U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

ENERGY EDUCATION AND WORKFORCE DEVELOPMENT

The Sun and Its Energy

(14 Activities)

Grades: K-4

Topic: Solar

Owner: NEED

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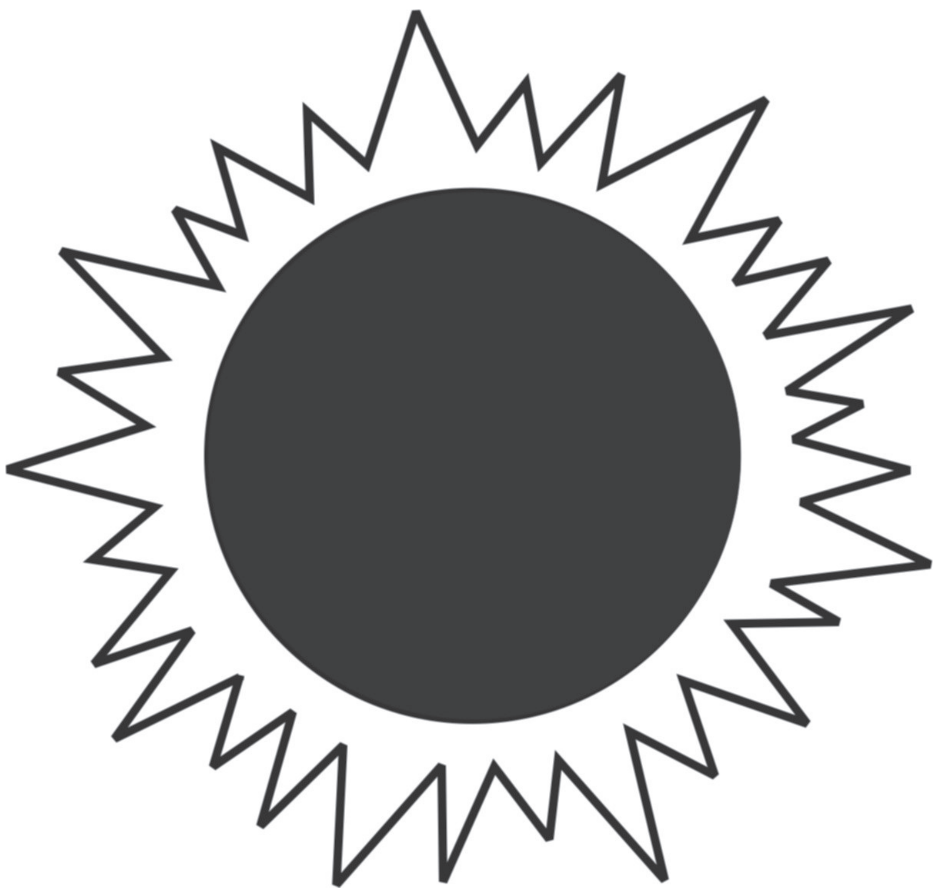
THE SUN AND ITS ENERGY

A flipbook with bold graphics and simple words to introduce primary students to solar energy, along with hands-on explorations.

GRADE LEVEL
Primary

SUBJECT AREAS
Science
Language Arts



NEED

2006-2007

Putting Energy into Education

NEED Project PO Box 10101 Manassas, VA 20108 1-800-875-5029 www.NEED.org

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NEED Mission Statement

The mission of the NEED Project is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs.

Teacher Advisory Board Vision Statement

In support of NEED, the national Teacher Advisory Board (TAB) is dedicated to developing and promoting standards-based energy curriculum and training.

Printed on Recycled Paper with Soy-Based Ink

TABLE OF CONTENTS

MATERIALS NEEDED

Shallow Pan with Water
White & Black Construction Paper
2 Similar Small Potted Plants
Tape
Scissors
Package of Refrigerated Cookie Dough
Plastic Wrap
Small Cardboard Box
Dark Pan

MATERIALS IN KIT (COST: $200)

250 Solar Beads & 100 Pipe Cleaners
1 Large Demonstration Thermometer
10 Student Thermometers
2 Solar Balloons with String
1 Solar Oven
1 Solar House Kit
2 Glow Toys
40-pack of NaturePrint® Paper
1 Radiometer

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Correlations to the National Science Standards

for grades K–4

PRIMARY STANDARD A: SCIENCE AS INQUIRY

1. Abilities Necessary to do Scientific Inquiry

a. Ask a question about objects, organisms, and events in the environment.

b. Plan and conduct a simple investigation.

c. Employ simple equipment and tools to gather data and extend the senses.

d. Use data to construct a reasonable explanation.

e. Communicate investigations and explanations.

2. Understandings about Scientific Inquiry

c. Simple instruments such as magnifiers, thermometers, and rulers provide more information than using only senses.

PRIMARY STANDARD B: PHYSICAL SCIENCE

1. Properties of Objects and Materials

a. Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools such as rulers, balances, and thermometers.

b. Objects are made of one or more materials, such as paper, wood, and metal. Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.

3. Light, Heat, Electricity, and Magnetism

a. Light travels in a straight line until it strikes an object. Light can be reflected by a mirror, refracted by a lens, or absorbed by the object.

b. Heat can be produced in many ways, such as burning, rubbing, or mixing one substance with another. Heat can move from one object to another by conduction.

PRIMARY STANDARD D: EARTH AND SPACE SCIENCE

2. Objects in the Sky

a. The sun provides the light and heat necessary to maintain the temperature of the earth.

PRIMARY STANDARD E: SCIENCE AND TECHNOLOGY

2. Understandings about Science and Technology

a. People have always had questions about their world. Science is one way of answering questions and explaining the natural world.

b. People have always had problems and invented tools and techniques to solve problems. Trying to determine the effects of solutions helps people avoid some new problems.

e. Tools help scientists make better observations, measurements, and equipment for investigations. They help scientists see, measure, and do things that they could not otherwise see, measure, and do.

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Teacher Guide

A FLIPBOOK WITH HANDS-ON EXPLORATIONS TO INTRODUCE PRIMARY STUDENTS TO THE BASIC CONCEPTS OF SOLAR ENERGY.

CONCEPTS

- The sun produces radiant energy (light) that travels through space to the earth.
- The sun's energy makes life possible on Earth.
- We use the sun's energy to see.
- Plants convert the sun's energy to sugars to provide food for growth and life.
- We use the sun's energy to produce heat.
- Radiant energy from the sun powers the water cycle and produces wind.
- It is difficult to capture the sun's energy because it is spread out—not concentrated in any one area. We can capture solar energy with solar collectors that convert the energy into heat.
- Photovoltaic (solar) cells convert radiant energy directly into electricity.

TIME

Eight 15-30 minute class periods.

PROCEDURE

Preparation

- Familiarize yourself with the information in the booklet and with the materials in the kit. Highlight the information and discussion questions on pages 11, 15, 23 and 25 that you want to use with the flipbook.
- Make copies of pages 26-28 for each student.
- Collect the materials that are not included in the kit. See the Materials List on page 3 for a list of these materials. Prepare the cardboard box to look like a house before the activity (see page 30).

Day 1—FlipBook

- Introduce the topic of solar energy to the students by discussing what they know about the sun and its energy.
- Read the flip book (pages 9–25) to the students, using the additional information and discussion questions you have highlighted on pages 11, 15, 23, and 25. Answer any questions the students have.

Day 1—Activity: The sun gives us light so that we can see. Light is energy.

- Talk about day and night and how we must use artificial light at night to see. Compare cloudy and sunny days. Compare length of daylight in winter and summer. Explain how we can see when light bounces off objects and into our eyes. If we close our eyes, we can't see because no light can enter.
- Turn off the lights in the classroom and observe the light from the sun. Close the blinds and observe how much harder it is to see clearly when there is less light.
- **CONCEPTS:** The sun gives us light to see. Light is energy.

Day 1—Exploration: Do plants need the sun's energy to grow?

Materials: *2 small potted plants*

- Instruct the students to carefully observe the size and health of two plants.
- Place one plant in a sunny place and the other in a place without any light. Give both plants the same amount of water and observe daily for one to two weeks. Have students draw the plants on page 26.
- **CONCEPT:** Plants need the sun's energy to grow.

Day 2—Activity: The Radiometer—The sun's energy can make things move.

Materials: *radiometer*

- Place the radiometer in bright sunlight and explain to the students that the sun's energy is making the vanes of the radiometer spin. See page 29 for a detailed explanation of how the radiometer works.
- Change the amount of sunlight hitting the radiometer and point out how the spinning slows as less energy hits the radiometer.
- **CONCEPT**: The sun's energy can make things move.

Day 2—Activity: Reading A Thermometer—We can measure heat energy.

Materials: *large demonstration thermometer, 10 student thermometers*
copies of page 27 - Reading a Thermometer

- Divide the students into five groups.
- Give each group two thermometers. **CAUTION** the students about taking care when working with glass.
- Give each student a copy of the **Reading a Thermometer** worksheet.
- Use the large demonstration thermometer to show the students how to read a thermometer. Explain that the thermometer works because the liquid inside expands as its temperature increases. Understanding and recording the exact numbers is not important - the concepts of being able to measure temperature and compare temperatures are what should be emphasized.
- Have the students fill in the tubes of the thermometers on their worksheet to show the temperatures of their thermometers. All the thermometers should read the same room temperature. Discuss the possible causes of any discrepancies (faulty equipment, one in the sun and one in the shade, people handling the thermometer).
- **CONCEPTS:** Heat is energy. A change in temperature indicates a change in the amount of heat energy in a substance—the higher the temperature, the more energy.

Day 2—Exploration: Light-to-Heat—Black absorbs light, white reflects light.

Materials: *10 student thermometers, black & white construction paper, scissors, tape*
copies of page 28 - Black and White

- Give each student a copy of the **Black and White** worksheet, black and white construction paper, scissors and tape.
- Instruct the students to make small pouches with the construction paper and cover the bulbs of the thermometers as shown on the pictures in the worksheet.
- Instruct the students to put the thermometers in a sunny place for five minutes, then record the temperatures on their worksheets.
- **CONCEPTS:** When light hits a substance, it is reflected or absorbed. Light often turns into heat when it hits a substance and is absorbed. Dark colors have a tendency to absorb light; light colors have a tendency to reflect light. Dark colors get hotter in sunlight than light colors.

Day 3—Activity: Solar Beads—Light can make a color change.

Materials: 5 solar beads and 1 pipe cleaner for each student

- Make sure the classroom blinds are closed so that sunlight does not enter.
- Distribute five beads and a pipe cleaner to each student. Instruct the students to string the beads on the pipe cleaner and make a loose bracelet out of it by twisting the ends together.
- Ask the students to observe the colors of the beads.
- Open the blinds or take the students outside on a sunny day to observe the colors of the beads in sunlight.
- **CONCEPT:** The ultraviolet radiation in sunlight reacts with a chemical in the beads to cause a change in color.

