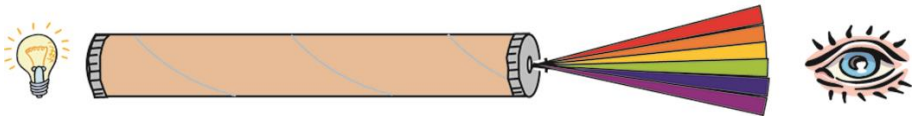
COLORS OF LIGHT

Exploring with a RAFT spectroscope



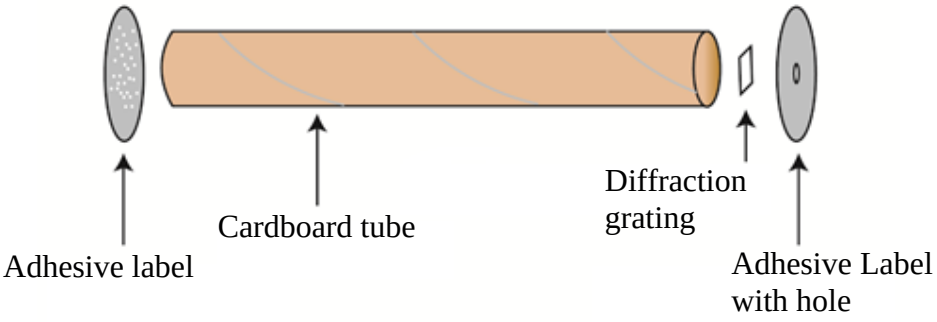
Curriculum topics:

- Light
- Color
- Electromagnetic spectrum

Subject:
Physical Science

Grade range: K – 12

White light is a combination of different colors. This easy-to-build spectroscope creates a rainbow pattern (spectrum) by separating incoming light into its component colors. The interesting patterns it displays can be used to identify different sources of light. Experiment with a variety of colored filters and see how the image changes!



Who we are:

Resource Area for Teaching (RAFT) helps educators transform the learning experience by inspiring joy through hands-on learning.

For more ideas visit
https://raft.net/for-educators/

Materials required

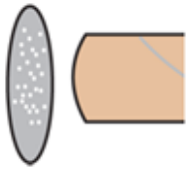
- Cardboard tube (x1)
- Plastic diffraction grating (x1)
- Adhesive labels (x2), one pre-punched
- Scissors, not included
- Pushpin, not included

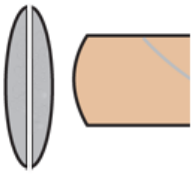
Set-Up

1 Cover one end of the cardboard tube with the adhesive label holding the diffraction grating. Fold the edges down to hold the label in place. Another method is to cut slits in the edge of the label and bend the tabs down to secure the label to the tube, as shown below.

2 Cover the other end of the tube with the adhesive label without a hole. There are two methods for doing this. **Method 1:** Put the label over the end of the tube and use a pushpin to poke small holes or a recognizable pattern in the label, such as a heart or star. **Method 2:** Cut the label in half and put each half over the end of the tube to make a narrow slit (see below).

Method 1





Method 2

To do and notice

1 Point the spectroscope at a light source (room lights or a window) and hold the end with the diffraction grating closest to your eye. Look through this end. Notice the colorful patterns.

Choose one rainbow (spectrum) to focus on. What colors do you see? Where do the colors of the rainbow look thinner? Where do they look wider? Try and name them in the order that you see them.

2 Find at least one difference between the spectrum produced by an incandescent bulb and the spectrum produced by a fluorescent bulb. Notice that a fluorescent bulb spectrum may contain bright lines of color, while the incandescent bulb produces a more even band of light.

3 Find a translucent (see-through) material that has color, such as a plastic tab divider or cellophane wrapper. Hold it in front of the tube while looking at a light source, noting what you see! What other materials and lights change the color spectrum?

Content Standards:

NGSS

Light & Vision:
1-PS4-3
4-PS4-2

Waves, amplitude, wavelength, energy:
4-PS4-1

Waves are reflected, absorbed, or transmitted:
MS-PS4-2

Learn more

- View a colored “bug light” through the spectroscope. What do you notice? (likely very few, if any, colors in the red and orange wavelengths)
- At night, look at the glow from mercury vapor lamps used for outdoor lighting, or neon advertising lights. They show only some colors interrupted by dark spaces between the different colored lines.
- Use colored transparent plastic sheets (blue, green, yellow, red) to filter out some colors before the light passes into the spectroscope. Place the plastic sheet in front of the spectroscope, between the spectroscope and the light source.
- Look at a full moon and draw its spectral pattern
- Attach the spectroscope to a digital camera or smartphone and snap a photo of the observed spectrum. Compare the captured spectrum to observation made without the camera.

Visit https://raft.net/for-educators/ to view the following related activities!

Absorbing the Rays
Black & White Makes Color?
Colors in the Mind
Hinge Mirror Kaleidoscope
Holding a Rainbow in Your Hand
Light Color Wheel
Spectrum Bracelets
Sunlight Beads

Resources

See these websites for more information on the following topics:

- **Emission & Absorption Spectra Lesson** - https://bit.ly/2vCamzV
- **Spectroscope guided explorations** – https://bit.ly/2UmZFcU
- **NASA Spectroscopy for Kids** – https://bit.ly/2UsVdcL