

# ACTIVITIES

## Student Activities *continued*

What happens when all colors meet? This is answer number 3. (White light).

**12** Ask students to explain how white light is made. (Mixing of all colors.)

**13** Ask students what it means if certain colors are showing up separately. This is answer number 4. (Light has been “bent” or refracted, so that each color appears separately.)

**14** Using the information sheet, what concept causes the colors

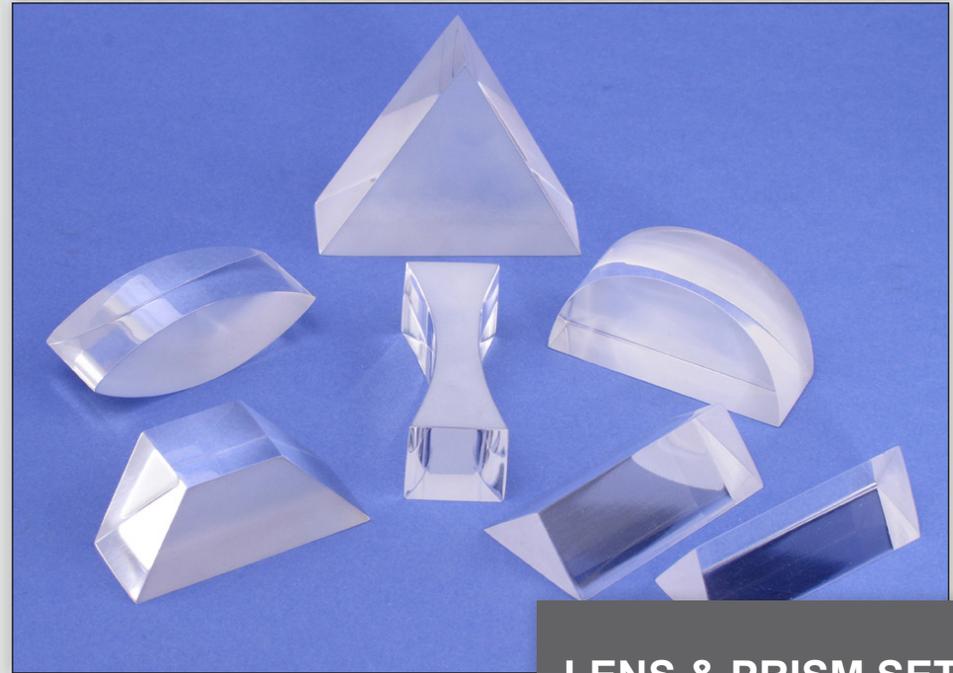
to come out individually? This is answer number 5. (Frequency of wavelength of each color causes each color to bend at a different angle.

**15** Assign each group a person to research to discover what he discovered about light, or how a telescope, camera, or eyeglasses use lenses, or prisms.

Aristophanes (5th century BC), Roger Bacon (1214-1292), John Dillond (1706-1761). Galileo.



# T E A C H E R S G U I D E



**LENS & PRISM SET**  
ITEM # 3358-20

## LIGHT AND COLOR - LENSES AND PRISMS

- How does my camera or telescope use principles found in prisms?
- How long has this information been used?

Demonstrate optical principles such as refraction, convergence, divergence and others in geometrical optics with the use of several glass prisms of various shapes.

# Materials

- Several pen lights or laser pointers
- overhead projector
- 12 flashlight (4 covered with blue cellophane, 4 with red and 4 with green)
- 4 prism sets
- access to the internet
- 4 magnifying glasses
- 20 random paragraph copied in tiny print
- light/prism handout

# Goals & Objectives

## Students will:

- explain the nature of light and its behavior both when uninterrupted, and when it is interrupted.
- summarize research regarding the history of the discovery of and use of optics.

# ASSESSMENT

- Participation
- Answers to five questions on their own paper
- summary of their research

# ACTIVITIES

- 1 Distribute the light/prism handout to each student, and split class into four groups.
- 2 Have students scan the information as you pass out flashlights (1 of each color per group), prism sets, magnifying glasses, and tiny-print paragraph per group.
- 3 Direct students to read the paragraph. Notice their complaints or solutions to the problem. Did any of them use the magnifying glass? Explain that this glass is a type of lens that affects light in a way that assists us in a task. Ask them to notice the information about lenses on their sheet. Have a volunteer read the relevant information aloud.
- 4 Have each group pick up a convex prism, put it over the small print, and notice that it looks somewhat bigger. (More light may be needed.)
- 5 Ask them what kind of lens is in a magnifying glass. (Convex)
- 6 Ask them what convex glass is doing to light. Then demonstrate with a convex prism, penlight, and overhead. Place two penlights on the overhead, and hold the prism so the light goes through it, noting that the 2 beams converge.
- 7 Now have each group do the same. On a sheet of paper, they should sketch what the light beams do. Number this answer "1".
- 8 Now ask them to do the same thing with a concave prism, write number two on their paper, and sketch what the beams do.
- 9 Students can repeat this procedure for each shape. After each shape, they should hypothesize about why the beams act as they do, using the light/prism handout as a guide.
- 10 Next, ask students if they noticed that a rainbow appears occasionally. What is happening there?
- 11 Ask the groups to pick up their flashlights, use a wall away from other groups to shine the flashlights.

## Note

It is always best to DO an experiment ahead of time to be able to best present it to the class.



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# S T U D E N T H A N D O U T

Student Name: \_\_\_\_\_

**Geometrical Optics is the study of light as photons that are seen as rays. Light can also be described in terms of wavelength, with different colors having different wavelengths. They move in a straight line unless interrupted in some way.**

- 1** The farther you are from a light source, the dimmer the light is.
- 2** The angle a light reflects after hitting a mirror is the same angle that it hit it.
- 3** Concave prisms or lenses cause light beams to diverge. (Concave shapes go in, like a cave. Diverge means to spread out.)
- 4** Convex prisms or lenses cause light beams to converge. This creates a magnifying affect. (Convex shapes come out, like a water droplet on a table. Converge means to meet.)
- 5** A lens is a curved material that light can pass through.
- 6** White light is made up of all colors.
- 7** Rainbows occur because light passes through air and then into another element, which differs in density, usually moisture from rain. This moisture acts as a lens. The change in density causes the light speed to change, and each component of that white light, having a different frequency, responds by bending (or refracting) at its own pace. Blue light has the highest frequency, so it bends the most. On the other end is the red light with the lowest frequency, so it bends the least. This is why a rainbow always puts the colors in the same order: ROYGBIV (Red, Orange, Yellow, Green, Blue, Indigo, Violet)

**Answer the questions asked in class on a separate sheet of paper.**

