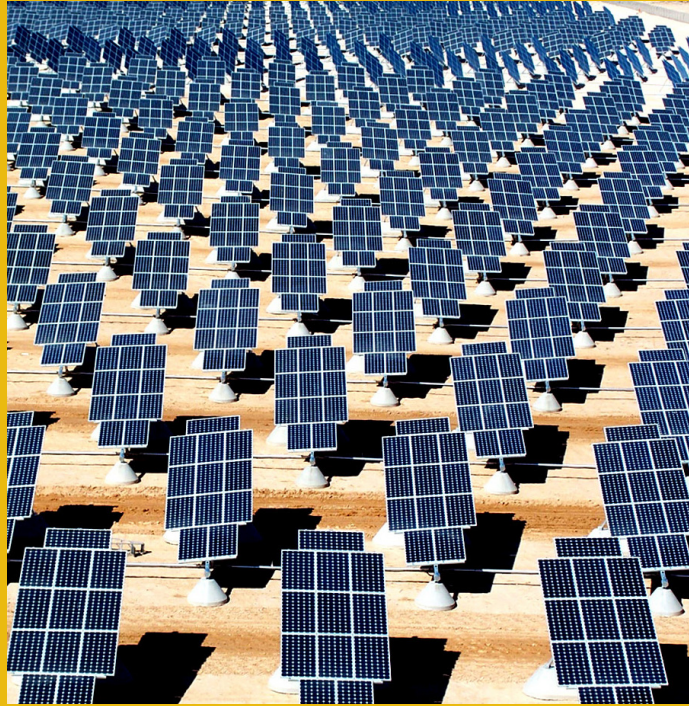


Solar Cells



Solar Cells

**Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.**

Start learning right now about how you can reduce your energy bills by using the power of solar energy. Take the following brief quiz to see how much you already know about solar cells. See the bottom of page 4 to check your answers.

1. Americans make up about 5% of the world population. About what percentage of the total energy used by everyone in the world do Americans use?
 - a. 2%
 - b. 5%
 - c. 15%
 - d. 25%
2. About how many people in the world population currently do *not* have electricity?
 - a. 2,000,000
 - b. 20,000,000
 - c. 200,000,000
 - d. 2,000,000,000
3. Solar energy is measured in units of kilowatt-hours. One kilowatt-hour of energy would power one 100-watt light bulb for how long?
 - a. 10 minutes
 - b. 1 hour
 - c. 10 hours
 - d. 100 hours
4. What is the efficiency rating, in terms of converting sunlight into electricity, for most modern solar cells?
 - a. 3%
 - b. 15%
 - c. 50%
 - d. 75%
5. The conversion of sunlight to make 1 kilowatt of electrical energy using a solar cell produces the same amount of energy as the burning of how many pounds of coal?
 - a. 17 pounds
 - b. 170 pounds
 - c. 1,700 pounds
 - d. 17,000 pounds



A Different Slant

How does the latitude on Earth impact the effectiveness of a solar cell in its conversion of sunlight to electricity? Conduct the following investigation to study this relationship.

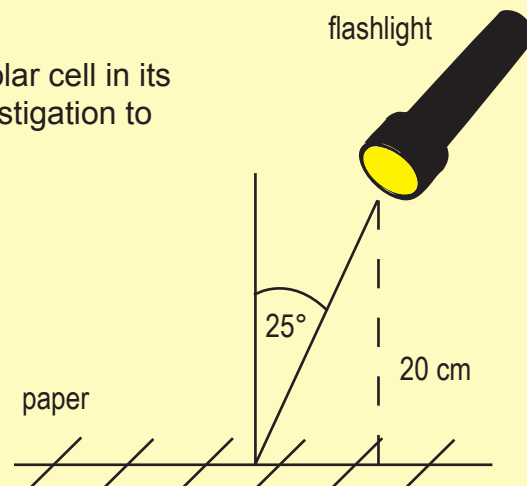
flashlight
4-sheets plain letter-sized paper
scissors
balance (± 0.01 grams)

