

6.1: The Octet Rule

In the previous section, we established a direct link between electron configurations, the periodic table, and the similarities of the elements within groups of the periodic table. We can generalize some of the ways in which many compounds and molecules form based on these trends. This generalization is called the octet rule. According to **the octet rule**, atoms will tend to lose, gain, or share electrons such that their valence electron shell resembles that of a noble gas. In most cases, the noble gas has 8 electrons in his valence shell, hence the word octet to describe the number 8.

When ions form, they conform to the **octet rule** by either losing or gaining electrons in order to achieve the electron configuration of the nearest noble gas. You can confirm this by looking at the trends of ion formation that we established in an earlier chapter. The reason why the periodic table is so good at predicting these trends in ion formation is because they result in filled valence electron shells.

In a similar way, nonmetal atoms share electrons in the formation of a covalent bond in such a way that each of the atoms involved in the bond can attain a noble-gas electron configuration. The shared electrons are "counted" for each of the atoms involved in the sharing. For hydrogen (H_2), the shared pair of electrons means that each of the atoms is able to attain the electron configuration of helium, the noble gas with two electrons. For atoms other than hydrogen, the sharing of electrons will usually provide each of the atoms with eight valence electrons. We will explore this concept more within the subsections here using a concept called Lewis structures.

When we first introduced the idea of compounds, we emphasized the difference between ionic and molecular compounds. In fact, it was the most important thing to consider when naming compounds! We can now discuss the reason for that difference: it is because the octet rule is satisfied in different ways in the formation of these compounds. In ionic compounds electrons are lost or gained. In molecular compounds, electrons are shared. It is because of this difference, that we must use different naming conventions for ionic compounds and molecules. Each electron that is lost by a metal will be gained by a nonmetal with forming an ionic compound. In contrast, there are multiple ways to share electrons in molecules as we will see. This difference is why it was necessary to use a different naming convention for ionic compounds compared to molecules.

Summary

- The octet rule is followed when an atom achieves the electron configuration of the nearest noble gas.
- When ions form, they conform to the octet rule by either losing or gaining electrons.
- When molecules form, they conform to the octet rule by sharing electrons.

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