

Ionic Compounds: Chapter 7

Bonding between atoms:

- As you know, atoms bond with each other to form chemical compounds. Usually, this process takes place easily.
- Why?
- **THE OCTET RULE! All elements want to be like the nearest noble gas!**
 - Elements adopt a “noble gas” electron configuration, with 8 Ve^- s by sharing or transferring Ve^- s, in order to have 8 e^- s in their valence shell.
 - Why the octet rule works: Everything in the universe prefers to be in low energy states over high energy states. Because having a noble gas configuration results in lower energy than not having this configuration, all atoms tend to do whatever they can to make this happen.
 - How atoms do this: They form chemical bonds!

What's a chemical bond?

- **Chemical bonds** are strong forces that cause atoms to stick to one another. These strong forces occur because the atoms change so that they have a noble gas electron configuration.
- Two ways they do this:
 - They exchange electrons: Atoms exchange electrons until all atoms are like the nearest noble gas. This results in the formation of **ionic compounds**.
 - They share electrons: Atoms share electrons until all atoms have the same number of electrons as the nearest noble gas. This results in the formation of **covalent bonds or metallic bonds** (depending on what elements are present).
- For now, we're going to focus on ionic compounds.

How are ionic compounds formed?

- Non-metals tend to want to gain electrons to be like the nearest noble gas. (These are the atoms on the right side of the periodic table).
- Metals tend to want to lose electrons to be like the nearest noble gas. (These are the atoms on the left side of the periodic table)
- When these two atoms get near each other, the metal atom gives electrons to the non-metal atom until both have the same number of valence electrons as the nearest noble gas.
- The atom that has gained electrons now has more electrons than protons, so it has a negative charge.
 - All atoms that have any charge on them are called “**ions.**”
 - Ions with negative charge are called “**anions.**”
- The atom that has lost electrons now has fewer electrons than protons, so it has a positive charge.
 - Ions with positive charge are called “**cations.**”
- Once a cation and anion are formed, they stick to each other magnetically via electrostatic attraction. Once they’ve stuck together, the resulting material is called an **ionic compound.**
- Ionic compounds are also called (**salts**)

Definition: Ionic compound: Any compound formed when anions stick to cations.

- Important: Another word for “ionic compound” is “salt”, so if I refer to a “salt”, what I mean is “ionic compound.” Don’t mix this up with “table salt”, which is a specific ionic compound, sodium chloride (NaCl).

- **How to tell if a compound is ionic or not by looking at its formula:**
 1. When metals bond to nonmetals, they form ionic compounds. So if there is a metal in the compound formula or name, it is ionic.

 2. The farther two elements are from one another on the periodic table, the more likely the compound is to be ionic.

