

PHIL COOK'S

SPLIT SUNLIGHT with a SPECTROSCOPE

Chemistry teacher by day, Tik Tok superstar by night, Phil Cook has over 3.6 million followers for his thrilling approach to demonstrating and explaining challenging science concepts.

I love teaching chemistry because it deconstructs the world around us into its basic components and tells us how everything is made. You can even do that with the sun, breaking sunlight into the colors of the visible light spectrum.

Be the superstar at your next science fair when you show your classmates how to split sunlight and make a rainbow on demand with this homemade spectroscope.

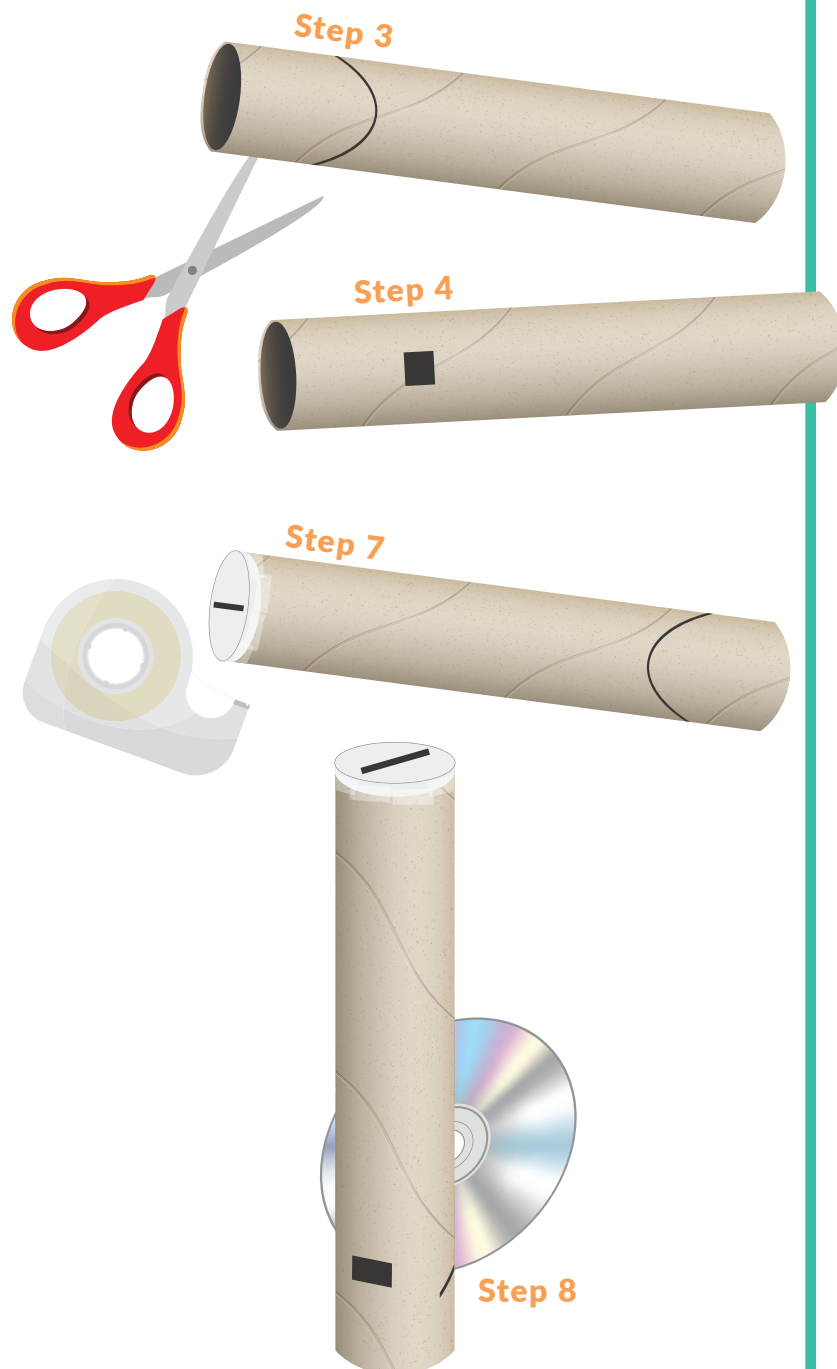


Your Homemade Spectroscope

SUPPLIES

- An empty paper towel roll
- A sharp pair of scissors or craft knife (with adult supervision ONLY)
- Something to write with
- A compact disc (CD)
- Tape
- A small piece of cardboard
- Paint (optional)

- 1** (optional): Paint and decorate the empty paper towel roll the way you would like.
- 2** Hold your paper towel roll vertically. When complete, your spectroscope will capture sunlight at the top end and let you view it as a rainbow toward the bottom end.
- 3** Have an adult cut an arch about one inch above the bottom end on one side of the paper towel roll at approximately a 45 degree angle. This is the slot that will hold the compact disc.
- 4** Have an adult cut a small rectangle out of the paper towel roll also on the bottom end but the opposite side as the arch cut. This is the viewing window.
- 5** Trace the circumference of the paper towel roll on the small piece of cardboard.
- 6** Cut out the circle after tracing and cut another small rectangle in the center of the circle.
- 7** Tape the circle flat to the top end of the paper towel roll. This should be the opposite end from the end with the cut outs.
- 8** Slip the compact disc with the metallic side facing up into the holder slot.
- 9** Take your spectroscope outside and point it toward the sun so that light enters through the slit on the top, reflects off of the compact disc, and can be seen through the viewing window.
- 10** Observe different sources of light (sunlight, lightbulb, colored light, etc.) and write down how the reflected wavelengths change between sources.



