# TEACHERS GUIDE


## GREEN LASER POINTER
**ITEM # 5134-00S**

## LIGHT AND COLOR - MISCELLANEOUS

- Why does light “bend” in water?
- What lenses collect light? Disperse light? When is each needed?
- Which part of the sky is being discussed?

The green laser pointer, most perceptible to the human eye, makes answering these questions easy. Laser is also clearly visible in the night sky for astronomers. Sturdy, padded plastic case with viewing window makes shelf storage easy and safe. Solid, heavy-duty construction measures 5.6” x .5”. Extremely bright green laser is at 532nm wavelength, with constant wave output. Range of 2 miles in darkness. Output power is <5mW (Class IIIa Laser Product)

**WARNING**

Caution!
This is a true laser. DO NOT point toward eyes.

**The laser pointer can be used in several lessons. Below, find a few lesson examples in which the laser pointer can be used as a vivid light source.**

# Lesson Plan 1

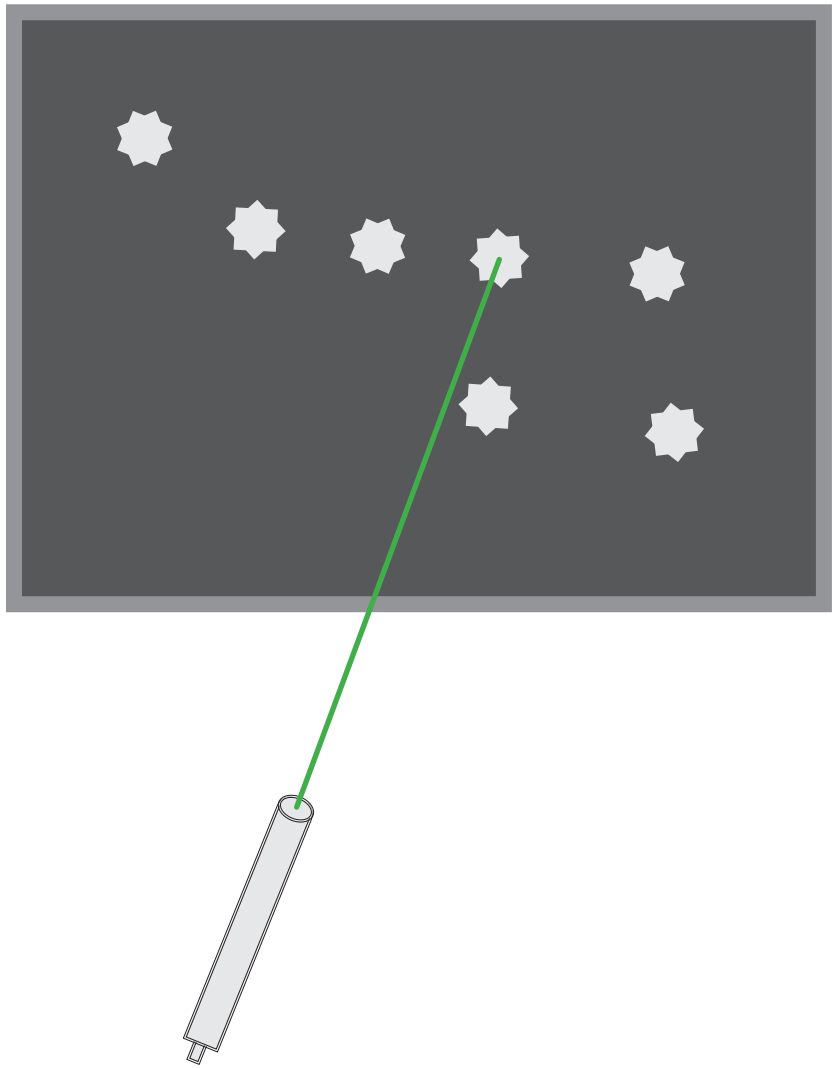
## Materials

- Green laser pointer
- small aquarium full of water with 3-4 drops of milk

## Goals & Objectives

**Students will:**

- Witness refraction of light vividly where the laser pointer is the light source.



## Activities

1. Set up the aquarium, about half full of water and several drops of milk.
2. Explain to the students that it will act just as the prism, as the light passes from less dense (air) to denser substance (water), its speed will slow and its trajectory change.
3. Using the laser in a darkened room, shine it from above the water level into the water.
4. Have students draw the angle the light beam changes.
5. Add more milk and do the same activity.
6. Did the beam's angle change again? Why or why not? (Milk amount changes density, so speed of light slows more.)

**Assessment:** Participation, sketches, and answers

# Lesson Plan 3

## Materials

- 2-3 Laser Pointers
- Lenses
- Prisms
- Mirrors
- Charts on Overhead or screen

## Goals & Objectives

**Students will:**

- Understand which areas to focus on during class discussion or lecture due to laser pointer use.

## Activities

1. In a darkened room, turn on the planetarium model, and point out several constellations or planet locations, using the pointer. Its vivid beam will make focusing on the correct light spots more accurate.
2. If no planetarium model available, charts of the night sky on the screen will also be made clearer by the laser pointer.

**WARNING**
Caution!
This is a true laser.
DO NOT point
toward eyes.



# Lesson Plan 2

## Materials

- Several green 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.

## Activities

1. Split class into four groups.
2. 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.
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)

Read the relevant information about lenses on the top of the Assessment Sheet *(on page 5)* to the class.

*continued on page 4*

# Activities

**Lesson Plan 2 Student Activites *continued***

6. Ask them what convex glass is doing to light. Then demonstrate with a convex prism, green laser pointer, and overhead. Place two laser pointers 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. 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. 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.

**WARNING**

Caution!
This is a true laser.
DO NOT point
toward eyes.

# Assessment Answers

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)

**For Student Assessment Use:**
Participation, Answers to five questions on their own paper, summary of their research.