

Astronomy 301 – Fall 2019

Homework 8

Due Date: Wednesday, October 30, 2018, 9:00 AM

You must turn in your homework answers electronically via Canvas. A .pdf or .docx file would be best, but if you can get a good image of your hand-written homework, a .jpg or .png file would okay also. Make sure your name and eid appear at the beginning of your homework.

We encourage you to work together on the homework but you are not allowed to copy from each other. You must write out the answers in your own words.

1. Draw the motion of a $2 M_{\odot}$ star in the Hertzsprung-Russell diagram as it evolves from the main sequence to the Horizontal Branch. Draw a diagram of the interior of a star on the red giant branch, labeling the various components and giving their sizes.
2. What does the word “evolution” mean in the phrase “stellar evolution?” What is the fundamental reason why stars evolve? What fundamental property of a star determines how rapidly it evolves? How long does a star with a G spectral type remain on the main sequence? An O star?
3. Draw a diagram showing the interior of a $2 M_{\odot}$ star just before it ejects a planetary nebula, labeling the various layers inside the star.
4. Describe how to measure the age of a cluster using its Hertzsprung-Russell diagram. The main-sequence turn-off of a cluster is observed to be at $1.0 M_{\odot}$. What is its age?
5. Describe the interior of a star just before it becomes a core-collapse supernova. Why does the core collapse? What happens to all the protons in all the nuclei of all the atoms in the core as it collapses? What does the core become at the end of the collapse? What is the source of energy in the collapse?