Day 3—Exploration: NaturePrint® Paper—Light can make a color change.

Materials: 1 piece of NaturePrint® paper for each student.

- Take the students outside on a bright sunny day. Instruct each student to find a leaf with an interesting shape, a twig, or other small, flat natural object with which to make a print. *(You can also have students cut designs from construction paper before going outside.)*
- Find a large, flat area. Distribute one piece of NaturePrint® paper to each student. Instruct the students to place their paper flat on the ground and place their objects in the center of the paper—do not move them. Direct the students to observe the color of the paper that is exposed to the sun for two to three minutes, until it fades to a pale blue.
- Take the papers inside quickly without further exposing them to direct sunlight. Soak the papers in a container of water for one minute and dry flat. Observe the image on the paper.
- **CONCEPT:** The energy in sunlight changed the color of the part of the paper exposed to the sun.

Day 4—Exploration: Solar Balloons—Heat makes substances expand.

Materials: 1 solar balloon with string

- Take the students outside on a bright sunny day.
- Tie off one end of the solar balloon with a small piece of the string.
- Open the other end of the balloon and fill the balloon as full as possible with air. If there is no breeze, walking quickly while holding the end open can help. Tie off the end of the balloon when it is full.
- Tie two strings (about four meters—or twelve feet—long) to the ends of the balloon and put the balloon in the sun. Watch as the air inside the balloon heats up and expands, it becomes less dense than the air around it, causing the balloon to rise into the air.
- **CONCEPTS:** Dark colors absorb light energy and turn it into heat. As substances get hotter, they expand. Less dense substances tend to rise, denser substances tend to fall.

Day 5—Exploration: Solar Oven—The energy in sunlight can cook food.

Materials: 1 solar oven, 1 package of refrigerated cookie dough, dark pan

- Arrange small portions of cookie dough on the dark pan.
- Take the students outside on a bright sunny day. Set up the solar oven and place the pan inside. Place the oven in the sun so that the light is focused on the food. *(With assistance, students can make their own solar ovens by lining pizza boxes with foil or using Pringles cans with rectangle cutouts to cook hot dogs on a skewer.)*
- Cover the oven with plastic wrap and observe the cookies as they bake (ten to 20 minutes). Allow the students to sample the cookies when they are finished.
- **CONCEPTS:** A shiny surface reflects light. Reflected light can be concentrated on an object. When sunlight shines on food, enough energy is changed to heat to cook the food.

Day 6—Activity: Glow Toys—Some objects can absorb and give off light.

Materials: 2 glow toys – one kept in envelope

- Keep one glow toy stored in the envelope out of the sun. Expose the other glow toy to the sun for an hour.
- Show the students the glow toy that has been in the sun and tell them about the other one in the envelope.
- Darken the room as much as possible.
- Show the students the glow toy that has been stored in the envelope. It should not glow at all.
- Show the students the glow toy that has been in the sun. It should be glowing.
- Explain why one toy is glowing and one isn't.
- **CONCEPT:** Glow toys have special chemicals that absorb sunlight. Instead of turning the light into heat, the glow toys store the radiant energy, then give it off (emit it) when the sun is no longer shining on them and their energy level decreases.
- **EXTENSION:** Will the glow toys work in artifical light?

Day 6—Activity: Solar House Kit—A solar cell turns sunlight into electricity.

Materials: solar house kit, cardboard box

- Show the students the solar cell and explain that it turns sunlight into electricity.
- Put the solar cell on the cardboard house and hook it up to the fan motor and light, as shown in the diagram on page 30.
- Place the solar house in bright sunlight and allow the students to observe the fan turning and the light shining inside.
- Vary the amount of sunlight hitting the solar cell and have the students observe the speed of the fan.
- Discuss other electrical items that electricity from the solar cell might operate—at home and at school.
- **CONCEPT:** A solar cell is made of two thin pieces of silicon with different chemicals inside them. When sunlight hits the solar cell, electricity is produced.

Day 7—Activity: Solar Cells—Electricity from solar cells can run machines.

- Take the students to see a working solar panel. If you have solar panels on your school, show the cells and monitoring equipment to the students and discuss what they do.
- **CONCEPT:** You can use electricity produced by solar cells to run machines or other appliances.

Day 8—Activity: Review and Evaluation

Materials: 2 plants from Day 1 exploration, flipbook, evaluation form on page 31
copies of page 26 for each student – Do Plants Need Sun to Grow?

- Observe the plants from the Day 1 Exploration. Give each student a copy of the worksheet. Instruct the students to draw the plants in the boxes on the sheet. Review the concept that plants need the sun's light to grow.
- Read the flip book to the students, reinforcing the concepts they have learned.
- Evaluate the activities with the students using the Evaluation Form.

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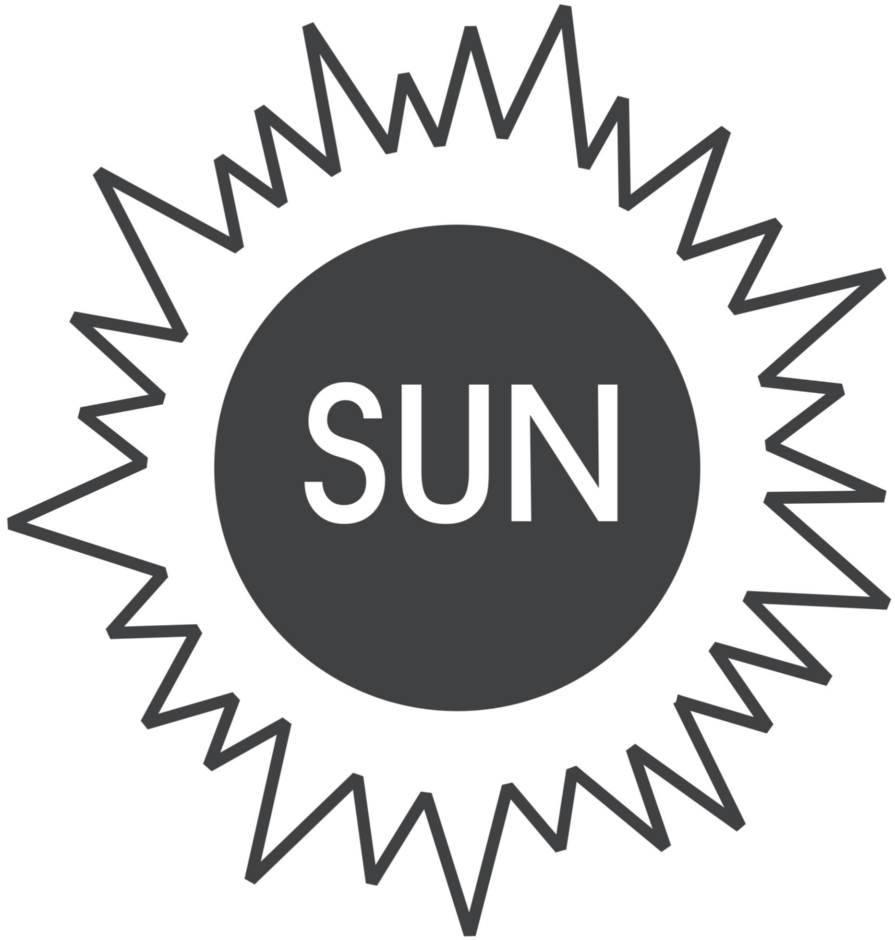
THE SUN AND ITS ENERGY

SOLAR ENERGY



The sun sends out light all the time.

The sun's light is called solar energy.

SOLAR ENERGY

The earth gets most of its energy from the sun. We call this energy **solar energy**. ***Sol*** means sun. Solar energy travels from the sun to the earth in **rays**. Some are light rays that we can see. Some are rays we can't see, like x-rays. Energy in rays is called **radiant energy**.

The sun is a giant ball of gas. It sends out huge amounts of radiant energy every day. Most of the rays go off into space. Only a small portion reaches the earth.

When the rays reach the earth, some bounce off clouds back into space—the rays are **reflected**. The earth **absorbs** most of the solar energy and turns it into **heat**. This heat warms the earth and the air around it––the **atmosphere**. Without the sun, we couldn't live on the earth—it would be too cold.

MORE INFORMATION

Every day, the sun radiates (sends out) an enormous amount of energy. It radiates more energy in one second than the world has used since time began. This energy comes from within the sun itself. Like most stars, the sun is a big gas ball made up mostly of hydrogen and helium atoms. The sun makes energy in its inner core through a process called **nuclear fusion.**

During nuclear fusion, the high pressure and temperature in the sun's core cause hydrogen (H) atoms to come apart. Four hydrogen nuclei (the centers of the atoms) combine, or **fuse**, to form one helium atom. During the fusion process, radiant energy (light) is produced.

It takes millions of years for the radiant energy in the sun's core to make its way to the solar surface, and then just a little over eight minutes to travel the 93 million miles to earth. The radiant energy travels to the earth at a speed of 186,000 miles per second, the speed of light.

