

# LIGHT & SOUND

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The activities in this book reinforce basic concepts in the study of light and sound, including the nature and behavior of light, sources and uses of light, types of lenses, the vibration and travel of sound, and the characteristics of sound. Various activities, such as experiments, puzzles, and review questions help students effectively learn the principles presented.

General background information, suggested activities, questions for discussion, and answers are included.

Encourage students to keep completed pages in a folder or notebook for reference and review.

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## LIGHT & SOUND

# NATURE OF LIGHT

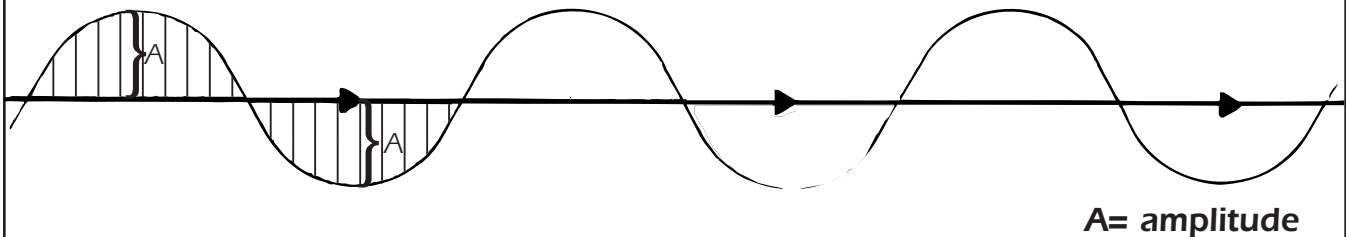
Light is a form of energy we call **radiant energy**. The light we can see is called visible light, but there are other kinds of radiant energy, such as radio waves and x-rays, which cannot be seen by the human eye. A **ray** is a beam of light energy.

Scientists think that light rays travel through space in waves. The waves spread out into space. The brighter the light, the farther the waves travel. The bright light from our sun travels 150 million kilometers (93,000,000 mi.) to Earth and beyond.

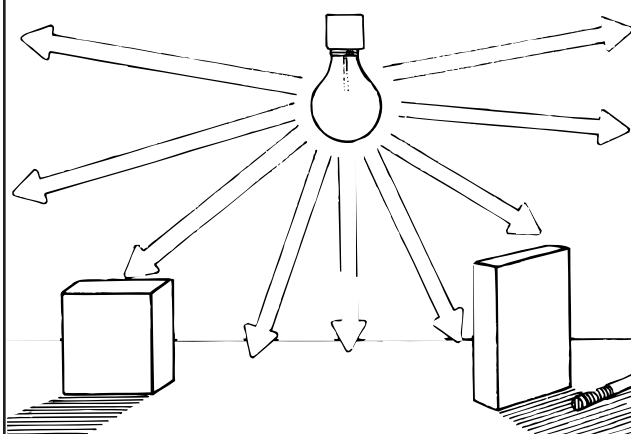
Light travels very fast. In space it travels about 186,000 mi. per second, a distance equal to about seven and one half trips around the Earth. Even at this speed, it takes eight minutes for sunlight to reach the earth.

Light travels at different speeds as it passes through different materials. Water is thicker than air, so light travel only three-fourths as fast in water as it does in air.

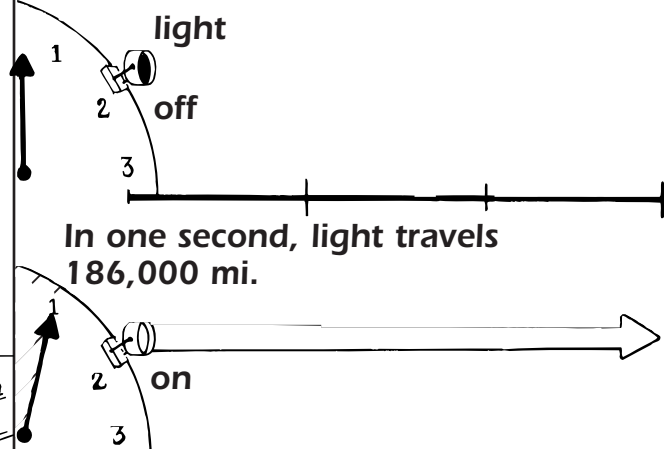
### Light rays travel like waves.



