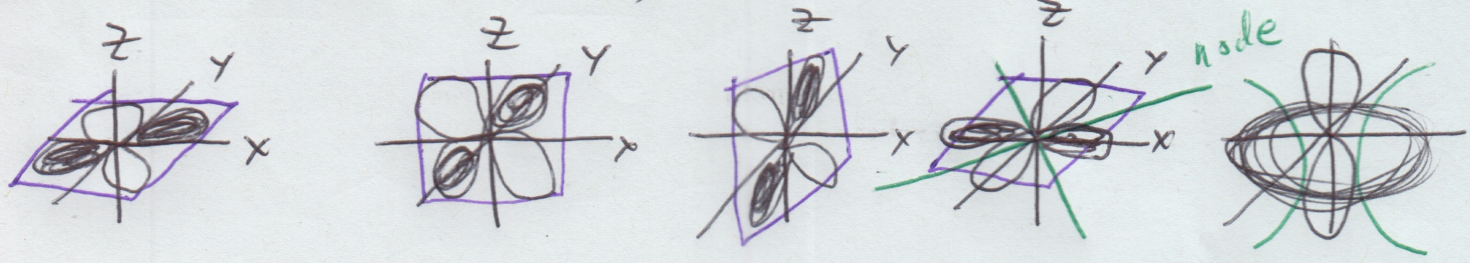
3/11/15

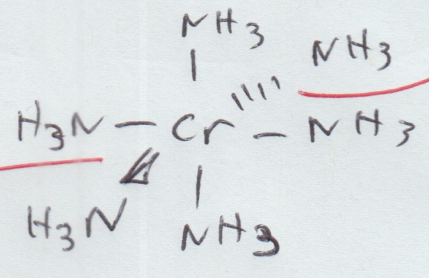
L1

crystal field theory



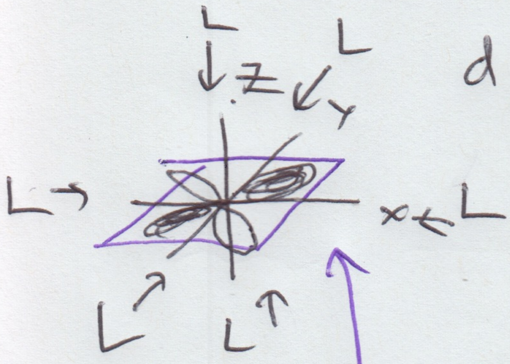
d_{xy} d_{xz} d_{yz} $d_{x^2-y^2}$ d_{z^2}

