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Quiz 4

Chemistry 3BB3; Winter 2005

1-3. What are the term symbols (you don't have to include the values of *J*) for the $1s^2 2p^1 4f^1$ state of the Beryllium atom. List them in increasing order of energy (using Hund's rules). [Justify your choice for the ground state symbol.]

4. Write a Slater determinant for the lowest-energy state of the $1s^2 2p^1 4f^1$ configuration. Do not use the shorthand notation.

5-7. List all available values of *J*, M_L and M_S for the ground state term of the $1s^2 2p^1 4f^1$ configuration?

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8. Which of the following operators commute with the electronic Hamiltonian for an atom. (There may be more than one answer.)

(a) $\hat{L}_x$ (d) $\hat{L}^2$ (g) $\hat{J}_x$

(b) $\hat{L}_y$ (e) $\hat{S}^2$ (h) $\hat{S}_y$

(c) $\hat{L}_z$ (f) $\hat{J}^2$ (i) $\hat{S}_x$

9. Which of the following operators commute with $\hat{L}_x$. (There may be more than one answer.)

(a) $\hat{L}_x$ (e) $\hat{J}_y$ (g) $\hat{S}_x$

(b) $\hat{L}_y$ (f) $\hat{L}^2$ (h) $\hat{S}_y$

(c) $\hat{L}_z$ (g) $\hat{S}^2$ (i) $\hat{S}_z$

(d) $\hat{J}_x$ (h) $\hat{J}^2$

10. Which of the following operators commute with $\hat{S}_x$. (There may be more than one answer.)

(a) $\hat{L}_x$ (d) $\hat{J}_x$ (g) $\hat{S}^2$

(b) $\hat{L}_y$ (e) $\hat{J}_y$ (h) $\hat{J}^2$

(c) $\hat{L}_z$ (f) $\hat{L}^2$

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