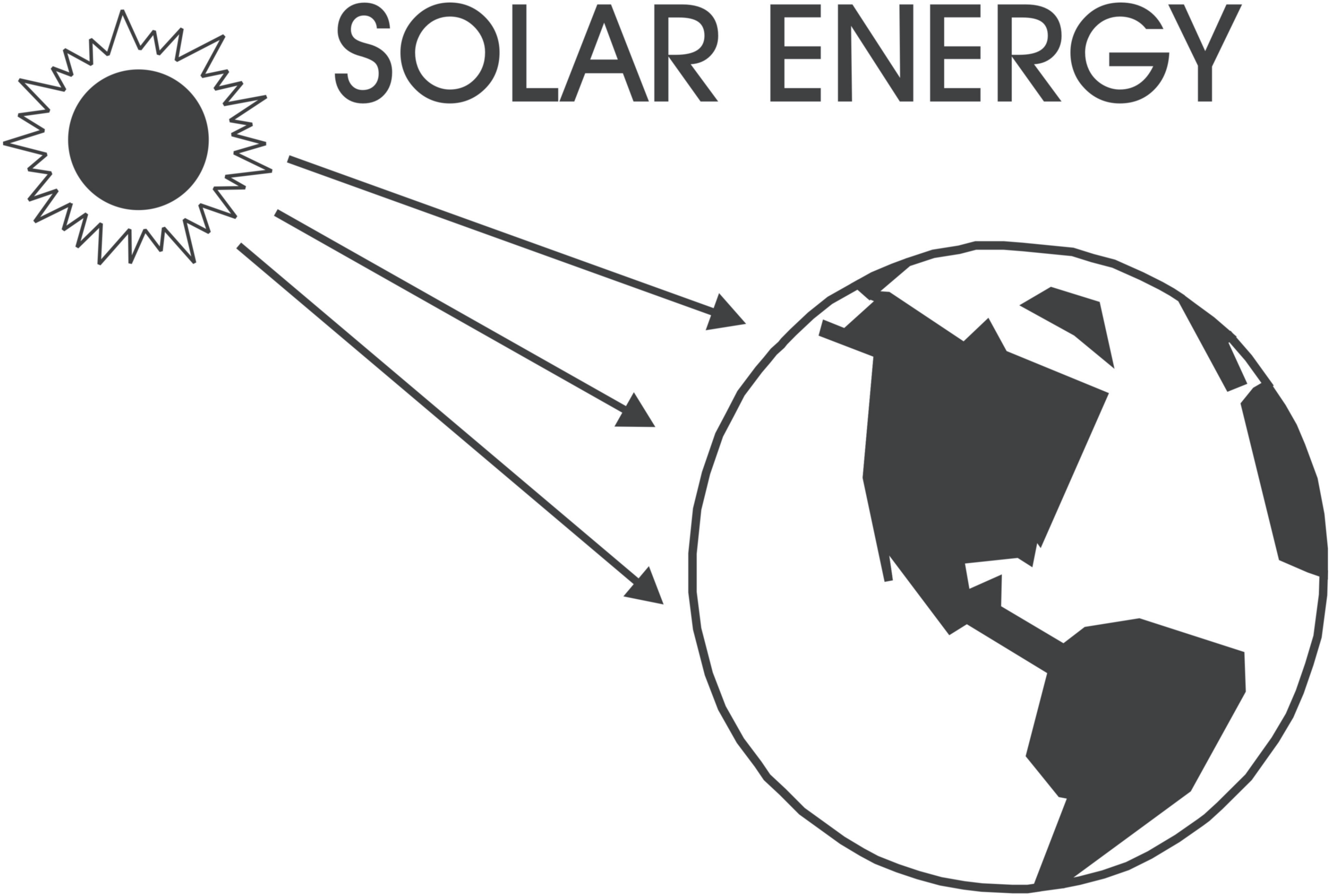
Only a small portion of the energy radiated by the sun into space strikes the earth, one part in two billion. Yet this amount of energy is enormous. Every day enough energy strikes the United States to supply the nation's energy needs for one and a half years. About 15 percent of the radiant energy that reaches the earth is reflected back into space. Another 30 percent is used to evaporate water, which is lifted into the atmosphere and produces rainfall. Radiant energy is also absorbed by plants, the land, and the oceans.

DISCUSSION QUESTIONS

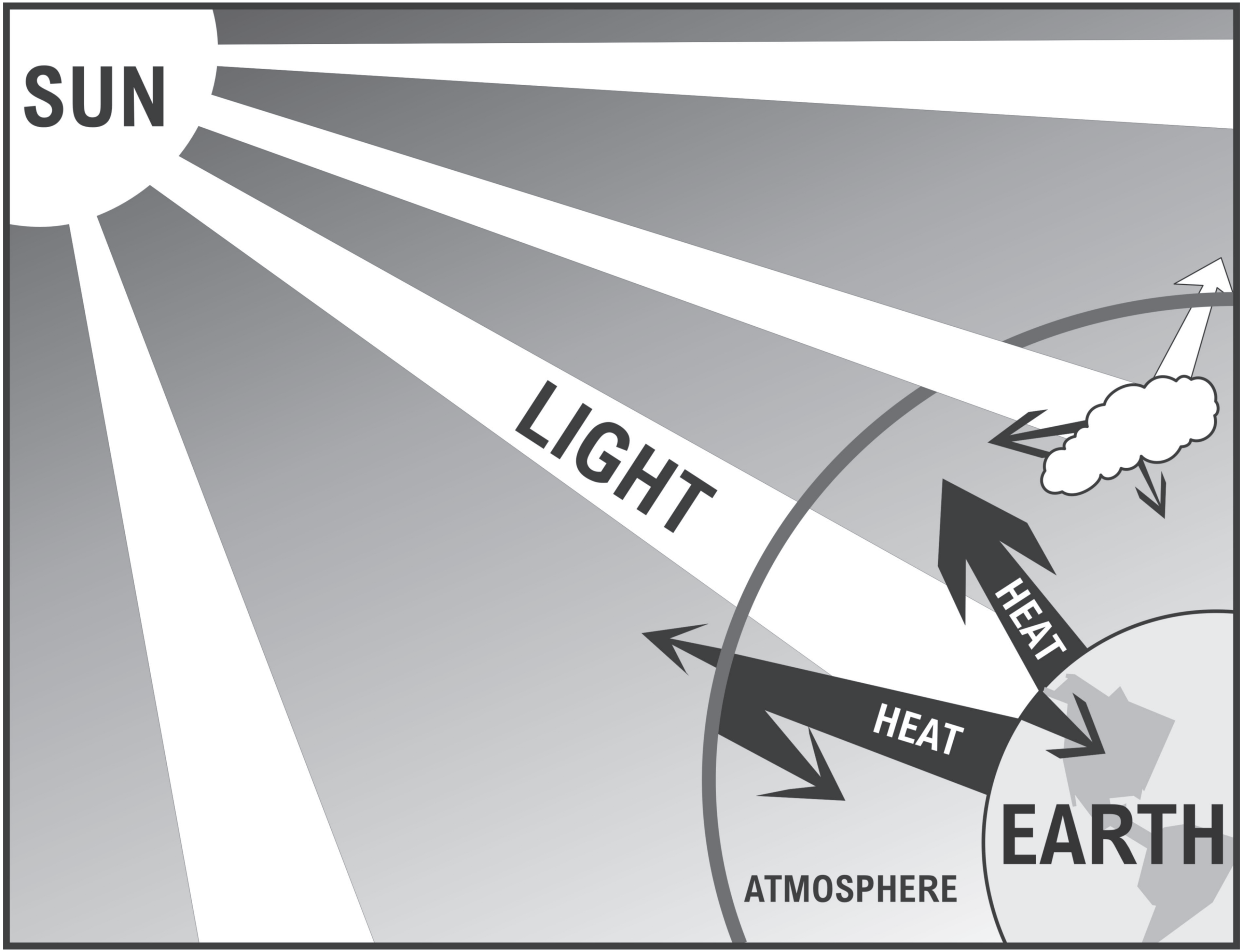
1. How do we know the light from the sun is energy? *(Energy makes change or gives us the ability to do work. The light from the sun allows us to see - without light it would be dark - light is a change - it is energy. We can feel it when it touches our skin - the light energy turns into heat - that is a change. We know it makes plants grow - growth is a change - plants die without the energy in sunlight.)*

2. What would the earth be like without the sun? *(The earth would be very cold with no living things. There would be no atmosphere. There would be no water cycle, no wind.)*

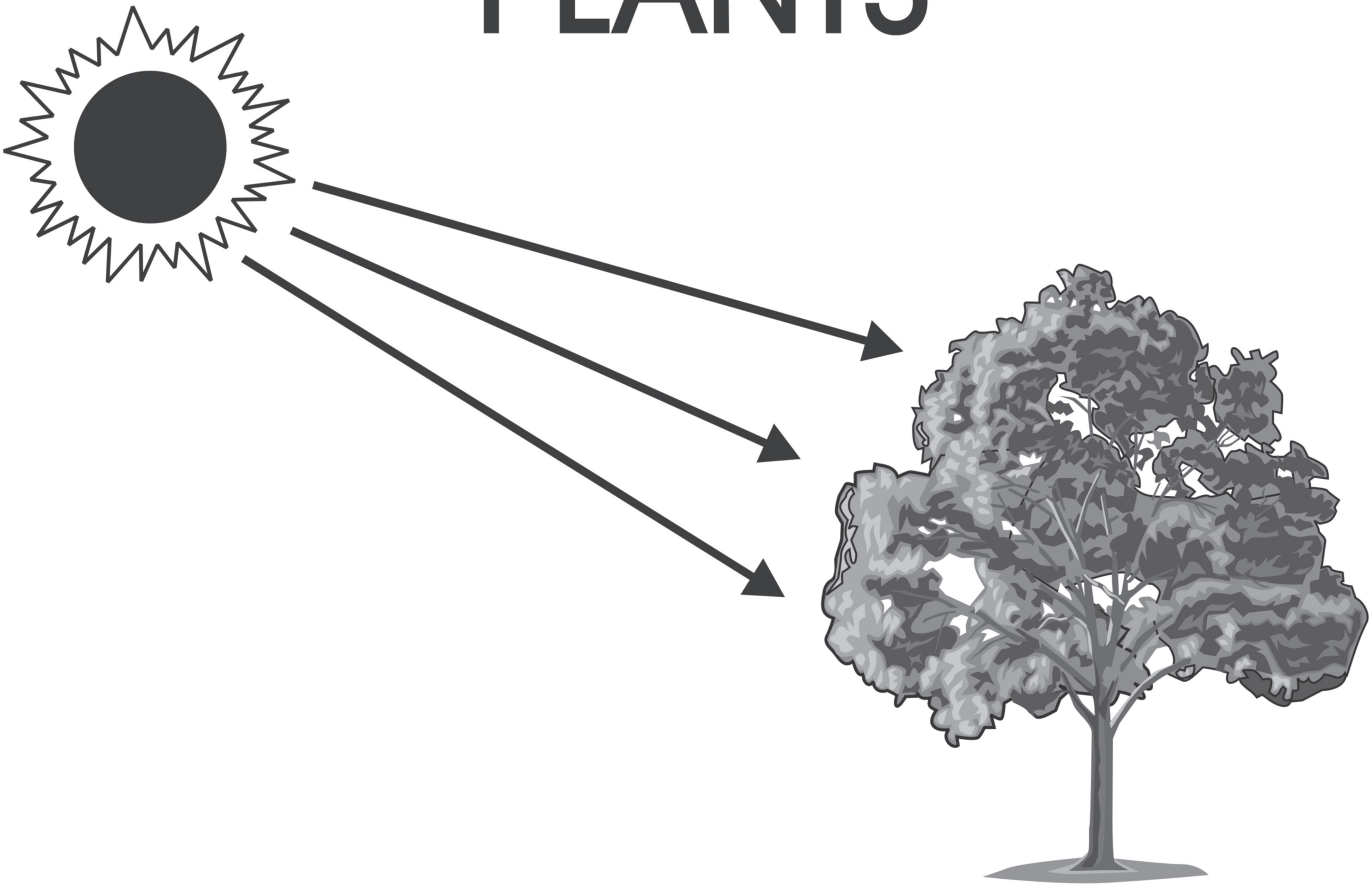
SOLAR ENERGY



Some of the energy from the sun reaches Earth.


SUN
LIGHT
HEAT
HEAT
EARTH
ATMOSPHERE

PLANTS



Plants turn sunlight into sugars.

Plants store the sugars in their leaves, stems, fruits, and roots.

WE USE SOLAR ENERGY IN MANY WAYS

We use solar energy in many ways. During the day, we use sunlight to see what we are doing and where we are going.

