Chapter 8

8.2  (a) Atoms tend to gain, lose, or share electrons until they have 8 valence electrons surrounding them.
     (b) 2
     (c) 1

8.4  (a) Li⁺
     (b) Se⁺
     (c) Al³⁺
     (d) S²⁻

8.6
\[
\text{Ca}^+ + 2 \text{F}⁻ \rightarrow \text{Ca}^{2+} + 2 \left[ \text{F}^⁻ \right]
\]

8.12 (a) The charges on the ions in MgO are twice as large as those on NaF.
     (b) Sr is larger than Mg so the internuclear distance in SrCl₂ is larger than that of MgCl₂.

8.22 (a) Anions are larger than their parent element and cations are smaller than their parent element.
     (b) Just like with atoms, as you move down the table within a group the cations (or anions) get larger.
     (c) As you remove electrons from an atom, the effective nuclear charge does not change so the remaining electrons are held tighter and tighter as more electrons are removed.

8.26 (a) Cl < S < K
     (b) K⁺ < Cl⁻ < S²⁻
     (c) The ions all have the same number of electrons but the nuclear charge is different. The ion with the higher nuclear charge will be the smallest in this case.

8.34
\[
\text{S} = \text{C} = \text{S}
\]
The bonds are double bonds which would be shorter than C–S single bonds.

8.36 (a) electronegativity increases
     (b) generally decrease
     (c) Electronegativity generally follows the same trend as both ionization energy and electron affinity.

8.38 (a) P < S < O
     (b) Mg < Al < Si
     (c) Mg < Be < C
(d) In < Te < Br

8.48

(a) \[ \begin{array}{c} \text{Cl} \\
\text{P} \\
\text{Cl} \end{array} \]

(b) \[ \begin{array}{c} \text{O} \\
\text{O} \end{array} \]

(c) \[ \begin{array}{c} \text{O} = \text{N} = \text{O} \end{array} \]

(d) \[ \begin{array}{c} \text{O} \\
\text{P} \\
\text{O} \end{array} \]

(e) \[ \begin{array}{c} \text{H} \\
\text{C} \\
\text{H} \end{array} \]

(f) \[ \begin{array}{c} \text{H} \\
\text{C} \equiv \text{C} \\
\text{H} \end{array} \]

8.50

(a) \[ \begin{array}{c} \text{O} = \text{S} = \text{O} \end{array} \]

\[ S = 6 - 2 - 3 = +1 \]
\[ \text{O(double)} = 6 - 4 - 2 = 0 \]
\[ \text{O(single)} = 6 - 6 - 1 = -1 \]
(b) \[
\begin{align*}
\text{O} &= \text{S} - \text{O} \\
\text{S} &= 6 - 0 - 4 = 2 \\
\text{O} &\text{(double)} = 6 - 4 - 2 = 0 \\
\text{O} &\text{(single)} = 6 - 6 - 1 = -1
\end{align*}
\]

(c) \[
\begin{align*}
\text{O} &= \text{S} - \text{O} \\
\text{S} &= 6 - 2 - 3 = 1 \\
\text{O} &= 6 - 6 - 1 = -1
\end{align*}
\]

(d) \[
\begin{align*}
\text{O} &= \text{S} - \text{O} \\
\text{S} &= 6 - 0 - 4 = 2 \\
\text{O} &= 6 - 6 - 1 = -1
\end{align*}
\]
\( O = N - O - H \leftrightarrow O - N - O - H \)

\( O = N - O \leftrightarrow O - N = O \)

\( O = N - N - O \leftrightarrow O - N - N = O \)

\( \begin{align*}
\text{(a)} & \quad \text{Does not obey the octet rule - odd number of electrons.} \\
\text{(b)} & \quad \text{Does not obey the octet rule - expanded valence around I.}
\end{align*} \)
Does not obey the octet rule - expanded valence around Te.

Does not obey the octet rule - boron is electron deficient.

Does not obey the octet rule - expanded valence around Xe.

8.78  (a) No  
(b) Yes  
(c) Yes  
(d) No