General Astronomy (29:61)
Fall 2012
Homework Set # 5
Assigned: October 12, 2012
Due: October 19, 2012

1. Assume that the average temperature of the Earth is 275K. At what wavelength is the blackbody radiation from the Earth brightest? In what part of the electromagnetic spectrum is this wavelength?

2. Radioastronomical observations are often made at a frequency of 5000 MHz (5.0 GHz). What is the wavelength of these radio waves? Be sure you know your scientific prefixes (i.e. Mega and Giga).

3. Use equations and calculations to confirm the statement made in the textbook that the energy of photons that are detected by the human eye have energies of 1.8 to 3.0 eV. Start your solution by finding the wavelength limits of the eye. Reference your source of this information.

4. Imagine the following blackbody radiator. Photons from the brightest part of the spectrum can *photoionize* hydrogen from the ground state. What is the temperature of this blackbody?

5. What is the most probable speed of a nitrogen molecule moving in the air of room 70, Van Allen Hall?

6. Think about a Maxwell-Boltzmann distribution. *Very roughly estimate* the fraction of molecules or atoms that have speeds greater than twice the most probable speed.

7. Problem 5.1 from textbook. The most obvious way to do this is using the tools of differential calculus. Do it this way if you have had calculus. If you have not taken that course, you need another approach. One way is to demonstrate through calculations that the statement is true or not true.

8. Problem 5.5 from textbook. *Parts (a) and (b) only.*

9. Problem 6.1 from textbook

1

10. Problem 6.2 from textbook