Science Lesson

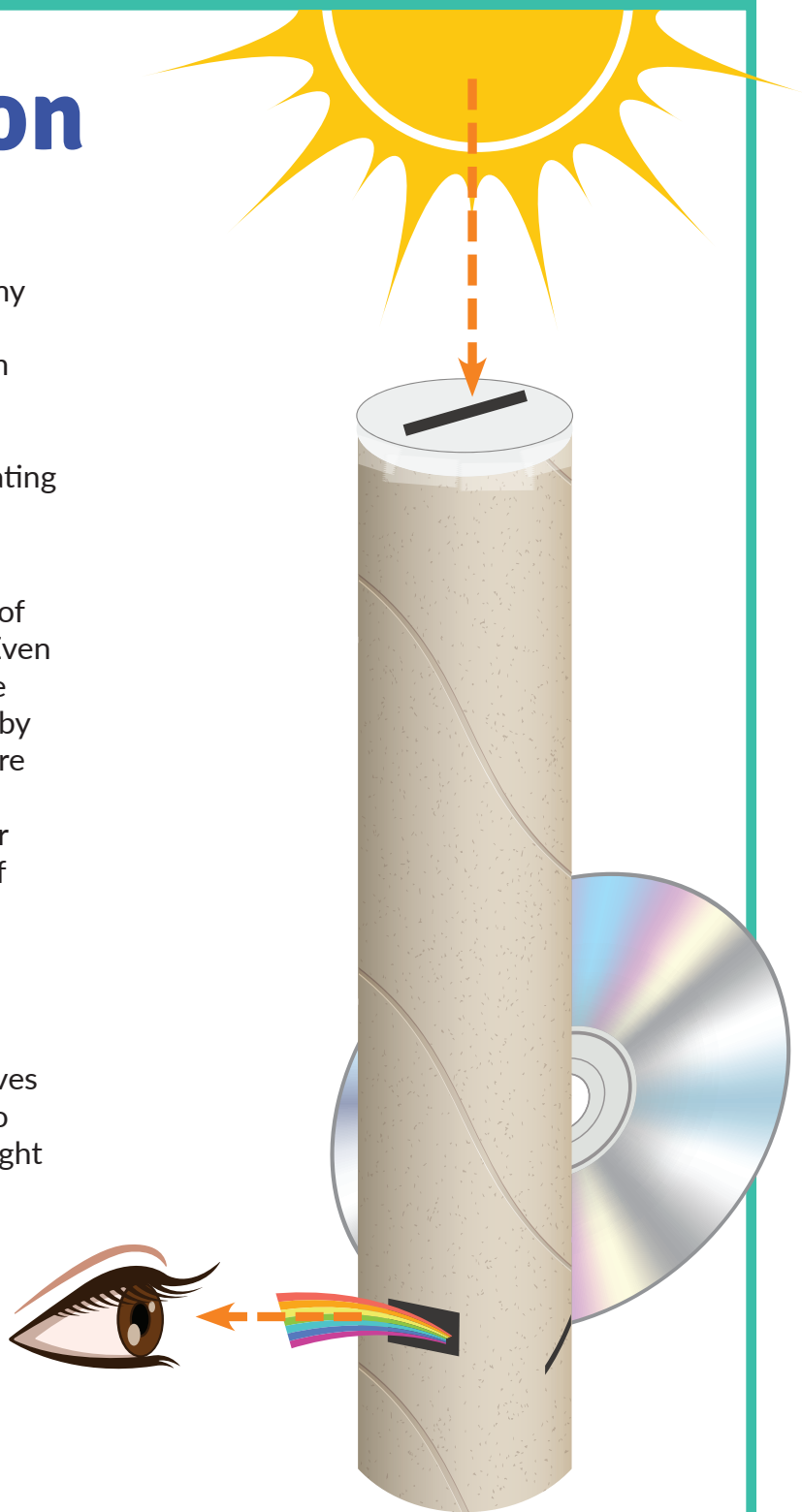
What just happened?

The metallic side of the compact disc has tiny ridges that diffract any light that bounces off. Sunlight is made up of white light, which contains all of the different wavelengths of light. When sunlight hits the CD, the wavelengths diffract at different angles creating a visible spectrum with all the colors of the rainbow.

Rainbows do this naturally, as tiny droplets of water diffract light in much the same way. Even the blue sky you see during daylight and the pink glow of a sunrise or sunset are caused by diffraction, as sunlight enters the atmosphere at different angles, and we see different portions of the spectrum light up. With your spectroscope, you can harness the power of diffraction anytime!

What is light?

Light is a special type of wave. Waves carry energy from one place to another. Light waves are made up of electricity and magnetism so they are called electromagnetic waves. All light waves travel very quickly, but some have a longer wavelength than others. The wavelength is what determines the color. Red light has a relatively longer wavelength and purple light has the shortest wavelength of the visible light spectrum.



"The colors you see in your spectroscope make up the visible spectrum, but there's more of that light that our eyes just can't see, including x-rays, gamma rays, ultraviolet and infrared light. Giant space telescopes like the Hubble and James Webb telescopes use spectroscopy technology to learn even more about faraway stars from these other wavelengths of their light. This really gives the idea that 'there's so much more to science than meets the eye' a whole new meaning!"