

1) Suppose a star has Luminosity 780 times that of our sun. The stars maximum emission occurs at 107.4 nm.

a) What type of star is this likely to be?

b) What is the radius of this star, in meters and compared to our sun's radius?

2a) The energy needed to ionize a hydrogen atom from its ground state is  $2.18 \times 10^{-18}$  J. What wavelength of photon does this energy correspond to?

b) How fast would an electron have to be moving to have this much kinetic energy?

3a) Explain the idea of cosmic fingerprinting to me. What is it? How and from where to we get the relevant data? Why is it so important in astronomical research?

b) What would happen if we observed spectra lines from a distant star that matched up with a known-element's rest wavelength. How can we be sure not to confuse the two elements?

4a) Explain the differences between nuclear fusion and nuclear fission. Give one real-world example of both processes.

b) How much hydrogen is converted into Helium each second in a star with Luminosity of  $6.2 \times 10^{32}$  Joules/second.

c) Draw a picture that explains the steps in the proton-proton chain with as few words as possible.

5) Suppose that when the Sun becomes a red giant it's radius will increase by a factor of 100 while its surface temperature will decrease by half of its current value (I've already given you this number, but you can look it up if need be). What will the Sun's luminosity be at this point:

a) As a ratio with its current luminosity?

b) In the standard units of watts?