Directions:

- Assignments may be periodically collected at the beginning of lecture following the completion of the chapter (and graded as a quiz) and/or representative problems can be placed on quizzes.

- Place your name and/or initials at the top of all pages submitted.

- Solve each of the following problems, showing all work for full credit.

- If an equation is involved, show the equation, the appropriate substitution (with units), and the solution (with units).

- If a chemical equation is required (and is not given), then the balanced equation should be shown.

- If the problem involves math (unit conversion/factor label), show the units and unit cancellation in arriving at your answer for full credit.

- To receive full credit – if the units in the problem pertain to a particular substance, state the substance (i.e. if you are talking about grams of gold – state grams Au - not just grams).

- All answers should be reported with the correct units to receive full credit.

- All answers should be reported with the correct number of significant digits to receive full credit.

- Only neat, clearly labeled work will receive full credit.

- Please print and write on only one side of each page you use. Assignments printed on two sides of the paper will not be graded.
Suggested Problems:

- Chapter Eight (Chemistry – A Molecular Approach – 2nd Edition)
- Pages 353 – 357.
- Problems: 44, 46, 52, 54, 62 (a, b, d), 64, 66 (a, b, c, d), 68 a, 71, 73 (a, b, d), 76, 80 (a, b, d), 88, and 100 (a, b)

44. a. C

b. P

c. Ar

d. Na
46. a. S

b. Ca

c. Ne

d. He

52. a. ___________________________ c. ___________________________

b. ___________________________ d. ___________________________

54.

<table>
<thead>
<tr>
<th>Element</th>
<th>Valence Electrons</th>
<th>Lose Electrons</th>
<th>Gain Electrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Al</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Sn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Br</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Se</td>
<td></td>
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</tr>
</tbody>
</table>
62. Circle the larger atom from each pair:
   a. Sn    Si
   b. Br    Ga
   d. Se    Sn

64. _______ > _______ > _______ > _______ > _______
    Largest            Smallest

66. a. Cl\(^{1-}\)

   b. P\(^{3-}\)

   c. K\(^{1+}\)

   d. Mo\(^{3+}\)
68. a. $\text{Cd}^{2+}$

71. ________ > ________ > ________ > ________ > ________
   Largest Smallest

73. Circle the atom from each pair with the larger first ionization energy:
   a. Br Bi
   b. Na Rb
   d. P Sn

76. ________ > ________ > ________ > ________
   Largest Smallest

80. Circle the atom from each pair with the negative (more exothermic) electron affinity from each pair:
   a. Mg S
   b. K Cs
   d. Ga Br
b. In order of decreasing atomic radius:

\[
\text{______ > ______ > ______ > ______ > ______} \quad \text{Largest}
\]

\[
\text{Smallest}
\]
Answers to Suggested Problems:

44. (a) C Carbon has 6 electrons. Distribute two of these into the 1s orbital, two into the 2s orbital, and two into the 2p orbital. \(1s^22s^22p^2\)

(b) P Phosphorus has 15 electrons. Distribute two of these into the 1s orbital, two into the 2s orbital, six into the 2p orbital, two into the 3s orbital, and three into the 3p orbital. \(1s^22s^22p^63s^23p^3\)

46. (a) S Sulfur has 16 electrons and has the electron configuration \(1s^22s^22p^63s^23p^4\). Draw a box for each orbital, putting the lowest energy orbital (1s) on the far left and proceeding to orbitals of higher energy to the right. Distribute the 16 electrons into the boxes representing the orbitals, allowing a maximum of two electrons per orbital and remembering Hund’s rule. You can see from the diagram that sulfur has 2 unpaired electrons.

(b) Ca Calcium has 20 electrons and has the electron configuration \(1s^22s^22p^63s^23p^64s^2\). Draw a box for each orbital, putting the lowest energy orbital (1s) on the far left and proceeding to orbitals of higher energy to the right. Distribute the 20 electrons into the boxes representing the orbitals, allowing a maximum of two electrons per orbital and remembering Hund’s rule. You can see from the diagram that nitrogen has no unpaired electrons.

52. a. Al b. S

54. | Element | Valence Electrons | Lose Electrons | Gain Electrons |
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a. Al</td>
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<td>✓</td>
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</tr>
<tr>
<td>b. Sn</td>
<td>4</td>
<td>✓</td>
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</table>

62. a. Sn b. Ga

64. Cs Pb Sb Se S
66. a. \( \text{Cl}^- \quad [\text{Ne}]3s^23p^6 \) This is isoelectronic with \( \text{Ar} \).

d. \( \text{Mo}^{3+} \quad [\text{Kr}]5s^04d^3 \)

68. a. \( \text{Cd}^{2+} \quad [\text{Kr}]5s^04d^{10} \)

\[ \begin{array}{cccc}
\hline \\
5s & 4d & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow \\
\hline 
\end{array} \]

\( \text{Cd}^{2+} \) is diamagnetic.

71. \( \text{O}^{2-} > \text{F}^- > \text{Ne} > \text{Na}^+ > \text{Mg}^{2+} \)

73. a. \( \text{Br} \)  
 b. \( \text{Na} \)

76. \( \text{Cl} \quad \text{S} \quad \text{Sn} \quad \text{Pb} \)

80. a. \( \text{S} \)  
 b. \( \text{K} \)

100. (a) \( \text{P}: [\text{Ne}]3s^23p^3 \)  
 \( \text{Si}: [\text{Ne}]3s^23p^2 \)

\( \text{S}: [\text{Ne}]3s^23p^4 \)  
\( \text{Ca}: [\text{Ar}]4s^2 \)  
\( \text{Ga}: [\text{Ar}]4s^23d^{10}4p^1 \)

(b) \( \text{Ca} > \text{Ga} > \text{Si} > \text{P} > \text{S} \)