

## 5.1: Why Atoms Form Bonds



Figure 5.1.1 (Credit: Flickr: Amelia Wells; Source: <https://www.flickr.com/photos/speculummundi/4896031682/>(opens in new window); License: CC by 2.0(opens in new window))

### Have you ever made cupcakes from scratch?

You mix together flour, sugar, eggs, and other ingredients to make the batter, put the batter into cupcake papers, and then put them into the oven to bake. The cupcakes that come out of the oven after baking are different from any of the individual ingredients that went into the batter. Like the ingredients that join together to make cupcakes, atoms of different elements can join together to form entirely different substances called compounds. In cupcakes, the eggs and other wet ingredients cause the dry ingredients to stick together. What causes elements to stick together in compounds? The answer is chemical bonds.

### What Is a Chemical Bond?

A chemical bond is a force of attraction between atoms or ions. Bonds form when atoms share or transfer valence electrons. Valence electrons are the electrons in the outer energy level of an atom that may be involved in chemical interactions. Valence electrons are the basis of all chemical bonds.

**Q:** Why do you think that chemical bonds form?

**A:** Chemical bonds form because they give atoms a more stable arrangement of electrons.

### Why Bonds Form

To understand why chemical bonds form, consider the common [compound](#)(opens in new window) known as water, or  $\text{H}_2\text{O}$ . It consists of two hydrogen (H) atoms and one oxygen (O) atom. As you can see in the on the left side of the figure below, each hydrogen atom has just one electron, which is also its sole valence electron. The oxygen atom has six valence electrons. These are the electrons in the outer energy level of the oxygen atom.

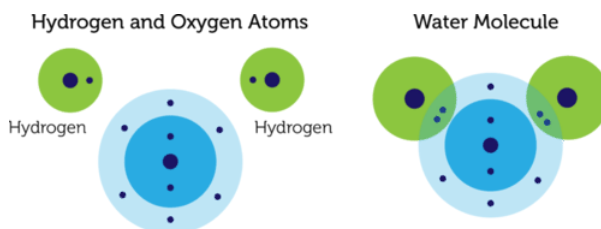


Figure 5.1.2: Copy and Paste Caption here. (Credit: Christopher AuYeung; Source: CK-12 Foundation; License: CC by-NC 3.0(opens in new window))

In the water molecule on the right in the figure above, each hydrogen atom shares a pair of electrons with the oxygen atom. By sharing electrons, each atom has electrons available to fill its sole or outer energy level. The hydrogen atoms each have a pair of shared electrons, so their first and only energy level is full. The oxygen atom has a total of eight valence electrons, so its outer energy level is full. A full outer energy level is the most stable possible arrangement of electrons. It explains why elements form chemical bonds with each other.

### Types of Chemical Bonds

Not all chemical bonds form in the same way as the bonds in water. There are actually three different types of chemical bonds, called covalent, ionic, and metallic bonds. Each type of bond is described in more detail within this chapter.

## Summary

- A chemical bond is a force of attraction between atoms or ions. Bonds form when atoms share or transfer valence electrons.
- Atoms form chemical bonds to achieve a full outer energy level, which is the most stable arrangement of electrons.
- There are three different types of chemical bonds: covalent, ionic, and metallic bonds.

---

This page titled [5.1: Why Atoms Form Bonds](#) is shared under a [CC BY-NC 3.0](#) license and was authored, remixed, and/or curated by [Alaka Pradhan](#).