

Light: The Astronomer's Friend!

Earth Science/Geology

Mr. Traeger

Name: _____

Period: _____

Date: _____

Purpose

The purpose of the following activities is to acquaint the student with the aspects of light that are necessary for studying stellar astronomy.

Materials

▪ 3+Adding Machine Tape	▪ Colored Pencils	▪ Spectroscopes
▪ Prism	▪ Projector	▪ Light Boxes (H, He, Hg, Ne)

Part 1: Visible Light

1. The teacher will shine white light through a prism using a slide projector.
2. Draw what you see. Include the light source, the prism, and the resulting colors in their correct order. State the ordering of colors.

3. Light has dual properties. What are these properties?

4. Draw a light wave. Label the crest, the trough, the wave height, and the wave length.

5. What are some other ways that visible light can be divided into its separate colors?

6. Can light travel through empty space? Why or why not?

7. Look at the graph on page 613 of your textbook. Which color has the shortest wavelength? The longest?

Shortest Wavelength?	Longest Wavelength?

8. Does light only exist in the visible wavelengths (ie. what we can see)? Why or why not?

Part 2: Infrared Radiation Video

1. What is infrared radiation?
2. What kinds of things give off infrared radiation?
3. Do **you** give off infrared radiation?
4. How might we use infrared radiation to ~~see~~ things in the universe?
5. What are some other items that you know of that are used to sense infrared radiation?

Part 3: The Electromagnetic Spectrum

1. Get into groups of no less than 2, and no greater than 3. Work with your seat partner.
2. Obtain a 1 meter long piece of adding machine tape.
3. Draw the electromagnetic spectrum on your tape. It will be impossible to draw it to scale. Draw each type of wave using the blue handouts and page 612-613 in your book as information.
4. Label the wavelength range of each type of wave. **Geology: You must also calculate the corresponding frequency in Hertz by using the formula: speed of light = frequency X wavelength.** Show your work by attaching your scratch paper.
5. Describe or draw examples of the things that use or give off each type of wave. Draw pictures, along with text.
6. Describe or draw how we ~~see~~ using that wave.
7. Describe or draw what that wave ~~shows~~ us in space or here on earth. In other words, how would astronomers use this particular wavelength?

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Part 4: Spectra of Stars

1. Using your spectroscope, look at each one of the light boxes. **Do not touch the light boxes! You will get zapped with 5,000 Volts of electricity!** Draw and **color** the spectral lines that you see for each type of light on the attached page. Write in the corresponding wavelengths for each color.
2. How do your spectra compare? Could you use these differences to determine a star's chemistry?

3. How do daylight and the incandescent bulb compare? Why are these spectra continuous?

4. What color star would be very hot?	What color star would be cool?

5. How do astronomers know what chemical elements are in a star?

6. Define the following:

Continuous Spectrum	Emission Spectrum	Absorption Spectrum

7. Describe the Doppler Effect. How would astronomers use it to know whether a star is moving towards us or away from us?

J-7, Spectroscopes and Spectrometers

Drawing Spectra

Red	Orange	Yellow	Green	Blue	Violet
Element 1: <u>Hydrogen</u>					

Red	Orange	Yellow	Green	Blue	Violet
Element 2: <u>Helium</u>					

Red	Orange	Yellow	Green	Blue	Violet
Element 3: <u>Neon</u>					

Red	Orange	Yellow	Green	Blue	Violet
Element 4: <u>Mercury</u>					

Red	Orange	Yellow	Green	Blue	Violet
Element 5: <u>Incandescent Light Bulb</u>					

Red	Orange	Yellow	Green	Blue	Violet
Element 6: <u>Daylight (Do not point directly at sun!)</u>					