Lab #7: Spherical Astronomy

The way stars move in the sky is actually quite easy to understand. All they do is they make one circle in 23^h56^m, around the North (and South) poles. This is called sidereal motion - one circle (360°) every 24^h, which simplifies to 15° per hour: the sidereal rate. Of course, this is a reflection of the rotation of Earth. When we look towards the South, the stars slowly "drift" from left to right; that is, they rise in the East and cross the *meridian* high up in the South (this is called *culmination*, or *transit* from the eastern sky to the western sky). When you look towards the North, you see the stars slowly go in circles around the North Pole, coming up on the eastern side, culminating, and going down on the western side.

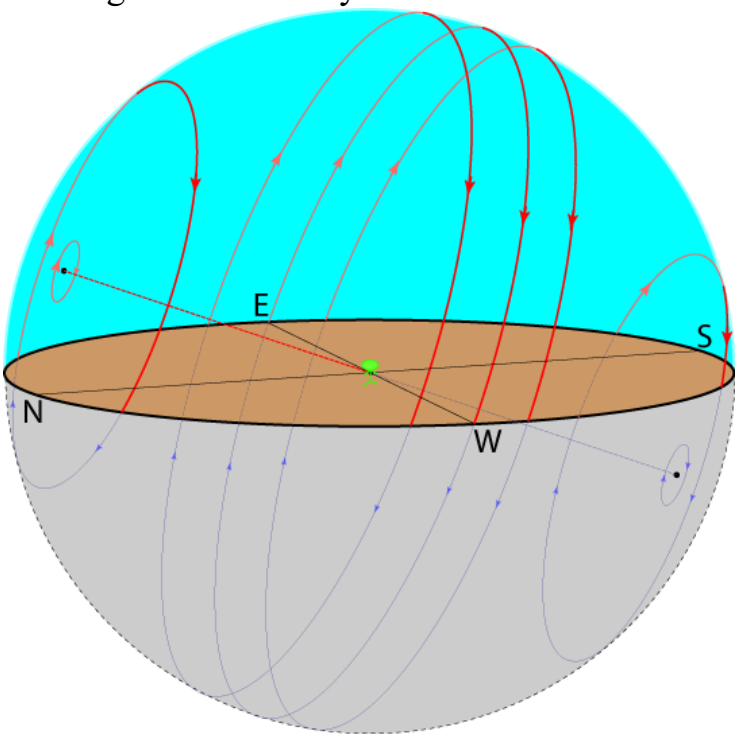
You'll use the concepts of *Zenith* straight above you, *Nadir* directly under you, and the *horizon* – that is where stars *rise* or *set*.

PROCEDURE AND LAB REPORT

Your name: _____ **Partner's name:** kjgy79 _____ **Section:** ___/___

Questions 1 through 8 need no advance knowledge in astronomy. Use common sense to figure out the answers to these. You may ask your instructor for advice on how good your reasoning is, but you will have to do the actual thinking.

Picture 1 shows the sky from the perspective of an observer in Mississippi's 34° latitude. The cardinal directions (E,S,W,N) are on the horizon; these are the directions we use in everyday life.



Picture 1

1. **Identify** the following in Picture 1. Use the requested letters or colored pencils to draw: Horizon (green), Meridian (red), North Pole (NP), Zenith (Z), Nadir (N), Equator (blue).

