

Symmetry of Molecules and Group Theory (Hagiwara)

Problem Set #7(For Chapter 9) 2019/12/18

1. The electronic ground states are 1A_1 for $[\text{Co}(\text{en})_3]^{3+}$ and 4A_2 for $[\text{Cr}(\text{en})_3]^{3+}$. Both ions have D_3 symmetry. Check if the A_1 excited states of the same spin multiplicity as the ground state are allowed for electronic transition. Which μ components make the transition allowed?
2. Work out the fundamental modes of vibration of PtCl_4^{2-} (square planar, D_{4h}) following the procedure below.
 - 1) Obtain the representations for the fundamental modes.
 - 2) Classify the fundamental modes to stretching and bending modes.
 - 3) Draw pictures of vibration for the fundamental modes (Hint: Reference the phases of atomic orbitals belonging to the same representations).
 - 4) Discuss the Raman and IR activities of each mode.