Plants use the radiant energy (light) from the sun to grow. Plants **absorb** (take in) the radiant energy and turn it into glucose or simple sugars. The plants keep some of the sugars in their roots, stems, fruits, and leaves. It is **chemical energy**. The energy stored in plants feeds every living thing on the earth. When we eat plants, and food made from plants, we store the energy in our bodies. We use the energy to grow and move. We use it to pump our blood, think, see, hear, taste, smell and feel. We use the energy for everything we do.

The energy in the meat that we eat also comes from plants. Animals eat plants to grow. They store the energy in their bodies.

We also use the energy stored in plants to make heat. We burn wood in campfires and fireplaces. Early humans used wood to cook food, scare away wild animals, and keep warm.

Solar energy turns into heat when it hits objects. That's why we feel warmer in the sun than in the shade. The light from the sun turns into heat when it hits our clothes or our skin. We use the sun's energy to cook food and dry our clothes.

Solar energy powers the **water cycle**. The water cycle is how water moves from clouds to the Earth and back again. The sun heats water on the earth. The water **evaporates**—it turns into **water vapor** and rises into the air to form clouds. The water falls from the clouds as **precipitation**—rain, sleet, hail or snow. When the precipitation falls to Earth, **gravity** pulls it to lower ground. There is energy in the moving water.

Solar energy makes the winds that blow over the earth. The sun shines down on the land and water. The land heats up faster than the water. The air over the land gets warm. The warm air rises. The cooler air over the water moves in where the warm air was. This moving air is wind.

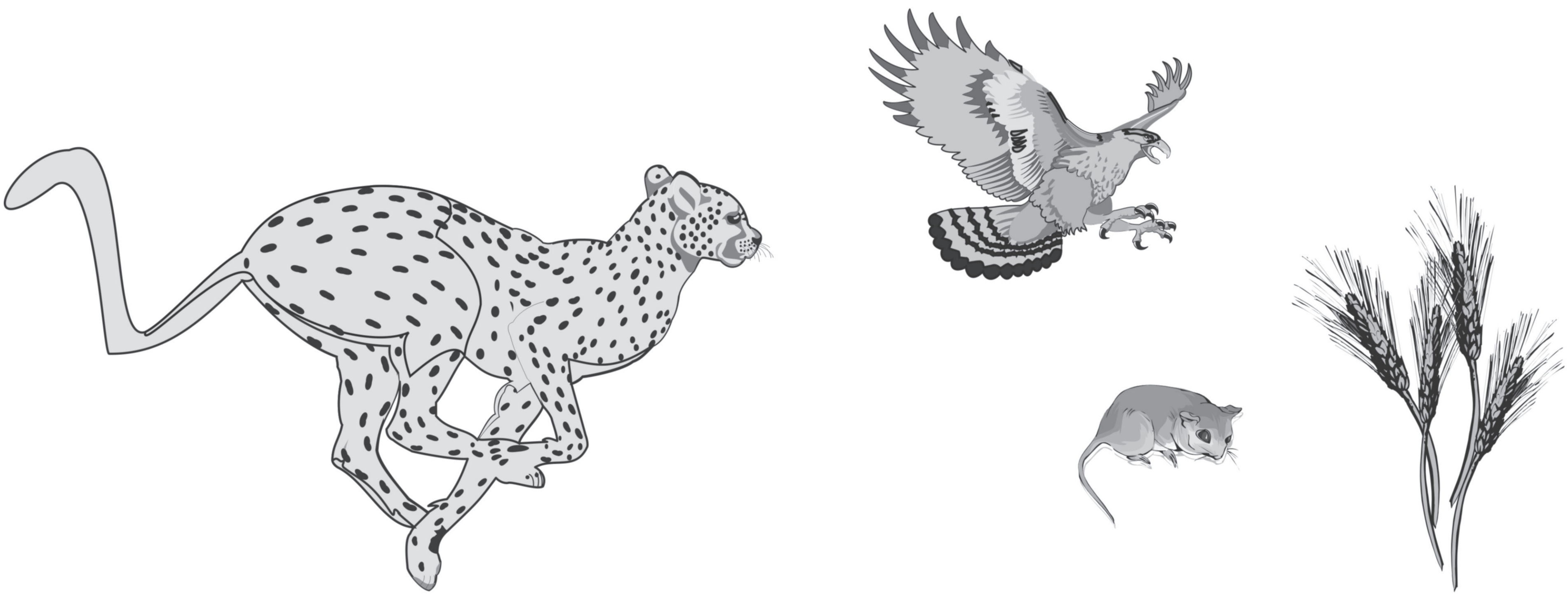
DISCUSSION QUESTIONS

1. What are some foods made from plants? *(Breads, pastas, rice, vegetables, fruits, lettuces, etc.)*

2. How does the energy in a hamburger come from the sun? *(A hamburger is made from beef from a cow that ate grass - the grass absorbed energy from the sun.)*

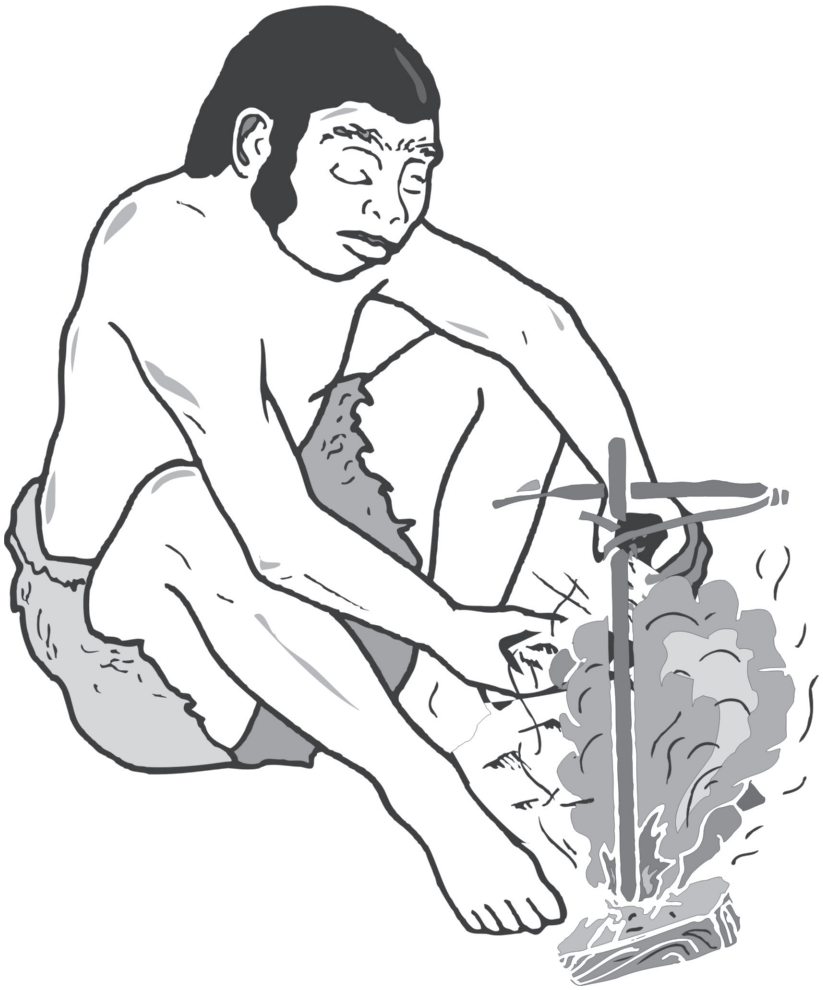
3. Should you wear a white shirt or a black shirt on a hot, sunny day? *(A white shirt - dark colors absorb more light energy and turn it into heat.)*

FOOD CHAIN



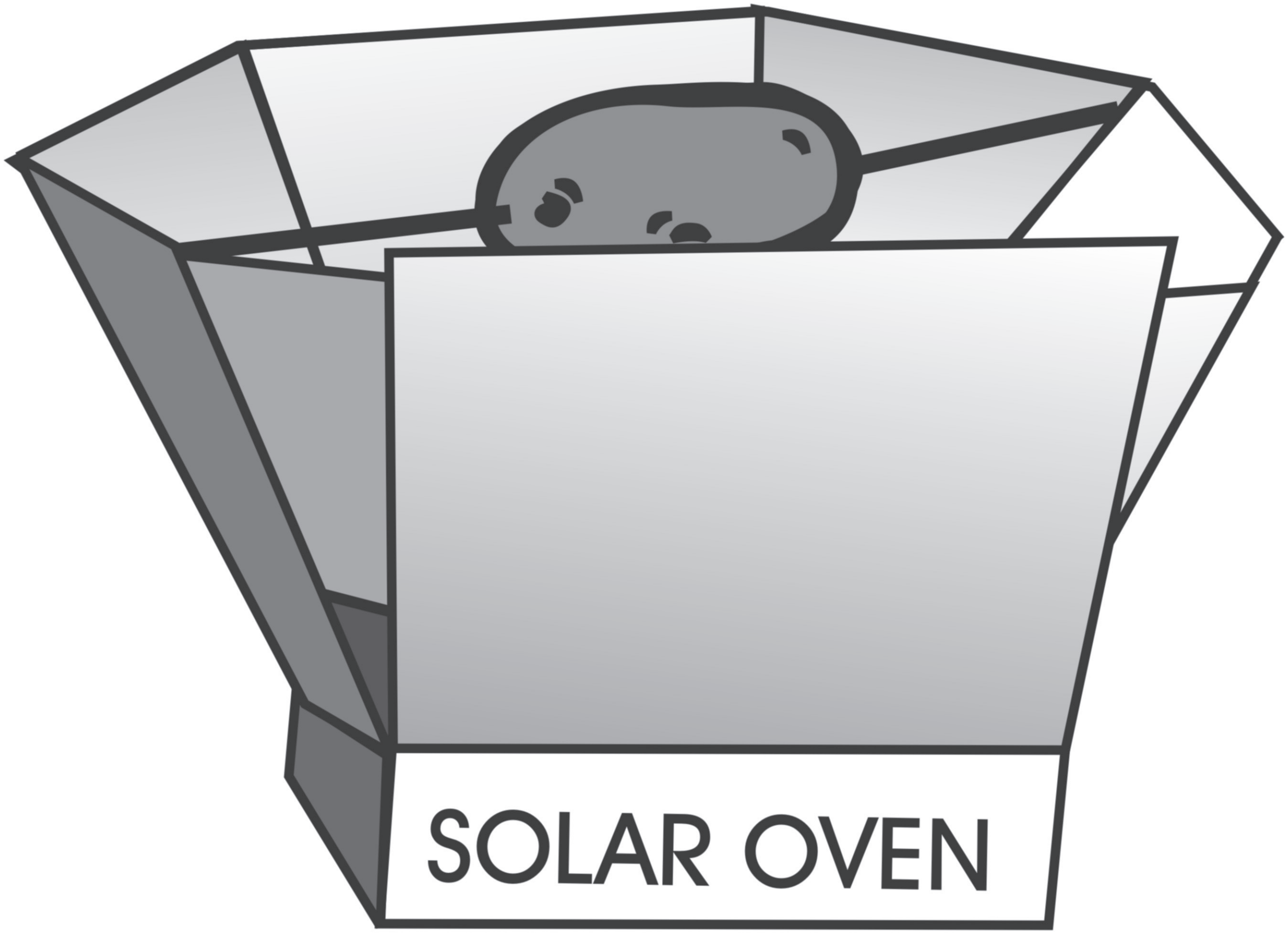
The mouse eats the plant. The hawk eats the mouse. The leopard eats the hawk. The sun's energy flows through them.

