. Explain why you would make each change.

First change: \_\_\_\_\_

Reason: \_\_\_\_\_

Second change: \_\_\_\_\_

Reason: \_\_\_\_\_

**EXTENSION**

1. **Applying Ideas** Use the materials you tested in the experiment to create a model of Earth's surface that represents how different parts of Earth's surface absorb or reflect solar energy. Which areas of Earth's surface absorb the least energy?

---

---

---

---

---