Chem 155 Homework #9 Due at the start of class on **Fri. March 13**
Reading: Finish skimming Chapter 20, focus on content related to lecture and lab

Textbook problems: 4.28 (photoelectric effect problem)
4.39 2D particle in a box
6.17 MO correlation diagram for F_2+
6.51 more hybridization practice
20.2 Beer's law
20.15 Vibrational spectroscopy on C-H stretch
20.21 Vibrational spectroscopy, deuterated phenyl ring
20.31 More Beer's law
20.34 More Beer's law
20.46 Hybridization of CO_2 and SO_2 (you don't need to read Chapter 20 for this one)
20.54 Molecular orbitals, electronic excitation, and vibration

Additional Problems:
1) a) Draw the structure of 1,3-butadiene. Label the hybridization of each carbon and bond angles.
b) qualitatively sketch the π molecular orbitals for 1,3-butadiene. Identify the HOMO and LUMO.
c) The lengths of the C=C bonds in butadiene are 1.338 Angstroms, and the length of the C-C bond is 1.454 Angstroms. The length of a C-C bond in ethane is 1.54 Angstroms, and the C=C bond length in ethene is 1.331 Angstroms. Explain these trends in the context of your answer to part "b" above.

2) **Extra credit** (8 points—all parts must be completed for credit): As noted in the textbook, the greenhouse effect caused by the IR absorption of CO_2 has important implications for our use of fossil fuel. Using the DOE data available at http://www.eia.doe.gov/emeu/aer/overview.html

a) determine what fraction of our energy supply current comes from fossil fuels

b) calculate what the average power consumption (in TW) was for the entire US during 2008

c) pick your favorite alternative power source: wave power, wind power, solar power, nuclear power, biofuels. Calculate how much land area (or number of km of wave power stations, or number of new nuclear power stations) that would be needed to generate (on average) 1 TW of non-fossil power. Print out a map of the US from Wikipedia and draw your area devoted to renewables to scale. You can find conversion efficiencies, density values etc. online. A great resource is the free book by David MacKay (chief advisor to the UK government on climate and energy) http://www.withouthotair.com/.