Astronomy 200/210
Project #1: Observing the Night Sky

Duration: September 14- October 12, 2015
Completion Date: 2nd week of October, 2015

The following lab is intended to give you experience in:

- identifying important stars and constellations
- charting the motion of the moon during part of its orbital cycle
- charting the seasonal motion of the constellations and sun
- determining the elevation of the sun and time of local noon
- determining the altitude of Polaris

Part One: Constellations and Bright Stars

For this part of the lab you will need either:

- a commercial version of a planisphere
- a "home-brew" planisphere (materials available in the Lab)
- copies of the star charts found at the end of your textbook. Photocopy (perhaps enlarging somewhat) the star charts to make them more useful. Be sure to select the charts for the late summer/fall months! Mount these on a stiff piece of cardboard or on a clip board for easy use in the field.
- A MUST is a small penlight equipped with a red filter (filter material will be available to tape over the lens of the penlight). As well, a clip-board or hard surface to write on is useful.

During the evening lab session your instructors will show you how to find the constellations found on these charts. Be sure to repeat these observations by yourself on later clear evenings so that you will learn to identify the constellations and their bright stars.

You must be able to identify the following stars, constellations and asterisms by the end of the lab project:

Hercules	Corona Borealis	Bootes	Pegasus
Vega	Andromeda	Lyra	Deneb
Summer Triangle	Andromeda	Albireo	Aquila
Cygnus	Altair	Ursa Major	Perseus
Cassiopeia	Arcturus	Northern Cross	Mizar
Polaris	Algol	Capella	Auriga
Ursa Minor	Sagittarius	Delphinus	

Problem #1:

Sort the list given above into constellations, asterisms, alternate names for constellations or bright stars.

Problem #2:

Give the meaning of each of the constellation names that you listed for problem #1.

Problem #3

Give the Arabic or common name for the following stars:

α Boo, α Lyr, α Cyg, β Cyg, α Aql, β Per, ζ UMa, α UM i, α Aur

Problem #4

Give the colour of the stars that you observed and listed in Problem #1. (Try to do this visually at first. Later you may want to "hunt" through your text, Stellarium or library resources to find the commonly accepted "colour" for each star. Star colours are usually blue, white, yellow, orange or red).

Part Two: Charting the Motion of the Moon

During the lab period keep a record of the following:

(1) constellation in which the moon appears for a specific time and date

(2) time of rising (if you can observe it)

Prepare a drawing showing the path that the moon takes "through" the constellations for the period September 12 – October 4. Use a small symbol to mark the moon's position relative to the stars. Beside this note the time and date of your observation.

Problem #5

In what direction does the moon appear to drift **relative to the stars** during a night and throughout the month?

Problem #6

Estimate the rate at which the moon drifts with respect to the stars. Express the result in degrees per hour. (Note: there is a simple way to do this without observing the moon at all - however, please support your answer with observations)

Part Three: Seasonal Motion of Constellations

Select a bright star in a constellation in the **southern** part of the sky. Throughout the duration of the lab project - whenever sky conditions permit - observe this star being careful to do the following:

(1) Always observe the star at exactly the same point in the sky. A convenient way to do this is select an observing site (a doorway etc.) and another point in the distance (perhaps the top of a high building or tower). Use this to establish a sight line to the star. Be sure to indicate which star you are using. (HINT: this lab works best if you select due south as your reference direction)

(2) Carefully, to the nearest second, note the time at which the star appears along (or near to) the sight line. (Note: use an accurate clock for this! A digital wristwatch is ideal. If your clock is off by even a minute per day you won't find anything useful!)

(3) Repeat these timings for as many nights as you can.

Problem #7

Which way do the constellations appear to drift during the season? In what way do the timings you obtained support this?

Problem #8

From all the timings that you made, find the average drift for the constellation expressed in minutes per day. How many days will it take before this star will again cross your reference line at exactly the same time as it did when you began your observations? Use this information to determine the length of a year expressed in units of days.

Part Four: Altitude of Polaris, the Sun and Time of Local Noon

To do this part of the lab you will construct a simple protractor (this will be done during a day time lab session). Select a sunny day and begin your observations about 12:30 p.m. MDT. Every fifteen minutes measure the angle of elevation (altitude) of the sun. Construct a table showing the time of observation and the altitude of the sun. Continue this until 2:30 p.m.

Problem #9

Use the time - altitude data that you collected to plot a graph showing the altitude of the sun as a function of time. Be sure to plot time along the horizontal axis of the graph. Draw as smooth a curve as you can through the data - BUT DON'T JOIN DOT TO DOT. Estimate from this the time at which the sun was at its highest altitude. This should be the time of local noon.

Problem #10

Use your measurement of the time of local noon to determine the **longitude** of your location on Earth.

Problem #11

Use your protractor to measure the altitude of Polaris - the North Star. How can you use this information to determine your **latitude** on earth? Determine the latitude for your location.

