Metals versus Non-Metals

Metals are on the left side. Non-metals on the right. Metals tend to lose electrons. Non-metals gain them tight.

The dividing line is the red or bold black line from between Boron and Aluminum down and to the right. Everything to the left is a metal: to the right, non-metal. One exception (don’t ya just hate that?!?) is hydrogen – a non-metal.

Sodium (Na) is a metal. Oxygen is a non-metal.

<table>
<thead>
<tr>
<th>Metal or Non-metal?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium:</td>
<td></td>
</tr>
<tr>
<td>Bromine:</td>
<td></td>
</tr>
<tr>
<td>Beryllium:</td>
<td></td>
</tr>
<tr>
<td>Helium:</td>
<td></td>
</tr>
<tr>
<td>Fluorine:</td>
<td></td>
</tr>
<tr>
<td>Hydrogen</td>
<td></td>
</tr>
<tr>
<td>Silver</td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td></td>
</tr>
</tbody>
</table>

Dot Diagrams

Dot Diagrams (sometimes known as Lewis dot diagrams) are a depiction of an atom’s valence electrons. They are a powerful tool in helping you understand, see, and even predict molecular bonding.

Put the correct number of valence electrons around the chemical symbol in this order in pairs:

\[
\text{Ne: } 1 \quad 5 \\
\text{4} \quad 3 \\
\text{8} \quad 7 \\
\text{2} \quad 6
\]

Notice that the electrons are in pairs not a circle.

Why would the electrons spread out around the atom instead of bunching up?

Neon has 8 valence electrons (in the right hand column). Neon has no unoccupied spaces. It is full.

Draw the Dot Diagrams for the following elements:

Beryllium   Sodium   Helium   Carbon   Boron

Lithium, with 1 valence electron (first column).

Carbon has 4 valence electrons

Oxygen has 6 valence electrons. How many more before it’s full?

\[\text{への} \]

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**Ch. 19:1**

**Ions**

Neutral atoms have an equal number of protons and electrons. A neutral atom has a net electrical charge of zero.

Why would atoms gain or lose electrons? To fulfill the octet rule and end up with a full outer shell of electrons. Metals will lose electrons and make positive ions (cations); non-metals will gain electrons and make negative ions (anions).

*Cations* cough up electrons - Lose electrons (+ ion). **METALS**

*Anions* accept electrons - Gain electrons (- ion). **NON-METALS**

**Lithium**

- **Li**
- 3 protons (+3)
- 3 electrons (-3)
- \(+3 - 3 = 0\)
- Neutral atom!

Loses an electron

**Lithium**

- **Li\(^{1+}\)**
- 3 protons (+3)
- 2 electrons (-2)
- \(+3 - 2 = +1\)
- Positive ion!

An ion is an atom with a net charge; that has gained or lost electrons.

\[\text{Protons} - \text{electrons} = \text{ion charge} \quad \text{OR} \quad p - e = \text{charge}\]

**What is the charge of an atom with 16 protons and 18 electrons?**

If Oxygen gains 2 electrons what charge will it have?

If Beryllium loses 2 electrons what charge will it have?

---

**Ex. How many electrons does Mg\(^{2+}\) have?**

\[
p - e = \text{charge} \\
12 (Mg) - e = +2 \\
12 = 2 + e \\
12 - 2 = e \\
e = 10 \text{ electrons}
\]

You also could have found this by knowing Mg has 12 protons and electrons if neutral. A 2+ charge means it is a cation—it lost 2 electrons = 12—2 = 10 electrons.

---

**Ion Notation**

**Na\(^{1+}\)**

**Chemical symbol**

Charge (1 electron lost)

---

**How many electrons does Cl\(^{1-}\) have?**

**How many electrons does N\(^{3-}\) have?**

**How many electrons does Al\(^{3+}\)?**

---

**Give the ion notation for an atom with 20 protons and 18 electrons.**

**Give the ion notation for an atom with 6 protons and 2 electrons.**

**Give the ion notation for an atom with 15 protons and 18 electrons.**

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