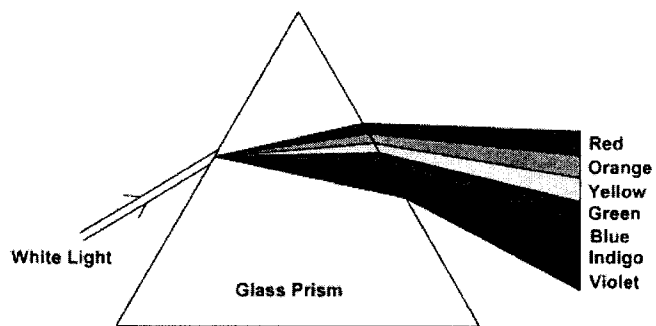


SPECTROSCOPE LAB

READ: In 1666, Isaac Newton used a prism to show that white light can be separated into the colors of the rainbow, and he used a second prism to show that these colors could be recombined to form white light again. Newton called the rainbow of colors a spectrum.

Instruments that separate colors of light are now called spectrosopes, and they more often use what is called a diffraction grating rather than a prism; however, the effect is the same.



DO: Look around the room you are in and spot something red (actually, any color of the rainbow will suffice). You see red because red light is entering your eye. Where is it coming from? The ceiling lights are giving off white light and it is white light that is striking the "red" object. Why isn't it white? It must be that all the colors except red are being absorbed, and only the red is being reflected to your eye. How can objects absorb only certain colors and not others? Everything is made of atoms, ions, or molecules, and somehow light must be interacting with these particles in such a way that only certain colors are absorbed. Also, when light is emitted, it often has a specific, distinctive color. Candle flames are always the same yellow, and neon gas in "neon" signs is always a distinctive orange.

In this activity, you will have a chance to learn some of the ways light and substances are related.

QUESTION: What do you observe when you examine spectra of visible light from a variety of sources, including flames?

For each light, draw what you see through the spectroscope using colored pencils or crayons. Make sure one of your light sources is sunlight:

Light Source: sunlight



700 650 600 550 500 450 400

Light Source: _____



700 650 600 550 500 450 400

Light Source: _____



700 650 600 550 500 450 400

Light Source: _____



700 650 600 550 500 450 400

Light Source: _____



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Light Source: _____



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Light Source: _____



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Now that you have some scientific data to work with, start looking for patterns in your observations. Think about things like similarities, differences, and consistencies. Record three patterns observed.

1.

2.

3.

INTERPRET

1. Why does sunlight show up as a “rainbow of colors” in your spectroscope?

2. Did you notice any changes in individual color intensity between the light sources? What does this mean?

3. Did you notice any dark lines or dark areas in the spectrum of any of the light sources? What does a dark line (or dark area) in a spectrum mean?

Be prepared to share observations and patterns in a class discussion.

1. Draw the electromagnetic spectrum and label all waves and indicate the colors in the wave that we see with our eyes.

2. Explain in detail why we have seasons? Evaluate what would happen if the earth shifted its axis by 10 degrees.

3. The component of the spectrum between ultraviolet light and infrared light interacts with the human eye allowing us to see. What is this part of the electromagnetic spectrum called?

A. communication waves

B. x-rays

C. microwaves

D. visible light

4. The sun emits all the different types of radiant energy on the electromagnetic spectrum. The Earth does not receive the full impact of all this radiation. The ozone layer in the Earth's atmosphere absorbs and helps to block which type of radiant energy?

A. X-rays

B. Ultraviolet light

C. Infrared light

D. Radio waves

5. Scientists have divided the energy in the electromagnetic spectrum in different categories. Each category is defined by a different ____.

A. visibility

B. ray

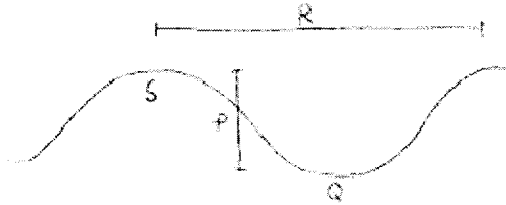
C. spectrum

D. wavelength

6. As the frequency of the radiation increases so does the energy in that type of radiation. Which form of radiation has the highest frequency and therefore most energy?

- A. gamma ray waves
- B. ultraviolet light waves
- C. infrared waves
- D. radio waves

7. Which letter in the diagram below identifies a wavelength?



- A. P
- B. Q
- C. R
- D. S

8. Which form of solar radiation causes sunburn?

- A. X-rays
- B. Infrared
- C. Visible
- D. Ultraviolet

9. In general, good absorbers of electromagnetic radiation are also good ____.

- A. refractors of heat
- B. radiators of heat
- C. reflectors of heat
- D. convectors of heat