The Herschel Experiment

Materials

Per group of three:

- A glass prism
- 4 thermometers with blackened bulbs
- Scissors (or a prism stand)
- A cardboard box
- A stopwatch
- A blank sheet of white paper
- Tape

Your group will construct a device to measure temperatures in different parts (colors) of the spectrum of sunlight.

You will have three members in your group. When making the measurements, you will perform different functions:

- **Time Keeper** will operate the stopwatch
- **Temperature Monitor** will read temperatures in the thermometers
- **Recorder** will record the results

You will construct a device like the one shown in Figure S1.

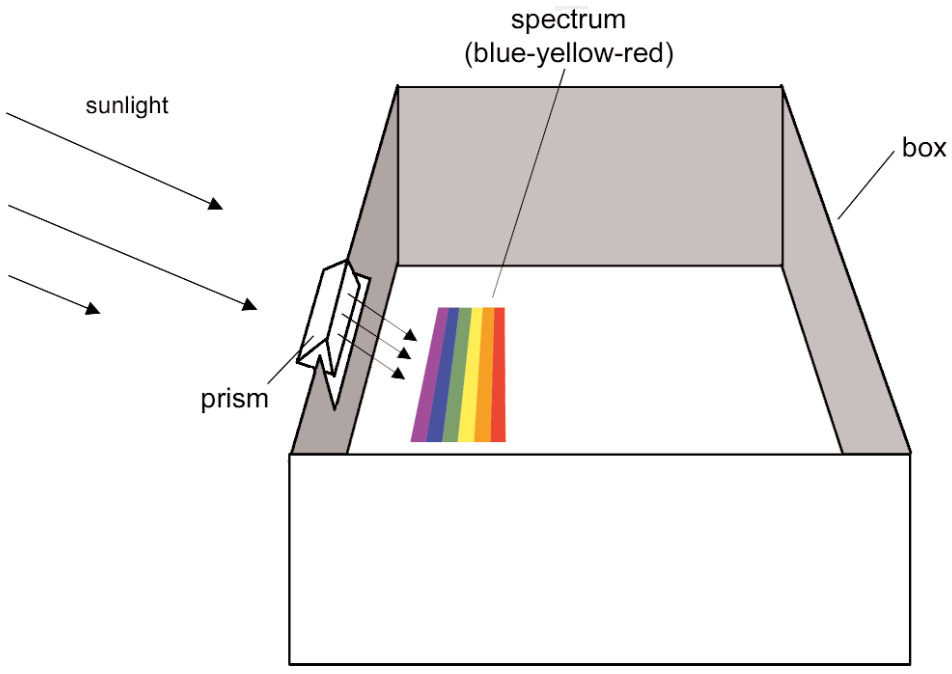

Figure S1.
The experiment device. Place a white sheet of paper in the bottom of a cardboard box. Fasten a glass prism to one side of the box. Place thermometers within the forming spectrum, with one thermometer bulb just beyond the red end of the spectrum and an extra thermometer in a shaded area of the box.

Name _____

Procedures

Preparing the device

1) Tape the white sheet of paper to the bottom of the box.

2) Attach the glass prism near the top of one edge of the box. If you have a prism stand, you can use it. If not, you can cut a notch in the edge of the box. Make sure the notch is just the right size for the prism to fit snugly while still allowing it to rotate about its long axis (see Figure S2). You can achieve this by making the side cuts so that the space is slightly less than the length of the prism, while the bottom cut is slightly deeper than the width of the prism. Now slide the prism into the notch.

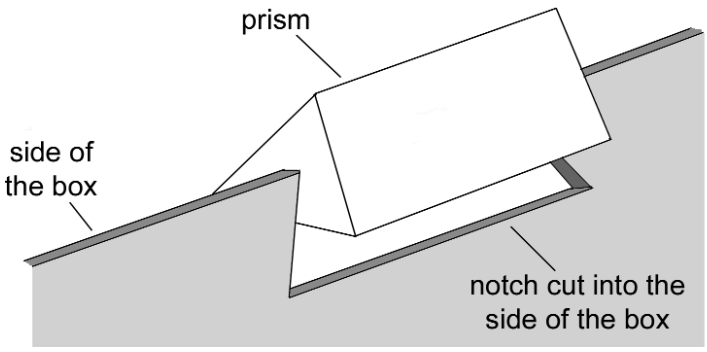

Figure S2.
A notch is cut in the side of the box so that the prism fits snugly and can rotate around its long axis.

