

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

## The Herschel Experiment

### Learner Outcomes:

- Investigate light beams and optical devices, and identify phenomena that provide evidence of the nature of light

### Key Terms:

Diffraction

Spectral lines

### Background Information:

William Herschel was a German astronomer who discovered that sunlight produced infrared radiation. In February of 1800, Herschel conducted an experiment where he passed sunlight through a prism, creating a spectrum of colors. He then measured and recorded the temperatures of each color as well as the temperature of the surrounding environment. He realized that there must be another type of light beyond the red end of the spectrum that we cannot see. This light became known as 'infrared', which means "just below red".

**Purpose:** To replicate Herschel's experiment and observe infra-red light.

### Materials:

Glass prism 3 sided

Stopwatch

4 thermometers with black bulbs

Tape

Cardboard box

White paper

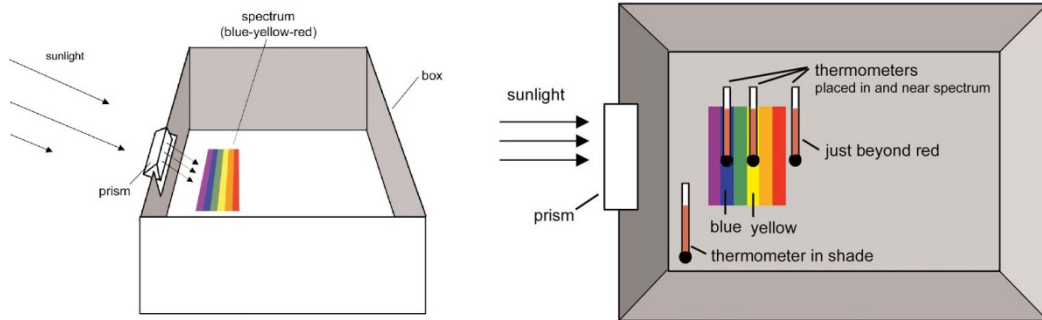
### Procedure:

1. Cut a notch into the side of the cardboard box and mount the prism with the flat side down and point up. You may need to cut a notch in to the side of the box for the prism to sit on. Place a piece of white paper in the bottom of the box.

This activity was adapted from:

<http://sciencenetlinks.com/lessons/sensing-the-invisible-the-herschel-experiment/>

- Align the box so that sunlight passes through the prism and leaves a series of colored spectral lines on the bottom of the box.
- Make sure the bulbs of the thermometers are blackened with paint. Place the thermometers with one bulb in the blue spectral line, one bulb in the yellow spectral line, one bulb in the shade and one bulb beyond the red spectral line as shown in the figure below. Tape the thermometers in place.



- Record the initial temperature readings on the thermometers.
- Start the stopwatch and record the temperature every minute for 5 minutes. Record your observations.

**Observations:**

Time (minutes)	Thermometer 1 (blue)	Thermometer 2 (yellow)	Thermometer 3 (beyond red)	Thermometer 4 (shade)
0				
1				
2				
3				
4				
5				

**Analysis:**

1. What did you notice about the temperature readings? Which thermometer recorded the highest temperature and which recorded the lowest?
2. What does this tell you about the sun's energy beyond the visible light spectrum?
3. Explain why you observed temperature differences in the different regions tested.
4. What does this experiment tell you about the nature of light?

**Conclusion:****Extension:**

1. Research ultra-violet light and create a poster or info-graphic summarizing the properties and effects of ultra-violet light.

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