### Light waves travel in straight lines.



### Light travels very fast.



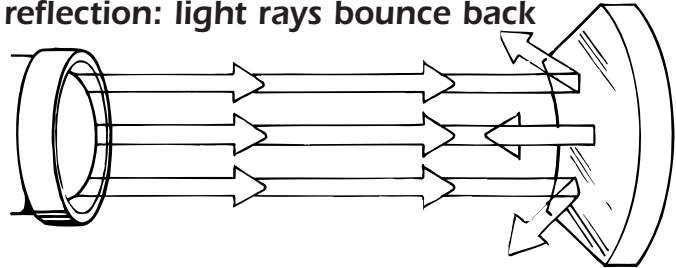
1. Light rays travel like \_\_\_\_\_.
2. Circle the picture that uses electricity to make light.
3. It takes one \_\_\_\_\_ for light to travel 186,000 miles.
4. Light waves travel in \_\_\_\_\_ lines.

**LIGHT & SOUND**

**REFLECTION**

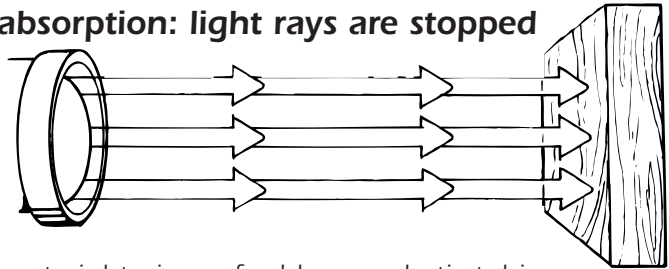
Light waves move away from their source in straight lines. They stop when they hit something they cannot go through, or they may bounce back as **reflected** light. When an object does not reflect light, it is because its surface is absorbing it. Some things reflect light better than others. Smooth, shiny surfaces like mirrors reflect light well; dark, rough surfaces do not.

