

Name:

Astronomy 3 - Problem Set 3

1. Human body temperature is about 310 K (98.6 F). At what wavelength do humans radiate the most energy? What kind of radiation do we emit?
2. A UCSC graduate student/TA, Neil Miller, observes a star which is twice as hot as the Sun but much fainter than the Sun. How can he determine the star's temperature? Why does the star appear so much fainter even though it is much hotter?
3. Do all the photons from this star have the same color? If so, how is this color determined? If not, how does the color spread out? Identify a natural phenomenon to support your answer.
4. The same student observe a binary star. The peak wavelength of star A is 300 nm and that of star B is 600 nm. What are their frequencies? What about the speed at which these lights reach us?
5. If one star has a temperature of 6000 K and another star has a temperature of 7000 K, how much more energy per second will the hotter star radiate from each square meter of its surface?
6. In the laboratory, the Balmer beta line has a wavelength of 486.1 nm. If the line appears in a star's spectrum at 486.3 nm, what is the star's radial velocity? Is it approaching or receding?
7. Explain how studying a star's spectrum can allow us to detect: a) its surface chemical composition, b) its surface temperature, c) its speed moving relative to us, and d) its rotation.
8. Briefly explain two most important advantages of putting telescope in space.
9. Calculate the diffraction limit of the human eye, assuming a lens size of 0.8 cm for visible light of 500 nm wavelength photons. How does this limit compare to the diffraction limit of a 10-meter telescope?