CHEM352 Exam II (May 10 2010).

 $33\frac{1}{3}$ points / problem with maximum of 100 points.

1. The normal modes of ethylene are shown below. What is the point group of ethylene and what are the irreducible representations for these normal modes?



(molecule in *yz*-plane)

2. Use the Hückel theory to calculate the π -electron energy of cyclobutadiene (see below). Draw the molecular orbital diagram and indicate which π orbitals are occupied.



3. C_{2v} point group has the following symmetry operations: E, C_2, σ_v , and σ'_v . Derive the group multiplication table for this group.