Answers to Section 7.9 and 7.10 Study Guide Questions

Section 7.9

1. The three energy contributions that must be considered when describing the helium atom are:
   a. The Kinetic Energy of electrons as they move around the nucleus.
   b. The Potential Energy of electrons between the nucleus and the electrons.
   c. The Potential Energy of repulsion between the 2 electrons around the nucleus.

2. Electron Correlation Problem states since scientists can't predict the exact pathway of an electron, their repulsions can not be exactly calculated. To deal with this problem, scientists make approximations. The electron is moving in a field of charge that is the net result of nuclear attraction and the average repulsions of all other electrons.

3. It takes more energy to remove an electron from an Al^+ ion than an Al atom because there are less electrons (26) around the nucleus of the ion than the Al atom (27). There is more of a force of attraction to the nucleus and at the same time, there is less of a repulsive force from the other electrons.

4. Electrons "prefer" to fill in s, p, d and f orbitals within a quantum level because there is less energy in an s orbital than a p than d than f in a particular energy level.

5. The penetration effect causes an electron in a 2s orbital to be attracted to the nucleus more strongly than an electron in a 2p orbital. Thus, a 2s orbital is lower in energy than the 2p orbitals. This continues on....

6. A 3d orbital has a higher energy than a 3p even though it has max. probability closer to the nucleus than the 3p because there is no small "penetration hump" for a d orbital (Figure 7.21 in book) which means it has less probability being close to the nucleus.

Section 7.10

1. The periodic table was originally designed to represent patterns of chemical properties of known elements.

2. Triads were Doebereiners' original groupings of 3 known elements with similar properties. Examples: Chlorine, Bromine and Iodine.

3. The properties that Mendeleev used to predict ekasilicon's position on the periodic table were: atomic weight, density, specific heat, melting point, oxide formula, oxide density, chloride formula and boiling point of chloride.

4. Based on Table 7.4 in book, element #116 would be chemically like Polonium, it would have an atomic mass of 300,

5. Mendeleev's table ordered the elements in order of atomic mass. The modern table is based on atomic #s!