

Homework # 4

Name _____

DUE: October 14 (at the start of class)

Your homework grade depends not only upon your getting the correct answer but also grammar, spelling and punctuation, particularly in questions that require explanations. Obviously numerical answers to problems do not need to be written in complete sentences. You will also be graded on the use of significant figures, proper units of measure and proper scientific notation. Partial credit may be given for showing your work even if your result is incorrect. You may work with others in determining the answers to the questions, but what you write should be in your own words – any homework assignments that look too similar to that of other students will receive no credit. Unless otherwise noted, all questions are worth 1 point.

1. (12 points total) Let's look at the star that you generated in the last homework assignment. And just so I can keep track, please write your star's name and spectral type below.

Name:

Spectral Type:

a. (2 points) Previously you determined the Main Sequence mass for your star. What is the approximate amount of time your star would spend on the Main Sequence? Use the formula given in the notes.

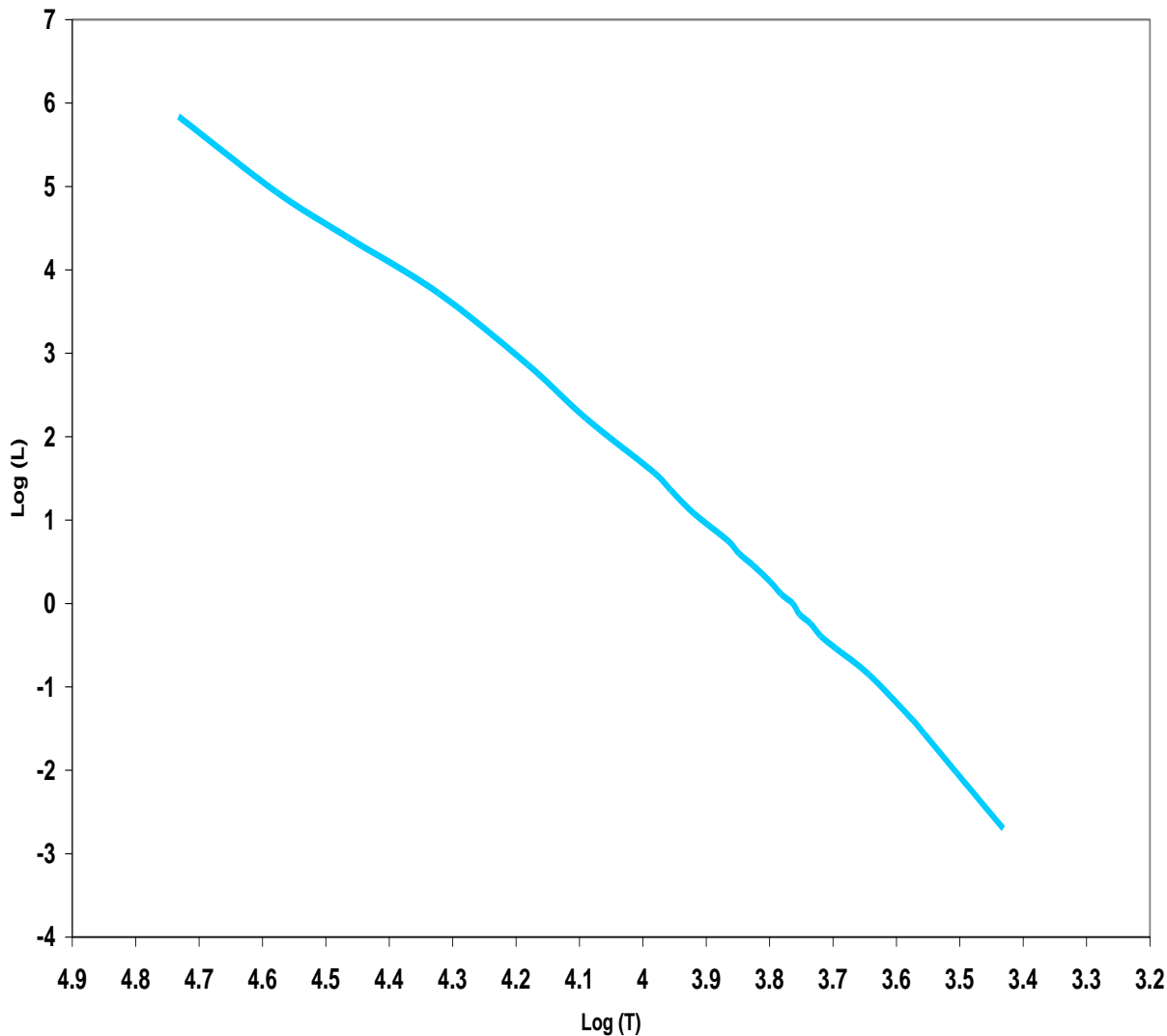
b. List all of the elements that your star will fuse in order for it to produce energy during its entire life time, both on the Main Sequence and after it leaves the Main Sequence.

c. What will ultimately happen to your star in the final stage of its life? In other words, how will it ultimately end up?

d. (2 points) On the H-R diagram below, map out the likely evolution of your star. Use the sample evolutionary paths shown at the course website as guides. Do not go beyond the Red Giant or Supergiant stage. The starting point should be based upon the Main Sequence values for the temperature and luminosity that can be found in the *Spectral Types Characteristic* table. Note that the graph below uses the Log values for both temperature and luminosity, so make sure you Log the Main Sequence values before you plot them.

Main Sequence T = _____ Log (T) = _____

Main Sequence L = _____ Log (L) = _____



f. (2 points) Mark on your graph the location that your star will have its greatest radius. What are the approximate corresponding Log (L) and Log (T) values for that point?

Log (L) = _____

Log (T) = _____

g. (2 points) In order to use the values you just obtained, you need to take their anti-log, which basically means taking 10 to the power of the value. For example if your value for $\text{Log}(L)$ was 3.7, then the value for the luminosity would be $10^{3.7} = 5000$ times the luminosity of the Sun (L_{\odot}). Determine the values for the luminosity and the temperature.

Luminosity (in L_{\odot}) = _____

Temperature (in K) = _____

h. (2 points) Determine the radius of your star for these values. To use the simple version of the L-R-T relation, you need to first divide the star's temperature by 5800 (so that it is in terms of the Sun's temperature) before you put it into the L-R-T relation, $L=R^2 T^4$. Using this formula gives the radius in terms of the R_{\odot} .

2. (4 points total). A star like the Sun will change in many ways during its lifetime. One way it can change is how fast it spins. The main stages for the Sun's life are Main Sequence, Red Giant, and White Dwarf. Let's make things simple and ignore any changes in mass for the Sun over the course of its life from formation to its final fate as a white dwarf when you answer these questions.

a. (2 points) During which stage of the Sun's life would it have the fastest rotation rate? What reasoning did you use to get that answer?

b. (2 points) During which stage of the Sun's life would it have the slowest rotation rate? Again, what was your reasoning behind this answer?

3 (4 points total) At the course website is a link to an article talking about the hazards of gamma ray bursters. Read through it and answer these questions -

a. (2 points) What are the specific hazards to humanity caused by such an event?

b. What could we do to protect ourselves from such an event?

c. Is this stuff scary?