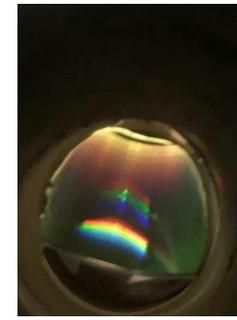


# DIY Air Force Activities: Simple Spectrometer



## Materials:

- empty paper towel roll
- scissors or a craft knife
- CD (blank or old)
- pencil
- index card
- ruler
- duct tape
- markers
- protractor
- ruler



Did you know that light was a wave? Light waves are organized in order of the waves' length (distance from peak to peak) and frequency (number of peaks in a given period). The electromagnetic spectrum can tell us about all the different types of light (see page 2). The light we can see, that gives us color, makes up only a very small portion of the spectrum. Light can be transmitted (passing through), absorbed, reflected, refracted (bent), and diffracted (spread out). Spectroscopy can measure these processes. Different types of light sources have different signatures, like a finger print! Following the directions below you will build your very own spectroscopic tool to help you analyze the light sources around you!

Directions: \*\*\*images in the back to help!

1. Wrap your tube in duct tape to reinforce it. Feel free to use your markers to decorate it!
2. Trace two circles out on the index card with the tube, then cut them out. Use remaining card to cut out two rectangles.
3. Cut a notch at the end of your tube about 2 inches in at a 45° angle.
4. Use duct tape to secure the circles to the end of the tube.
5. Cut an oval in the tube 1.5 inches from the top center your 45° angled slice.
6. Tape the rectangles you cut from the index card over the oval hole to create a narrow slit.
7. Slide the CD into the angled cut with the shiny side facing the slit. Secure it with duct tape.
8. Cut a viewing hole in the far end of your tube. You have made your own spectrometer!!

Look through your tube under different types of light. What do you see?? The CD has hundreds of grooves that cause the light to spread out into its spectrum upon reflecting off the surface. Test different light sources (incandescent bulb, LED bulb, sunlight, neon light) and note how the spectra changes! Try changing the width of your slit, how does this alter what you see?

## Air Force Associations:

Spectroscopy does not just examine the visible range of the electromagnetic spectrum. Some techniques get information from other areas, such as the infrared (IR). This is the area that comes after red light. Air force researchers are using active IR spectroscopy to develop a lightweight battery operated chemical detection system to identify explosives, poisonous chemicals, and narcotics in the field. This technology will help keep our soldiers safe.

