

ROY G. BIV! Which mnemonic device do you use to remember the colors of a rainbow? Design a spectroscope to explore the unique way light diffracts to see the rainbow colors!

## TEKS:

SCI 3.6 A: The student is expected to explore different forms of energy, including mechanical, light, sound, and thermal in everyday life.

SCI 5.6 C: The student is expected to demonstrate that light travels in a straight line until it strikes an object and is reflected or travels through one medium to another and is refracted.

SCI 8.8 C: The student is expected to identify how different wavelengths of the electromagnetic spectrum such as visible light and radio waves are used to gain information about components in the universe.

## Materials:

- Blank or old CD
- Paint (optional)
- Paper towel roll tube
- Pencil
- Precision knife and/or scissors
- Small piece of cardboard or cardstock
- Tape

## How To:

1. If you want your spectroscope to be a specific color, paint the paper towel roll tube your desired color and let it dry.
2. Using a precision knife or scissors, cut a thin slit at a 45-degree angle approximately 2 inches from the bottom of the tube. **Safety: An adult should assist when using a precision knife.**

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3. Near the same end of the tube, but directly across from the slit on the opposite side of the curve, make a thin, rectangular hole using the precision knife.

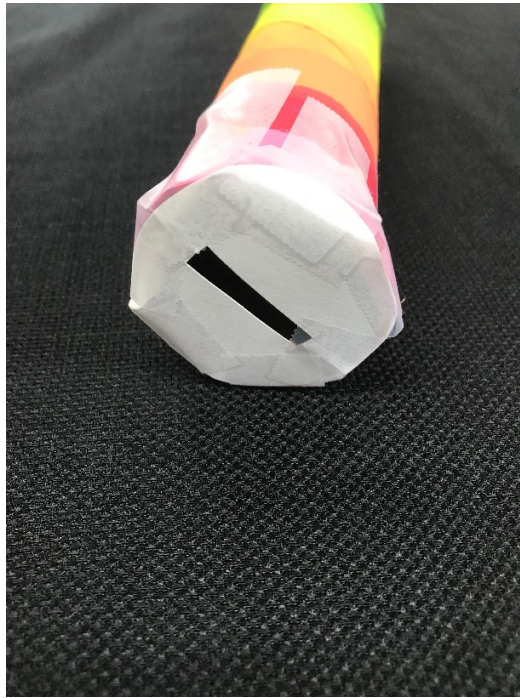


4. Trace a circle onto the cardboard or cardstock using one circular end of your paper towel roll tube. Then cut out the circle.
5. Cut a thin, rectangular hole out of the center of the circle you just made.
6. Tape the circle to the end of your paper towel roll tube that is farthest from the hole you made earlier.

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7. Insert the CD into your 45-degree angled slit with the shiny side facing up.



8. Use your spectroscope! Point the top slit at the sky and look through the rectangular peephole on the side of the paper towel roll tube. You will be able to see a rainbow inside. If you don't see the rainbow, point the top closer to your light source. Try your spectroscope in different lighting, too!

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## STEM Explanation:

Most of the light we see appears to be white, but there are actually several wavelengths (or colors) in light that our eyes can't see unless they are separated. One way they can be separated into their individual wavelengths is through refraction. An example of refraction is a rainbow, in which sunlight passes through raindrops and is split into its different colors.

In this activity, the light you saw was diffracted, or separated, by the CD. The CD has little lines carved into it in a circular pattern. When the light bounces off of these evenly spaced lines, it is separated into different colors. The light then enters your eye because the CD is reflective like a mirror. How many colors can you see?

## Career Connection:

*Optical engineers* design components of optical instruments such as lenses, microscopes, telescopes, and other equipment that use properties of light. They must have knowledge about optical physics and how light reacts to the outside world and materials in order to control, direct, and manipulate light to behave in a certain way.

## Resources:

<https://buggyandbuddy.com/homemade-spectroscope/>

<https://www.livescience.com/41548-spectroscopy-science-fair-project.html>

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