HEAT



We burn plants to turn their energy into heat.

COOKING

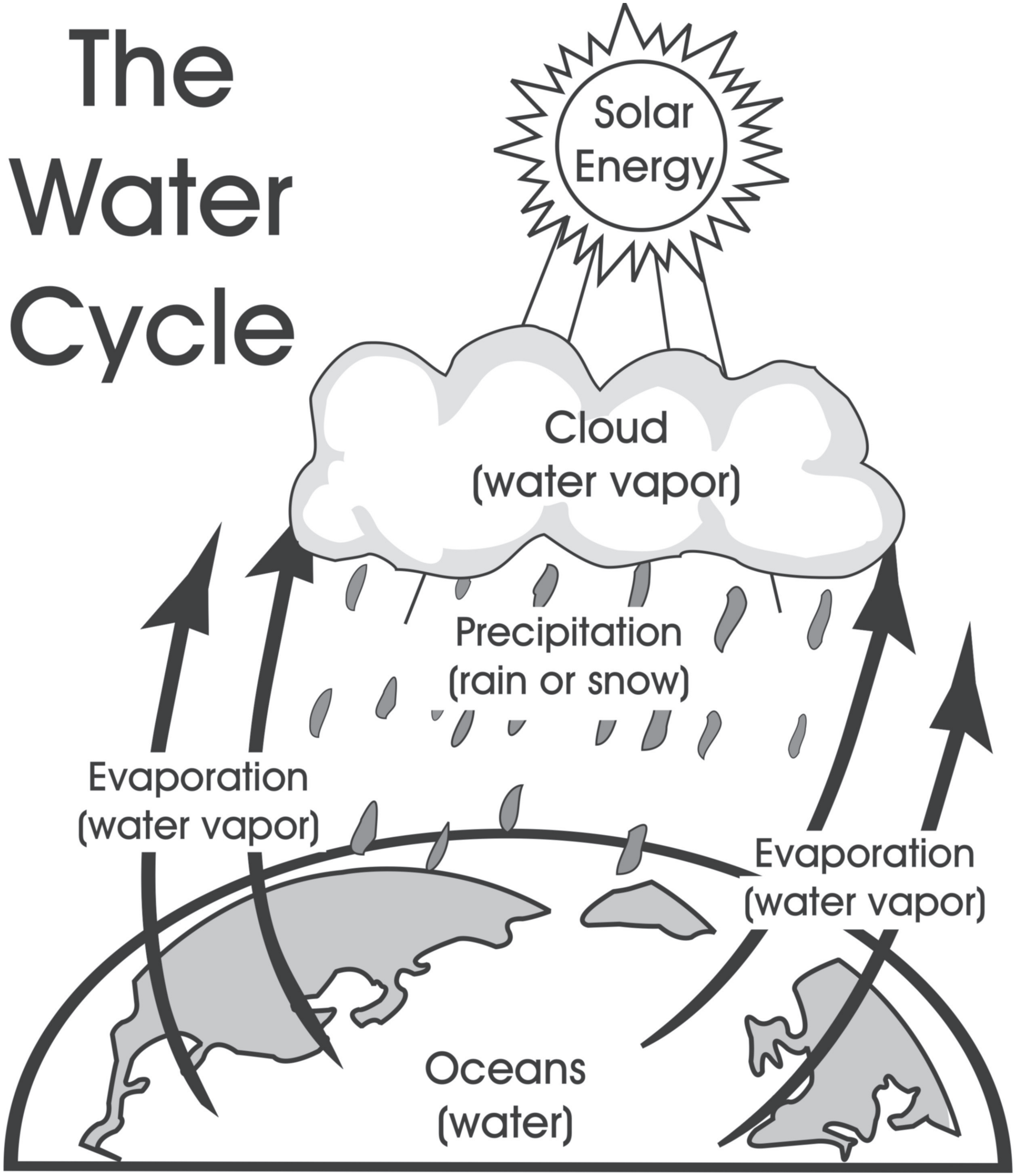


We can cook food with solar energy.

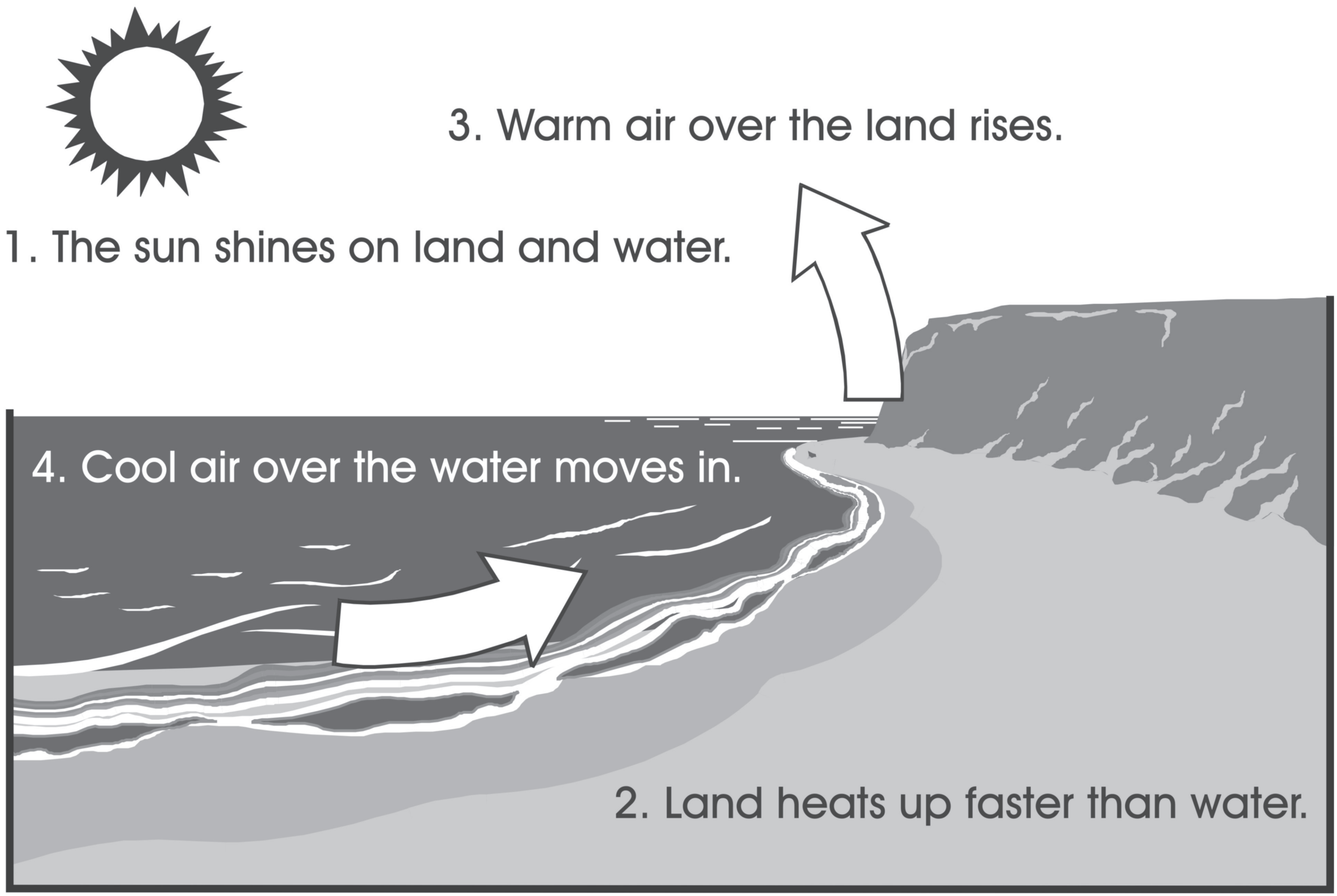
DRYING

We can dry clothes with solar energy.

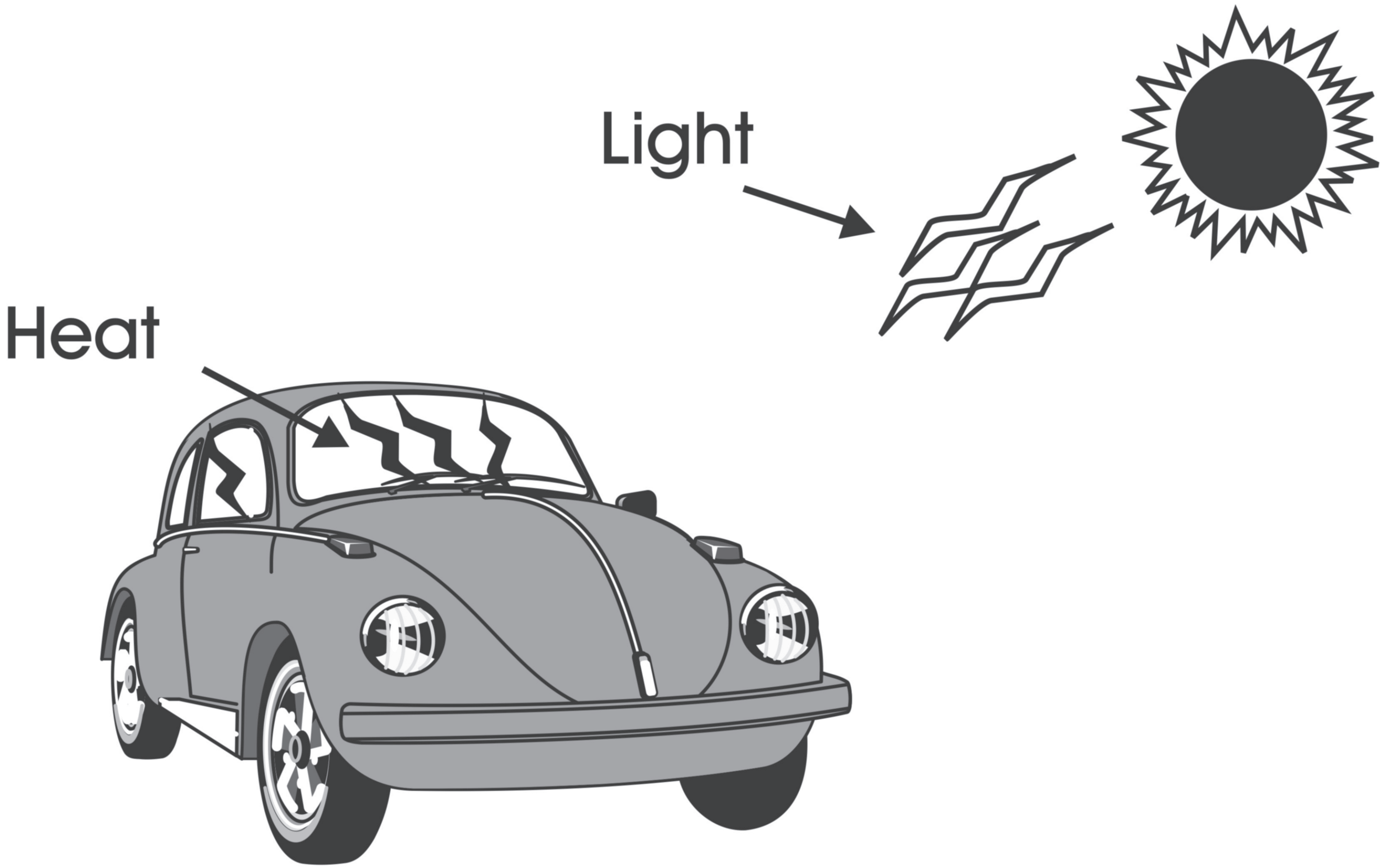
The Water Cycle



How Wind Is Made



SOLAR COLLECTOR



Light passes through the window and hits the inside of the car.
It turns into heat and is trapped inside.

