

Fire and Optics

Because this activity involves fire, make sure you do this on a flame-proof surface and not your dining room table! Good choices are your driveway, cement parking lot, the concrete sidewalk, or a large piece of ceramic tile. Don't do this experiment in your hand, or you're in for a hot, nasty surprise.

Overview: Today you get to concentrate light, specifically the heat, from the sun into a very small area. Normally, the sunlight would have filled up the entire area of the lens, but you're shrinking this down to the size of the dot.

What to Learn: Magnifying lenses, telescopes, and microscopes use this idea to make objects appear different sizes by bending the light. When light passes through a different medium (from air to glass, water, a lens...) it changes speed and usually the angle at which it's traveling. A prism splits incoming light into a rainbow because the light bends as it moves through the prism. A pair of eyeglasses will bend the light to magnify the image.

Materials

- sunlight
- glass jar
- nail that fits in the jar
- 12" thread
- hair from your head
- 12" string
- 12" fishing line
- 12" yarn
- paperclip
- magnifying glass
- fire extinguisher
- adult help

Experiment Please do this on a fireproof surface! This experiment will damage tables, counters, carpets, and floors. Do this experiment on surface like concrete or blacktop.

1. Have your adult do these steps for you:
 - a. Hold the magnifier above the leaf and bring it down toward the leaf until you see a bright spot form on its surface. Adjust it until you see the light as bright and as concentrated as possible. First you'll notice smoke, then a tiny flame as the leaf burns.
 - b. You are concentrating the light, specifically the heat, from the sun into a very small area. Normally, the sunlight would have filled up the entire area of the lens, but you're shrinking this down to the size of the dot that's burning the leaf.
2. Screw the lid on the jar.
3. Tie one end of the thread to the paperclip.
4. Poke the other end of the thread inside the hole on the lid.
5. Unscrew the lid and tie a nail to the other end of the thread. You want the nail to be hanging above the bottom of the jar by an inch or two, so adjust the height as needed.

6. Bring your jar outside.
7. Question: *Without breaking the glass or removing the lid, how can you get the nail to drop to the bottom of the jar?*

Fire & Optics & Eyes Data Table

Material for Suspending Nail	How Long Did It Take to Drop? <i>(measure in seconds)</i>

Reading

Magnifying lenses, telescopes, and microscopes use this idea to make objects appear different sizes by bending light. When light passes through a different medium (from air to glass, water, a lens...) it changes speed and usually the angle at which it's traveling. A prism splits incoming light into a rainbow because the light bends as it moves through the prism. A pair of eyeglasses will bend the light to magnify the image.

This lab is in two parts. The demonstration you do with the kids is not the one they do for their activity. You're going to concentrate the power of the sun on a flammable surface.

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Thermoelectric power plants use this principle to power entire cities by using this principle of concentrating the heat from the sun.

Never look through anything that has lenses in it at the sun, including binoculars or telescopes, otherwise what's happening to the leaf right now is going to happen to your eyeball.

Exercises

1. What happened to the leaf? Why?
2. How did you get the nail to drop?
3. Which material ignited the quickest?

Answers to Exercises: Fire and Optics

1. What happened to the leaf? Why? (You are concentrating the light, specifically the heat, from the sun into a very small area. Normally, the sunlight would have filled up the entire area of the lens, but you're shrinking this down to the size of the dot that's burning the leaf.)
2. How did you get the nail to drop? (By concentrating the energy from the sun using the magnifier.)
3. Which material ignited the quickest? (Refer to data table.)