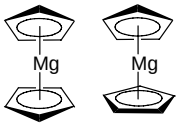
University of Windsor
Chemistry and Biochemistry
Chemistry 59-250, Fall Term 2005

Assignment 2

Question #1
Identification of Point Groups

Determine the point groups for the following molecules:

(a) ClF_4^{-1}
(b) PF_6^{-1}
(c) carbon disulfide, CS_2
(d) cyanogen, N≡C-C≡N
(e) nitrate, NO_3^{-1}
(f) carbon monoxide, CO
(g) ozone, O_3
(h) phosphonium cation, PH_4^{+1}
(i) sulphur dioxide, SO_2
(j) acetone (with the highest symmetry possible), $H_3CC(O)CH_3$
(k) thionyl fluoride, OSF_2
(l) $CHFCl_2$
(m) boric acid (planar), $B(OH)_3$
(n) allene, $H_2C=C=CH_2$
(o) AsF_4^{-1}
(p,q) the two common conformations of magnesocene:



(r) H_3C-CFBrCl
(s) XeF_4
(t) buckminsterfullerene, C_{60}

Question #2
More VBT
Use localized bonding models to describe the bonding in the molecules from (a) to (o) in Question #1. Use VSEPR and VBT for each of the non-terminal atoms. You must draw pictures to show the shapes of the hybridized orbitals and how they interact with other orbitals to form bonds! The electron configuration boxes do not show the shapes and are not advised.

Question #3
More Point Groups

Draw a picture and determine the point group for EACH of the possible structural arrangements of $AsF_nCl_{(5-n)}$ for n = 0 to 5. *I.e. start with $AsCl_5$ and end with AsF_5.* Assuming a static structure, indicate the number and relative intensities of the signals that you would expect to see in the ^{19}F NMR spectrum of each molecule.