Section 6.3

1. A magnesium atom is smaller than a sodium atom because the shielding effect is constant for elements in the same period, but the nuclear charge is greater in magnesium. So the electrons are drawn closer to the nucleus. Magnesium and calcium have the same number of electrons in their highest occupied energy level. A magnesium atom is smaller than a calcium atom because there are fewer occupied energy levels.
2. Astatine is in period 6. Tellurium is in period 5. Astatine is in Group 7A; tellurium is in Group 6A. Although atomic size decreases across a period, the additional occupied energy level in astatine significantly increases the size of the astatine atom as compared to the tellurium atom. The prediction is that atoms of astatine are larger than atoms of tellurium.
3. A chlorine atom is smaller than a magnesium atom because atomic size decreases from left to right across a period. When a magnesium atom reacts, it loses electrons from its highest occupied energy level. A magnesium ion has filled first and second levels. When chlorine reacts, it gains an electron in its highest occupied energy level. An ion with three

occupied energy levels is larger than an ion with two occupied energy levels.

4. Across a period from left to right the principal energy level remains the same, but the nuclear charge increases. The increasing nuclear charge pulls the electrons closer to the nucleus, resulting in a smaller atomic radius. The trend is less pronounced as the number of electrons increases because the inner electrons shield the electrons in the highest occupied energy level. Atomic size increases as you move down a period because the electrons are added to higher principal energy levels. This enlarging effect is greater than the shrinking effect caused by increasing nuclear charge.

5. When a sulfur atom reacts to form an ion it adds two electrons while chlorine adds one electron. Sulfide and chloride ions have the same number of electrons. Because the chloride ion has the greater nuclear charge, it will be smaller than the sulfide ion.
6. Sodium's first ionization energy is higher than that of potassium because ionization energy tends to decrease from top to bottom within a group.
7. Beryllium's first ionization energy is greater because first ionization energy tends to increase from left to right across a period.
8. Barium is less electronegative than struntium because electronegativity values tend to decrease from top to bottom within a group.

9. Because magnesium has a relatively low first and second ionization energy, the removal of two electrons from magnesium is likely. The relatively high third ionization energy indicates the difficulty of removing a third electron from the filled second energy level. Magnesium normally forms an ion with a 2+ charge.

10. Because electronegativity decreases from top to bottom within a group, sulfur is less electronegative than oxygen. Because electronegativity increases from left to right across a period, fluorine is more electronegative than oxygen. The correct order for increasing electronegativity is then sulfur < oxygen < fluorine.