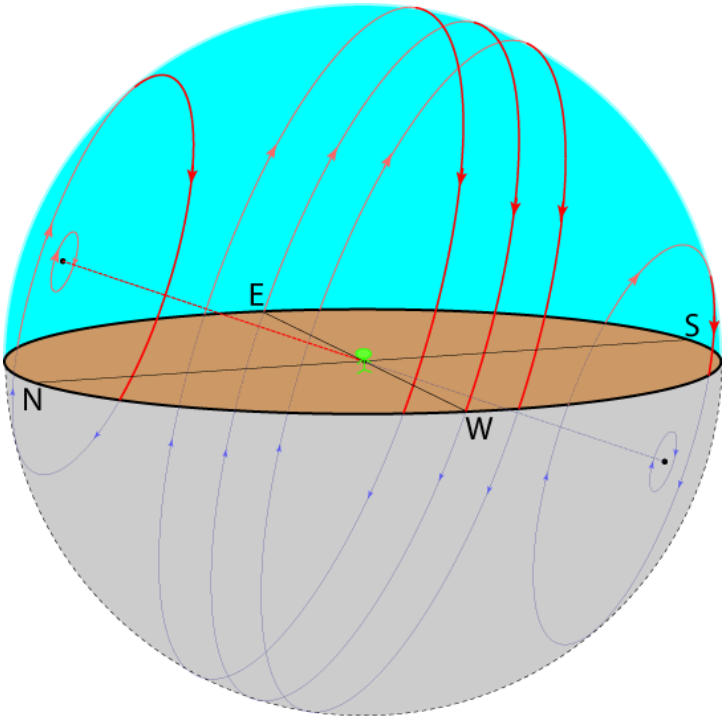
2. **Take the star** that rises exactly in the East. Indicate its position with a blue star shape when it is rising, green high up before transit, red when culminating, yellow after transit, and orange when setting. When can you see this star in the northern sky? _____ How many hours will this star take from rising to transiting? _____ Is this star under, on, or over the equator? _____

3. Use Picture 2 to draw. Take the star that culminates at zenith, draw its path across the sky in black with an arrow showing the direction of its motion, and repeat Exercise #2 (drawing the colored stars). Based on the length of its path over and under the horizon, will this star be up longer or down longer every day? .

_____

4. Still in Picture 1, indicate the **path of Polaris** across the sky with a red line, and mark it with a red P.

5. In Picture 2, indicate the way the Sun moves in the sky during one day (i) in the summer (red), and . (ii) in the winter (blue).

