CHAPTER NINE

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.

- Place your final answer on the blanks or in the box provided.

- **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 Nine (Chemistry – A Molecular Approach – 2\textsuperscript{nd} Edition)
- Pages 393 – 397.
- Problems: 40 (a, b, c, d), 42 (a, b, d), 52 (a, c, d), 56 (a, b, c, d), 58, 60 (a, b, d), 62 (b, c), 64 c, 70 a, 74 (a, b), 76, 88, and 99.

40.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>a. SrO</td>
<td></td>
</tr>
<tr>
<td>b. Li\textsubscript{2}S</td>
<td></td>
</tr>
<tr>
<td>c. CaI\textsubscript{2}</td>
<td></td>
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<tr>
<td>d. RbF</td>
<td></td>
</tr>
</tbody>
</table>
Name ______________________________

42.

a.  

b.  

d.  

Formula: ______________  Formula: ______________  Formula: ______________

52.

a.  NF₃  

b.  

c.  SBr₂  


52. Continued

   d. CCl₄

56.  | Elements in Bond | Pure Covalent | Polar Covalent | Ionic |
    |-----------------|--------------|---------------|-------|
    | a. C and N      |              |               |       |
    | b. N and S      |              |               |       |
    | c. K and F      |              |               |       |
    | d. N and N      |              |               |       |

58. Do not do the % ionic character.
Name ______________________________

60.

a.    b.    c.    d.

62.

a.    c.

b.
64. Do not assign formal charge.

c.

Resonance Structures (if appropriate):

70.

a.
74.

<table>
<thead>
<tr>
<th>a.</th>
<th>b.</th>
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</table>

76. Show Lewis Structures:

<table>
<thead>
<tr>
<th>H₂NNH₂</th>
<th>HNNH</th>
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</table>

- **Stronger Nitrogen – Nitrogen Bond**: H₂NNH₂, HNNH
- **Shorter Nitrogen – Nitrogen Bond**: H₂NNH₂, HNNH
88. Not required to give formal charges or explain stability.
Hints: Evolution of \( \text{N}_2 \) implies nitrogen atoms are bonded together in diazomethane. Hydrogens are bonded to the carbons.

Molecular Formula:

Lewis Structure for Diazomethane:
99. Only calculate $\Delta H$ for the reaction given. Do not complete the remainder of the problem.
(Potentially Useful Information found on page 387 - Table 9.3)
Name ______________________________

Answers to Suggested Problems:

40. (a) SrO: Draw the Lewis structures for Sr and O based on their valence electrons. Sr: 5s^2 O: 2s^22p^4

\[ \text{Sr:} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad 2+ \\
\text{O:} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad 2- \]

Strontium must lose two electrons and be left with the octet from the previous shell, while oxygen needs to gain two electrons to get an octet.

(b) Li_2S: Draw the Lewis structures for Li and S based on their valence electrons. Li: 2s^1 S: 3s^23p^4

\[ \text{Li:} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad 2+ \\
\text{S:} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad 2- \]

Lithium must lose one electron and be left with two 1s electrons from the previous shell, while sulfur needs to gain two electrons to get an octet.

42. (a) Ca and N: Draw the Lewis structures for Ca and N based on their valence electrons.

\[ \text{Ca:} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad 2+ \\
\text{N:} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad 3- \]

Calcium must lose two electrons and be left with the octet from the previous shell, while nitrogen needs to gain three electrons to get an octet.

\[ 3 \text{Ca}^{2+} \quad 2 \left[ \begin{array}{c} \cdot \\ \cdot \end{array} \quad \begin{array}{c} \cdot \\ \cdot \end{array} \quad 3- \right] \]

Thus, we need three Ca^{2+} and two N^{3-} in order to lose and gain the same number of electrons. Write the formula with subscripts (if necessary) to indicate the number of atoms, Ca_3N_2.
42. (Continued)

(d) Cs and F:

Draw the Lewis structures for Cs and F based on their valence electrons.

\[ \text{Cs: } 6s^1, \quad \text{F: } 2s^2 2p^5 \]

Cesium must lose one electron and be left with the octet from the previous shell, while fluorine needs to gain one electron to get an octet.

Thus, we need one Cs⁺ and one F⁻. Write the formula with subscripts (if necessary) to indicate the number of atoms.

\[ \text{CsF} \]

52. a.  

\[ \text{F} \ldots \text{N} \ldots \text{F} \]

c.  

\[ \text{S} \ldots \text{Br} \]

56.

<table>
<thead>
<tr>
<th></th>
<th>Elements in Bond</th>
<th>Pure Covalent</th>
<th>Polar Covalent</th>
<th>Ionic</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>C and N</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>K and F</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

58.

\[ \text{Br} \ldots \text{F} \]

60.

62. b.

64. c.

74. a.

76. Stronger Bond: HNNH

    Shorter Bond: HNNH

88. Molecular Formula: CH₂N₂

99. – 243 kJ per mole of water