Materials (per group)

pencil
ruler
protractor

Procedure

1. Place one piece of plain letter-sized paper flat on a tabletop.
2. Turn on the flashlight and hold the light vertically 20 centimeters above the paper.
3. Use your pencil to trace the bright-spot outline made by the flashlight on the paper.
4. Turn off the flashlight.
5. Use the scissors to cut out the bright spot you outlined.
6. Record the mass of the cutout in Table 1 below.
7. Place a new piece of plain letter-sized paper flat on the tabletop.
8. Turn on the flashlight and hold the light 25 degrees from the vertical, 20 cm above the paper.
9. Repeat steps 4 – 7.
10. Repeat the investigation for angles of 50 and 75 degrees from the vertical.
11. Divide the mass of each cutout by the mass of the vertical cutout. This value gives you an estimate of the relative area for each cutout.



Angle	Mass of Paper Cutout	Relative Area
Vertical		1
25 degrees from the vertical		
50 degrees from the vertical		
75 degrees from the vertical		

Questions for You

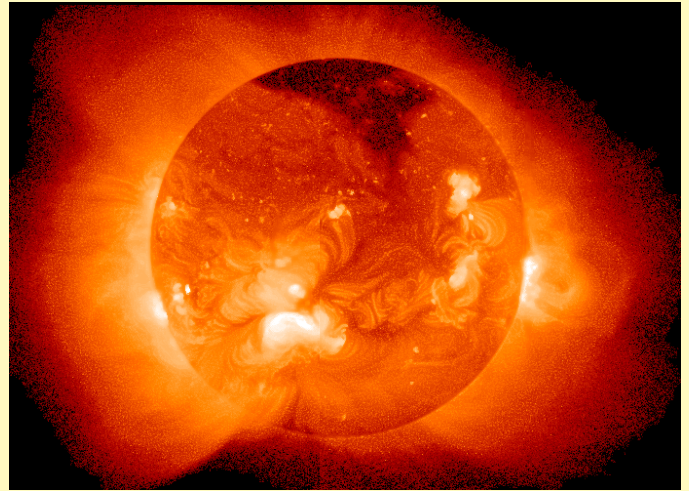
1. Describe the relationship between the angle of the flashlight and the area covered by the light.
2. How do you think the intensity of the light that reached the paper's surface changed as the coverage area of the light changed?
3. What implications do your answers from the previous two questions have for people wanting to install solar systems for electricity generation?

Solar Cells

Some **Enlightening** Facts

Many people have touted solar energy as the energy source for tomorrow. A number of facts about solar energy both support and reject this idea.

- Enough solar energy reaches Earth's surface each hour to supply the world's energy needs for one year.
- The volume of the Sun could hold about 1,000,000 Earths.
- A solar-powered steam generator is about 30% efficient in its energy conversion, and a standard diesel engine is about 50% efficient.
- The cost to build and operate a solar panel to produce electricity cannot compete with current forms of power generation, such as burning fossil fuels, until the price reaches about \$1 per watt. Current production and operation costs for solar panels are about three to four times that amount.
- Solar powered vehicles have reached speeds of over 90 mph.
- Leonardo Di Vinci designed a solar thermal system to heat water. He used curved mirrors to focus sunlight to provide hot water during the 15th century.
- Solar energy currently provides about 5% of the total energy produced in the United States.
- If the Sun burned out right now, people on Earth would not know about the loss of the Sun for over 8 minutes. This is the length of time sunlight takes to travel from the Sun to Earth.



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Answers: Page 2 Answers: 1) d, 2) d, 3) c, 4) b, 5) b.

The Science Fair Kits project was funded in part under the Department of Homeland Security Science and Technology Directorate grant contract #N10PC20003. Its contents are solely the responsibilities of the authors and do not necessarily represent the official views of the Department of Homeland Security.

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