Instructions for Making an Astronomical Protractor

On the reverse side of this sheet you will find a protractor scale. Please attach this securely to a stiff piece of cardboard, matte board or, better still, a thin piece of plywood. Next, attach a piece of thread to the dark point beneath "O" on the scale. On the other end of the thread attach a weight (a bolt, nail etc.). Along the sight line (AO) attach a drinking straw (visit the "Golden Arches - great straws!) or a paper tube (wax-paper tubes work well). You will use this as a sight. Be careful to align the sight parallel to the sight line.

The protractor is now ready to use. If you are viewing Polaris sight either along or through the straw while letting the string hang freely. When you have located Polaris gently clamp the thread in place with your hand and read the scale. Repeat this about 5 times and average the results. You should be able to estimate to the nearest degree.

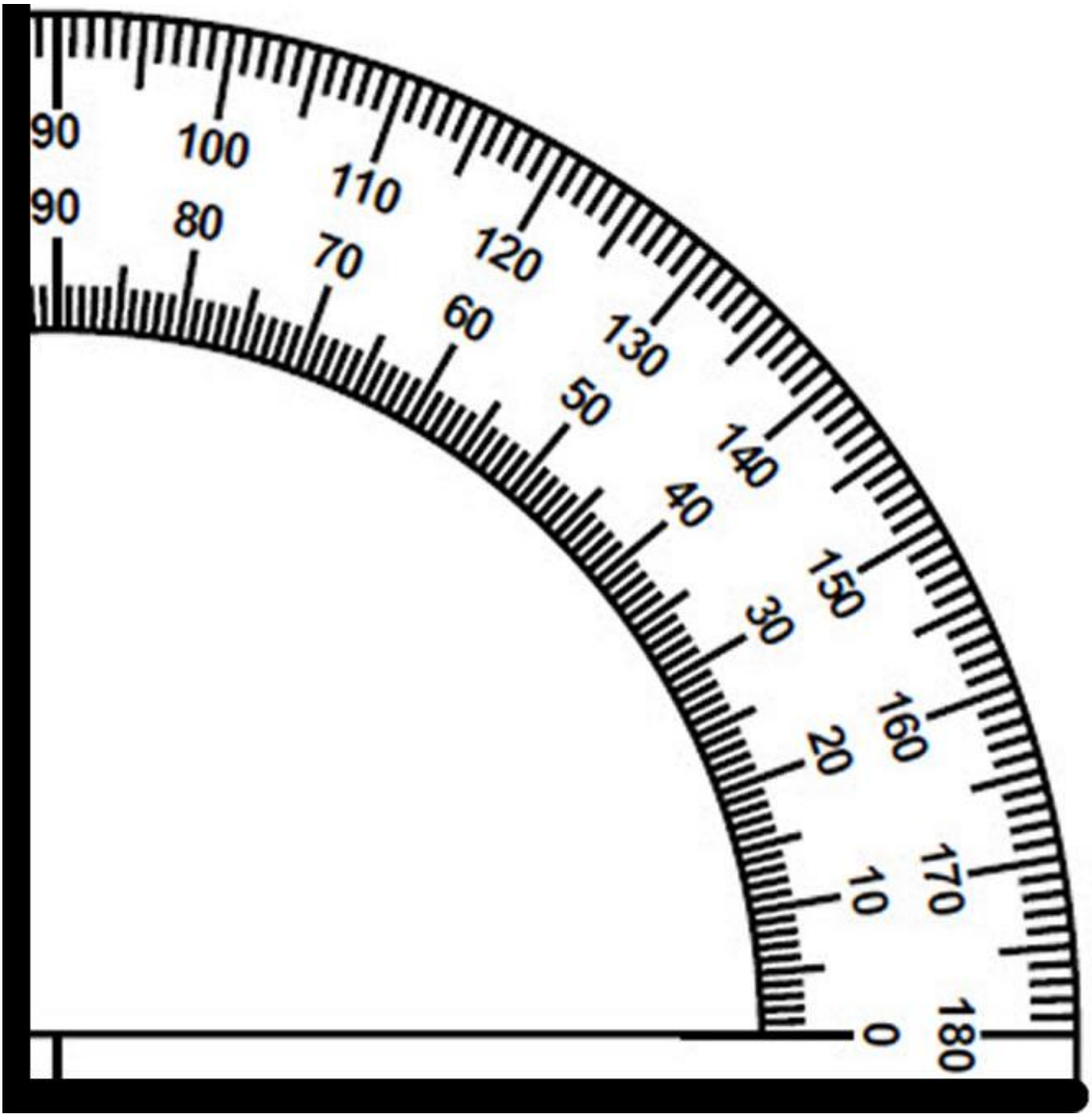
When viewing the sun DO NOT look directly at the sun. Instead, look at the shadow cast by the protractor. When you are pointing at the sun the shadow will brighten along the direction of the straw.

Since we may we use this for other labs, put the protractor up for "safe keeping" - DON'T DISCARD.

NOTE ON CURRENT LAB STATUS

Curious whether or not there will be a lab tonight? You can get latest information on lab status by checking :

http:/ / www.kcvs.ca/ martin/ astro/ course/ index.html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