Ionic Bonding

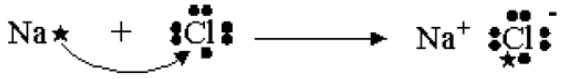
What is an ionic compound?
Ionic compounds are lattices of charged particles (ions), held together by electrostatic forces of attraction. Ions that make up an ionic substance exist in a **fixed ratio**. This ratio depends on the elements involved:

Recall that the most stable electron configuration is full valence shell, often an **octet** (s^2p^6). In general, elements with 1, 2 or 3 valence electrons react by losing electrons. By doing so, the atom becomes a **cation** which is positively charged. In general, elements with 5, 6, or 7 valence electrons react by gaining electrons. By doing so, the atom becomes an **anion** which is negatively charged.

Since a metal and non-metal can achieve a stable electron configuration through opposite means (losing vs. gaining electrons), they will often react during which the electron(s) from the metal is/are transferred to the non-metal.

After this electron transfer occurs, there will be oppositely charged-particles in close proximity to one another, which leads to the formation of a lattice of particles held together by electrostatic forces of attraction. These forces of attraction between ions is what we will refer to as an **ionic bond**

Example 1.

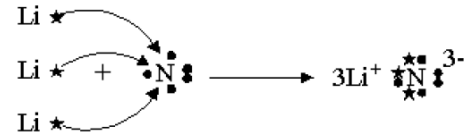


- different "dots" are used for each type of element in order to better track the movement of electrons
- an arrow depicts the **<u>transfer</u>** of the electron(s) from one atom to another
- the charges on the ions are shown, representing the electrostatic force of attraction between them

Example 2:

- in this case, magnesium needs to lose 2 electrons to reach a stable configuration while oxygen needs to gain 2 electrons.
- thus, one Mg atom will react with one Oxygen atom, resulting in an ionic compound in which the ions have 2+ and 2- charges respectively.

Example 3:



- In the reaction between lithium and nitrogen, the number electrons lost/gained per atom differs: lithium loses 1 electron to reach a stable octet, while nitrogen gains 3 electrons.
- Thus, 3 lithium atoms are need for every1 nitrogen.

- This ratio is depicted by a numerical coefficient in front of the lithium (the “1” in front of the N is implied).
- A bracket may also be employed to clearly indicate the ratio: $3[Li^{+}]$