

AST 301

Review questions for Exam #2

Exam date: Friday Oct. 24

1. What is a photon? What is an electromagnetic wave? How are the photon and wave pictures of light related?
2. Make a sketch of an atom, labeling its parts.
3. How do the wave properties of electrons result in only certain electron orbits being allowed in an atom?
4. How does the fact that only certain electron orbits can occur result in photons of only certain wavelengths being emitted by an atom?
5. Describe emission and absorption line spectra and the conditions under which each occurs.
6. Describe black body radiation and the relations between a) temperature and the power emitted, and b) temperature and the wavelengths of light emitted.
7. Describe the Doppler shift. If the observed wavelength is 1.1 times the emitted wavelength, what does this tell you about the motion of the source or observer?
8. How does the Sun generate the energy that is radiated from its surface?
9. Describe the first reaction in the proton-proton chain of nuclear reactions in the Sun. What is the overall result of the nuclear reactions in the Sun?
10. How does Einstein's equation, $E = mc^2$, help explain how nuclear reactions generate energy? How can we use it to calculate the amount of energy generated?
11. Describe how neutrinos allow us to observe the interior of the Sun, and say what was found.
12. What's the difference between a photon and a proton? A neutron and a neutrino? An atom and an ion? An electron and a positron?
13. How do astronomers use parallax to measure the distances to stars? Why does parallax vary inversely with distance?
14. Describe and explain the relationship between a star's apparent brightness (or flux), its absolute brightness (or luminosity), and its distance from us. If I moved a star to twice its previous distance from us, by what factor would its flux change? Why?
15. Describe and explain the relationship between a star's luminosity, its radius, and its temperature. If I doubled the radius of a star, without changing its temperature, by what factor would its luminosity change? What if I doubled its temperature?
16. Sketch an H-R diagram, showing the location of main sequence stars, red giants, and white dwarfs.
17. Explain how astronomers measure masses of stars.
18. Describe how the luminosities of main sequence stars are related to their masses.
19. Describe the process of formation of a protostar from a molecular cloud.
20. Describe the concept of hydrostatic equilibrium.
21. Describe the concept of thermal equilibrium.
22. Describe how a star changes if it is not in thermal equilibrium, and how this causes a protostars to become a main sequence star and keeps the Sun's luminosity stable.
23. Describe how the mass-luminosity relation can be used to calculate the lifetimes of main sequence stars.