

C10 final review

December 2018

1 C10 Final Exam review

Here are a random assortment of questions completely off the top of my head. This list is not comprehensive and the number of questions was set entirely by the amount of time I had available while waiting for Philipp to finish his work so we could go grab dinner.

1. How do we measure the recession velocity of very far away galaxies?
2. What problems does inflation solve?
3. If Star A is 16 times the mass of Star B, and both are on the main sequence, what is the ratio of their luminosities?
4. What is the ratio of the energies of two photons with wavelengths 500 nm and 1000 nm? Ratio of frequencies? Speeds? What type of photons are each of these (i.e., where do they fall in the EM spectrum)?
5. What are the two types of black holes that we observe in the universe, and how do each form?
6. Draw an HR diagram. Label it. Label the main sequence, red giants, and white dwarfs on the diagram.
7. What is the endpoint in the evolution of a $1 M_{\odot}$ star? Describe its evolution, from the time when it was just a mere cloud of gas to 100 billion years from now.
8. Which type of galaxy do you expect to find Type II supernovae in and why?
9. What fraction of the mass of the universe is dark matter? What is Ω_{DM} ?
10. Suppose $\Omega_{\Lambda} = 0$. What is the ultimate fate of the universe if $\Omega_M > 1$?
11. You look at a star through a diffraction grating. What do you see? What does a plot of the brightness as a function of wavelength look like?

12. If Star A is twice as far away as Star B, but three times hotter, what is the ratio of their apparent brightnesses? You may assume they have the same size.
13. Why are AGN so bright (i.e., what powers them)?
14. What would happen to the Earth's orbit if we suddenly replaced the Sun with a black hole of the same mass?
15. Newton's law of gravity says the force of the Sun on the Earth is the same as that of the Earth on the Sun. Why is it that the Earth is orbiting around the Sun then, and not the other way around?
16. What time do all the moon phases rise, peak in the sky, and set? Draw the diagram!
17. How do we know there's dark matter?
18. What is fusing in the center of a neutron star, main sequence star, and red giant?
19. Star A starts off with 4 times the mass that Star B starts off with. What is the ratio of their main sequence lifetimes?
20. How do we know the chemical composition of stars?
21. If a star is 8 parsecs away, what is its parallax angle?
22. Give two reasons bigger telescopes are better.
23. What *is* the main sequence?
24. Explain why we are most likely to find stars on the main sequence.
25. Pick a random star in the Universe. What is its mass likely to be (i.e., what's the typical mass of a star)?
26. What is the event horizon of a black hole? If I double the mass of a BH, what happens to the radius of the event horizon?
27. Are more massive white dwarfs bigger or smaller? Why?
28. What keeps a neutron star from collapsing in on itself?
29. What spectral type is our Sun? Are O-type main sequence stars hotter or cooler than the Sun? More massive or less massive? Longer or shorter lived? Larger or smaller?
30. Draw the spectrum of a blackbody (brightness vs. wavelength). Now suppose you increase the temperature of the blackbody by a factor of 2 (keep everything else constant). Draw the new spectrum on the same axes. What changes, and why?