COLLECTING SOLAR ENERGY

Why don't we use the sun for all our energy needs? We don't know how to yet. The hard part is capturing the energy. Only a little bit reaches any one place. On a cloudy day, most of the solar energy never reaches the ground at all.

Lots of people put **solar collectors** on their roofs. Solar collectors capture the energy from the sun and turn it into heat. People heat their houses and water using solar energy.

MORE INFORMATION

Heating with solar energy is not as easy as you might think. Capturing sunlight and putting it to work is difficult because the solar energy that reaches the earth is spread out over a large area. The amount of solar energy an area receives depends on the time of day, the season of the year, the cloudiness of the sky, and how close it is to the earth's equator.

A **solar collector** is one way to capture sunlight and change it into usable heat energy. A closed car on a sunny day is like a solar collector. As sunlight passes through the car's windows, it is absorbed by the seat covers, walls, and floor of the car. The absorbed energy changes into heat. The car's windows let radiant energy in, but they don't let all the heat out.

Space heating means heating the space inside a building. Today, many homes use solar energy for space heating. A **passive solar home** is designed to let in as much sunlight as possible. It is like a big solar collector. Sunlight passes through the windows and heats the walls and floor inside the house. The light can get in, but the heat is trapped inside. A passive solar home does not depend on mechanical equipment, such as pumps and blowers, to heat the house.

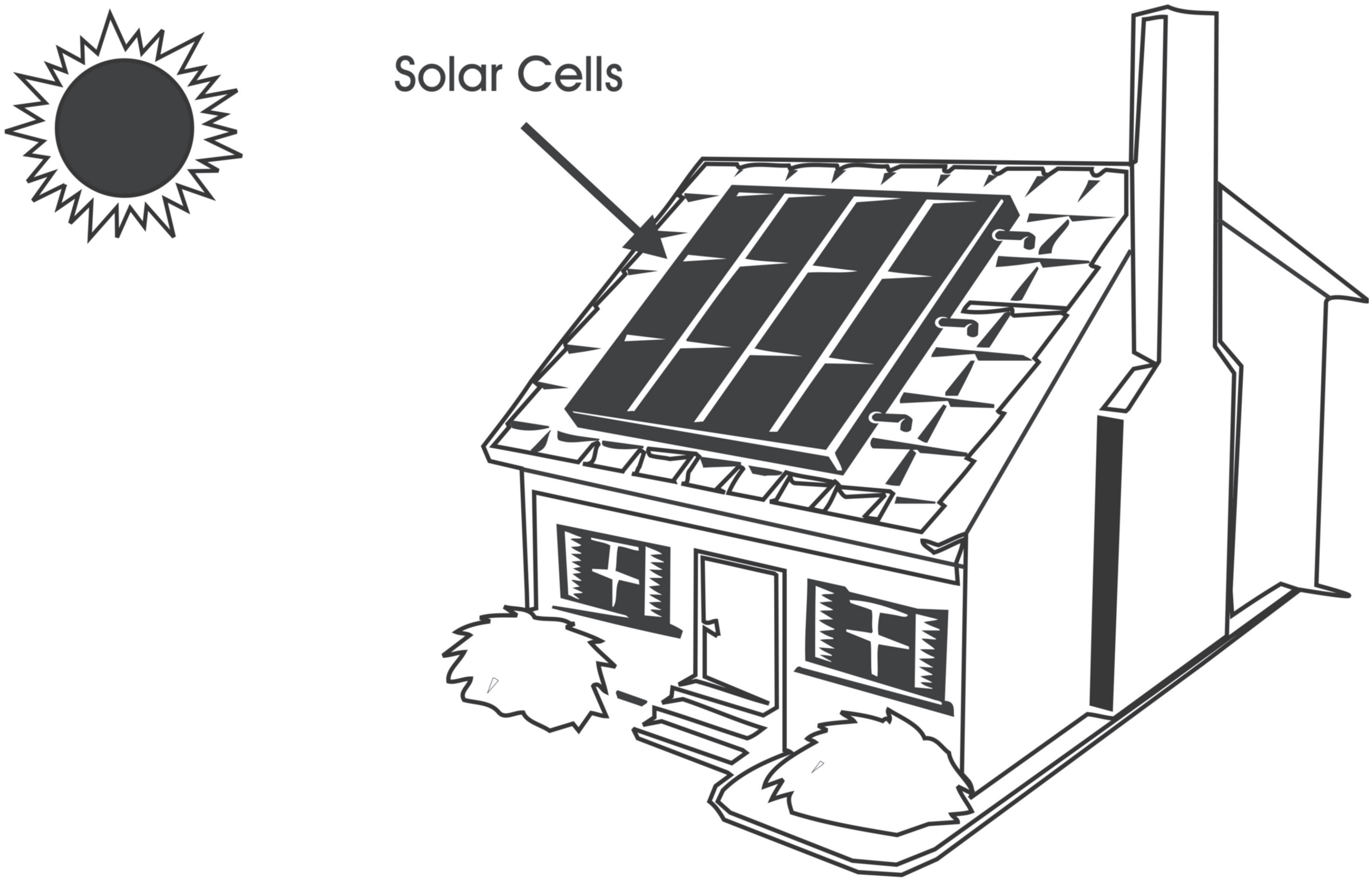
An **active solar home**, on the other hand, uses special equipment to collect sunlight. An active solar house may use special collectors that look like boxes covered with glass. These collectors are mounted on the rooftop facing south to take advantage of the winter sun. Dark-colored metal plates inside the boxes absorb sunlight and change it into heat. (Black absorbs sunlight better than any other color.) Air or water flows through the collector and is warmed by the heat. The warm air or water is distributed to the rest of the house, just as it would be with an ordinary furnace system.

Solar energy can be used to heat water. Heating water for bathing, dishwashing, and clothes washing is the second biggest home energy cost. A **solar water heater** works a lot like solar space heating. In our hemisphere, a solar collector is mounted on the south side of a roof where it can capture sunlight. The sunlight heats water and stores it in a tank. The hot water is piped to faucets throughout a house, just as it would be with an ordinary water heater. Today, more than 1.5 million homes in the United States use solar water heaters.

DISCUSSION QUESTION

Where on the earth do you think it would be easy to capture solar energy? *(The desert, near the equator, any place where it is sunny most of the time.)*

ELECTRICITY



Solar cells turn light into electricity.

SOLAR ENERGY CAN MAKE ELECTRICITY

Photovoltaic (PV) cells turn the sun's energy into electricity. ***Photo*** means light and ***volt*** is a measure of electricity. PV cells are made of two pieces of **silicon**, the main ingredient in sand. Each piece of silicon has a different **chemical** added. When **radiant energy** hits the PV cell, the chemicals make electricity. Some toys and calculators use small PV cells instead of batteries. Big PV cells can make enough electricity for a house. They are expensive, but good for houses far away from power lines.

Some schools are adding PV cells to their roofs. The electricity helps lower the amount of money schools must pay for energy. The students learn about the PV cells on their school buildings. Today, solar energy provides only a tiny bit of the electricity we use. In the future, it could be a major source of energy. Scientists are looking for new ways to capture and use solar energy.

MORE INFORMATION

Photovoltaic comes from the words *photo* meaning light and *volt*, a measurement of electricity. Photovoltaic cells are also called PV cells, or solar cells, for short. You are probably familiar with photovoltaic cells. Solar-powered toys, calculators, and roadside telephone call boxes all use solar cells to convert sunlight into electricity.

Solar cells are made of two thin pieces of **silicon**—the substance that makes up sand and the is the second most common substance on earth. One piece of silicon has a small amount of boron added to it, which gives it a tendency to attract electrons. It is called the **p-layer** because of its positive tendency. The other piece of silicon has a small amount of phosphorous added to it, giving it an excess of free electrons. This is called the **n-layer** because of its tendency to give up electrons, a negative tendency. When the two pieces of silicon are placed together, some electrons from the n-layer flow to the p-layer, forming an electric field forms between the layers. The p-layer now has a negative charge and the n-layer has a positive charge.

When the PV cell is placed in the sun, the radiant energy energizes the free electrons. If a circuit is made connecting the layers, electrons flow from the n-layer through the wire to the p-layer. The PV cell is producing electricity—the flow of electrons. If a load such as a lightbulb is placed along the wire, the electricity will do work as it flows. The conversion of sunlight into electricity takes place silently and instantly. There are no mechanical parts to wear out.

