

Lesson 3: Bonds and predicting electron transfer using Bohr Diagrams

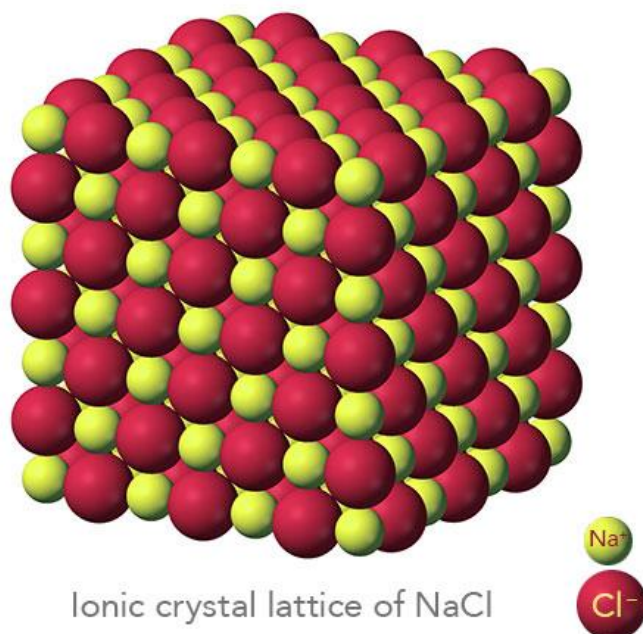
Notes:

Most elements exist in compounds. Compounds form when 2 or more elements combine chemically in a fixed ratio.

Q: How do atoms do this?

A: One method is for atoms to combine chemically using an ionic bond.

Ionic (ionic bonding) resulting in positive and negative ions arranged in regular repeating patterns called lattices. Ionic bonds involve the transfer of electrons from a metal to a nonmetal. e.g., NaCl, $\text{Mg}(\text{OH})_2$



Ionic compounds are hard and have very high melting temperatures because the bonds are strong.

When ionic compounds are melted or dissolved they conduct electricity because the charged ions are able to move freely in these states.

Rules for Ionic Bonding:

1. Metals transfer electrons (e^-) to non-metals until the outermost shell of electrons is full for both the metal and non-metal (i.e., stable...unreactive)
2. The oppositely charged ions attract and the charges must balance.

This link below shows how electrons are transferred between metal and non-metal to form an ionic bond resulting in a crystal lattice structure.

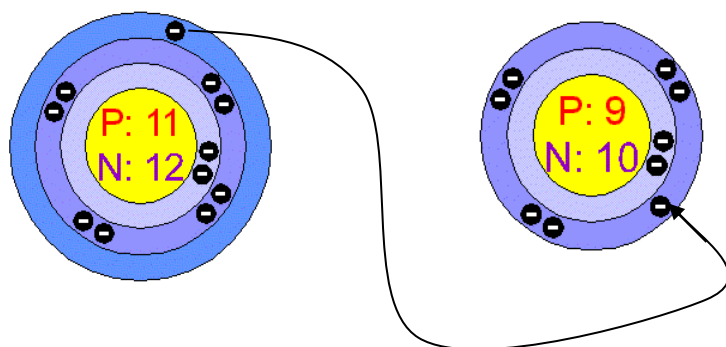
<https://www.youtube.com/watch?v=g-tE6MN-wrE>

Stop the video after ionic bonding.

Practice Problems

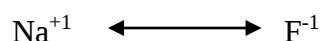
1. Predict how Sodium atoms (Na) combine to form a compound with Fluorine atoms (F)

Orally: Sodium can lose 1e- or gain 7e- to fill the outermost shell. Recall that metals tend to lose e- and become positively charged. Fluorine can gain 1e- or lose 7e-. Recall that non-metals tend to gain e- and become negatively charged.



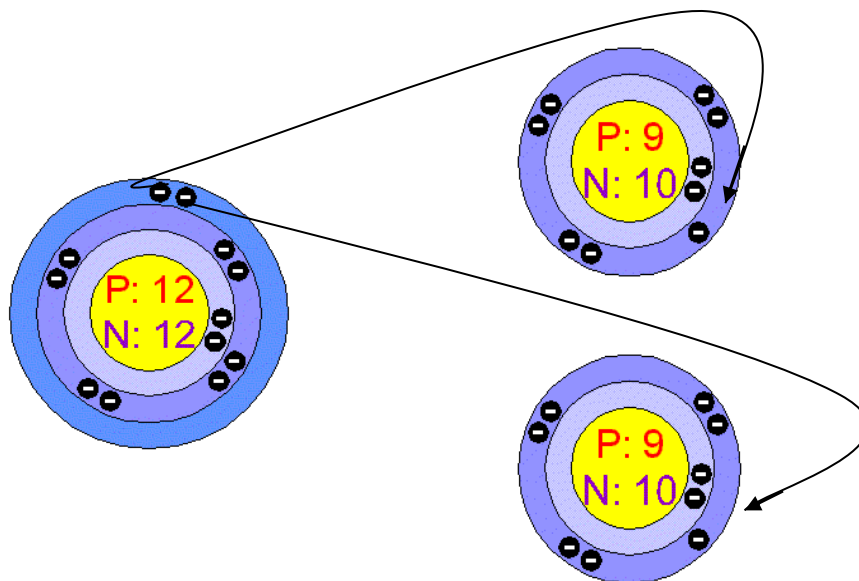
Result:

After the electron transfer has occurred the sodium atom becomes a Na^{+1} ion and the fluorine atom becomes a F^{-1} ion. Since opposite charges attract, the oppositely charged ions attract and form an ionic bond.



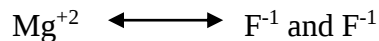
The attraction here is referred to as an electrostatic attraction. Note the overall charge will be zero.

2. Predict how magnesium atoms (Mg) combine to form a compound with Fluorine atoms (F)



Orally: Magnesium will lose 2 e- from it's outer shell b/c it's easier than gaining 6e-. The problem is that a fluorine atom only has room to accept 1e-. This problem is resolved if two fluorine atoms accept 1e- each to balance the charge.

Result: The magnesium atom becomes a Mg^{+2} ion and two fluorine atoms become F^{-1} ions.



Note that there is the same number of electrons in the outermost shell for elements in the same group of the periodic table. This explains why the reactivity of elements in the same group is similar.

Do a few more practice exercises with a variety of metals and non-metals.

Assign: - Worksheet cyu 7.4 page 223 #12, 13, 14, 17.

- Draw ionic Bohr diagrams for Na reacting with S, Mg with O, Mg with F, and K with N.