3) Take the box to the experiment site.

WARNING

Do *not* look directly at the Sun!

Looking for even a few seconds can cause permanent damage to the eyes!
Note that sunglasses do *not* provide an adequate safeguard against looking directly at the Sun.

So remember to ***never*** look directly at the Sun**!**

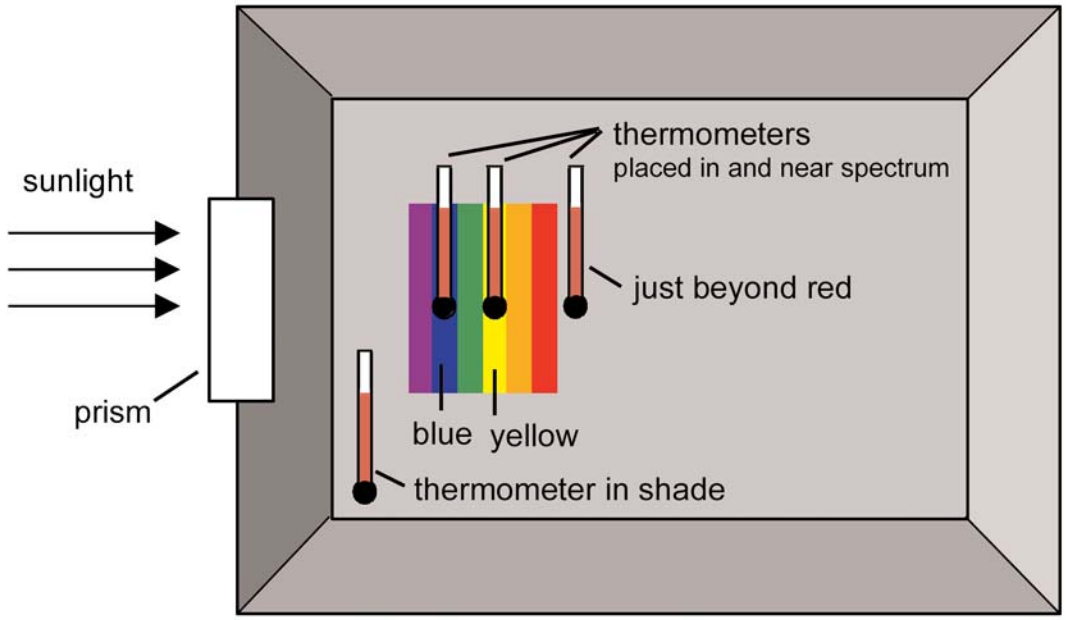

Figure S3.
Place the thermometers in the spectrum created by the prism, with two thermometer bulbs in different colors of the spectrum (such as blue, yellow), and one just beyond the red end of the spectrum. Place the fourth thermometer in a shaded area of the box.

4) Set down the experiment device and place the thermometers so that they are in the shade inside the box. Let the box sit for five minutes. Check the temperature of the thermometers and record the result in the chart on Page 4.

5) Place the box so that the side with the prism faces the Sun (see Figure S1). Rotate the prism so that you get a nice, wide spectrum on the sheet of paper.

6) Place the thermometers on top of the spectrum so that one thermometer is on top of the blue band, one is on top of the yellow, and the third one is just beyond the red end of the spectrum where there is no visible light (see Figure S3). Place the fourth thermometer in a shaded area of the box. Tape the thermometers to the bottom of the box so that they do not move during the experiment, and they are easy to read. Be careful not to move the box while you tape down the thermometers!

7) When everyone in the group is ready, start the stopwatch. The Time Keeper will operate the stopwatch and tell the Temperature Monitor when to check the thermometers, and the Recorder will record the results in the chart on Page 4.

Observations in the Shade

Temperature in the Shade	Thermometer 1	Thermometer 2	Thermometer 3	Thermometer 4
After 5 minutes				

Observations with the Spectrum

Temperature in the Spectrum	Thermometer 1 (blue)	Thermometer 2 (yellow)	Thermometer 3 (beyond red)	Thermometer 4 (shade)
1 minute				
2 minutes				
3 minutes				
4 minutes				
5 minutes				

Answer the following questions individually.

1. What did you notice about your temperature readings?

2. Which thermometer recorded the highest temperature? The lowest?

3. What does this tell you about the sunlight's energy beyond the visible light spectrum?

4. List other observations.

5. List problems you had conducting the experiment.