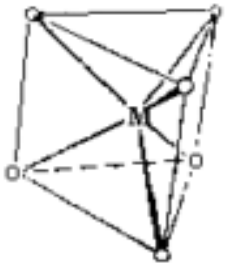
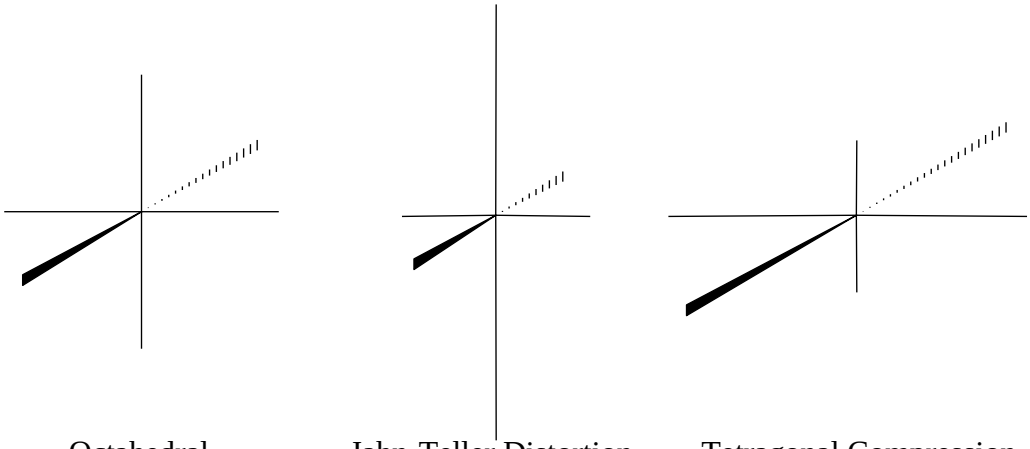
Chemistry 300 – Inorganic Chemistry Name: _____
Exam #3 – December 6, 2004

1. What *d*-orbital splitting pattern would you expect to see in a trigonal prismatic geometry? Explain your splitting assignments including assignment of specific orbitals. The *z*-axis of your coordinate system should pass through both trigonal faces and the central metal ion. Many metals form octahedral 6-coordinate complexes, but there don't seem to be as many trigonal prismatic compounds. Are there any *d*-electron counts that might favor trigonal prismatic geometry? (20pts)



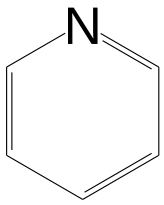
http://wwwchem.uwimona.edu.jm:1104/courses/IC10Kcnstory.html

2. We discussed the Jahn-Teller distortion (tetragonal elongation) in which the ligands along the *z*-axis of an octahedral complex are pulled farther away from the central metal and the ligands along the *x*- and *y*-axes are drawn in closer. The opposite distortion (tetragonal compression) is also known where the two ligands along the *z*-axis are pulled closer to the central metal and the ligands along the *x*- and *y*-axes are farther away from the central metal. How would you expect the *d*-orbital splitting to change with this new distortion? Explain your splitting assignments including assignment of specific orbitals. (20pts)



Octahedral Jahn-Teller Distortion Tetragonal Compression

3. You are attempting to synthesize some magnetic materials using either Vanadium, Manganese or Cobalt (V, Mn, Co) and have available the ligands pyridine, iodide (I^-), carbon monoxide (CO) and hydroxide (OH^-). What complexes (oxidation states, geometries, etc.) might you expect to make good magnetic materials? (20pts)

Pyridine = 

4. Describe some technique, class of material, problem or solution addressed by one of the papers we discussed in class (*not you own paper!!*) that you found interesting and explain why. (40pts)