

# Light Activities

## What path does light follow?

Materials: Four 5 x 8 index cards with a small hole punched in each card.

1. Stand each card in a small ball of clay.
2. Space the cards about 1 foot apart, with the holes lined up.
3. Have someone hold the flashlight so that it shines into the hole of one of the end cards while you look through the hole of the card at the other end.
4. What do you see?
5. Now move one of the cards about one inch to the side and repeat step 3.
6. What happened? What does this tell you about the path light travels?

*This activity shows that light travels in a straight path. Unless the cards are positioned with the holes in a straight line, the light does not pass through the holes in the cards.*

# Light Activities

## How does color affect energy absorbed from light?

Materials: Two thermometers; heat lamp (or high wattage bulb); one sheet of white paper and one sheet of black paper of the same thickness; paper and pencil

1. Prop the thermometers in an upright position about 20 cm apart, facing in the same direction.
2. Record the temperatures of both thermometers.
3. Place the sheet of white paper in front of one thermometer and the black paper in front of the other.
4. Shine the heat lamp at the sheets of paper in such a way that it faces both equally. It should be about 40-50 cm away from the papers.
5. After the heat lamp has shined on the papers for about two minutes, check and record the temperatures of the two thermometers again.
6. Repeat for two more minutes and again record the temperatures.
7. Compare the changes in the first and last temperature readings of the two thermometers.
8. What can you say about the effect of color in this activity?

# Light Activities

## What happened to the pencil?

1. Fill the cup about two thirds full of water.
2. Put a pencil into the water.
3. Look at the pencil from the top and from the side.
4. What appears to happen to the pencil at the water level?
5. What ideas do you have about this effect?

*Light travels at different speeds through different substances, creating a bending effect on any light rays that enter a substance at an angle. This is called refraction. Light travels faster through air than it does through water. The bending of the light rays as they pass from air to water or from water to air results in an optical illusion as the object in the water appears to be broken at the surface of the water.*

# Light Activities

## Can you find the coin?

1. Place the coin in the bowl.
2. Stand in such a position that the coin is just barely hidden from your view by the edge of the bowl.
3. Without shifting your position, have your partner slowly fill the bowl with water, be3ign careful not to disturb the coin at the bottom of the bowl.
4. What happened to the coin as your partner poured water into the bowl?
5. What do you think could have caused this?

*Light travels in what appears to be a straight line in the air, but when it passes from water to air, it is bent by refraction, because it travels more slowly through water than through air. As water is poured into the bowl, the light will bend and more of the bottom of the bowl will be exposed. The coin will appear.*

# Light Activities

## How can an object hide under a clear glass?

1. Put a sticker or stamp on the table.
2. Fill the jar with water and put the lid on.
3. Place the jar on the stamp.
4. Look at the stamp.
5. Explain your observations.

Replace the jar with a plastic cup. Try this same activity with many different containers. They all need to be clear, of course, but try various shapes and sizes, using both glass and plastic. Do they all work the same? What are the differences? Can you tell why?

*As light passes from water to air the light bends (refracts) because it travels through these materials at different speeds. In this activity the refraction makes the stamp/sticker appear higher than it really is. When it is looked at from an angle, reflected light from the stamp doesn't reach the eyes, so the stamp seems to have disappeared. The lid on the jar prevents you from looking straight down on the stamp.*

# Light Activities

## How does water affect the way light travels?

1. Draw a simple diagram on the art paper and color it with dark or bright colors.
2. Hang the paper on the wall or lean it against something on a table.
3. Fill the jar with water and put the lid on.
4. Hold the jar between your eyes and your diagram.
5. What do you see?
6. Keeping your eyes on the diagram, hold the jar at different distances from your eyes and from the diagram.
7. Explain your observations.

*The jar filled with water acts as a convex lens and reverses the image.*

# Light Activities

## How does a lens affect the way light travels?

Materials: Candle, match, white cardboard, magnifying glass, pan

1. Prop the cardboard on a table.
2. Stand the candle in a pan or nonflammable container about 2-3 feet away from the cardboard.
3. Light the candle.
4. Hold the magnifying glass near the cardboard. Move it slowly toward the flame until a clear image of the flame appears on the cardboard.
5. Do you see anything strange about the flame? What effect do you think the magnifying glass has on what you see?

*The bending of light through refractions results in an inverse image of the flame as it is projected onto the cardboard. The same thing happens with the eye. Images are projected onto the back of the eye upside down, but they are reversed to their true perspective as they are interpreted by the mind.*

# Light Activities

## What affects the quality of reflection?

1. Shine a flashlight on a smooth sheet of aluminum foil.
2. Shine a flashlight on a crumpled sheet of aluminum foil.
3. Explain the difference in your reflections. What made the difference? What do you think happened?

*A polished surface reflects light rays in a consistent pattern. A rough surface diffuses light rays (reflects them in all directions, preventing a clear focus).*

# Light Activities

## How well can you control the reflection of light?

1. Arrange people with mirrors in a pattern such that light can be reflected from one to the other.
2. From what you know about reflected angles of light, see if the group can direct the light from the flashlight to one mirror and have it reflected from the first mirror to a second mirror. From the second to a third?
3. Determine who will reflect the light to whom in order to reflect the light all around the group.
4. Pick a target on the wall opposite the last person and light up the target with reflected light. Be sure the light from the projector reflects from all mirrors before lighting up the target.
5. With the light reflecting from all mirrors, compare the angle of reflection (the light leaving the mirror) with the angle of incidence (the light approaching the mirror) for each mirror.
6. How does the angle of reflection compare with the angle of incidence?

# Light Activities

## What do color filters do to colors?

1. View various sheets of construction paper while placing a strip of green acetate in front of your eyes.
2. Record the color of paper that you see. Have your partner record the actual color of the construction paper.
3. Repeat the process with blue acetate and red acetate.
4. Discuss the effect of each color of acetate and compare information from the group.

# Light Activities

## What does a prism do to light?

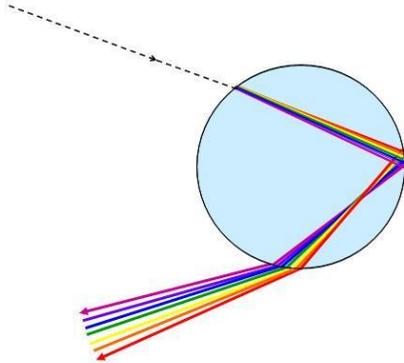
1. Shine the flashlight on the screen.
2. What do you think will happen if you place the prism in the path of the beam of light?
3. Place the prism in the path of the beam of light. Were your predictions accurate?
4. What is white light?
5. Which color seems to bend the most as light passes through the prism? Which the least?

# Light Activities

## Rainbows

The process of making the rainbows we see in the sky combines the properties of reflection and refraction within a water droplet. Here is how it works:

1. Light from the sun enters the water droplet and is refracted within the droplet.
2. The refracted light is then reflected off the back of the water droplet.
3. The reflected light exits the front of the water droplet and is again refracted, thus further separating the various colors of white light into its red, green and blue components.



### Bubble Rainbows

1. Blow bubbles and view the prisms that appear on the bubble.
2. Discuss with your partner what is happening.
3. Describe the process of refracting white light.