**reflection: light rays bounce back**



**curved mirror**

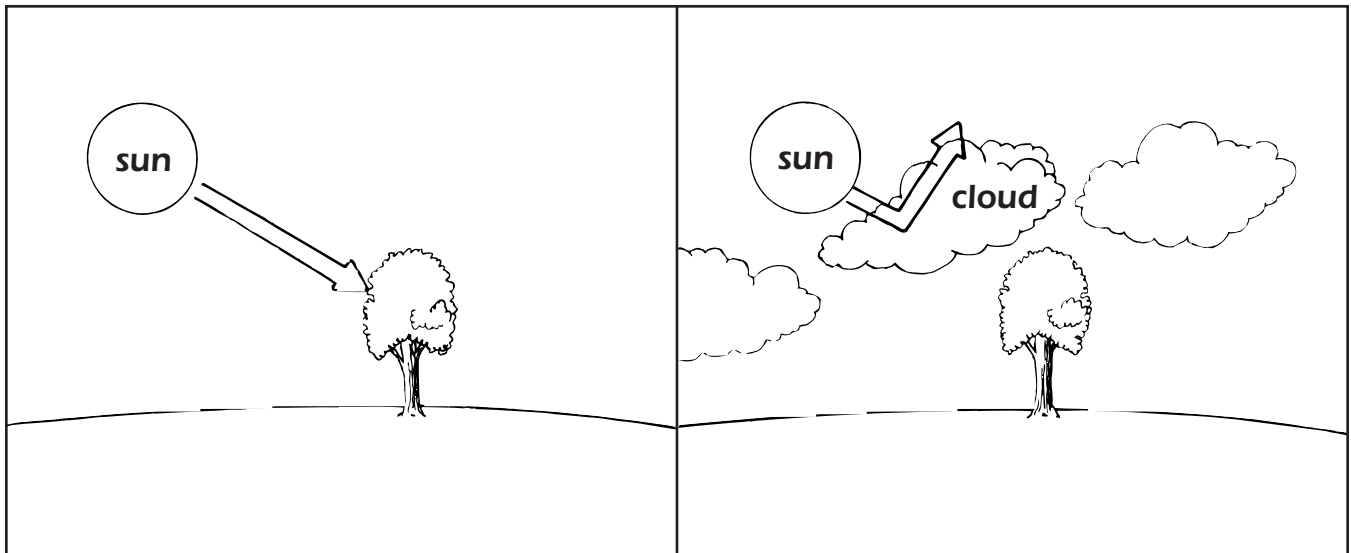
**absorption: light rays are stopped**



**ACTIVITY**

To see how light moves, look at a light through a straight piece of rubber or plastic tubing. You can also use a sheet of paper rolled into a tube. *(Do not look directly at a strong light that hurts your eyes.)* Bend the tube a little so that it is not straight.

1. Can you still see the light? Why or why not? \_\_\_\_\_



2. When a solid object stops light rays, a shadow is formed behind it. Draw the tree's shadow in the left drawing.

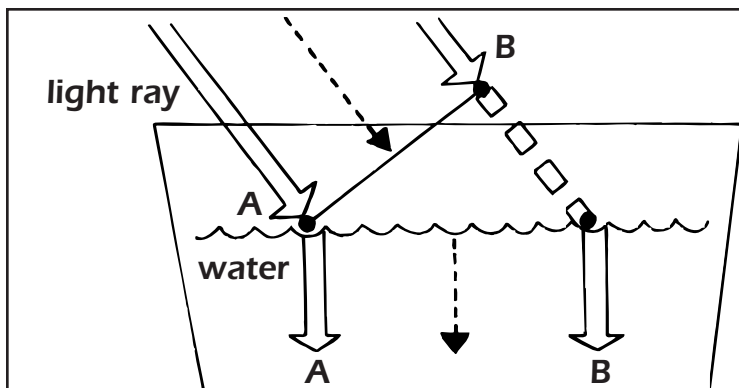
3. Would the tree in the right drawing make a shadow? \_\_\_\_\_

4. Why? \_\_\_\_\_

## LIGHT & SOUND

# REFRACTION

Light travels in straight lines, but it can be **refracted**, or bent. Refraction occurs only when the light rays enter or leave a substance *at an angle*. If the rays are straight up and down, they do not bend.



**refraction: bending of light rays**

**A** hits the water first.

**B** travels faster (dotted line) until it hits water.

Then **A** and **B** travel at the same speed, but the direction of the light ray has changed.

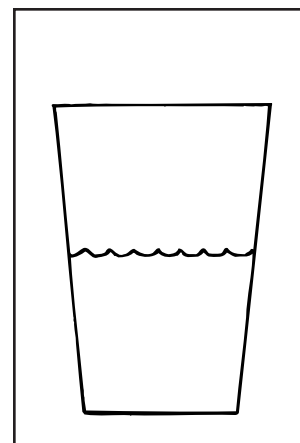
### ACTIVITY

Fill a clear glass half full with water. Put a pencil into the glass. Look at the pencil through the side of the glass.

How does the pencil look different than it did before you put it in the water?

\_\_\_\_\_

Draw the way it looks in the glass at the right.



Light travels faster in some materials than in others, and some materials refract light to a greater degree than others. When light rays pass from one material to another, they may speed up, slow down, or change direction.

To see how this happens, roll a pencil down a sloping surface. Slow down one end of the pencil by placing an obstacle in its way. The other end of the pencil is not slowed, so it swings around. The direction of the pencil changes.

