

**Astronomical Observations (Fall 2005)**  
**Midterm Exam**

**1 November 2005, Tuesday 18:10~20:10**

1. Which three stars form the “Summer Triangle”? You can write down the names of the stars either in English or in Chinese. Sketch roughly a diagram to show the relative position of these three stars. Show the north direction on your diagram (10%)
2. The 1-m telescope at Lulin Observatory (called LOT) has a focal length of 8000 mm, and is equipped with a CCD camera of 2048 x 2048 pixels, with each pixel of a physical dimension of 13 micron x 13 micron. (a) What is the sensitivity (or the amount of light being collected in the same amount of time) of the LOT compared to that of a 10-m telescope? (b) What is the theoretical diffraction limit (angular resolution) of the LOT optic, in unit of arcseconds? (c) Calculate the field of view of the camera. (15 points)
3. How does the Earth’s atmosphere affect astronomical observations? For each kind of effects, elaborate on an explanation and show some examples of how each effect influences our observations. If the atmosphere in many aspects limits our capability to observe, why don’t we put all telescopes in space? (20 points)
4. Compare the advantages and disadvantages, optically and mechanically, of a refracting telescope (using lenses) versus a reflecting telescope (using mirrors). Why are modern large optical telescopes all reflectors? (10 points)
5. Explain spherical aberration and chromatic aberration. Describe one way to correct for each of these optical defects. (10%)
6. Jupiter is at an average of 5 AU away from the Sun. (1) Seen from Alpha Centauri, the nearest stellar system from us at a distance of 4.3 light years (or 1.3 pc), what is the maximum angle (in seconds of arc) subtended by Jupiter and the Sun? (2) If there is also a Jupiter-like planet around Alpha Centauri, and we want to devise an optical telescope on the surface of the Moon to observe the system, what is the minimal required diameter of the primary mirror of this lunar telescope to resolve the star-planet system? (10%)
7. The Pleiades (also called M45) is a young star cluster with the equatorial coordinates of RA ~ 03.5h and DEC ~ +22 deg. What is the best month/season to observe this cluster from Taiwan? Is it better to observe it in Australia? If so, why? If not, why not? Clearly state your reasoning in each case. (10%)
8. Briefly explain the following terms (a) zenith, (b) azimuth, (c) ecliptic, (d) Universal Time, (e) meridian (15%)