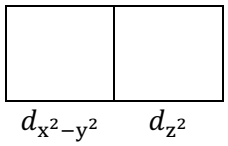
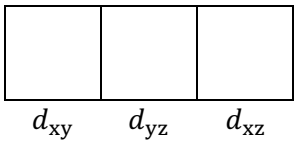
1. Complete the following table.

Chemical Formula	Metal Ox. State	Systematic Name
$[Fe(H_2O)_6]^{3+}$		
$[Co(NH_3)_5Cl]^{2+}$		
$Na_2[NiCl_4]$		
		Tetraammineplatinum(II)
		Hexacyanoferrate(III)
		Triamminebromoplatinum(II) chloride

2. Fill in the *d*-orbital splitting diagram for a d^6 octahedral complex that is paramagnetic. Is this a high-spin or a low-spin complex?





3. Consider the following complex ions and their associated/observed colors.

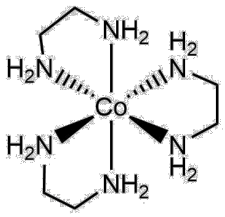
(i) $[Ni(H_2O)_6]^{2+}$ (green) (ii) $[Cr(H_2O)_6]^{2+}$ (blue) (iii) $[V(H_2O)_6]^{3+}$ (yellow)

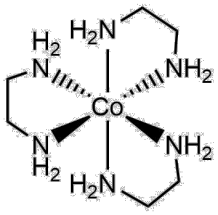
A) Order the complex ions in order of smallest to largest crystal field splitting energy (Δ_o).

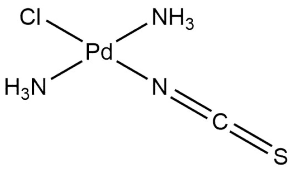
B) Why might some coordination complexes be colorless?

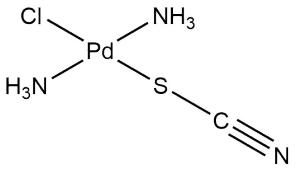
C) Would you expect a colorless coordination complex to require more or less energy to excite an electron from its ground state than a colored coordination complex?

4. Determine the relationship between each pair of complexes as cis-trans isomers, linkage isomers, or enantiomers.









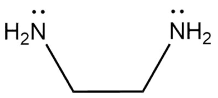
5. The chelate effect describes the phenomenon wherein polydentate ligand coordination is significantly more favorable than monodentate ligand coordination, which is proposed to be primarily an effect driven by entropy.

Consider the following two aqueous reactions:

i. $[Co(H_2O)]^{3+} + 6\ NH_3 \rightleftharpoons [Co(NH_3)_6]^{3+} + 6\ H_2O$

ii. $[Co(H_2O)]^{3+} + 3\ en \rightleftharpoons [Co(en)_3]^{3+} + 6\ H_2O$

Hint: NH_3 is a monodentate ligand. The "en" ligand is an abbreviation for ethylenediamine, a bidentate ligand with the following structure:



Using the information above and given that the ΔH for both reactions are approximately equal, circle the correct relationship between each of the following thermodynamic properties.

A) $K_{f,(i)}$ is (larger than/smaller than/about equal to) $K_{f,(ii)}$.

B) $\Delta S_{(i)}$ is (more positive than/more negative than/about equal to) than $\Delta S_{(ii)}$.

C) $\Delta G_{(i)}$ is (more positive than/more negative than/about equal to) than $\Delta G_{(ii)}$.