Name _____ Date _____

SI Physics Lab #42 (50 pt)

Period _____ Mrs. Nadworny

Partners: Due Date: _____

Diffraction of Light

NO Lab Write-Up Required

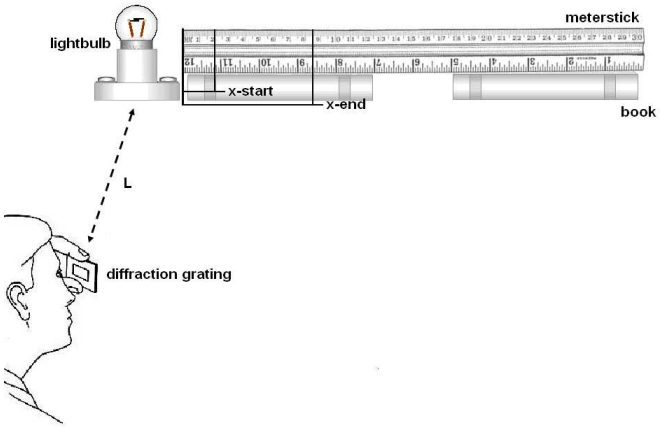
Purpose To determine the wavelength of visible light

Materials

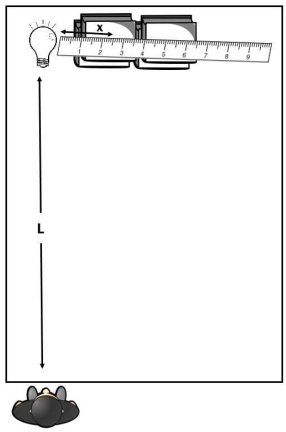
- 2 Meter sticks
- Light bulb base
- Diffraction grating
- Textbooks
- Line filament bulb

Procedure

Side View:



Overhead view:



1. Put the light bulb into the base and plug it in at end of the lab table nearest the wall. Remember not to stare directly at the bulb for long amounts of time as it can hurt your eyes.
2. Place a meter stick on the lab table next to the light bulb as shown. You may need to prop the meter stick on books to raise it up to the rainbow's height.
3. Hold the diffraction grating in front of your eyes and look at the light bulb. Rotate the diffraction grating until the colors of the rainbow appear spread out horizontally above the meter stick. Once you are comfortable with your position, **remain still!**
4. Measure the horizontal distance between the light bulb and your location (where you are standing with the diffraction grating). Estimate to the nearest whole centimeter.
5. Looking at the colors above the meter stick, record their order in the data collection section, starting with the color closest the light bulb.
6. Choose **three** color bands that are the most visible. Determine the beginning position of those **three** colors (x-start) and the final position of those **three** colors (x-end). Record the positions in the data table. Estimate to the nearest tenth of a centimeter.
    - You are not finding the length of the color bands! Record the distance from the light bulb to the start of the color (x-start) and then from the light bulb to the end of each color band (x-end).

Data Collection (18 pts)

The number of slits in the diffraction grating: 5360 slits/cm

The number of **slits per meter** in the diffraction grating: _____

The distance (d) between slits on the diffraction grating: _____

Starting from the bulb, the colors are _____

_____

Distance between light source and diffraction grating (L): _____

Color					
x_{start}	(cm)	± ____			
	(m)	± ____			
x_{end}	(cm)	± ____			
	(m)	± ____			
λ_{start} (m)					
λ_{end} (m)					
f_{start} (Hz)					
f_{end} (Hz)					

Sample Calculations

Show all work using the GUESS method and proper significant figures

1. Calculate the starting wavelength for each color using the honors equation from the Waves chapter. Show your calculations for one color below using the GUESS method. (4 pts)

2. Calculate the ending wavelength for each color using the honors equation from the Waves chapter. Show your calculations for one color below using the GUESS method. (4 pts)

3. Calculate the starting frequency for each color. Show your calculations for one color below using the GUESS method. (4 pts)

4. Calculate the ending frequency for each color. Show your calculations for one color below using the GUESS method. (4 pts)

Post-Lab Questions Show all work using the GUESS method and proper significant figures or answer in complete sentences where appropriate.

1. Determine the average frequency for one of the color bands using your experimental data. Show your work below using the GUESS method. (2 pts)

2. Determine the average frequency for the same color using your reference tables. Show your work below using the GUESS method. (2 pts)

3. Calculate the percent error between your measured data and the accepted average frequency from the reference tables. Show your work below using the GUESS method. (2 pts)

4. Give a possible reason for the difference that occurred between the reference table values and the experimental value for the average frequency of your chosen color. State what happened, how it happened, how it affected the data collected (x), how it affected the results (f, λ) (4 pts)

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_____

_____

_____

5. Why was there a space between the light bulb and the colored light spectra that we observed? (2 pts)

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6. Which color gets spread the furthest from the light source by a diffraction grating? Why? (2 pts)

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7. Describe two ways you could change the experiment to get the spectra to spread further from the light source. (2 pts)

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