HW
CHEM 362

Due: November 12, 2019

1. What is the crystal field stabilization energy? For an octahedral complex, how is the CFSE calculated?

2. Why is Δ_o typically greater than Δ_t? *Hint: you may want to include diagrams in your answer*

3. Classify the following as strong field or weak field ligands Is there a relationship between ligand type and field strength?
   a. H_2O
   b. CN^-
   c. Br^-
   d. CO
   e. NH_3

4. Calculate the crystal/ligand field stabilization energy for the following:
   a. d^2
   b. d^4 (Low-spin)
   c. d^4 (High spin)
   d. d^8
   e. d^{10}

5. Which d electron counts are capable of giving rise to both low spin and high spin configurations? Show using orbital diagrams.

6. When can one expect a high spin configuration? Low spin configuration? Discuss this in the context of crystal field splitting energy and pairing energy.

7. For the following compounds: a) Draw the orbital splitting diagram b) If applicable, explain why you chose a LS or HS configuration c) Predict the magnetic properties (diamagnetic or paramagnetic?)
   a. $[Fe(Cl)_6]^{3-}$
   b. $[Cu(Cl)_6]^{4-}$
   c. $[CoF_6]^{3-}$
   d. $[Ti(H_2O)_6]^{2}$
   e. $[CoCl_4]^{2-}$

8. Give the ground state term symbols for the following free ions. *To receive full credit, you must **show all** your work.*
   a. Ti^{2+}
   b. Mn^{3+}
   c. Fe^{3+}

d. Cu^{2+}
e. Zn^{2+}