

ASTR 220 Homework #6

Spring 2005

Due Tuesday, April 12, 2005, at the beginning of lecture.

All of the textbook questions are from *The Essential Cosmic Perspective*.

Please neatly write or type your homework.

Be aware of potential plagiarism: make sure to put the answer into your own words. Feel free to discuss the questions with your classmates, but write up the answers yourself - do not copy.

Make sure to show your work for any calculations - answers that appear like magic will receive no credit.

1. Ch. 12, Sensible Statements, #18.
2. Ch. 12, Sensible Statements, #22.
3. Ch. 12, Review Questions, #4.
4. (a) What happens to the core of a star when its hydrogen is exhausted from nuclear fusion?
(b) Why does hydrogen shell burning begin around the inert helium core?
5. Red giants have surface temperatures of about 3000 K.
(a) At what wavelength will the light emitted from the red giant be the brightest?
(b) What type of light is this?
6. If you compare a photograph of a *nearby* planetary nebula taken 100 years ago to one taken today, in what two ways would the nebula's appearance be different?
7. Ch. 12, Review Questions, #12.
8. The supernova remnant from SN 1054 is called the Crab Nebula. The latest observations show that the Crab Nebula has a radius of 5 lyr (which is $4.73 \times 10^6 m$). Observations of the emission spectrum from the part of the nebula heading directly toward us have found that the red hydrogen emission line has a wavelength of $6.524 \times 10^{-7} m$. Measured in a laboratory, the red hydrogen line has a wavelength of $6.563 \times 10^{-7} m$.
(a) How much is the wavelength of the emission line Doppler shifted?
(b) What is the velocity of the gas in the nebula?
(c) Assuming that the gas has always been traveling at the same velocity, how long ago was the supernova? Give your answer both in seconds and in years. Are you in rough agreement with the accepted date of the supernova, 1054 A.D.?