WEEK 6

Topic: Structure and Bonding

Sub-topic: Formation of Ionic and Covalent Bonds (cont’d)

Objectives: After reading and looking at related diagrams students will predict the likelihood of an atom forming an ionic or a covalent bond based on atomic structure.

Content:

The atomic structure of an element relates to the arrangement of electrons around the central nucleus and is therefore, directly related to bonding and bond formation. The formation of bonds must take into consideration the structure of electrons within atoms, as these electrons are actually involved in the reaction.

The valency, electron configuration, electronegativity and electro-positivity are very important characteristics contributing to chemical bonding.
- Ionic bonds occur between atoms of high electronegativity, and high electro-positivity.
- Only metallic elements are likely to form cations, and two elements are unlikely to form an ionic compound unless one of them is a metal.
- Covalent bonding occurs between atoms of a small difference in electronegativity.
- Covalent bonds occur between nonmetals (atoms mostly at the right of the periodic table).
- Molecules of identical atoms are held together by covalent bonds.
- Lewis Dot Symbols are a way of indicating the number of valence electrons in an atom. They are useful for predicting the number and types of covalent bonds within organic molecules.

![Lewis Dot Symbols](image)

- Bond length: the difference between the nuclei of two atoms, can influence how strong the chemical bond is.
- The octet rule: atom lose, gain or share electrons in order to have a full valence shell of eight electrons. Hydrogen is an exception because it can hold a maximum of two electrons in valency. The number of electrons needed to complete a full valence is crucial in bonding.
Bonding would allow stabilization of each atom, by filling their valence shell.

**VOCABULARY:**

**Chemical Bond:** is a strong attractive force between atoms or ions in a compound.

**Cation:** Atom loses one (or more) electrons. Cations are positive in charge. (Metals = Cations)

**Anion:** Atom gains one (or more) electrons. Anions are negative in charge. (Nonmetals = Anions)

**Crystal Lattices:** The three-dimensional arrangement of atoms.

**Octet Rule:** Each atom would then have 8 (an octet of) electrons in its valence orbitals.

**Ionic Bond:** The electrostatic attraction between ions of opposite charge.

**Nonpolar Covalent Bond:** A bond characterized by the equal sharing of a pair of electrons between atoms.

**Polar Covalent Bond:** A bond characterized by the sharing of one or more pairs of electrons between two different atoms.

**References:**

https://courses.lumenlearning.com/boundless-chemistry/chapter/the-covalent-bond/

https://www.britannica.com/science/chemical-bonding/Hypervalence

https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Map%3A_Organic_Chemistry_(McMurry)/01%3A_Structure_and_Bonding/1.S%3A_Structure_and_Bonding_(Summary)