CHEM 1
Problem Set Ch. 8

1. Describe the four quantum numbers used to characterize an electron in an atom.

2. An electron in a certain atom is in the $n = 2$ quantum level. List the possible values of l and m_l that it can have.

3. What is the difference between a $2p_x$ and a $2p_y$ orbital?

4. Write the electron configuration and orbital box diagrams for Al and S.

5. Write the electron configurations for the atoms of chromium and iron.

6. Explain briefly why each of the following is *not* a possible set of quantum numbers for an electron in an oxygen atom (in its ground state). In each case, change the incorrect value (or values) in some way to make the set valid.

   a) $n = 2, \quad l = 2, \quad m_l = 0, \quad m_s = +½$

   b) $n = 2, \quad l = 1, \quad m_l = –1, \quad m_s = 0$

   c) $n = 3, \quad l = 1, \quad m_l = +1, \quad m_s = +½$

7. Draw orbital box diagrams for atoms with the following electron configurations:

   a) $1s^2 2s^2 2p^5$

   b) $1s^2 2s^2 2p^6 3s^2 3p^3$

   c) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$

8. How does atomic radius change as we move

   a) from left to right across the period?

   b) from top to bottom in a group?

9. Arrange the following atoms in order of decreasing atomic radius: Na, Al, P, Cl, Mg.

10. Ionization energy usually increases form left to right across the given period. Aluminum, however, has a lower ionization energy than magnesium. Explain.

11. Arrange the following atoms in the order of increasing ionization energy: Si, K, As, and Ca.

12. Compare the elements Li, K, C, and N.

   a) Which has the largest atomic radius?

   b) Which has the most negative electron affinity?

   c) Place the elements in order of increasing ionization energy.