Chem 155 Homework #7 Due at the start of class on Mon. Feb 25
Reading: Finish Chapter 15

Chapter 13 Problems:
13.35

Chapter 15 Problems:
15.13
15.15
15.30
15.32
15.36 (hint: see the deeper look section for the 3D version of the 1D formula from lecture)
15.78
15.83
15.94 (hint 1: the first ionization energy of K is 419 kJ/mol) (hint 2: if the photons arrive at exactly the same time so you don't have to worry about any intermediate states)
15.95
15.100

Additional Problems:
1) In class we showed the Planck distribution for blackbody radiation went to zero in the limit that λ went to zero. Use L'Hopital's rule to show that the Planck distribution formula goes to zero energy density as λ goes to infinity (which is required so that the integrated energy density is finite).

2) Differentiate the Planck formula to find the most intense wavelength (the wavelength for which $\rho(\lambda,T)$ is a maximum as a function of temperature.

3) Use the radial probability distribution to calculate the most probable distance of finding an electron from the nucleus of a hydrogen atom in the ground state.

4) Quantum tunneling occurs when the wave function of a particle "leaks through" a potential energy barrier that it could not cross classically. This is a very important process in chemistry—tunneling is common in redox (electron transfer) reactions, and also in some proton motion (the umbrella inversion of ammonia is an example). Tunneling is used in an important form of microscopy also (see the images on the first page of Oxtoby Unit 1, on page 502). However, tunneling events involving atoms such as C are generally much rarer, and I have never been able to successfully tunnel through my office door no matter how fast I'm walking. Explain.