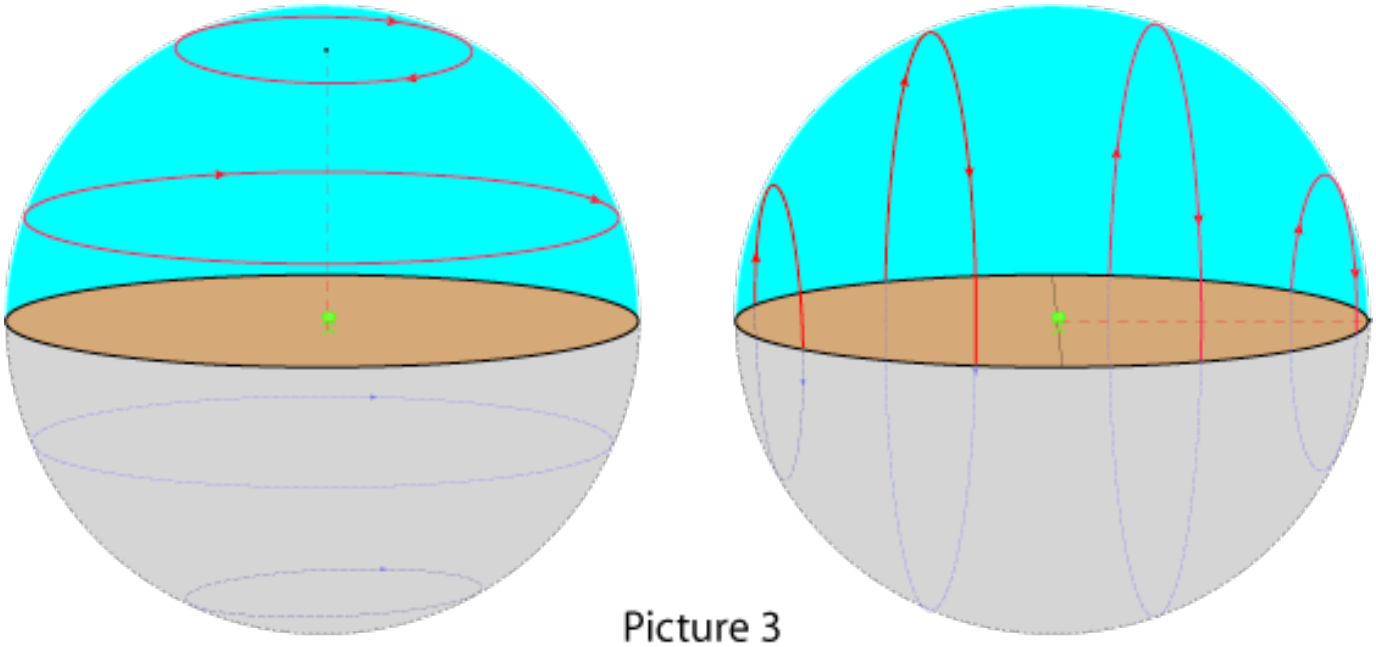


Picture 2

6. Read off from your drawing where the sun rises/sets: in the summer: ____/____; and in the winter: ____/____.

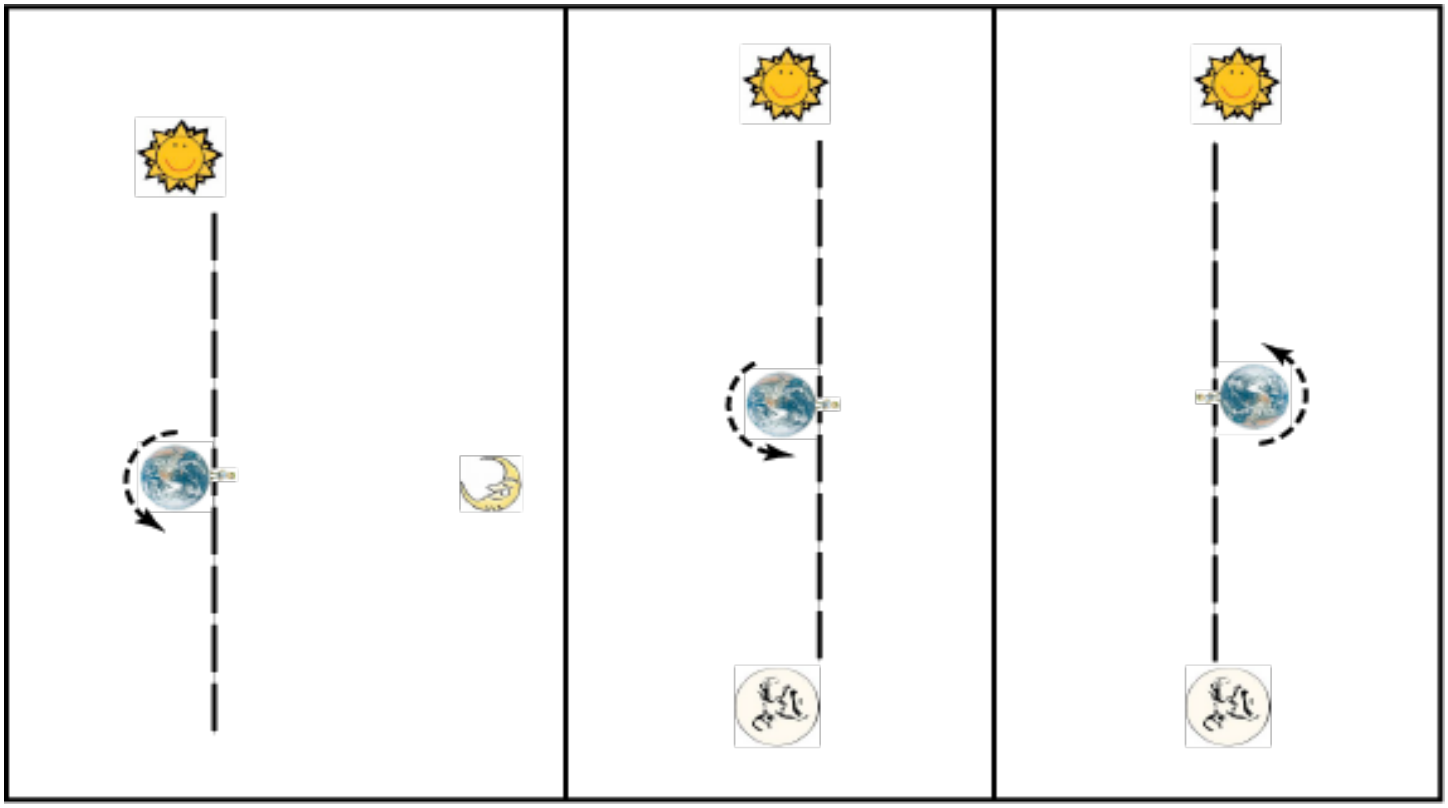
7. Picture 3 indicates the way the sky moves from two locations. Where on Earth are they? Write your answers under the pictures.

