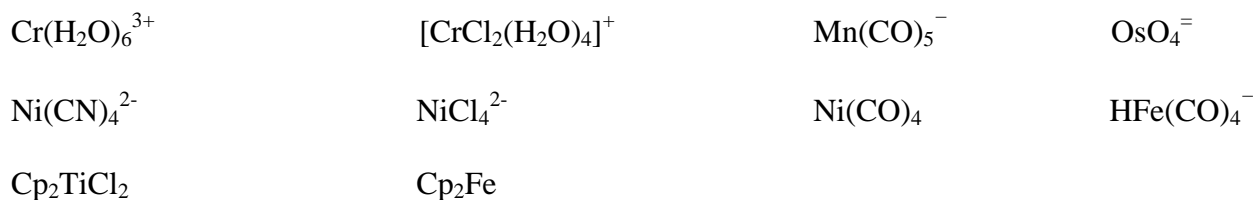


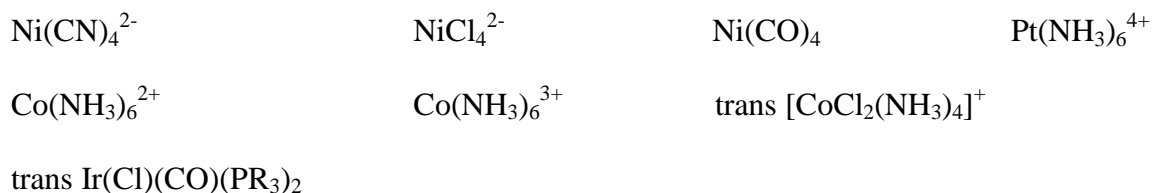
Worksheet I Coordination Chemistry Review

Background Assumed:

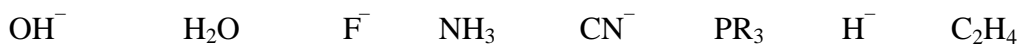
1. Can assign oxidation states on inspection and give d-electron count of transition metal. Check: oxidation state and d-electron count of:



2. Can predict geometries and from geometries of complexes, predict crystal field, d-orbital splitting diagrams, electron assignment, and magnetism:



3. Know the basis of spectrochemical series. Order the following in terms of ligand field strength:



4. Lewis Acids /Bases and HSAB.

Which of the ligands above are “hard” and which are “soft” donors?

5. Predict the composition and geometries of the following:

- (a) the ammine complex of Ru(II) (NH_3)
- (b) the carbonyl complex of Cr(0)
- (c) the bromide complex of Co(II)
- (d) the phenanthroline complex of Co(III)
- (e) the ammine complex of Cu(II)
- (f) the ethylenediamine complex of Cr(II)

6. Consider the following list of species and *indicate by number* (in the spaces provided) those species that possess the indicated property. Note that a given species may possess more than one (or none) of the indicated properties.

- | | | |
|-------------------------------------|---|--|
| (1) $\text{Cr}(\text{OH}_2)_6^{2+}$ | (5) $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$ | (9) $\text{Fe}(\text{C}_2\text{O}_4)_3^{4-}$ |
| (2) $\text{Fe}(\text{CN})_6^{4-}$ | (6) MnO_4^{2-} | (10) $\text{Zn}(\text{EDTA})^{2-}$ |
| (3) $\text{Pt}(\text{CN})_4^{2-}$ | (7) HgI_4^{2-} | |
| (4) $\text{Ir}(\text{en})_3^{3+}$ | (8) $\text{Co}(\text{NCS})_4^{2-}$ | |

- (a) paramagnetic
- (b) inert to ligand substitution _____
- (c) colored
- (d) tetragonally distorted from regular octahedral geometry _____
- (e) tetrahedral complex
- (f) chelate complex
- (g) capable of existing in isomeric form

7. Indicate which of the following complexes would be expected to be inert to ligand substitution:

- | | | |
|-------------------------------------|-------------------------------------|-------------------------------------|
| (a) FeF_6^{3-} | (g) $\text{Co}(\text{NH}_3)_6^{3+}$ | (m) $\text{Rh}(\text{NH}_3)_6^{3+}$ |
| (b) $\text{Ni}(\text{OH}_2)_6^{2+}$ | (h) $\text{Co}(\text{NO}_2)_6^{3-}$ | (n) PtCl_6^{2-} |
| (c) $\text{Cr}(\text{OH}_2)_6^{2+}$ | (i) $\text{Zn}(\text{OH}_2)_6^{2+}$ | (o) $\text{V}(\text{phen})_3^{3+}$ |
| (d) $\text{Fe}(\text{CN})_6^{4-}$ | (j) $\text{Sc}(\text{OH}_2)_6^{3+}$ | (p) $\text{Zn}(\text{EDTA})^{2-}$ |
| (e) $\text{Cr}(\text{NH}_3)_6^{3+}$ | (k) $\text{Ru}(\text{NH}_3)_6^{3+}$ | (q) $\text{Fe}(\text{OH}_2)_6^{3+}$ |
| (f) $\text{Co}(\text{NH}_3)_6^{2+}$ | (l) $\text{V}(\text{OH}_2)_6^{3+}$ | (r) $\text{Co}(\text{OH}_2)_6^{3+}$ |