

Notes for chapter 19

Valence electrons (remember the song) are the most important characteristic to determine how an element will react with other elements. All the elements in a group (vertical column) will react similarly. If Oxygen reacts with Lithium, then Sulfur will, too: because they both are in group 16A with 6 valence electrons. Likewise, Sodium (Na) and Potassium (K) will react like Lithium: all in group 1A, with 1 valence electron.

Ions –

We have learned that when building atoms the number of protons equals the number of electrons. This is true for neutral atoms. A neutral atom is one that's net electrical charge is zero.

For example: if Lithium has 3 protons (+3) and 3 electrons (-3), then $+3 - 3 = 0$. No net charge.

But to gain a full set of outer electrons most atoms will lose or gain electrons. Metals lose and non-metals gain. Lithium having only 1 valence electron will lose it to end up with a full Helium shell of 2 electrons. If it loses an electron (a negative) it will become a positive *ion*. Fluorine will gain 1 more electron to gain a full Neon shell of 8. One extra electron makes a fluorine *ion* negative by 1. We notate ions with charge number on the upper right side of the chemical symbol.

Li has 3 protons (+3) and 3 electrons (-3) = $+3 - 3 = 0$: a neutral atom.

Li¹⁺ has 3 protons (+3) and 2 electrons (-2) = $+3 - 2 = +1$: a positive ion.

F has 9 protons (+9) and 9 electrons (-9) = $+9 - 9 = 0$: a neutral ion.

F¹⁻ has 9 protons (+9) and 10 electrons (-10) = $+9 - 10 = -1$: a negative ion.

Formula: Protons – electrons = ion charge. OR $p - e = \text{charge}$

Li¹⁺

$$3 - e = 1$$

$$3 = 1 + e$$

$$3 - 1 = e$$

$$e = 2 \text{ electrons}$$

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 right is a metal: to the left, non-metal. One exception (don't ya hate them!) is hydrogen – a non-metal.

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

Dot Diagrams – We use dots surrounding an element's chemical symbol to represent valence electrons. Since if I 8 I full, we never have more than 8 electrons in a dot diagram. When doing the dots remember there are 4 sides, not a circle. With 8 valence electrons you would have two on each side.

Lithium has 1 valence electron, so its dot diagram would be Li with one dot above it. Beryllium would be Be with two dots around it.

You will be surprised just how well you can predict chemical formulas with dot diagrams.