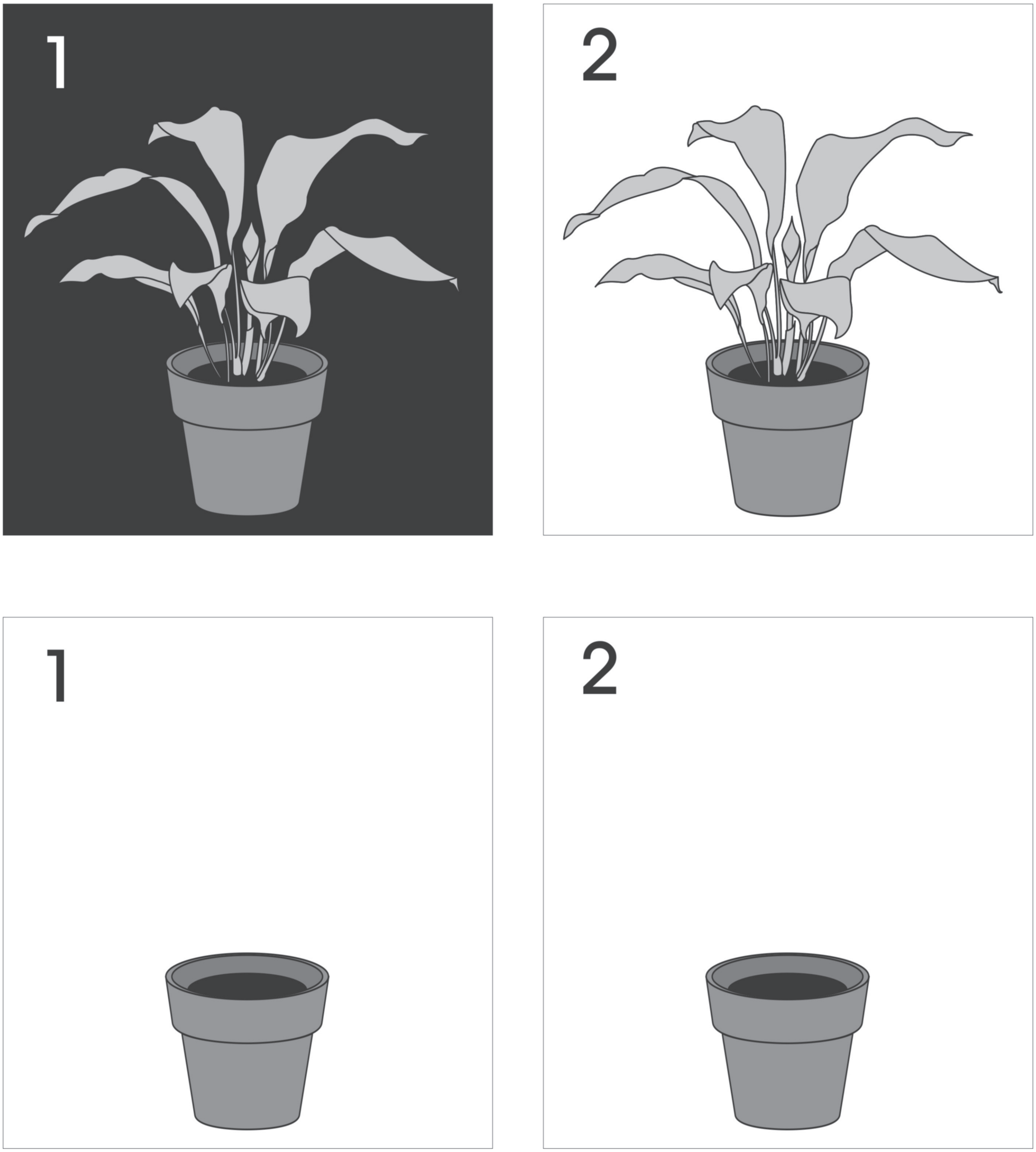
Compared to other ways of producing electricity, PV systems are expensive. It costs 10-20 cents a kilowatt-hour to produce electricity from solar cells. On average, people pay about eight cents a kilowatt-hour for electricity from a power company using fuels like coal, uranium or hydropower. Today, large PV systems are mainly used to generate electricity in areas that are a long way from electric power lines.

DISCUSSION QUESTIONS

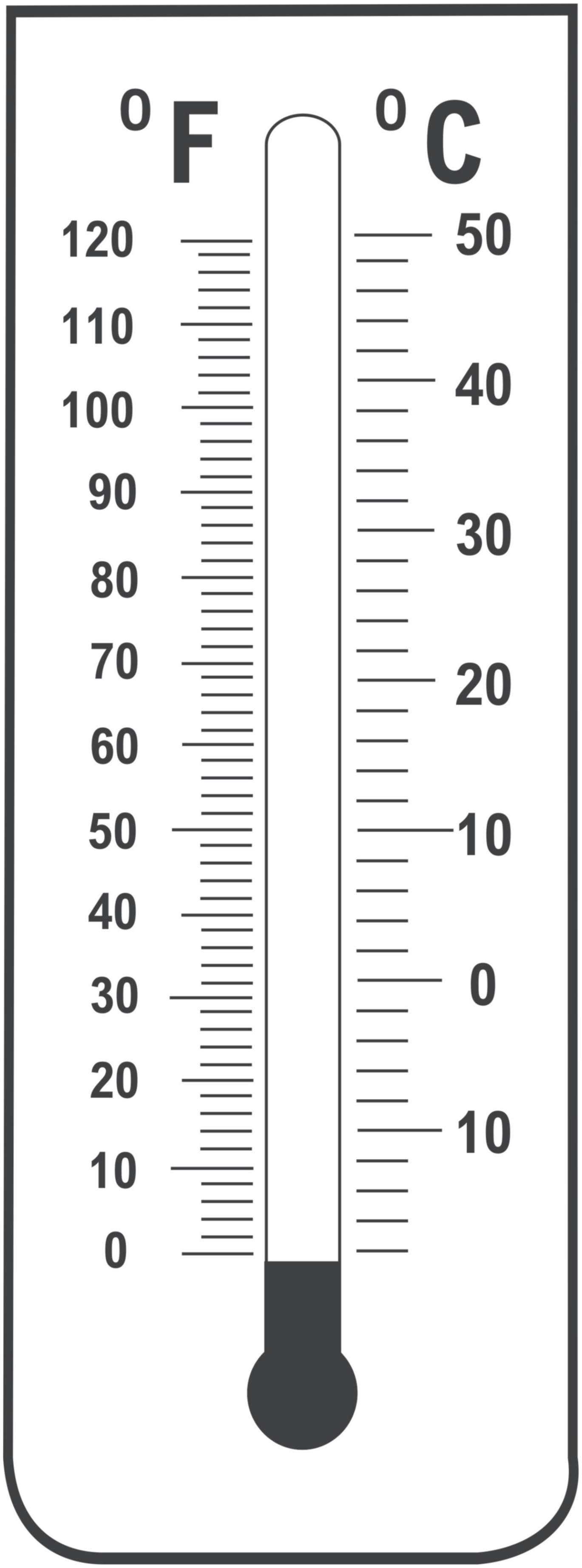
1. Have you seen a solar cell? Where did you see it?

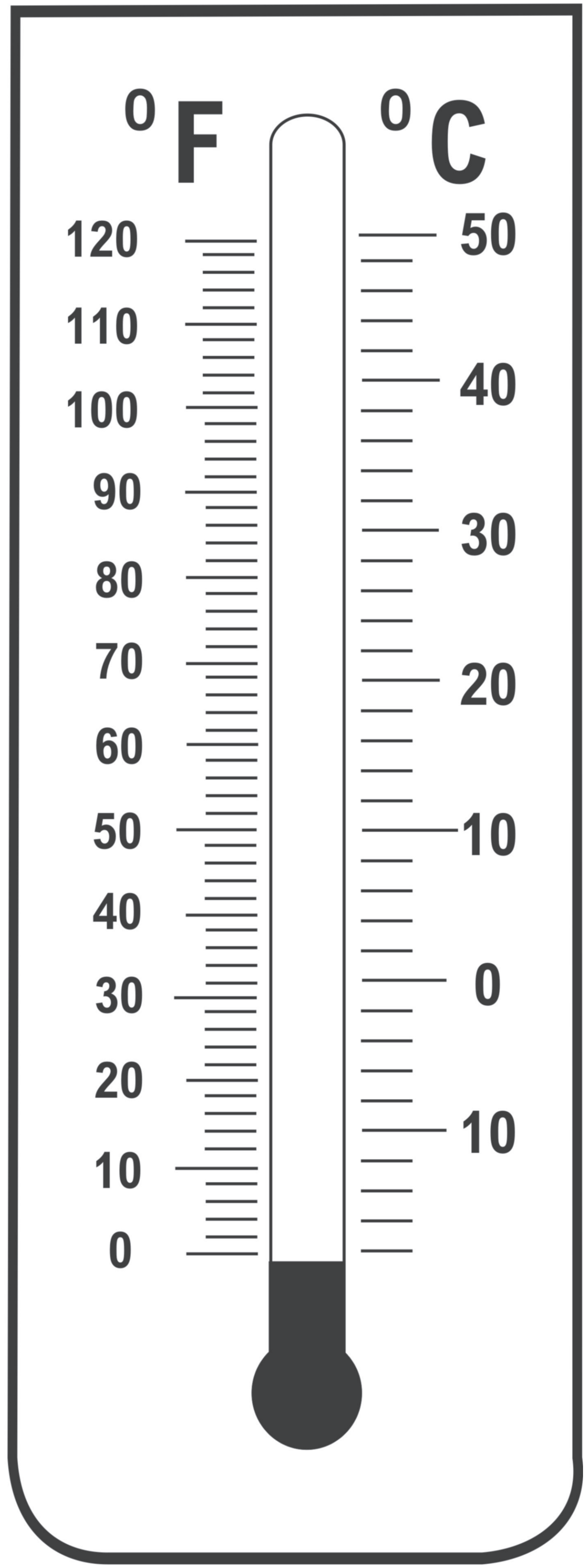
2. What did it power?

