

Supplemental Homework for ASTR 2310  
Covering Chapter 5 of Ryden and Peterson  
Due Thursday 4, March 4 in Laboratory

Use Angstroms for optical wavelengths, microns for infrared wavelengths, and other units as appropriate.

1. Assuming hydrogen gas at room temperature, what is the particles' average speed, most probable speed, rms speed, and average energy (in eV)?
2. If the gas were changed from hydrogen to helium, how would those numbers change?
3. What if the temperature was 10,000 K? How do the answers change for questions 1 and 2?
4. What is the peak wavelength of light emitted by a bowling ball at room temperature?
5. How would that peak wavelength change if the temperature were doubled? Cut in half?
6. How would the total energy radiated per second change if the bowling ball's temperature were doubled? Cut in half? Tripled?
7. For the Bohr model, what is the wavelength corresponding to changes between the  $n=110$  and  $n=109$  levels? What part of the electromagnetic spectrum is this found in?
8. Same as number six, but for helium.
9. Verify that Wien's Law's works for the sun (look up a peak wavelength and temperature).
10. What are the energies (in eV) and wavelengths corresponding to the Lyman limit, Balmer limit, Paschen limit, and Brackett limit for hydrogen?