$[Cr(NH_3)_6]^{3+}$

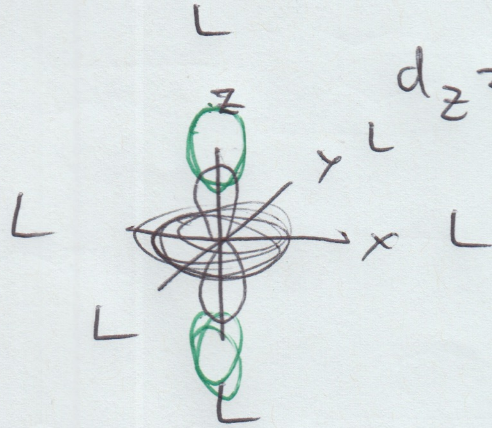


dash - pointed away from reader

wedge - pointed towards reader



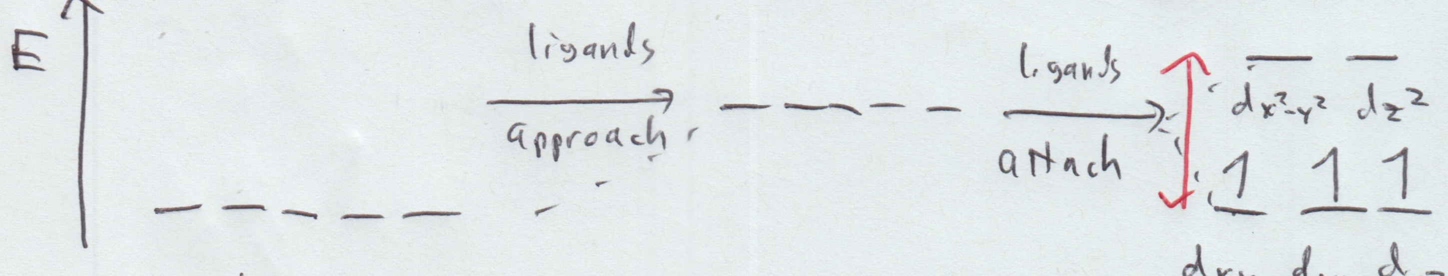
d_{xy}



d_{z^2}

Since the d orbital is <u>not</u> on the axis, the ligands do not interact as much with ~~them~~ it.

Since the d orbital <u>is</u> on the axis, the ligands <u>do</u> interact with it.



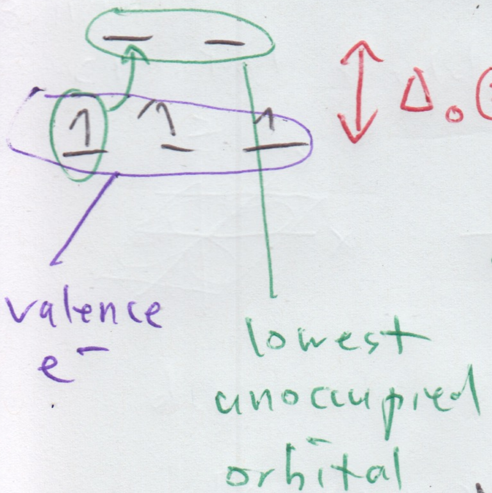
ion (no ligands)

octahedral splitting

$Cr: [Ar] 4s^1 3d^5$

Exception due to subshell stabilization

$Cr^{+3}: [Ar] 3d^3$



$\updownarrow \Delta_o (= E)$

$E = h\nu$

- E: energy of a photon
- h: Planck's constant
- ν: frequency of light

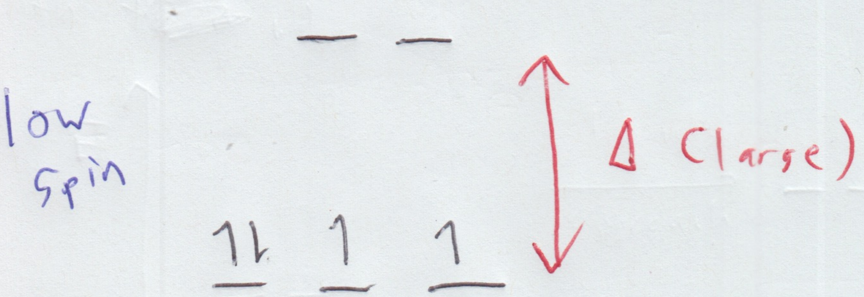
$\pm \frac{1}{2} \frac{h}{2\pi} = \pm \frac{1}{2} \hbar$

In a transition metal complex in which the energies of the d orbitals are split, if light of the correct frequency that corresponds to a photon with just the right energy that matches this split in energy levels, an electron can be excited from ~~the~~ a lower-energy orbital to a higher one. After absorbing that energy, the electron will release it again, causing light ~~to~~ to be released with the same frequency as was absorbed.

color wheel

Strong field ligands

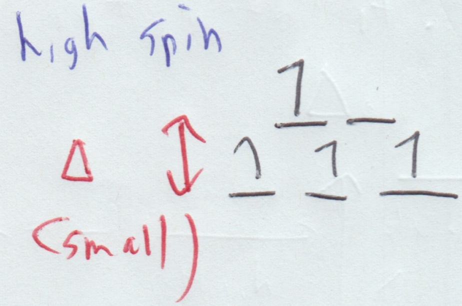
CO $\quad Cr^{+2} \rightarrow d^4$



When the splitting energy (Δ) is larger than pairing energy, normal filling rules are followed.

weak field ligands

$H_2O \quad Cr^{+2}$



If the splitting energy (Δ) is smaller than the pairing energy, ~~electrons will~~ the normal filling rules will not be followed.