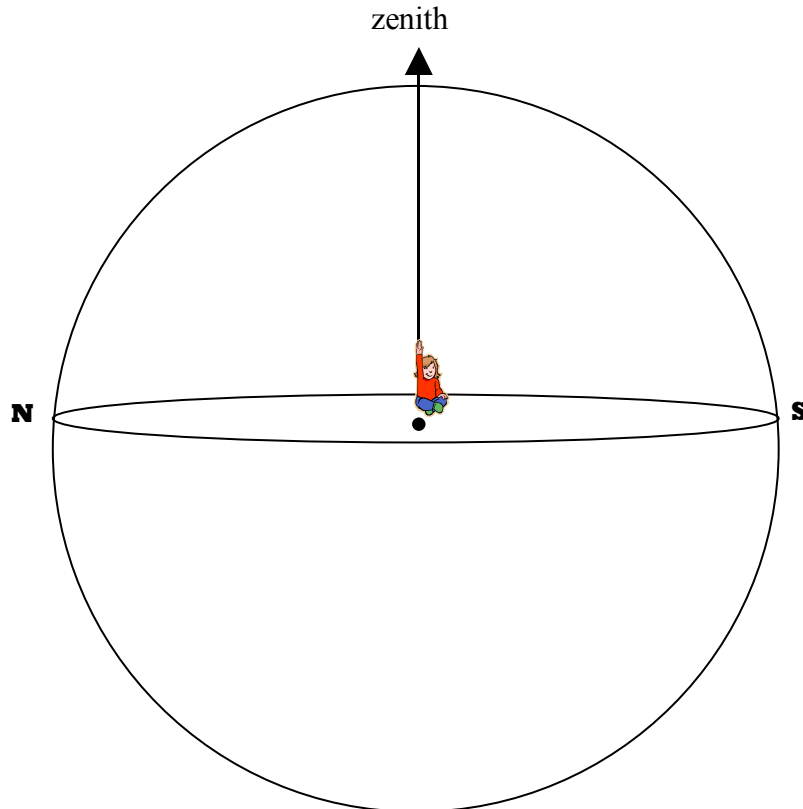


## Astronomy 480 - Review of Celestial Sphere, Telescopes, and Celestial Objects

### Celestial Sphere and the Night Sky

01. Here is a member of last year's 480 course, pointing straight up at her "zenith." The large, outer circle represents the celestial sphere. Remembering that Seattle's latitude is about 48 degrees N, draw a line from the dot in the middle to the following features of the celestial sphere, labeling each one, and each angle (you are measuring along the meridian):

a) celestial north pole; b) celestial equator; c) ecliptic on June 21; d) ecliptic on December 21



02. What is the altitude of the Sun above the southern horizon on the Spring equinox? \_\_\_\_\_

03. What is the Sun's right ascension (RA) and declination (dec) on the Spring equinox? \_\_\_\_\_

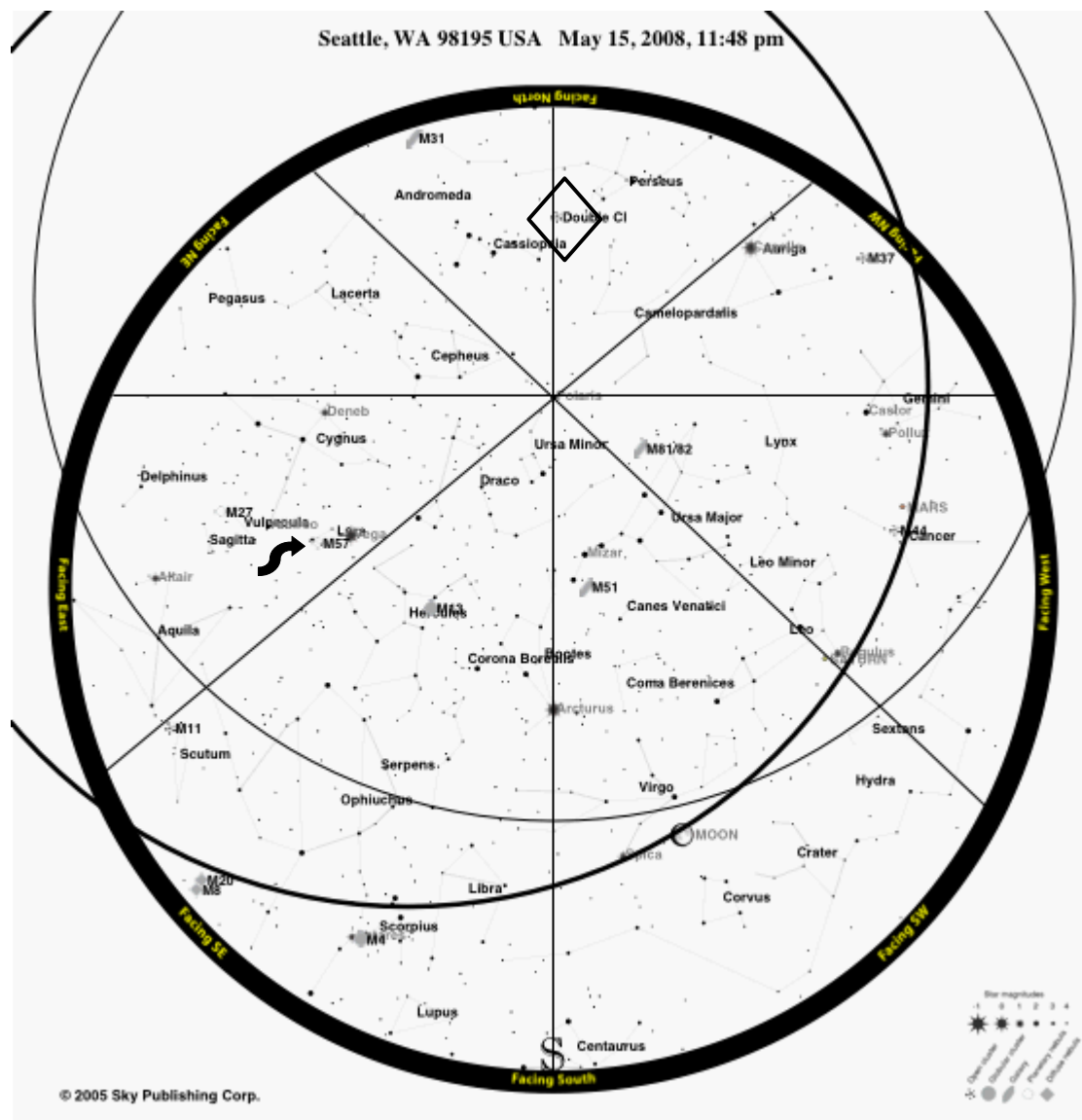
04. In which constellation does the Sun lie on the spring equinox? \_\_\_\_\_

