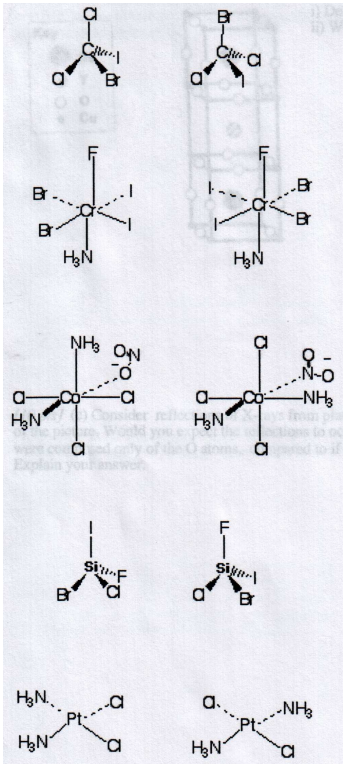
1 Cognitive reasoning in the chemical sciences 6.5

1. For the following three ions, two are low spin and one is high spin: $NiBr_2(CO)_2$, $NiCl_4^{2-}$, and $Ni(CN)_4^{2-}$. Which of these species are high spin and which low spin?

2. Draw the d-orbital diagram for the tetrahedral and square planar geometries. Assume that the filling of very antibonding orbitals is unstable. Will low spin d^8 compounds be square-planar or tetrahedral?

3. Based on your answer above, please draw the structure of $Ni(CN)_4^{2-}$.

4. Please determine whether the following molecules are chiral or not chiral.



5. Please draw the d-orbital energy diagram for the molecule $CrCl_2(CO)_2$ shown below. Please state the name of the relevant d-orbitals in your picture. Assume the compound is in low spin. How many different wavelengths of light can be accepted by this molecule, assuming that the electron goes from a valence d to a valence d orbital?