8. Why can the planets never be in the northern sky? _____



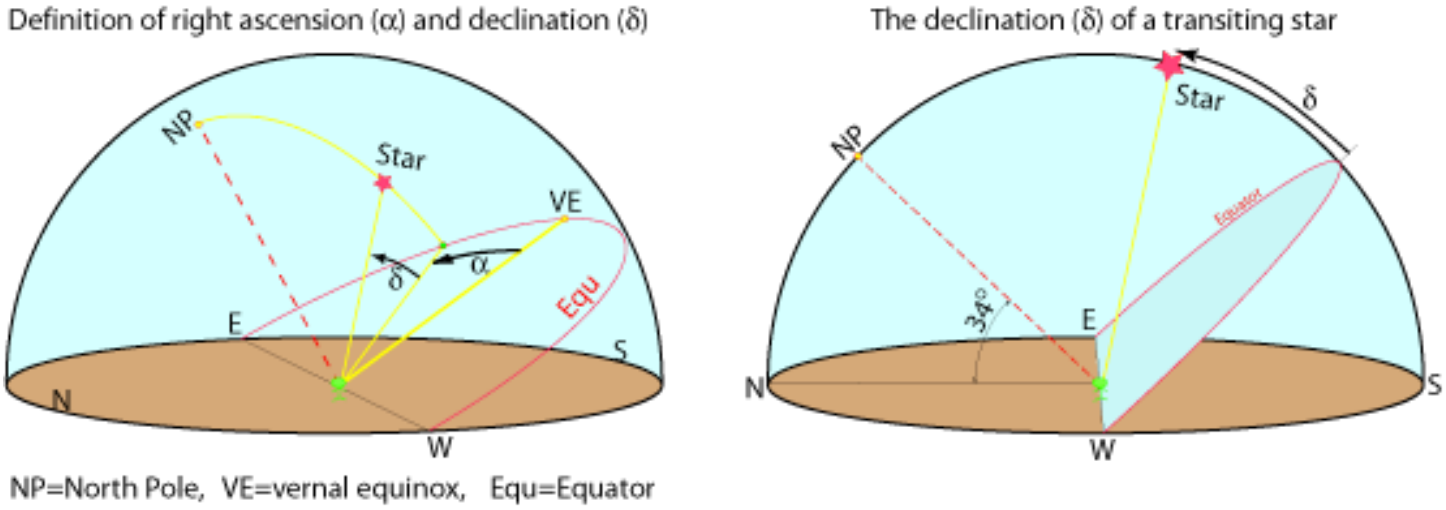
Picture 3

9. In Picture 4, you see a person standing on Earth. Indicate in each of three cases what time it is and whether the Moon is rising, setting, culminating, or not up at all.



Picture 4

The angular distance of a star over the equator is called its declination, as Picture 5 indicates.



NP=North Pole, VE=vernal equinox, Equ=Equator

10. Declination. Based on this picture, what is the declination of Polaris? _____ What is the declination of a star that is located on the equator?_____ And a hard question: the most spectacular globular cluster in the sky is ω Centauri. It barely comes up for a few minutes and goes down immediately. What is its declination? _____