



Observing the Spectrum of Different Light Sources

with a Diffraction Grating

Name: _____

Date: _____

Topic: Waves and Light

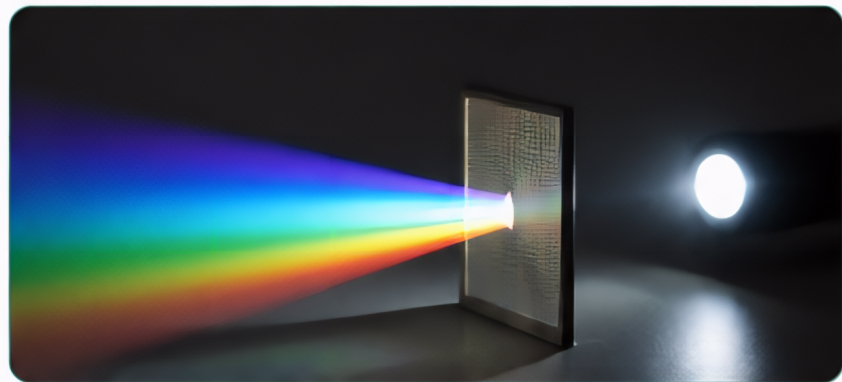
Difficulty: ★★☆☆☆

QUESTION

How do the spectra of different light sources compare when viewed with a diffraction grating?

BACKGROUND

A diffraction grating has many tiny, evenly spaced lines. When light passes through these lines, it is spread out into its colors. The pattern of colors (spectrum) can tell us about the light source. Some sources, like the sun or a light bulb, show a continuous spectrum. Others, like LEDs or gas discharge lamps, show bright lines at specific colors.



White light from a flashlight dispersed by a diffraction grating.

MATERIALS

- Diffraction grating (transmission type)
- Cardboard or poster board
- Tape
- White paper or white wall
- Light sources to compare, such as:
 - Sunlight
 - Incandescent light bulb
 - LED bulb (white)
 - Fluorescent or CFL bulb
 - Computer or phone screen (white)
 - (Optional) Colored LED or neon sign
- Ruler
- Pencil
- Notebook or lab journal

SAFETY

- Never look directly at the sun. Use indirect sunlight reflected onto a surface.
- Do not stare at bright LEDs or lights for long periods.
- Handle the diffraction grating by the edges. Do not scratch the surface.

HOW A DIFFRACTION GRATING WORKS

Light waves pass through many tiny slits (lines) on the grating. The waves bend (diffract) and interfere with each other. The colors spread out at different angles. Shorter wavelengths (violet/blue) bend more. Longer wavelengths (red) bend less.

PROCEDURE

1. Set up your viewing screen by taping a sheet of white paper or using a white wall.
2. Make a simple holder for the diffraction grating. Cut a small slit in a piece of cardboard and tape the grating in place. Stand it up on a table facing the screen.
3. Choose your first light source. Turn it on.
4. Aim the light at the grating from several feet away.
5. Move the grating and/or screen until you see a clear spectrum on the screen.
6. Observe and record the spectrum.
7. Measure the distance from the center (white or brightest spot) to the red edge and to the violet edge of the spectrum. Record your measurements.
8. Repeat steps 3–7 for each different light source.
9. Keep your setup the same as much as possible for fair comparisons.

DATA TABLE

Light Source	Type of Spectrum (Continuous / Line / Other)	Colors Observed (List in order seen)	Distance to Red (cm)	Distance to Violet (cm)	Notes / Observations
Sunlight					
Incandescent Bulb					
LED Bulb (White)					
Fluorescent/CFL Bulb					
Computer/Phone Screen					
Other: _____					

ANALYSIS QUESTIONS

1. Which light sources produced a continuous spectrum? Which produced line spectra?
2. Which light source showed the most colors? Which showed the fewest?
3. How did the distances to the red and violet edges compare between light sources?
4. What might explain the differences in the spectra you observed?
5. What other light sources could you test? What do you predict you would see?

