

HW # 7 Chem 2430

1. Consider an atom with two unpaired electrons, one in a p orbital and one in an f orbital. What states result, and give their term symbols.
2. Consider the singlet and triplet  $\pi \rightarrow \pi^*$  states of ethylene. The triplet state occurs near 4 eV and the singlet state near 8 eV. In addition, the IP is 10.5 eV and the EA is -1.5 eV. Estimate the value of the J and K integrals between the  $\pi$  and  $\pi^*$  orbitals.
3. Consider two particles bound harmonically in a 1D potential well ( $\frac{1}{2} kx_1^2 + \frac{1}{2} kx_2^2$ ). Further assume that the two particles interact through a  $\delta(x_2 - x_1)$  potential. What is the total energy of this system assuming that the wave function is the product of ground state HO wave functions? Determine the orbital energy in the Hartree approximation.