1. 58.7 mL
2. a. \(2 \text{N}_2(g) + 3 \text{O}_2(g) \rightarrow 2 \text{N}_2\text{O}_3(g)\)
   b. \(\text{O}_2\) is the limiting reactant and 63.4 g \(\text{N}_2\text{O}_3\) are obtained.
3. 486.0 nm Radiation is \textbf{EMITTED}.
4. a. \(8.90 \times 10^{14}/\text{s}\)
   b. 337 nm
   c. 2.16 \times 10^3 \text{ m/s}
5.
<table>
<thead>
<tr>
<th>Electron configuration</th>
<th>Circle one</th>
<th>If ALLOWED, circle one</th>
<th>If NOT ALLOWED, why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1s^2 , 2s^1 , 2p^5)</td>
<td>ALLOWED</td>
<td>EXCITED STATE</td>
<td></td>
</tr>
<tr>
<td>(1s^2 , 2s^2 , 2p^6 , 3s^2 , 3p^7)</td>
<td>NOT ALLOWED</td>
<td></td>
<td>3p(^7) requires that one orbital hold 3 electrons. That would mean that two electrons have the same set of 4 quantum numbers. This is prohibited by the Pauli Exclusion Principle</td>
</tr>
<tr>
<td>(1s^1 , 2s^3 , 2p^6)</td>
<td>NOT ALLOWED</td>
<td></td>
<td>2s(^3) Same as above.</td>
</tr>
<tr>
<td>(1s^2 , 2s^2 , 2p^6 , 3s^2 , 3p^2)</td>
<td>ALLOWED</td>
<td>GROUND STATE</td>
<td></td>
</tr>
</tbody>
</table>
6. a. \(1s^2 \, 2s^2 \, 2p^6 \, 3s^2 \, 3p^6 \, 4s^2 \, 3d^{10} \, 4p^6\)
   b. and c. \([\text{Kr}] \, 4d^{10} \, 5s^2 \, 5p^2\) OR \([\text{Kr}] \, 5s^2 \, 4d^{10} \, 5p^2\) (because tin has a filled 4d subshell, this is a pseudo-noble gas structure)
   d. 
   \[
   \downarrow \uparrow \\
   5s \\
   \uparrow \ \\
   5p \\
   \]
7.
<table>
<thead>
<tr>
<th>n</th>
<th>(l)</th>
<th>(m_l)</th>
<th>(m_s)</th>
</tr>
</thead>
</table>
   Electron 1 | 3 | 2 | Choose one: 2, 1, 0, \(-1\), \(-2\) | Choose one: \(+\frac{1}{2}\) or \(-\frac{1}{2}\) |
   Electron 2 | 3 | 2 | Different from above | Same as above |
8. a. \(\text{F} \quad \text{B} \quad \text{Be} \quad \text{Na}\)
   b. \(\text{Li} \quad \text{O} \quad \text{N} \quad \text{Ne}\)
9. a. \(\text{Mg} \quad \text{Si} \quad \text{S} \quad \text{Cl}\)
   b. \(\text{Mg}^{2+} \quad \text{Na}^+ \quad \text{F}^- \quad \text{O}^{2-}\)
10. a. \(\text{Ga}_2\text{O}_3\)
    b. hypobromous acid
    c. +4 and +2 (tin is a metal so forms cations losing all valence electrons or all p-valence electrons)
    d. Across a period, metallic character decreases. Down a group, metallic character increases.
    c. \(\text{Br}\) (bromine \(Z=35\))
1. 39.2 mL
2. a. \(2 \text{N}_2(\text{g}) + 5 \text{O}_2(\text{g}) \rightarrow 2 \text{N}_2\text{O}_5(\text{g})\)
   b. \(\text{O}_2\) is the limiting reactant and 54.0 g \(\text{N}_2\text{O}_5\) are obtained.
3. 433.9 nm Radiation is \textit{absorbed}.
4. a. \(6.01 \times 10^{14}/\text{s}\)
   b. 499 nm
   c. \(1.46 \times 10^3\) m/s
5. | Electron configuration | Circle one | If ALLOWED, circle one | If NOT ALLOWED, why? |
<table>
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<td>(\text{GROUND STATE})</td>
<td></td>
</tr>
<tr>
<td>(1s^2 \ 2s^1 \ 2p^5)</td>
<td>(\text{ALLOWED})</td>
<td>(\text{EXCITED STATE})</td>
<td></td>
</tr>
<tr>
<td>(1s^1 \ 2s^2 \ 2p^6)</td>
<td>(\text{NOT ALLOWED})</td>
<td>(2s^3) Same as above.</td>
<td></td>
</tr>
</tbody>
</table>
6. a. \(1s^2 \ 2s^2 \ 2p^6 \ 3s^2 \ 3p^6 \ 3d^1 \ 4s^2 \ 4p^3\)
   b. and c. \([\text{Ar}] \ 3d^{10} \ 4s^2 \ 4p^3\) (because arsenic has a filled 3d subshell, this is a pseudo-noble gas structure)
   d. \(\downarrow \uparrow \downarrow \uparrow\)
\(\begin{array}{cccc}
4s & & 4p & \\
\end{array}\)
7. | n | l | \(m_l\) | \(m_s\)
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<td>3</td>
<td>2</td>
<td>Choose one: 2, 1, 0, –1, or –2</td>
</tr>
<tr>
<td>Electron 2</td>
<td>3</td>
<td>2</td>
<td>Different from above</td>
</tr>
</tbody>
</table>
8. a. \(\text{Cl}\) \(\text{Al}\) \(\text{Mg}\) \(\text{Na}\)
   b. \(\text{Na}^{+}\) \(\text{Al}^{3+}\) \(\text{Mg}^{2+}\) \(\text{Cl}^{-}\)
9. a. \(\text{Li}^{+}\) \(\text{C}^0\) \(\text{Mg}^{2+}\) \(\text{O}^{-}\) \(\text{F}^{-}\)
   b. \(\text{Ca}^{2+}\) \(\text{K}^{+}\) \(\text{Cl}^{-}\) \(\text{S}^{2-}\)
10. a. \(\text{Ca}_3\text{N}_2\)
    f. Iodous acid
    g. +5 and +3 (Bi is a metal, so forms a cation losing all valence electrons or all p-valence electrons)
    h. Across a period, metallic character decreases. Down a group, metallic character increases.
    i. Sn (tin \(Z=50\))