General Astronomy I: Jan. 13, 2015

1. (10%) What is Wien's Displacement Law? Write down the equation and explain each variable in the equation.
2. (15%) The Sun's luminosity is L_O, surface temperature is T_O, and radius is R_O.
   (a) A star has the same surface temperature as the Sun, but has a radius $3R_O$. Please calculate its luminosity (express as a function of L_O).
   (b) Another star's surface temperature is $0.5T_O$, and its radius is $4R_O$. Please calculate its luminosity (express as a function of L_O).
3. (5%) Explain (a) tide, (b) solar eclipse, (c) lunar eclipse, (d) heliocentric universe, (e) Maunder butterfly diagram.
4. (15%) Please use a few simple equations to show that the more massive star has a shorter life.
5. (5%) What is the H-R diagram? Please draw a picture with both axes labeled, and draw some points to show the locations of most stars.
6. (10%) Please describe the main differences of evolution after the main-sequence stage between the low mass and high stars.
7. (10%) List two methods which can be used to detect binary stars.
8. (5%) Describe the mechanism to emit a 21-cm radio wave from a hydrogen atom.
9. (5%) Write down the names of three different kinds of nebula.
10. (15%)
    (a) What is the period-luminosity relation for variable stars? Draw a simple picture to show this relation.
    (b) Why is there a period-luminosity relation for variable stars?
11. (5%) What is the Chandrasekhar Limit? Please describe.

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