Solar Scavenger Hunt
Due July 26, 2002 (6 PM)

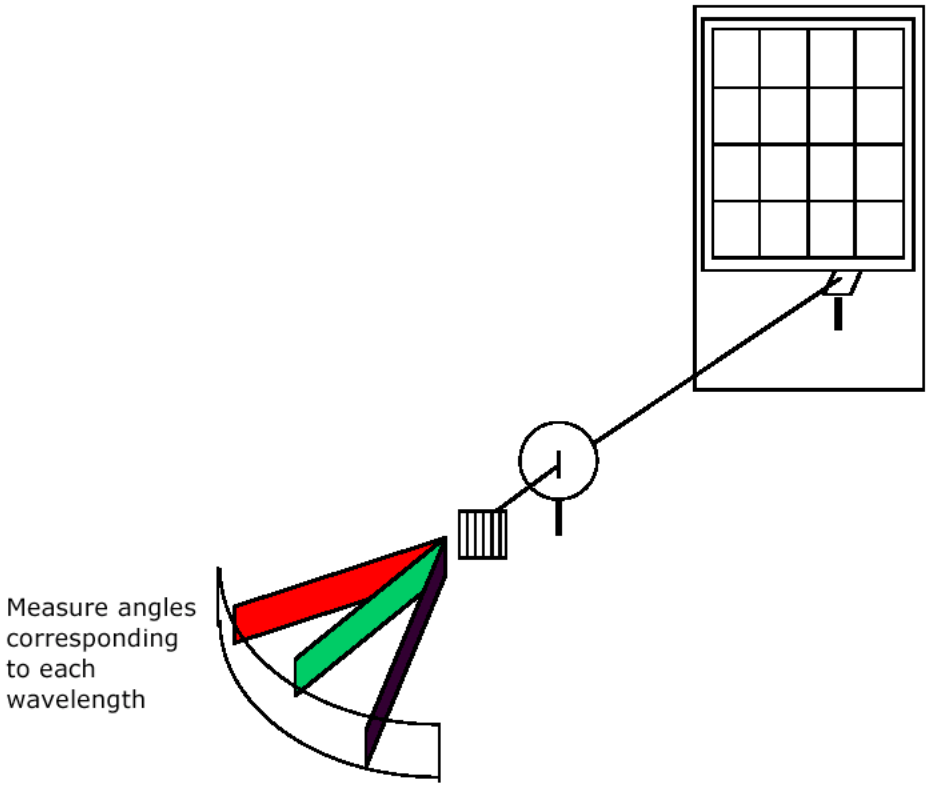
Basic Goal:

- To determine the presence of various elements in the Sun

Overview:

Bring this write-up with you to the lab in ***Wilder 302.*** *Bring a calculator. A laptop with a spreadsheet program may be useful, but isn't necessary.*

You and your lab partner will be given a spectroscope. You will look at sunlight that has passed through a slit and a grating that disperses the light into separate colors. Your job is to determine if absorption or emission features are visible in the solar spectrum at certain specific wavelengths.



Procedure:

1. Begin with calibration (determine which angles correspond to which wavelengths). You'll put a Hydrogen lamp in front of the slit, and measure where three specific lines fall. These lines are H alpha 656.3 nm (red), H beta 486.1 nm (aquamarine) and H

gamma 434.0 nm (violet - harder to see).

Use the widest slit setting for the lamp, and measure the line at the RIGHT edge of the line. The left edge changes when you make the slit narrower. Your job here is to figure out which angle (marked on the spectroscope's base) corresponds to which wavelength. You'll want to determine the linear relationship between angle and wavelength.

Angle = m(Wavelength) + b, what are *m* and *b*?

By the way, don't move the grating once you've done the calibration.

2. Now look at the solar spectrum. Set the mirror stand outside the window, and reflect sunlight onto the slit and down the tube. Good alignment will make your spectrum much clearer. Set the slit to its narrowest setting, and focus the eyepiece by moving it in and out until you can see sharp absorption lines. Using the line list on the next page, determine which lines are

visible and hence which elements are present in the Sun. (Note: the absence of a line does not necessarily mean that an element is *not* present in the Sun, and there are elements that are not in this short list.) You can calculate the expected angle at which each line should appear using the linear formula: Ang. = mλ + b. Use your calculator, or enter the line list into a spreadsheet and apply (mλ + b) to the entire column.

Various lines might be slightly off, or not visible. Record your observations (include position angle and subjective visibility).

Element	Symbol	WaveLn(nm)	Expected Angle?	Your Observations?
Manganese	Mn I	662.50000		
Hydrogen	H I	656.30000		
Nitrogen	N II	641.60000		
Sodium	Na I	589.70000		
Sodium	Na I	588.90000		
Nickel	Ni I	546.30000		
Magnesium	Mg I	518.40000		
Magnesium	Mg I	517.30000		
Iron	Fe I	516.70000		
Nickel	Ni I	511.40000		
Hydrogen	H I	486.10000		
Cobalt	CO I	475.70000		
Chromium	Cr I	460.30000		
Iron	Fe I	440.50000		
Hydrogen	H I	434.00000		
Iron	Fe I	432.60000		
CH	(molecule)	431.00000		
Calcium	Ca I	422.60000		

Note: The "I" and "II" indicate the level of ionization; e.g., I =neutral, II = singly ionized, etc.

3. Your Report

Your report should include the following:

- Your names
- A brief description of your calibration procedure and solar observing procedure. Enought detail to let someone recreate your experiment.
- The calibration calculations for *m* and *b*.
- Lab vs. observed wavelengths for the various spectral lines
- A list and short discussion on which elements you found present in the Sun.