

Astronomy 1020 Exam 3 Review Questions

1. Describe the evolutionary sequence of star formation. What is a T Tauri star? A Herbig-Haro object? An accretion disk? Summarize how planetary formation is related to stellar formation.
2. Stars form in star clusters. Which are the oldest and which are the youngest star clusters in the Galaxy? What is an OB association?
3. What is meant by *extrasolar planet*? There are 4 techniques that are currently being used to search for extrasolar planets. List all 4 and describe each in detail. The majority of the recently discovered extrasolar planets have been found with one of these 4 techniques. Which is it?
4. In terms of energy production, what is significant about main sequence stars? Name the two reaction processes in hydrogen fusion and list the stellar mass where each is important.
5. What is ZAMS? What is true about the structure of $M > 2M_{\odot}$ main sequence stars? $0.4M_{\odot} < M < 2M_{\odot}$ main sequence stars? $M < 0.4M_{\odot}$ main sequence stars?
6. What are the 3 laws of stellar structure? What is meant by *opacity*?
7. What is the lower mass limit of main sequence stars? The upper mass limit? Why are both of these numbers such as they are? What is a brown dwarf star? How is something classified as a star, brown dwarf, or planet?
8. Explain why the luminosity of a star scales as mass to the 4th power. (*Hint*: Think of central pressures and temperatures and how reaction rates depend upon these quantities.)
9. Name the 3 different spectral classes of brown dwarfs. What characteristics must a brown dwarf possess to be classified in each spectral class.
10. Explain how we are able to measure the age of a star cluster. Be specific and give details!
11. What is the Russell-Vogt Theorem?
12. Describe the ascent of a star up the red giant branch and in the red giant clump. What is meant by the helium flash? What is the triple alpha process and why is it important to life on Earth?
13. How are horizontal branch stars different from red giant clump stars? How are they the same in terms of stellar evolution?

14. When a star rises up the red giant branch, its surface cools even though the core is getting smaller and hotter. Why does this happen?
15. What is meant by the Pauli Exclusion Principle?
16. Describe the post-red giant evolution of stars in the following mass range: $M < 0.08 M_{\odot}$, $0.08 M_{\odot} < M < 0.4 M_{\odot}$, $0.4 M_{\odot} < M < 4 M_{\odot}$, $4 M_{\odot} < M < 8 M_{\odot}$, and $M > 8 M_{\odot}$.
17. What is an alpha particle, beta particle, and gamma particle?
18. What is the “Alpha (α) Process” (see page 570 of the textbook)?
19. What gives rise to stellar chromospheres and coronae (also, what are they — refer back to the section on the Sun)? Why don’t we see these structures in O, B, and A main sequence stars? Observationally, how do we determine whether a star has a chromosphere and/or corona?
20. What is a stellar wind? In terms of driving properties, how is the stellar wind of an O main sequence star similar and different from that of a red giant star?
21. Describe the evolution of the Sun in detail.