

**CHEM 245**

**PROBLEM SET 8**

- Determine the term symbol for the ground state of  
a) atomic N    b) atomic Mo    c)  $s^2$     d)  $p^2$     e)  $p^4$     f)  $p^6$     g)  $d^{10}$
- Determine the splitting pattern of a  $d^9$  free ion in an octahedral field, including the distortion due to Jahn-Teller effect. Name the terms.
- Set up a table of microstates to show that the ground term for the  $d^1$  ion is  ${}^2D$ . What are the components of this term in a tetrahedral field?
  - Repeat the process for a  $d^2$  ion. Show that the ground and excited terms are  ${}^3F$  and  ${}^3P$ .
- Which of the following will have the highest C-O stretching frequency (i.e. highest bond order):  $[\text{Fe}(\text{CO})_5]$ ,  $[\text{Fe}(\text{CO})_4(\text{PF}_3)]$ ,  $[\text{Fe}(\text{CO})_4(\text{PCl}_3)]$ ,  $[\text{Fe}(\text{CO})_4(\text{PMe}_3)]$ ?