Chemistry 300 – Inorganic Chemistry Name: _____
Exam 3 – Due Dec. 7th

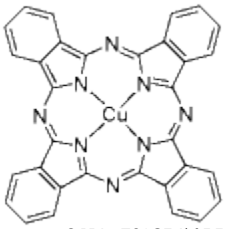
1. Calculate the magnetic moment you would expect for each of the following complexes: $[Mn(CN)_6]^{4-}$, $[CoF_6]^{3-}$, $[Ni(NH_3)_4]^{2+}$. Explain all answers and assumptions.

2. In mixed-ligand complexes, sterically demanding ligands can distort the "ideal" geometry one might expect for a complex. Consider the two complexes MF_6 and MF_5I. Describe any differences in the structure, crystal field splitting and symmetry of these two complexes. Specify any assumptions you make and explain all your answers.

3. Trigonal bipyramidal (TBP) complexes that can undergo Berry pseudorotation (Figure 9.12, p.434, Wulfsberg textbook) rapidly are described as "fluxional". The Berry pseudorotation changes the 5-coordinate TBP complex to a 5-coordinate square pyramidal complex and back to TBP. This transformation is usually rapid if the energy of the square pyramidal complex is less than energy of the TBP complex. Using crystal field splitting energy arguments, determine and describe which d-electron counts you would expect to be fluxional. Rank all d-electron counts and explain any assumptions you make.

4. Assign point groups to each of the following. Show each symmetry element. Explain all assumptions you make about the structure and make reasonable assumptions.

$POCl_4$, adamantane, 2,3-dichloro-2-butene



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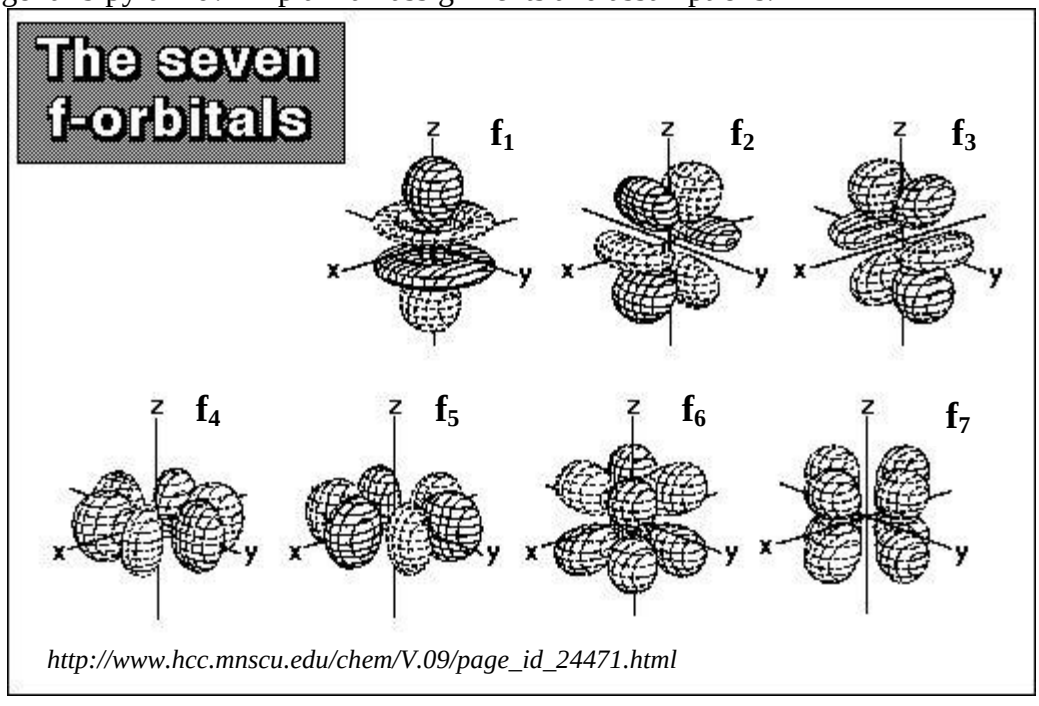
5. Describe the crystal field splitting you would expect for the f-orbitals pictured below in an octahedral geometry. Explain your splitting assignments. How would the splitting change if the octahedral complex lost a ligand to become a square pyramid? How would the splitting change if the square pyramid rearranged to form a trigonal bipyramid? Explain all assignments and assumptions.



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