

8.9: Problems

1. Write a table of microstates and predict the term simple that arise for N with an electronic configuration of $[\text{He}] 2s^2 2p^3$. Which is predicted to be the ground electronic state?
2. On the planet Zorg, electrons can exist in ζ orbitals, with $l = \frac{3}{2}$ (and so $m_l = +\frac{3}{2}, +\frac{1}{2}, -\frac{1}{2}, -\frac{3}{2}$). All other rules apply (2 electrons per orbital, Hund's Rules, etc.)
 - a. How many microstates arise from a ζ^2 configuration?
 - b. Write a table of microstates for the ζ^2 configuration. What term symbols arise from this set of microstates?
3. Using the accepted conventions, draw an orbital diagram for the d electrons in V.
 - a. What is the predicted ground state term?
 - b. How many additional microstates contribute to the term?
4. Consider a $^3P - ^3P$ transition (in which both states increase in energy with increasing J).
 - a. Draw an energy level diagram for the transition and predict the component transitions.
 - b. consider the following values: $A'' = 12.3 \text{ cm}^{-1}$, $A' = 8.4 \text{ cm}^{-1}$ and the $^3P_1 - ^3P_0$ transition occurs at 12459.3 cm^{-1} . Based on these complete a Deslandres table describing all of the component transitions and the spin-orbit spacings in the $^3P - ^3P$ transition.

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