

Strand: 8.2	Standard: 8.2.5	Episode 4	Big Idea: The structure of a wave affects its ability to be reflected, absorbed, or transmitted through various materials.
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Title: Prisms and Rainbows	Time: 45 min.	CCCs: <u>Structure and function</u>	Practices: Developing and using models
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Narrative of episode:

To clarify their understanding of refraction, students will use **models** such as prisms and computer simulations to discover how the structure of a light wave causes a rainbow to form.

Gather

Provide the students with materials they can use to explore what happens to light when it encounters another transparent medium (prism). Let the students explore using the **models**. They are looking for two things:

- The beams of light bend when they encounter the prism.
- White light splits into all of the colors of the rainbow when it hits the prism at a certain angle.

OPTION 1: Have students build a prism using instructions from [this link](#). You will need jars, water, mirrors that fit into the jar at an angle, and a bright light source such as a flashlight or a flashlight app on a phone.

OPTION 2: Find prisms, single color bright light sources such as laser pointers, and bright white light sources for each group (flashlight phone apps work). Turn off the lights and let the students experiment. They are trying to build a rainbow.

As the students are exploring, walk around the room and listen to the observations they are making to each other. Write some of these observations on the board. When they are done exploring, discuss their observations with the class. The students will record these on their [student sheets](#) and identify the process of energy transfer that happens when light hits a prism: Refraction.

Provide the student with the link to this [PhET simulation](#) - Bending Light. They will go to the Introduction page first, turn on the red laser, and on their student sheets, use colored pencils to draw what they see happening. Next they will go to the Prisms page. On their student sheets are several scenarios. Ask the students to set up each scenario using the simulation and then draw what is happening. Caution them to be very careful about drawing the colors in the same order, exactly as they appear in the simulation. When they are finished, give them time to explore using the various shapes of prisms, colors of light and mediums available in the simulation.

Take a minute or two to discuss what the students saw. You may want to draw white light going through a prism up on the board (or let a student do it).

Reason

Why do all the colors in white light split apart when it goes through a prism?

The students will now find information about how the structure of a white light wave splits it into colors as it goes through a prism. You can allow them to research it using the internet or books, provide them with reading such as [this one](#), or show them videos like [this one](#). The students will write a summary of what they have learned on their student sheets.

Show the students this [video](#) about how rainbows form. The students will draw a model of what happens to form a rainbow.

Communicate

The students will now return to the phenomenon from episode 1. Using what they have learned, they will [explain](#) why the penny came back into view when they filled the bowl with water.

Assessment:

Students return to the penny in a bowl phenomenon and explain it using the information they have learned.

Materials, resources, handouts, etc:

- [Student Sheet](#)
- Glass jar filled with water
- Small, compact mirror
- LED flashlight or flashlight phone apps
- Prisms
- Lasers or other colored light sources
- Bright white light sources
- Computers
- Colored pencils
- Penny in a bowl [phenomenon summary](#)