Chem 315, Fall 2000
Answers to Problem Set #4

P4.7) MA_3B_3 two isomers (fac vs mer), $MA_2B_2C_2$ five isomers

P4.8) BF_3 is D3h, NF_3 is C3v, and ClF_3 is C2v. Looking at the irreducible representation one can tell the difference between the molecule based on their point group and what symmetries are IR and Ramon active.

Ex.4.10) 5 in the plane [(4x2)-8], 1 perpendicular to the plane (total vibrational modes 3(4)-6=6, 6-5=1)

Ex.4.11) SF_6 if Oh, and have no vibrations which are both IR and Ramon active, BF_3 is D3h and E' is both IR and Ramon active.

a) **D2h.** Key symmetry elements are: C2, 2 C2, ? h.
b) Oh. C4, multiple C3, ? h, multiple ? v).
c) D5d. C5, 5 C2, no ? h , 5 ? v.

d) D3d. C3, 3 C2, no ? h, 3 ? v.
e) ***Two option***s: 1)if you ignore the angle between two silicon and oxygen atoms - D3h. C3, 3 C2, ? h, 3 ? .2)If you do consider the angle between these atoms (150°), then C2v. C2, no C2, no ? h, 2 ? .
f) D2h C2, 2 C2, ? h.
g) D3h C3, 3 C2, ? h, ? 's.
h) Td multiple C3, multiple ? .
i) D3h (trig. bipyramide) C3, 3 C2, ? h, ? v's, or C4v (sq. pyramide) C4, no C2, no ? h, 4? .
j) Td multiple C3, multiple ? .
k) D3h (eclipsed) C3, 3 C2, ? h, ? 's; D3d (staggered) C3, 3 C2, ? h, ? 's; D3 (intermediate) C3, 3 C2, no mirror planes.