

Name _____

Date _____

Worksheet #2 - Transition Metals

I. Electronic Structure (a review?)

1. Transition Metals often have more than one possible charge on their ions. Usually the +2 form is the most stable. Explain why.

2. Iron has two possible oxidation states (+2 and +3). Use the orbital diagrams below to show the electronic structure of the iron atom and Fe^{2+} and Fe^{3+} ions. Explain why the 3+ ion is more stable than the 2+ ion.



II. Nomenclature

Provide the missing name or formula for the following compounds.

1. tris(ethylenediamine)iron(III) chloride

2. $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$

3. $[\text{Pt}(\text{NH}_3)_4\text{F}_2][\text{FeCl}_4]_2$

4. diamminedibromochromium(VI) aquapentafluoroaluminate

III. Isomerism

1. Give an example of each type of isomerism. Provide structural drawings to illustrate the concept.

a. Coordination isomerism

b. Linkage isomerism

c. Geometric or cis-trans isomerism

d. optical isomerism (show both enantiomers for a chiral compound)

2. Determine the type(s) of stereoisomerism present in each complex. Draw structures to verify your determination. (*Hint: you may need to make a 3-dimensional model for problem b.*)

a. $[\text{Pt}(\text{NH}_3)_2\text{Br}_2]$ (square planar)

b. $[\text{Cr}(\text{en})_3]^{3+}$

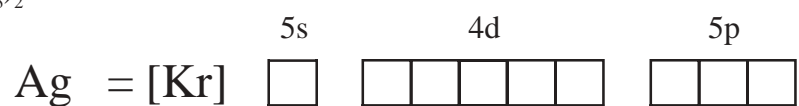
IV. Bonding and Structure

1. Using orbital diagrams, determine the orbital hybridization and the shape of the following complexes.

a). $[\text{AuCl}_4]^-$



b. $\text{Ag}(\text{NH}_3)_2^+$



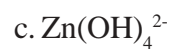
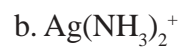
c. $\text{Zn}(\text{OH})_4^{2-}$



d. $\text{Fe}(\text{CN})_6^{4-}$

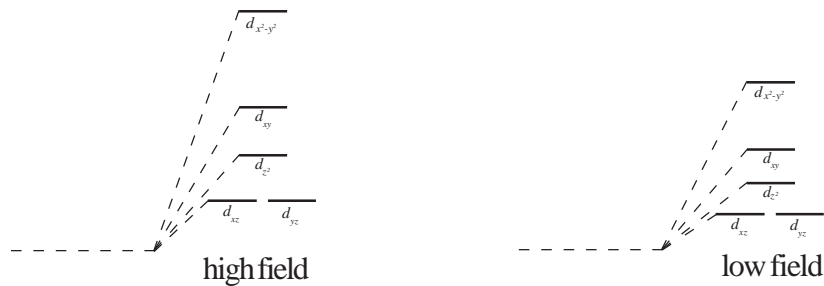


2. Use crystal field theory to create diagrams showing the appropriate orbital occupancy for the electrons on the metal ion in the following complexes. Indicate whether your diagram represents low field or high field splitting. (p.991-997)

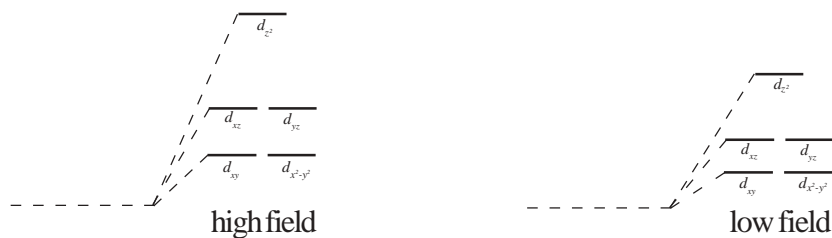


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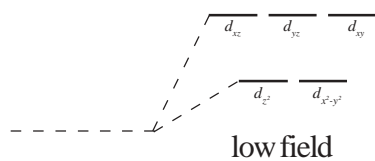
a). $[\text{AuCl}_4]^-$
square planar



b. $\text{Ag}(\text{NH}_3)_2^+$
linear



c. $\text{Zn}(\text{OH})_4^{2-}$
tetrahedral



d. $\text{Fe}(\text{CN})_6^{4-}$
octahedral

