

Name:

Group:

Class:

Date:

Spectroscope: Student Worksheet

Introduction

Just as a geologist collects rocks or minerals and a botanist collects plants, an astronomer collects light. Astronomers usually can not touch the objects they study, like stars or galaxies. But they can analyze the light these celestial objects radiate using a spectroscope. When an astronomer looks at a star through a spectroscope, he or she sees a colorful spectrum that is full of information.

Materials

For each spectroscope:

- Half of a manila folder
- 1 sheet of black construction paper
- Transmission grating card
- 2 small (20 mm or 3/4 inch) binder clips
- 2 index cards (3 by 5 inch size) to make the adjustable slit
- Clear tape and 2 rubber bands

Engage

Read the StarDate script “Electromagnetic Spectrum” about the electromagnetic spectrum. How do you think astronomers “split light”?

Explore

Using just the grating card, Look around the room at light sources. Describe the appearance of the spectrum from each of the light sources.

Light Source	Spectrum Description

Your goal is to build a tool so that you can examine the spectrum emitted from light sources. Your teacher will help you understand the need for each part of the tool while you examine spectra of light sources. As you explore, think of materials or parts that would enhance the appearance of the spectrum, then test them to see if they work. By the end of this activity, you will have built your own tool – a spectroscope.

Explain

1. What happens to the emission spectrum as you slowly close the slit? Explain why with words and drawings.

2. Compare and contrast what you see when you look through the spectroscope at a light bulb and fluorescent light source. Make drawings to explain.

3. What atomic elements do you think are emitting light inside the fluorescent bulb? Refer to an emission line spectrum chart.

Elaborate

1. Look at the light bulb with your spectroscope. As your teacher places the Glo-Doodler in front of the bulb, what happens to the spectrum?
2. Look at the Glo-Doodler from the side, so that you can see the light bulb and Glo-Doodler separately. Put the spectroscope to your eye, and target only the cherry-red light emitted by the Glo-Doodler. What kind of spectrum do you predict? What kind of spectrum do you observe?
3. Does the emission spectrum line up with the absorption feature? What is going on?
4. Compare the spectrum observed in (1) with a direct spectroscope observations of the incandescent light plus the Glo-Doodler.
5. What happened to the “missing” green light in the Glo-Doodler absorption spectrum? Is it really missing? How is this an example of conservation of energy?

Assessment or evaluation

Draw and label each part of the spectroscope, and explain its function.

What kind of spectrum would you observe with your spectroscope at each observation position?

