Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Lab Night \_\_\_\_\_\_\_\_\_\_\_

SPECTRAL CLASSIFICATION LAB WORKSHEET (Rev 1/26/16)

PART I CLASSIFY SPECTRUM

If you have not covered this in class read about spectral classification at <https://en.wikipedia.org/wiki/Stellar_classification>. Read from the start of the article down to Contents menu. Using stellar spectra you can find the temperature, chemical composition, and distance to stars. For binary stars you can also determine mass.

1. Use part 3 Spectral Types in the Contents menu to give the letter part of the spectral classification of these stars:

Vega \_\_\_\_\_

Betelgeuse \_\_\_\_\_

Rigel \_\_\_\_\_

Pollux \_\_\_\_\_

Sun \_\_\_\_\_

Based on spectral class, which of these is the hottest? \_\_\_\_\_\_\_\_

1. Log on as directed. When virtual desktop appears, go to COSAM software on start menu. Then Physics>Astronomy> VIREO. Click on VIREO and login. Chose Stellar Spectra exercise. You will first practice classifying stellar spectra. Then you will take spectra with a simulated telescope and spectrometer and classify them.
2. Under Tools in the VIREO window select Spectral Classification. Under File select Atlas of Standard Spectra. Then select Main sequence. Under File select Display>Show Difference Select File>Unknown Spectra>Program List and choose first item on list. . The third graph will show the difference between the unknown and standard spectra. We will go through the classification procedure as a group using this star.

1. After doing the example classify stars below using difference graph. To load them go to File>Unknown Spectra>Program List. Then go through the standards list from O to M until you find closest match. Put standard spectral class that is closest to unknown in blank.

HD 242936 \_\_\_\_\_\_\_\_

HD 27685 \_\_\_\_\_\_\_\_

HD 23511 \_\_\_\_\_\_\_\_

Feige 41 \_\_\_\_\_\_\_\_

O 1015 \_\_\_\_\_\_\_\_

HD 23733 \_\_\_\_\_\_\_\_

BD 63 137 \_\_\_\_\_\_\_\_

HD 158659 \_\_\_\_\_\_\_\_

Part III Chemical Elements

1. Bring up the spectra of the first star on the Program List as you did above. Under File select Spectral Line Table. Identify the elements producing the 3 biggest dips in the spectrum of this star between 3950 and 4400 Angstroms. Click on the bottom of the dip and get name and wavelength from Spectral Lines Table (highlighted entry).

Wavelength Element

\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

Part IV Obtaining Spectra

1. Select 0.4 m telescope from Telescopes menu. When you have control open dome and turn on control panel. Turn on tracking and change slew rate to 16. Change view to telescope. Click on “Telescope”.

2. Click on Slew and set coordinates to star given below. Click to move scope. If the parallel lines are not on target, use NEWS control to move lines onto target. Click on access (spectrometer)

3. In the window that comes up click on Go. 2. Stop when Signal/Noise is >100. Look below spectrum for number and record below. Save spectrum (File > Data). **Record apparent magnitude(m) below before moving on.** Close window with graph.

# Star # RA DEC

1 7h 11m 39.5s 39deg 19m 5s

2 7h 11m 40s 39deg 23m 21s

4. Go back to Tools menu and select Spectral Classification. Bring up Atlas of Standard Spectra you used earlier. Load your spectrum and compare yours with standards. Go through the standard spectra to find a match. **Record nearest standard spectral class below**.

5. Get absolute magnitude from Internet for your spectral class. Try this web site first: http://www.uni.edu/morgans/astro/course/Notes/section2/spectraltemps.html. Calculate distance in parsecs (m-M+5 = 5 log D, D = 10logD ).

6. Repeat process with other star.

# Number Apparent Mag (m) Spectral Class Absolute Mag(M) Temp Distance (pc)

1.

2.

Part V Photographic Classification

1. Go to Tools> Classify Spectra
2. In the window that comes up go to File>Display. Select Greyscale Photo. Before electronic devices were available to measure intensity of lines spectra were classified by matching lines on photographs.
3. Load Atlas of Standard Spectra (Main Sequence).
4. Go to File>Unknown>Program List. Select SAO 81292 as unknown. With the aid of the wide dark line in the center classify the spectrum by comparing with standards.

5. Load Feige 40 and classify using photo not tracing.

#4 Spectral Class \_\_\_\_\_\_\_\_\_

#5 Spectral Class \_\_\_\_\_\_\_\_\_

Point Values: 3 points each blank except Which hottest? = 1 pt so total=100