

NAME: _____ DATE: _____

Homework #3

1. Find the approximate wavelengths λ of the following colors:
 - (a) Blue _____
 - (b) Green _____
 - (c) Yellow _____
 - (d) Red _____

2. Why must Astronomers use satellites and Earth-orbiting observatories to study the heavens at X-ray wavelengths?

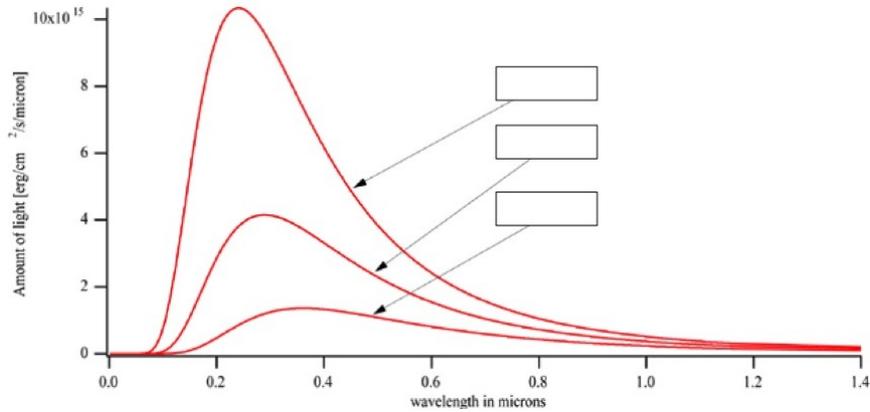
3. Does red light travel faster than blue light? (a) Yes (b) No.

4. In one of our optical telescopes, the focal length of the objective mirror is $f_0 = 2.3\text{m}$, and the focal length of the eyepiece is $f_e = 0.25\text{cm}$, what is the magnification of the telescope?

5. Compared to visible light, radio waves have
 - (a) higher energy and longer wavelength
 - (a) lower energy and longer wavelength
 - (a) lower energy and shorter wavelength
 - (a) higher energy and shorter wavelength

6. What is the meaning of the term *Sidereal Day*? How long is it? Show what it is with a simple diagram.

The graph below shows the spectrum of light emitted by 3 different temperature objects.



7. What is the name of the type of spectrum seen here, and which object is hottest?

8. What are the Temperatures T of the three different bodies If the wavelengths at the **peak** of the three spectra are, from top to bottom
 - (a) $\lambda_{pk} = 0.25\mu m$

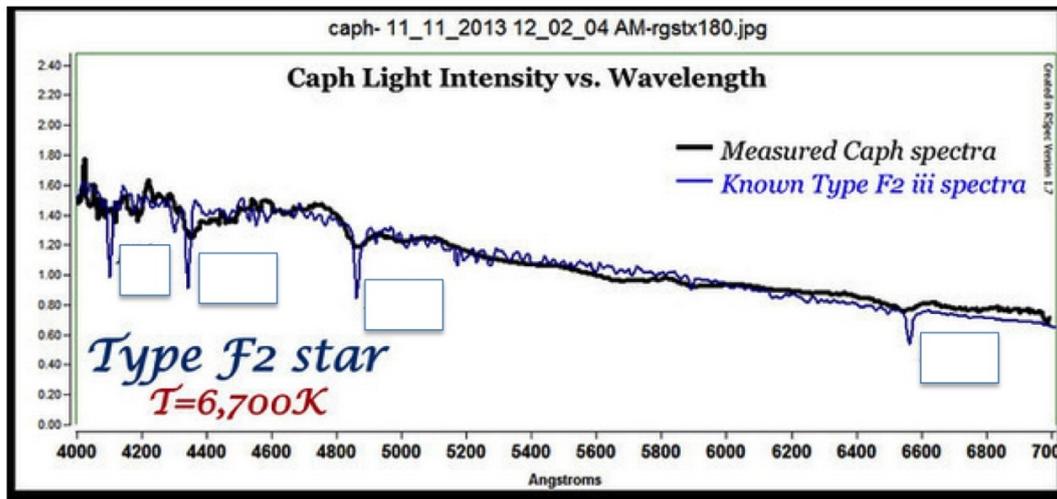
 - (b) $\lambda_{pk} = 0.30\mu m$

 - (c) $\lambda_{pk} = 0.35\mu m$

9. The bright star Bellatrix in the constellation of Orion has a surface temperature of $T = 22,000K$. Approximately what is the dominant, or peak, wavelength λ_{pk} that it emits at? Does Bellatrix have a more Bluish or Reddish color to it?

10. Atoms of different elements have unique spectral lines because each element
 - (a) has atoms of a unique color.
 - (b) has a unique number of neutrons.
 - (c) has a unique set of electron orbits.
 - (d) none of the above, spectral lines are not unique to each type of atom.

11. The graph below shows the spectrum of light emitted by the Star Caph in the constellation Cassiopeiae. The absorption lines are from the Hydrogen Balmer series. Look up the series and fill in the names of the absorption lines. In addition, write down below the figure the exact wavelengths and colors of each of the 4 lines.



12. Imagine that I measure the spectrum of a distant star. I identify the Hydrogen Balmer lines in the spectrum, and I find that the H_{α} absorption line is at a wavelength of $\lambda = 656.23 \text{ nm}$. Can I conclude that the star is moving, and is so, how fast and in what direction?

13. Two stars, Brightus and Dimmus, are the same size, but Brightus has a surface temperature of $T=8000\text{K}$, and Dimmus has a surface temperature $T=4500\text{K}$, how much more luminous is Brightus compared to Dimmus?