Due, March 2, 1999

1. Sketch the π and π^* MO's of ethylene and label them according to symmetry.

2. Sketch the π and π^* orbitals of trans butadiene and label them according to symmetry. (Note that relevant group ls in C_{2h}, given below)

3. Consider the CH_3F molecule.

   a) Now consider a basis set with an atomic s orbital centered on each the three H atoms. Conduct the symmetry adapted MO's comprised of these s basis functions.

   b) Now consider the $2p_x$, $2p_y$, $2p_z$, and 2s orbitals on F. Indicate which of these atomic orbitals mix with the various symmetry-adapted H_{1s} orbitals derived in part a).

4. Consider the  molecule. Assume that it has C_{2v} symmetry. Determine the

   number of vibrations of each symmetry type and sketch these (using arrows).

C_{2h}	E	C_2	I	σ_h		
A_g	1	1	1	1	R_z	z^2, y^2, z^2, xy
B_g	1	-1	1	-1	R_x, R_y	xz, yz
A_u	1	1	-1	-1	z	
B_u	1	-1	-1	1	x, y	