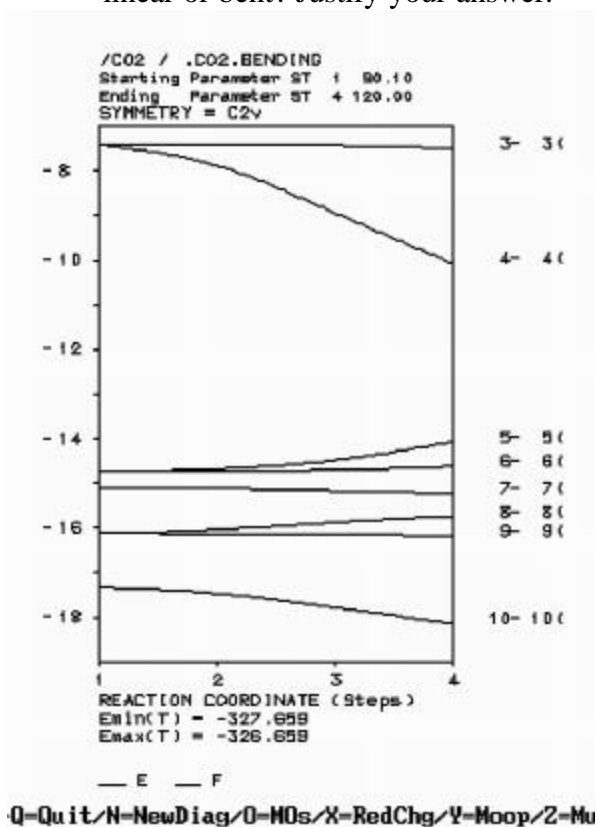
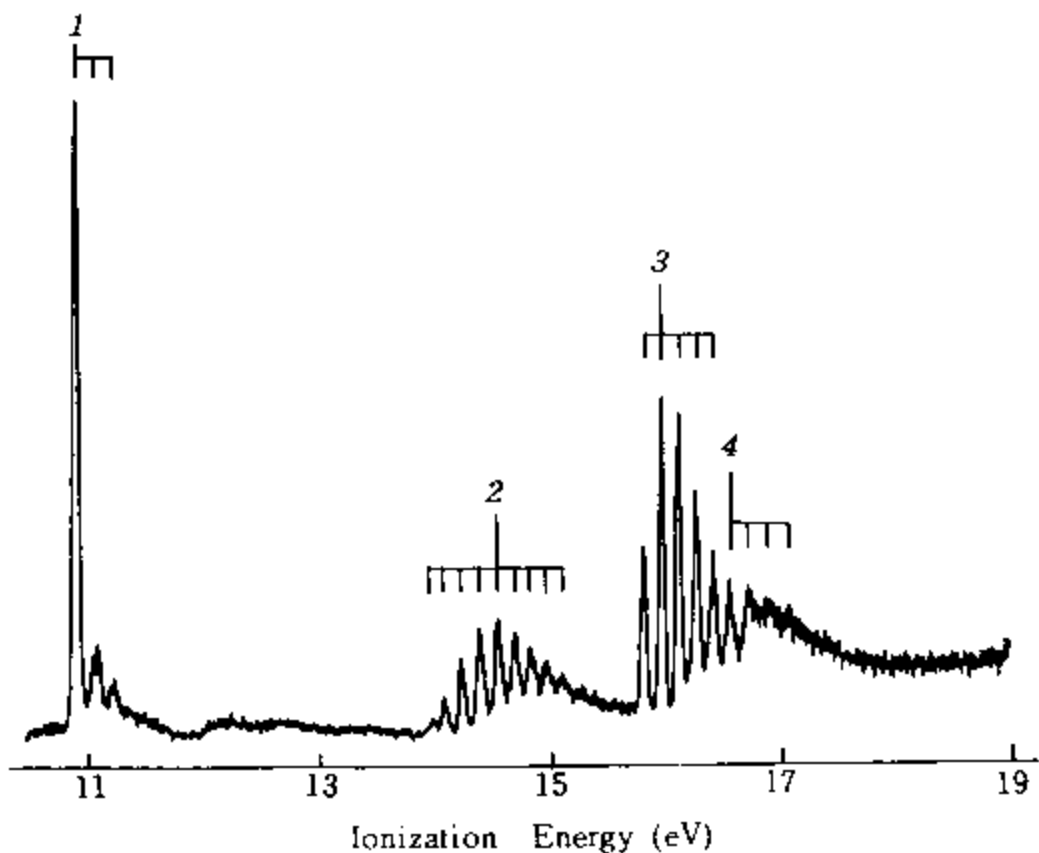


## ASSIGNMENT 7

DUE: March 23, 2000

1. Below is a Walsh diagram, showing the effect of bending on the orbitals of a  $\text{CO}_2$  molecule. Two valence orbitals are not shown, since they have much lower energy and do not change with the O-C-O angle. Use this diagram to rationalize the geometry of  $\text{CO}_2$ . Do you predict that the first electronically excited state is linear or bent? Justify your answer.





2. Above is the photoelectron spectrum of formaldehyde. The ionization potentials (in order of increasing IP) correspond to ionization from a  $b_2$ , a  $b_1$ , an  $a_1$  and a  $b_2$  orbital. Classify the orbitals according to whether they are  $\sigma$  or  $\pi$  symmetry. Also, explain why some peaks have pronounced vibrational structure and some do not. Which vibration of the molecule does this vibrational structure belong to?