

How Are Parts of the Spectrum Different?

Journal Assignment

Scientists use what they know about a subject - especially new ideas that they have learned from recent research - to generate new questions for further investigation. You have learned several new things about light, color, and the light spectrum.

In your journal write two or three questions about the light spectrum that could be used to start new investigations. Also tell why you think these are important and interesting questions. You do not need to write a procedure. However, think about how reasonable it would be for you to do this investigation.

Your entry will be evaluated on the thoughtfulness of your questions and the completeness of your reasoning for doing the investigation.

Laboratory Investigation

Purpose: To determine whether different colors in the light spectrum heat objects differently.

Prediction: Predict whether a thermometer will record different temperatures in different parts of the light spectrum. If you believe the temperatures will be different, predict which color will be hottest and which will be coolest.

Materials:

- 1 Equilateral **glass** prism
- Prism holder (optional)
- 3 alcohol thermometers taped together
- Tape
- Cardboard box (a photocopier paper box works very well)
- White paper for bottom of box
- Scissors
- 3 **Data Sheets**

Procedure:

1. Put all materials in box and take outside.
2. Use prism holder or insert prism into notch in side of box so that one flat surface of the prism is toward the bottom of the notch and point this side of the box toward the Sun.
3. Place white paper in bottom of box
4. Rotate the prism slightly until a clear spectrum is visible on the paper. You may have to prop up the Sun-side of the box to produce a wide, clear spectrum.
5. Place the three thermometers into the shade inside the box, wait approximately 30s (until the temperature doesn't change), and then record the air temperature on your data sheet.

6. Very carefully place the thermometer bulbs in the spectrum so that bulb #1 is just outside the violet band (where there is no color). Bulb #2 will be in the blue and the bulb #3 will probably be in the green. (Where the bulbs are depends on the width of the spectrum and the width of the thermometers.) Make certain that only the blackened bulbs and not the rest of the thermometers are in the spectrum.
7. On your data sheet record position (spectrum color) of each bulb and record the starting temperature.
8. Record the temperature at each bulb every 30 seconds until you obtain the same temperature for 3 readings (about 5 minutes). Because the Earth is rotating, the position of the spectrum will change. Watch the bulbs carefully and move them as necessary so that they don't move from the starting position in the spectrum.
9. Move the thermometers so that each bulb is in a new color band. Now bulb #1 will be in the violet.
10. On your data sheet record position (spectrum color) of each bulb and record the starting temperature.
11. Record the temperature at each bulb every 30s until you obtain the same temperature for 3 readings (about 5 minutes). Because the Earth is rotating, the position of the spectrum will change. Watch the bulbs carefully and move them as necessary so that they don't move from the starting position in the spectrum.
12. Move the thermometers again so that each bulb is in a new color band. Repeat step 10 and 11.
13. Continue to move the thermometers and record temperatures until bulb #3 is just beyond the red band. This position will be your last set of readings.
14. Place thermometers in shade and allow them to reach air temperature and repeat steps 1-13. Try to place the thermometers in the same places as before.

Data Sheet

Name: _____

Time	Thermometer #1 Spectrum Color _____	Thermometer #2 Spectrum Color _____	Thermometer #3 Spectrum Color _____
In Shade			
0 seconds			
30 seconds			
60 seconds			
90 seconds			
120 seconds			
150 seconds			
180 seconds			
210 seconds			
240seconds			
270seconds			
300seconds			
330seconds			
360seconds			

Graph the data from each set on the same graph. Use different colors for each data set. Match the color of the points and lines to the color of light falling on the bulb. Use a dotted black line for the temperature of the bulb in the region beyond the violet. Use a solid black line for the temperature of the bulb in the region beyond the red.

Conclusions

Write a thoughtful, short essay answering the following questions. Defend your assertions with evidence from your investigation.

Did different regions of the light spectrum heat the thermometer differently? If there was a difference, which region heated the thermometer the most? What can you conclude from your data?