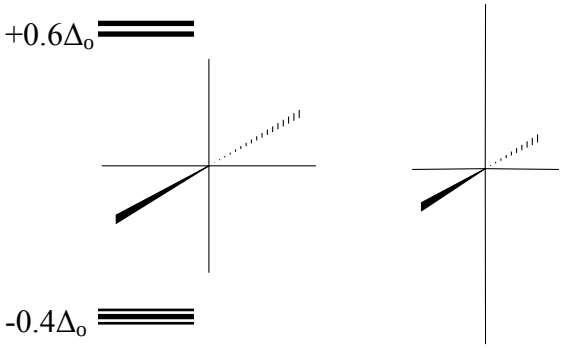
Chemistry 300 – Inorganic Chemistry Name: _____
Exam 3 – November 11, 2011

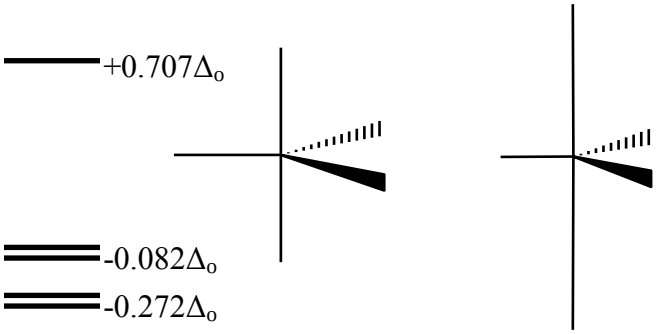
1. Calculate the magnetic moment you would expect for each of the following complexes: $[Fe(CN)_6]^{3-}$, $[CoF_6]^{3-}$, $[Cu(NH_3)_4]^{2+}$. Explain all answers and assumptions.

2. In mixed-ligand complexes, sterically demanding ligands can distort the ideal geometry one might expect for a complex. Consider the two "octahedral" complexes MF_6 and MF_3I_3. Describe any differences in the structure and crystal field splitting of these two complexes. Specify any assumptions you make and explain all your answers.

3. Some octahedral complexes can undergo a Jahn-Teller distortion (axial elongation) to achieve a lower energy (more stable) state. Are there any d-electron counts that would favor an axial elongation in a trigonal bipyramidal complex? Show how you would expect the crystal field splitting to change when the TBP axial elongation occurs. Explain all answers and assumptions.



Jahn-Teller Distortion



TBP Axial Elongation?

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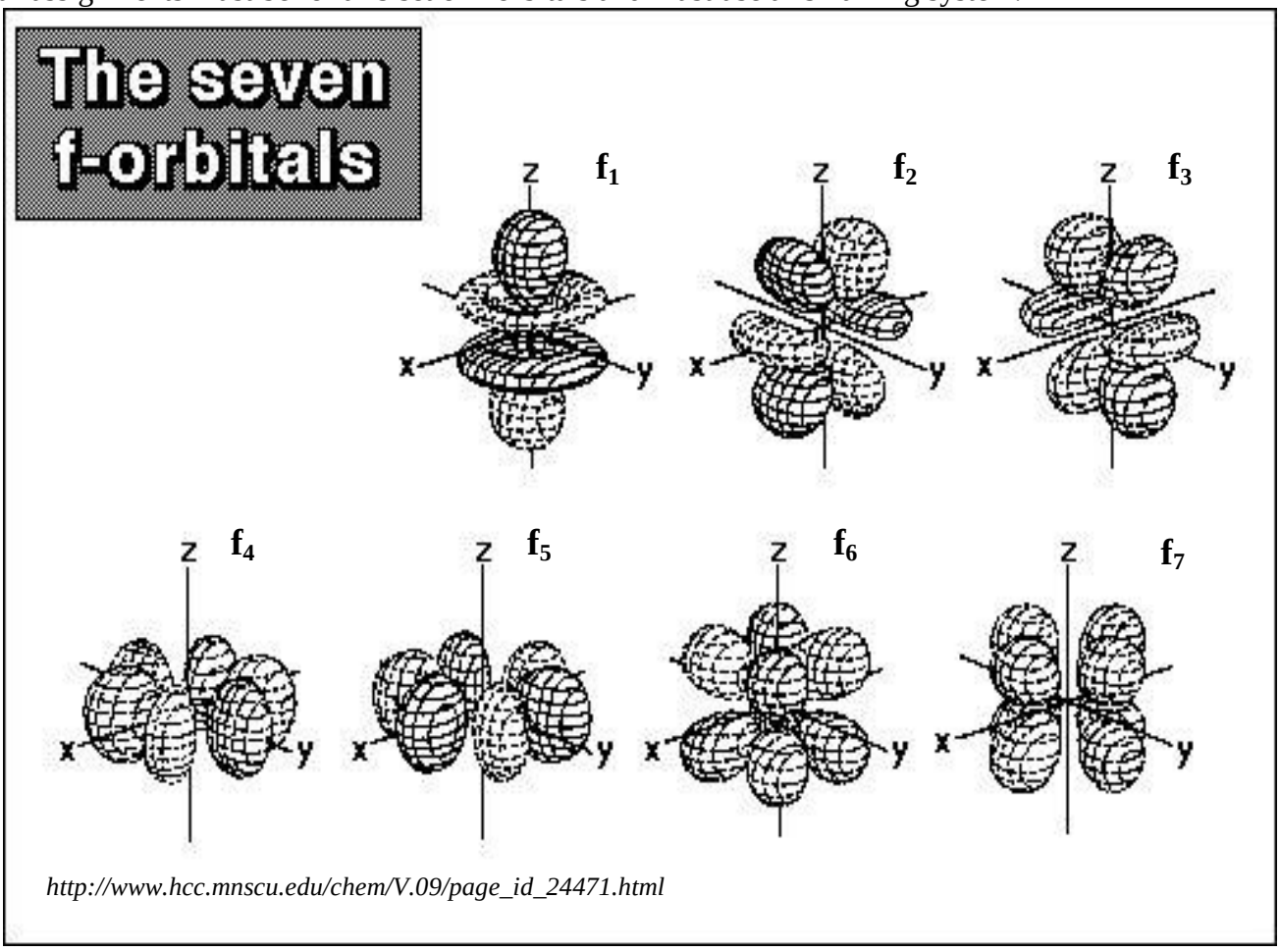
4. Describe the crystal field splitting you would expect for the f-orbitals pictured below in an octahedral geometry. Explain your splitting assignments. How would the splitting change if the octahedral complex lost a ligand to become a square pyramid? How would the splitting change if the square pyramid rearranged to form a trigonal bipyramid? Explain all assignments and assumptions. If you have trouble visualizing any of these orbitals, ***ask!*** f_2-f_5 have the same basic shape with different orientations; f_6 and f_7 have the same shape with different orientations, f_1 is unique. There are a number of different versions of the f-orbitals, your assignments must be for ***this*** set of f-orbitals and must use ***this*** naming system.



http://www.hcc.mnscu.edu/chem/V.09/page_id_24471.html