



CHEMISTRY 5404

Advanced Inorganic Chemistry

Homework Set 3

Due Friday, 23 Sept. 2005, 10:30 AM

No late homework accepted. Include your name and student number on your homework. Group discussions of homework problems are permitted but answers must be your own individual response and composition. All homework must be signed and pledged. Include a list of references with your homework citing all written material, including web sites, and oral discussions used in the preparation of your homework assignment.

1) (20 points) Give the IUPAC names for the following:

- A) $[\text{Ag}(\text{NH}_3)_2]\text{Cl}$
- B) $\text{Na}_4[\text{Fe}(\text{CN})_6]$
- C) $[\text{PtClBr}(\text{H}_2\text{O})(\text{pyridine})]$
- D) $[\text{Ni}(\text{CO})_3(\text{PMe}_3)]$

2) (30 points) Atomic orbitals on adjacent atoms can be combined using linear combinations to form molecular orbitals.

A) Using a $3d_{xy}$ orbital on one atom, select an appropriate orbital on the adjacent atom such that the linear combinations form a σ and σ^* molecular orbital. Clearly identify your orbital choice and the nature of the bonding axis. Draw boundary surfaces for your molecular orbitals including all nodal surfaces. Indicate the property of each MO that makes it σ and σ^* respectively.

B) Using a $3d_{xy}$ orbital on one atom, select an appropriate orbital on the adjacent atom such that the linear combinations form a π and π^* molecular orbital. Clearly identify your orbital choice and the nature of the bonding axis. Draw boundary surfaces for your molecular orbitals including all nodal surfaces. Indicate the property of each MO that makes it π and π^* respectively.

3) (25 points) Find a paper in the current (2003-2005) Inorganic Chemistry literature that includes a molecular orbital diagram with graphical representations of the orbitals. Provide a copy of two different molecular orbitals from your paper. For each molecular orbital, indicate the nature of this orbital, i.e. non-bonding, σ , σ^* , π , π^* etc.. Show where the nodal surfaces occur in these two orbitals and how their location is consistent with the nature of this orbital, i.e. non-bonding, σ , σ^* , π , π^* etc..

4) (25 points) Find a paper in the current (2003-2005) Inorganic Chemistry literature that uses either AFM or DPN. Write a one paragraph summary of the goal of the research. Provide a copy of one image from your paper generated with AFM or DPN. Explain what the data in your figure illustrates. Include the citation for your paper (with the manuscript title etc.) and a copy of the abstract. Your paper can not be one we discussed in class.