Unit 1, Lesson 05: Answers to Homework on Introduction to Bonding and Ionic Bonding

**Page 165, Question 1**

a) Li$^{1+}$ 1s$^2$

b) Ca$^{2+}$ 1s$^2$2s$^2$2p$^6$3s$^2$3p$^6$

c) Br$^{-}$ 1s$^2$2s$^2$2p$^6$3s$^2$3p$^6$4s$^2$3d$^{10}$4p$^6$

d) O$^{2-}$ 1s$^2$2s$^2$2p$^6$

**Page 165, Question 2**

As a rule, for metal ions, you do not draw in any valence electrons because they have been lost. For non-metals, you draw all eight valence electrons, inside square brackets, to show the electrons that have been gained. You may be asked to follow other conventions in other courses.

<table>
<thead>
<tr>
<th>Metal ion</th>
<th>Electron configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li$^{1+}$</td>
<td>[He]2s$^1$</td>
</tr>
<tr>
<td>Ca$^{2+}$</td>
<td>[Ar]3d$^5$4s$^1$</td>
</tr>
<tr>
<td>Br$^{-}$</td>
<td>[Kr]4d$^10$5s$^2$5p$^6$</td>
</tr>
<tr>
<td>O$^{2-}$</td>
<td>[Ne]3d$^5$4s$^2$4p$^6$</td>
</tr>
</tbody>
</table>

**Page 165, Question 3**

a) bonding between Li and S:

\[
\text{Li} \rightarrow [\text{Li}]^{1+} + [\overset{\cdot}{\text{S}}]^{2-} + [\overset{\cdot}{\text{S}}]^{2-} \quad \rightarrow \text{Li}_2\text{S}
\]

a) bonding between Ca and Cl:

\[
\overset{\cdot}{\text{Ca}} \rightarrow [\overset{\cdot}{\text{Cl}}]^{1-} + [\overset{\cdot}{\text{Cl}}]^{1-} + [\overset{\cdot}{\text{Cl}}]^{1-} \quad \rightarrow \text{CaCl}_2
\]

b) bonding between K and Cl:

\[
\overset{\cdot}{\text{K}} \rightarrow [\overset{\cdot}{\text{Cl}}]^{1-} + [\overset{\cdot}{\text{Cl}}]^{1-} \quad \rightarrow \text{KCl}
\]

c) bonding between Na and N:

\[
\overset{\cdot}{\text{Na}} \rightarrow [\overset{\cdot}{\text{N}}]^{3-} + [\overset{\cdot}{\text{N}}]^{3-} + [\overset{\cdot}{\text{N}}]^{3-} \quad \rightarrow \text{Na}_3\text{N}
\]
3. Write ionization reactions (as shown in our notes, without electron configurations) to show the formation of the following ions. What Noble gas is each ion isoelectronic with?

d)  Mg\(^{2+}\)  
   \[ \text{Mg} \rightarrow \text{Mg}^{2+} + 2e^- \]  
   Mg\(^{2+}\) is isoelectronic with neon

b)  O\(^{2-}\)  
   \[ \text{O} + 2e^- \rightarrow \text{O}^{2-} \]  
   O\(^{2-}\) is isoelectronic with neon

c)  Sc\(^{3+}\)  
   \[ \text{Sc} \rightarrow \text{Sc}^{3+} + 3e^- \]  
   Sc\(^{3+}\) is isoelectronic with argon

d)  Si\(^{4+}\)  
   \[ \text{Si} \rightarrow \text{Si}^{4+} + 4e^- \]  
   Si\(^{4+}\) is isoelectronic with neon

e)  Si\(^{4-}\)  
   \[ \text{Si} + 4e^- \rightarrow \text{Si}^{4+} \]  
   Si\(^{4-}\) is isoelectronic with argon

4. Predict four properties of RbBr\(_2\).

Because RbBr\(_2\) is an ionic compound, it will probably be a hard crystal, solid at SATP, have high melting and boiling points, and be odourless. From grade 11, it is also very soluble in water and will conduct electricity in solution.