

The Motions of the Sun and Stars

In this exercise we will familiarize ourselves with the night sky. We will observe how the stars move across the sky and how this apparent motion varies depending on your viewing direction and geographic position. Furthermore, we will investigate how the Sun appears to move with respect to the stars throughout the year.

Materials: *Starry Night Pro 3.1* planetarium software

Procedure

- A. Open *Starry Night Pro* by double clicking the icon on your desktop. If prompted to register the software or update files, decline to do so.
- B. Now we need to set-up the window so that we can make some observations. First, stop the program from running by clicking on the stop button located on the information tool box.

Now click on the digital clock display and set the time to 9:00 pm by using either the arrows or the number keys. Make sure that the display shows today's date, if not change it now.

Next, Click on the arrow next the to the rate display and select minutes from the dropdown menu. Now for every second of real time a minute will pass in the program.

Finally, we need to disable daylight by selecting *sky>hide daylight* from the main program window.

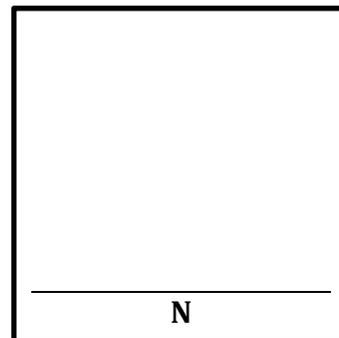
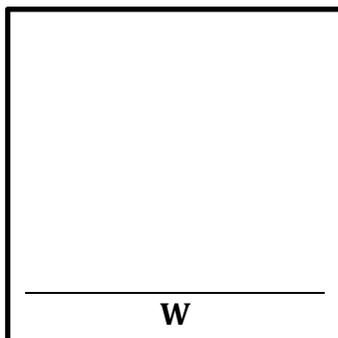
C. The Night Sky From Different Geographic Latitudes

1. Huntsville, Alabama

35°N 85°W

Change your current viewing location by clicking *go>viewing location* from the main program window. Enter the following coordinates: **35° N Latitude 85° W Longitude**.

Orient your window by clicking and dragging the screen so that you are facing an azimuth of 270° (due west). Click play and observe how the stars move relative to the horizon for a few hours. Sketch how the stars move by drawing arrows that depict the general direction they travel relative to the horizon in the box provided. Now rotate your view to azimuth 360° (due north) and observe the motion of the stars relative to the horizon. Sketch this motion.



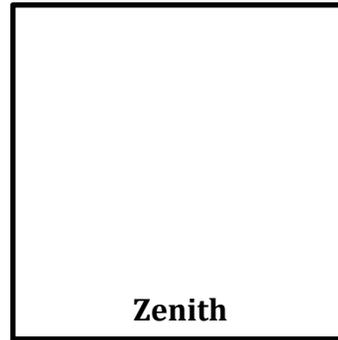
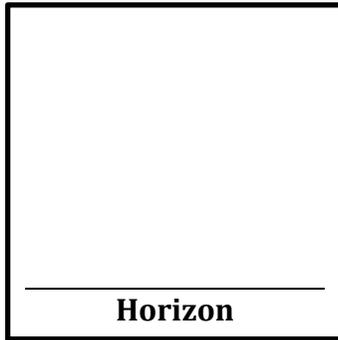
Do all of the stars appear to move when looking north? How do the stars appear to move with respect to Polaris?

Double click on Polaris and record its altitude _____

2. North Pole

90° N

Change your latitude to 90° N in the viewing location window. Look in any azimuthal direction with a low altitude so that you can observe the motion of the stars with respect to the horizon. Sketch this motion. Now look towards zenith and sketch this motion. In the boxes provided.



Do any of the stars appear to rise or set at the North Pole?

Record the altitude of Polaris _____

3. Change your latitude to 60° N

Record the altitude of Polaris _____

4. Change your latitude to 10° N

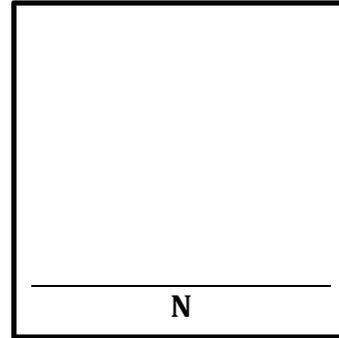
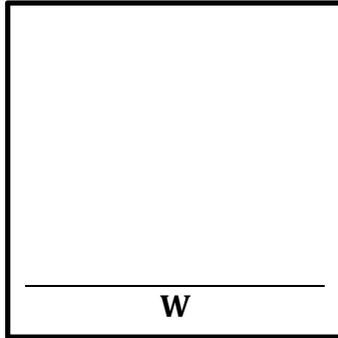
Record the altitude of Polaris _____

Using the data you have collected describe what the relationship is between the altitude of Polaris and the observer's latitude.

5. Equator

0° N

Change your current location to the equator by setting your latitude to 0° N in the viewing location window. Observe and sketch the motion of the stars with respect to the horizon when looking north and when looking west.



Compare the motion of the setting stars when looking west with the observation you made in Huntsville. Particularly, how do the angles made with the horizon compare?

D. The Apparent Annual Motion of The Sun Through The Stars

Here we will investigate how the Sun appears to move with respect to the stars throughout the year.

First we need to change our viewing orientation in *Starry Night*. To do this, click **settings >orientation>equatorial**. Turn on “boundaries” and “labels” for constellations by selecting **guides>constellation**.

Click the **planets** button from the tool box and double click on **Sun** to center it in the field of view. Now right click on the Sun and select **center/lock**. Click the stop button and change the date to 1 January of this year. Now change the rate to days.

Observe how the Sun moves through the stars throughout the year. List all of the constellations that the Sun passes through in one year.

Are these constellations the same as the twelve constellations of the Zodiac?

What direction does the Sun move among the stars?

Is motion of the Sun responsible for its change in position with respect to the stars? Why or why not?
