CHM 1045 Ch7 Homework

1. Review Examples 7.01, 7.02, and 7.03, as well as scientific notation and the color spectrum.
   For a photon with $\lambda = 546$ nm, write the equation to convert λ from nm into m.
   Then, determine its speed, frequency, energy, and color.
   Show **all** units and conversion factors. Write all results in correct scientific notation. (2 pts)

2. Review Examples 7.03 and 7.04, as well as the equation for E_{photon} in the chapter notes.
   Suppose an e^{-1} in an H atom has a transition from n = 3 to n = 2.
   a. Determine the energy (ΔE) in Joules (J) for the released photon.
      Use SI units only. Do not use eV. Show **all** units and conversion factors.
      Also, the ΔE is negative for the e^{-1}, but it is positive for the photon. (1 pt)

   b. Convert ΔE to ν, and then to λ. Write the equation to convert λ from m into nm.
      Use the color spectrum to determine if the photon is visible.
      What is its color? Show **all** units and conversion factors. (1.5 pts)

3. An e^{-1} is released by an electron microscope at 3.00×10^6 m/s.
   Determine λ in meters using the de Broglie relation, as in Example 7.05.
   Substitute $kg \cdot m^2/s^2$ for J in Planck's constant (h) and show all units.
   Then, convert λ to pm and show the conversion factor equation.
   Determine the kinetic energy using $E_K = (1/2)mv^2$, where v is velocity.
   Refer to Example 6.01 in the chapter 6 notes. Show all units. (1.5 pts)

4. Review Example 7.06 and the quantum number chart. Determine all possible values of each quantum number (n, l, m_l, and m_s) for electrons in both the 2s and 2p subshells. (1 pt)

5. Determine the total possible number of orbitals and electrons for both 2s and 2p.
   What is the maximum number of electrons in one orbital?
   How are the spins related for electrons in the same orbital?
   Refer to the quantum number chart. (2 pts)

6. Suppose an electron's quantum numbers are n = 3, l = 2, $m_L = -2$, and $m_S = +½$.
   Determine its shell/subshell designation (shell number, then subshell letter).
   Draw a rough sketch of its orbital. Refer to this chart and this chart. (1 pt)