Astronomy 101 - Stars of Spring

Part I: Planisphere

Objective: You will construct a planisphere and use it to determine the location of some of the more popular constellations as viewed from our latitude on Earth. This device should be very valuable in your own observations of the sky and in learning a few constellations.

Procedure: You will find three stacks of materials in the lab, each being on card stock paper. Take one sheet from each stack, labeled pages 1, 2, and 3.

1) Use scissors to cut out the large squares on pages 1 and 3, plus the large circular star chart on page 2.
2) Carefully cut out all the black areas on page 1, including the large oval and the little rectangles. Sometimes a hole punch makes the little rectangles easier to cut.
3) Using a brass fastener, poke a small hole through both the center of the circular chart (through the star Polaris (dot), not the name Polaris) and through the "X" on page 3.
4) Push the fastener through the circular chart and through the back of page 3 and fasten it. Attach page 1 to the front, so you can see the circular star chart through the oval in page 1. Line up the corners of the squares and tape them. Make sure the wheel can turn between the squares.

You now have a tool that can be used to chart the night sky. The oval represents the horizon, so anything appearing in the oval can be seen. The point directly in the center of the oval is the point straight up or the "zenith." Constellation names are in capital letters while star names are in parenthesis. To set your planisphere, note that the rotating circular chart has months and dates inscribed on its edge. The front of the planisphere has times around its outside. Match the desired date with the desired time and you have a chart of the sky for that time. Face a direction outside and then put that direction (labeled in the corners) down. For example, if you face south, hold the chart with south pointing towards the ground.

You do not need to turn in your completed planisphere (you may want to hold on to it to help you study for the sky quiz). Use the completed planisphere to fill in the answers to the following questions.
Questions:
Dial January 30 at 9 p.m. on your planisphere.

1. You'll note three bright stars, close together and in a straight line, due south, about halfway up in the sky. What constellation do these stars belong to? __________________

2. There are two stars labeled in this constellation. What are the names of those stars? ____________________

3. What very bright star can now be seen in the southeast, not far from the horizon? ____________________

4. What constellation of the zodiac can now be seen rising in the east? Note that the zodiac constellations are listed on the back of the planisphere. These star patterns mark the path of the Sun, Moon, and planets. ____________________

5. In what direction would you look to see the "Big Dipper?" Be specific! __________________

6. If we connect stars Betelgeuse, Sirius and Procyon together, what shape does it appear to make? ____________________

7. As you turn the planisphere counterclockwise, what motion are you simulating? ____________________

8. At what time does the star Aldebaran set in the west on January 30? __________

9. What time does the Big Dipper set on January 30? __________

10. The planets appear to move against the background stars and hence won't be in the same place from month to month. That's why they aren't shown on the star chart. The zodiac constellations, where we find the planets, are listed on the back along with a web page. Use the computer in the lab to find this page and plug in the year. It will tell you the constellations where you can find the planets. What planets are visible on January 30 at 10 p.m. and what constellations are they located in?

11. On February 5 at 8:30 p.m., what star is closest to the zenith point? __________

12. On this date, the Milky Way runs from _______ to _______. [insert specific directions]

13. If today was February 5, when is the next major meteor shower? __________ What is the name of that shower? __________ About how many meteors per hour (called the "rate") can we expect to see on that night? __________

14. What is so special about the North Star, Polaris? ____________________

15. On February 5th, why is it difficult to see the star Altair? ____________________

16. BONUS QUESTION: What time does the Sun set on February 5th? __________

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.

For the second part of the lab, you need to complete an activity using the Starry Night software.

Be sure to turn in your answers to this portion of the lab and the pre-lab before you leave the lab room.
Part II - Starry Night Activity: Changing Latitudes

Start up Starry Night. Set the initial conditions to the following:

- Location: Champaign (or Urbana)
- Date: February 7 2012
- Daylight Savings Time: On
- Time: 9:00:00 PM
- Time Step: 5 minutes

Under the "View" menu, select "Hide Daylight". Turn your field of view so that you are facing to the North. Go into the "View" menu and select "Constellations -> Asterisms" and "Constellations -> Labels". Go into the "Labels" menu and select "Stars".

Find the Big Dipper in the northern sky.

1) Describe the location of the Big Dipper relative to Polaris.

Click on the play button and watch as the Big Dipper moves around in the sky.

2) Which star of the Big Dipper reaches the lowest altitude as the Big Dipper moves?

Click on the stop button. Change your viewing location to Chandler, Canada (by going into the Options menu and choosing "Viewing Location"). Click on the play button again and then click on the stop button when the star from question 2 reaches its lowest altitude. Click on the star to select it and then open the "Info" tab on the left side of the screen. Open the section labelled "Position in Sky".

3) What is the altitude of the star?

Now, change your location to Murmansk, Russia. Repeat the procedure above, finding the lowest altitude of the star from Question 2.

4) What is the altitude of the star?

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

5) Describe what happens to the minimum altitude of the star from question 2 as you move farther north. Why is this the case?

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

6) What is the latitude of Cairo, Egypt?

7) What is the altitude of Polaris as seen in Cairo, Egypt?

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

8) Describe the positions of Merak and Dubhe when they are at their lowest altitude as seen from Cairo, Egypt.

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.
9) Find the altitude of Pherkad when it is at its lowest in the sky in Cairo.

10) Estimate the latitude at which Pherkad will just touch the horizon at its lowest.

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