Name: _____

Lecture Instructor: _____

Astronomy 102 Lab: Motions of Stars

If you own a laptop, please bring it to class. You will use Stellarium and submit your answers on Cobra using a Word document provided on the website.

Pre-Lab Assignment: You will use Stellarium to examine the daily and annual motions of stars. Answer these questions before coming to lab.

1) Why is the North Star so important?

2) What is a "constellation" as opposed to an "asterism"?

3) During which seasons can you find the Big Dipper in the sky, as seen from Champaign?

4) Why is it important to have constellations? What good are they?

Introduction: After familiarizing yourself with Stellarium, you will now use it to determine the location of some of the more popular constellations as viewed from our latitude on Earth. It should be very valuable in your own observations of the sky and in learning a few constellations. I recommend using it to prepare for your sky quizzes! **You will submit your answers on Cobra. Please use the answer sheets at either URL below.**
http://natsci.parkland.edu/ast/102/labs/starsfall.docx
http://natsci.parkland.edu/ast/102/labs/starsfall.rtf

Please refer to this table of shortcuts whenever you use Stellarium. You may have to hold "Function" with some of these keys.

F11	full-screen mode	J	Reverse	C	constellation lines	A	atmosphere display
F6	Location window	K	Play/Pause	V	constellation labels	G	ground display
F5	Date and Time	L	Fast Forward	B	constellation borders	/	zoom in to a selection
F3	Search window	P	planet labels	R	constellation art	\	field of view is 60°
Pg Up	zoom out	Pg Dn	zoom in	Z	azimuthal grid	E	equatorial grid
- = Ctrl - Ctrl = [ ] 8			These seven were questions from the last lab.				

Procedure: Start up Stellarium. You should have the location set to Champaign by default on the software. Set the initial conditions to the following:

Date: September 7 (09-07) of the current year
Time: 21:00:00 UTC-05:00 (9:00 PM CDT)

Open the Configuration window using either the shortcut key "F2" or by clicking the fifth button on the left menu shaped like a wrench. Select the Information tab. **Uncheck** every box for the "Displayed fields" except the following: Name, Visual magnitude, Altitude/Azimuth, and Type. Close the Configuration window.

Turn on the azimuthal grid. This will show you altitude and azimuth for the local sky.

1. What **two** bright stars can be found near the zenith with altitudes greater than 70°? *Brighter stars have bigger circles, and if a star has no label, you can identify it by selecting it with the cursor.*

2. What constellations are each of these **two** stars located in?

Type the comma key to display the ecliptic, which runs through thirteen Zodiac constellations.

3. What **two** constellations of the Zodiac are currently rising in the east?

4. What direction would you look to see the Big Dipper asterism at that time? Describe the location of the Big Dipper relative to Polaris. Use "up, down, left, or right" rather than cardinal directions.

5. Turn off the atmosphere and change the time to determine when the Big Dipper sets to the nearest hour.

6. As you change the time, what distinguishes the North Star from every other object in the sky?

Consider the terms for the motions of stars we discussed in class and are found in the first chapter.

7A. What is the term for the motion shared by the North Star and the Big Dipper in Champaign?

7B. As time moves forward, note the cardinal directions of the stars which go above and below the horizon. What is the term for these stars' motion?

8. Reset the date and time to 09-07 21:00. What is the name of the bright star that is due west?

9. What is the name of the bright star **(not a planet)** low in the southwest?

10. What time (rounded to the nearest hour) does the star in Question 9 set on September 7?

11. The planets appear to move against the background stars and hence won't be in the same place from month to month. We find the planets in the Zodiac constellations. What planets are visible (above the horizon) to the naked eye (magnitude less than 5) on September 7 at 21:00 and in what constellations are they located? If there are none, what constellation is Venus located in at that time?

12. The brightest star other than the Sun is Sirius. What time, rounded to the nearest hour, does Sirius rise on September 7 and in what direction should we look for it?

13. On September 7 at 21:00, the Milky Way runs across the sky and meets the horizon in what azimuthal degrees?

14. Explain why we would have a difficult time seeing the star Spica in the night sky on September 7.

Now you should be at least somewhat familiar with the sky from Champaign. However, the appearance of the sky does change depending on where you are on the Earth. Specifically, changing latitudes changes the stars and constellations that can be seen.

Make sure the atmosphere is still turned off, and that your field of view is facing north. Turn off the azimuthal grid and turn on the constellation lines and labels.

Find the Big Dipper in the northern sky. Click the Fast Forward button about four times and watch as the Big Dipper moves around in the sky.

15. Which star of the Big Dipper reaches the lowest altitude as the asterism moves? Record the lowest **altitude** of that star rounded to the nearest degree (round up at 30' or more). Use the Location window to record the rounded **latitude** of Champaign.

Click the Stop button. Change your viewing location to Edmonton, Canada in the Location window. The atmosphere seems to turn on when you change location, so turn it off again. Set the motion to fast forward again and then stop the motion when the star from Question 15 reaches its lowest altitude. Make sure the star is selected before answering Question 16.

16. What is the lowest **altitude** of the star rounded to the nearest degree? What is the **latitude** of Edmonton to the nearest degree?

Now, change your location to Tromsø, Norway. Repeat the procedure above, finding the lowest **altitude** of the star from Question 15.

17. What is the lowest **altitude** of the star rounded to the nearest degree? What is the **latitude** of Tromsø to the nearest degree?

If you haven't already noticed, each time you've changed your location, you've moved farther north.

18. Calculate the difference between the altitudes of the star in Tromsø and Edmonton. Calculate the difference between the latitudes of Tromsø and Edmonton.

19. Describe what happens to the minimum altitude of the star from Question 15 as you move farther north. Why is this the case?

Now, let's move southward. Set your location to Houston, Texas, being sure to note the latitude as you do so.

20. What is the **latitude** of Houston to the nearest degree?

21. Polaris is the brightest star in Ursa Minor, i.e. the Little Dipper. What is the **altitude** of Polaris as seen in Houston?

The two "pointer stars" of the Big Dipper are Merak and Dubhe.

22. Describe the positions of **both** Merak and Dubhe when they reach their lowest altitude as seen from Houston.

At this location, you should notice that the Little Dipper is still circumpolar. The star Pherkad is the one which will reach the lowest altitude.

23. Find the **altitude** of Pherkad when it is at its lowest in the sky in Houston.

24. Estimate the **latitude** rounded to the nearest degree where observers will see Pherkad barely touch the horizon at its lowest altitude.

25. Explain how the altitude of stars in the sky can be used to determine your latitude.