

Astronomy 120: Assignment 3, atoms, the sun and the family of stars

1. If a star has a surface temperature of 16,000 K, at what wavelength will emit most of its energy? What part of the electromagnetic spectrum is this? If the radiation of a star is most intense at 2000nm, what is its surface temperature and in what part of the electromagnetic spectrum does it emit most of its energy? Which has more energy, a UV photon or a microwave photon?
2. What is the definition of 1 parsec? Copy and complete the following table

m_v	M_v	distance (pc)	parallax (arcseconds)	distance modulus
...	7	10	...	0
11	...	1000
...	-2	...	0.025	...
4	0.040	2

3. What main characteristic determines the spectral type of a star? Will a K-type have a bluer or redder spectrum than a B-type (and why)? Explain how the motions of atoms in a star's atmosphere govern the width of absorption lines. The Balmer α line has a rest (laboratory) wavelength of 656.3 nm. If it is observed to show a shift of 0.1 nm, what velocity is the source travelling at?
4. How much energy is released when the sun converts 50 kg of hydrogen to helium? How many megaton bombs is that (1 MT bomb= 4×10^{15} J)? What mass of helium is produced? (mass defect is 0.007).
5. The star scorchio is three times as hot as the sun and twice as large. How bright will it be compared with the sun? The radius of the sun is 7×10^5 km, what is the *diameter* of scorchio? What would be scorchio's angular diameter if it is 5 light years away?