05. You start observing at 10 pm on May 15. At midnight that evening, you notice that the star Arcturus is precisely on the meridian (see the star map on the next page). The coordinates of Arcturus are 14h 15m 39.67 sec +19 deg 10' 56.7" [2000].

a) What is the sidereal time at this instant? \_\_\_\_\_

b) What is the hour angle of Arcturus? \_\_\_\_\_

c) What is the approximate angle between your zenith and this star? \_\_\_\_\_



06. The object you are really after, however, is the Ring Nebula, M57 (see arrow on map).  
 a) Is the right ascension of the Ring Nebula greater than or less than Arcturus's? \_\_\_\_\_  
 b) What is the approximate hour angle for the Ring? \_\_\_\_\_  
 c) Should you have already observed the Ring, or will you have to stay up until the wee hours of dawn (is the hour angle positive or negative)? \_\_\_\_\_
07. What is the approximate right ascension of the Double Cluster in Perseus? \_\_\_\_\_ (Find:  $\diamond$ )
08. What constellation is the Sun in on the autumn equinox (answer is on this chart)? \_\_\_\_\_
09. There is a red giant star with the Bayer designation of delta Sagittarii that may have a planet orbiting

it. Unfortunately, it has not been observed enough times to confirm the existence of a planet. The coordinates for this star are 18h 21m 00 -29 deg 49' 42.

(continued on next page)

- a) What is the highest altitude that this star will get when observing from Seattle? \_\_\_\_\_
- b) To what latitude would we need to go to have this star pass directly overhead? \_\_\_\_\_

10. You want to know the angular separation between two stars that lie on the celestial equator. You know that the RA of one of the stars is 2h 45m and the RA for the other one is 2h 41m.

- a) What is the angular separation (degrees, arc minutes, or arc seconds)? \_\_\_\_\_
- b) Would your answer for the angular separation be the same if the declination for these stars was +20 deg? Why or why not?

### Telescopes

01. What purposes do telescopes serve in the professional astronomical community?

02. What is the difference between an equatorial-drive telescope and a telescope that has an alt-az (altitude-azimuth) drive?

03. Our 304.8 mm Meade LX200GPS telescope has a focal-ratio of  $f/10$ . What is the focal length of the primary mirror? \_\_\_\_\_

04. List two good reasons why the largest telescopes are reflectors and not refractors?

05. Sticking with our Meade telescope:

- a) Which eyepiece would give the greatest magnification, one with a focal length of 12 mm or one with a focal length of 40 mm? \_\_\_\_\_
- b) Would you have to refocus the telescope after changing the eyepiece? Why or why not?

c) We don't care about magnification when using our digital CCD camera, just its field of view. Why not?

### Celestial Objects

We will be able to view a wide variety of celestial objects during our spring observing season. Here is a list of just a few: globular clusters, open clusters, elliptical galaxies, spiral galaxies, barred spiral galaxies, planetary nebulae, emission nebula, dark nebula, reflection nebula, planets, RR Lyrae variables, and cataclysmic variables.

01. How does a globular cluster differ from an open cluster? Include in your discussion location in the Galaxy, number of stars, ages of stars, and metallicity content.

02. What is a planetary nebula? What kind of star does it come from? How did it become a planetary nebula?

03. List three differences between an elliptical galaxy and a spiral galaxy. You may wish to include overall morphology, star content, origin, location in galaxy clusters, and size.

04. How would you describe an emission nebula and a reflection nebula? (Just saying, “one emits, the other reflects,” won’t count.)

05. From an evolutionary standpoint, contrast an RR Lyrae variable and a cataclysmic variable.