Electron Configurations and the Periodic Table

The Periodic Table and Electron Configurations

1. You can use this mnemonic.
   - Write the electron configuration and orbital fill notation for P and Br.

2. Or you can use the periodic chart.
   - We fill orbitals in increasing order of energy.
   - Different blocks on the periodic table, then correspond to different types of orbitals.

Now, let's read the electron configuration for bromine off of the periodic table.
Try reading the electron configurations for the following atoms from the periodic table. If you have difficulty, refer back to the mnemonic device. Write them down your paper.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Li</td>
<td>7. P</td>
</tr>
<tr>
<td>2. Na</td>
<td>8. As</td>
</tr>
<tr>
<td>3. Be</td>
<td>9. Cl</td>
</tr>
<tr>
<td>5. B</td>
<td>11. Kr</td>
</tr>
<tr>
<td>6. Al</td>
<td>12. Xe</td>
</tr>
</tbody>
</table>

The question now becomes:

Why is it so important to know the location of electrons around the nucleus of the atom?

The answer?

Valence electrons

Valence electrons are the electrons located in the highest main energy level (or valence shell) of an atom.

Notice:

Group 2 atoms had how many valence electrons?

Group 3?

Group 7?

Group 8?

What trend can be identified on the periodic table related to valence electrons?

What about the transition metals (d and f block elements)?

Valence Electrons & the Periodic Table

- **Representative Elements**
  - Are the elements in A groups on periodic chart.
  - These elements will have their “last” electron in an outer s or p orbital.
  - The number of valence electrons for these elements are truly represented by their group number.

Shade the representative elements on the top periodic table on the reference sheet and label.

Valence Electrons & the Periodic Table

- **d-Transition Elements**
  - Elements on periodic chart in B groups.
  - Sometimes called transition metals.
  - Each metal has d electrons.
  - Exhibit smaller variations from row-to-row than the representative elements.
  - The number of valence electrons for these elements are not always represented by their group number.
Valence Electrons & the Periodic Table

- *f* - transition metals
  - Sometimes called inner transition metals.
  - Electrons are being added to *f* orbitals.
  - Consequently, very slight variations of properties from one element to another.
  - The number of valence electrons for these elements are not always represented by their group number.

Electron Distribution in Molecules

- Valence Electron distribution is depicted with **Lewis electron dot notation**

Electron Dot Notation shows the number of valence electrons of an atom around the atom's nuclear symbol.

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For example:

**Oxygen has 6 valence electrons (group 6)**

\[
\begin{array}{c}
\text{O} \\
\text{8} \\
\end{array}
\]

1. When assigning valence electrons to an atomic symbol, each side of the symbol should receive one electron before a second electron is placed on a side.

2. Always assign electrons across from each other when possible.

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Valence electrons (the outer most electrons) are responsible for the interaction between atoms when forming chemical compounds.

Another way to say that is that valence electrons are the electrons that participate in chemical bonding.

The **Octet Rule** explains that every atom seeks a full valence shell. It is the attaining or loss of valence electrons that will satisfy the octet rule.

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Obtain the number of valence electrons for each of the following atoms from its group number and draw the correct Electron Dot Notation (a.k.a. Lewis Dot Structures).

2. N 7. C
3. Cl 8. Ar
5. Be 10. H