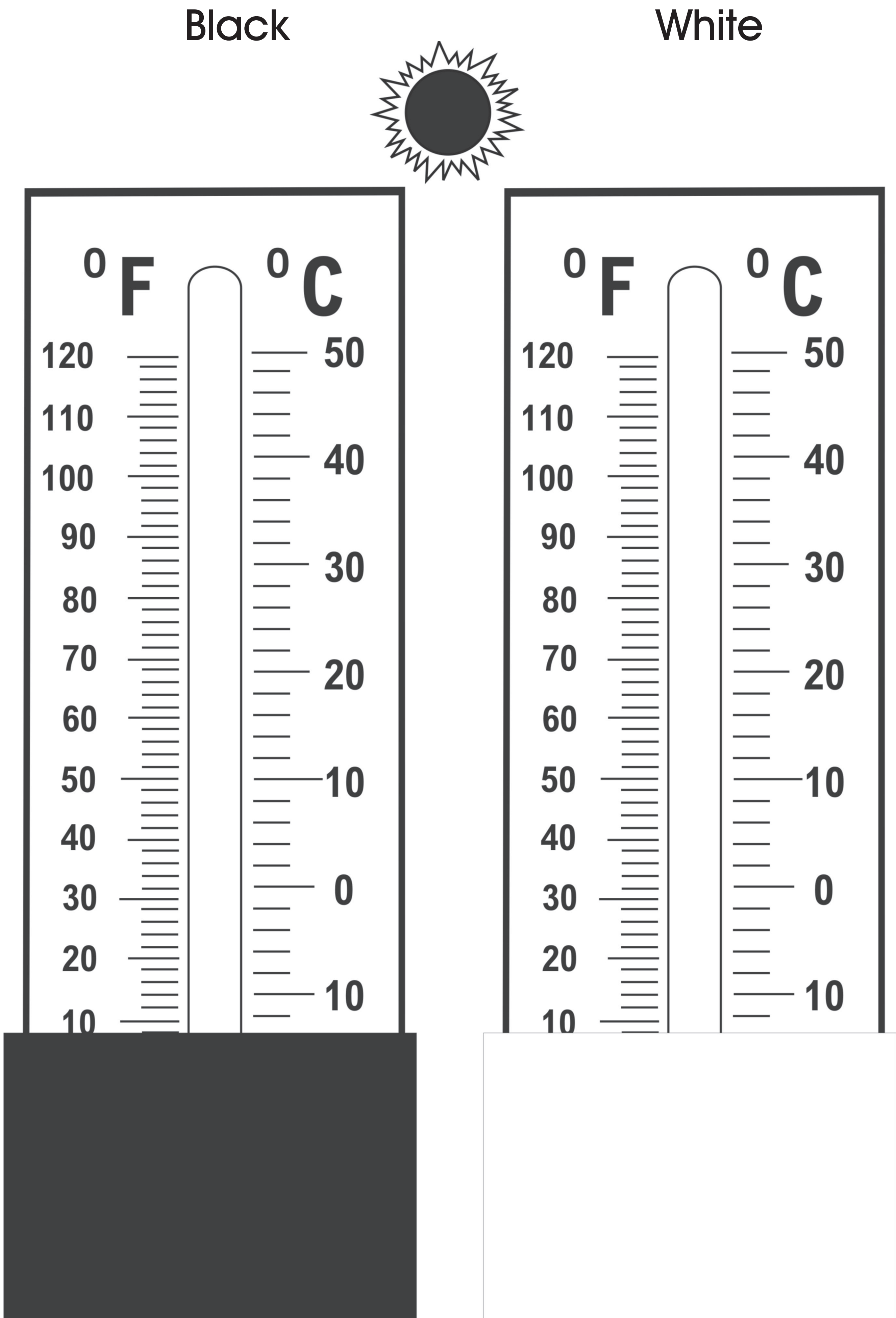
Question
Do plants need sun to grow?



Reading a Thermometer



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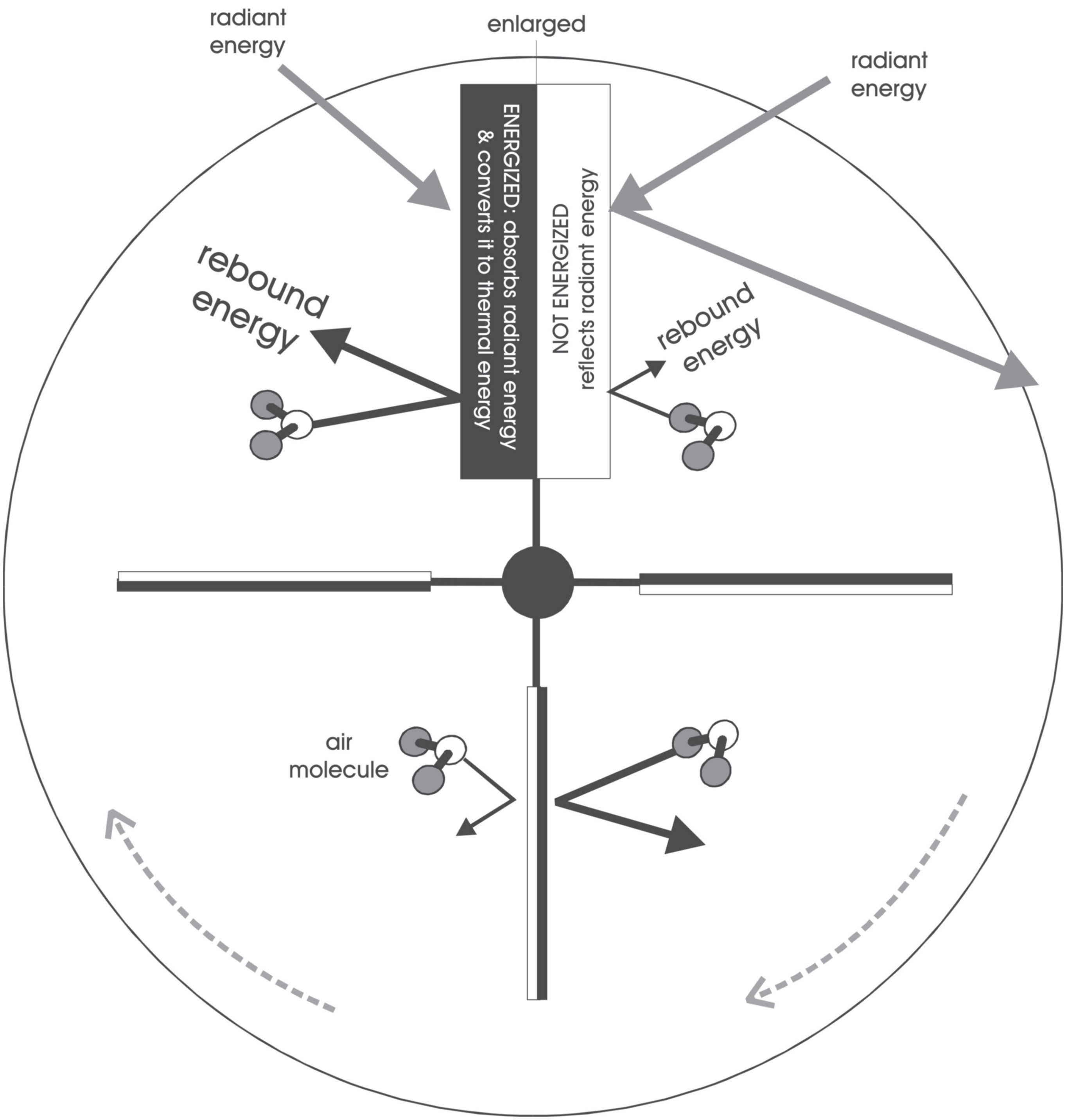
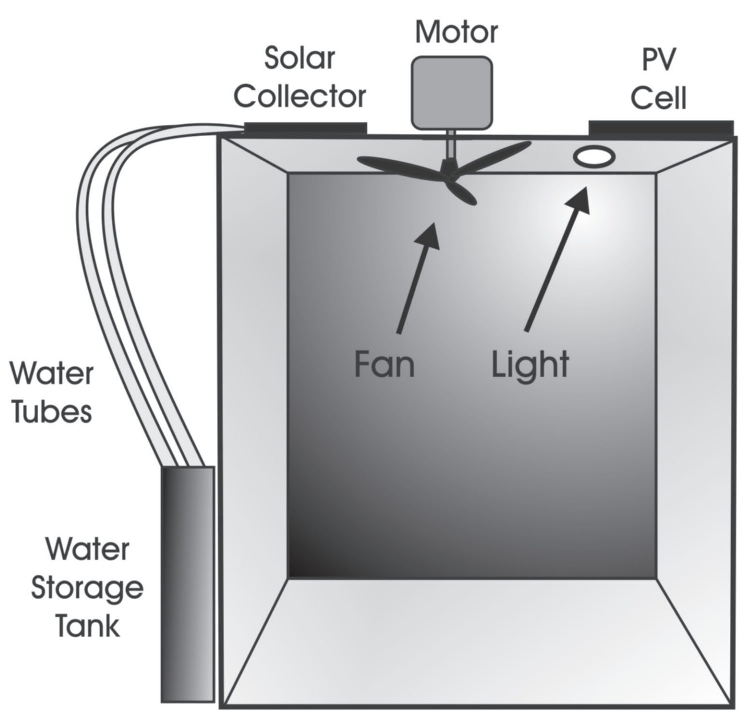
TOP VIEW OF RADIOMETER



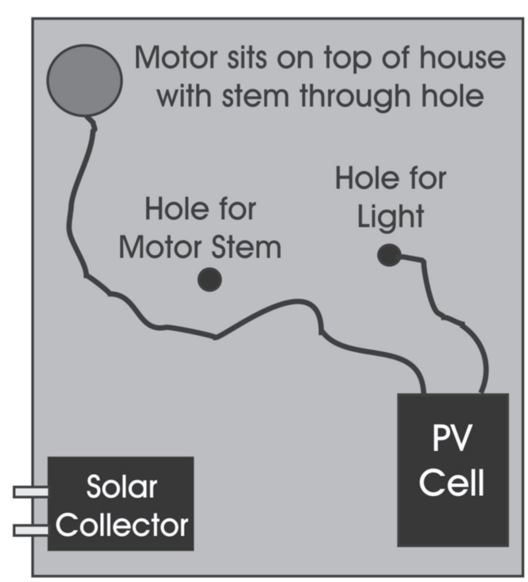
SOLAR HOUSE

A photovoltaic (PV) cell changes radiant energy into electricity. Electricity can run a motor to make motion and make light. A solar collector absorbs radiant energy and turns it into heat. A solar collector can heat water. A water storage tank painted black can store hot water and keep it hot by absorbing radiant energy.

Step 1: Use a cardboard box to make a house with big windows and a door in the front.
Step 2: Use clear transparency film to cover the windows.
Step 3: Use black construction paper to make a round water storage tank. Attach it to the side of the house with tape.
Step 4: Make two holes in the top of the box like in the drawing. Each hole should be about one centimeter (1 cm) in diameter.
Step 5: Place the solar collector on top of the house as shown in the drawing. Put the tubing from the solar collector into the water storage tank.
Step 6: Place the PV cell on top of the house. Insert the light through the hole as shown in the diagram.
Put the stem of the motor through the hole for the motor stem.
Step 7: Put a tiny bit of clay into the hole of the fan and push it onto the stem of the motor that is sticking through the ceiling.
Step 8: On a sunny day, place the house in the sun with the front facing south.
Step 9: Observe the light shine and the fan turn as the PV cell turns radiant energy from the sun into electricity. The solar collector shows how a real solar house could heat and store water. It doesn't really work.



Front View of House



Top View of House

THE SUN AND ITS ENERGY
Evaluation Form

State: ___ _ Grade Level: ___ _ Number of Students: ___ _

1. Did you conduct the entire activity?	Yes	No
2. Were the instructions clear and easy to follow?	Yes	No
3. Did the activity meet your academic objectives?	Yes	No
4. Was the activity age appropriate?	Yes	No
5. Were the allotted times sufficient to conduct the activity?	Yes	No
6. Was the activity easy to use?	Yes	No
7. Was the preparation required acceptable for the activity?	Yes	No
8. Were the students interested and motivated?	Yes	No
9. Was the energy knowledge content age appropriate?	Yes	No
10. Would you use the activity again?	Yes	No

How would you rate the activity overall (excellent, good, fair, poor)?

How would your students rate the activity overall (excellent, good, fair, poor)?

What would make the activity more useful to you?

Other Comments:

Please fax or mail to:
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PO Box 10101
Manassas, VA 20108
FAX: 1-800-847-1820

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Pacific Gas and Electric Company
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