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November 29, 2022 10:15 AM

Science 9 – Chemistry Topic 2.4 – Concept 3: Covalent compounds are made of molecules.

PART A: What are Covalent Compounds made of?

- Covalent, or molecular, compounds generally result from two non-metals reacting with each other. The elements form a compound by sharing electrons, resulting in an electrically neutral molecule.
- Covalent bond:** a strong attraction between atoms that forms when atoms share valence electrons
- Molecule: a particle made up of two or more neutral atoms bonded together by covalent bonds.

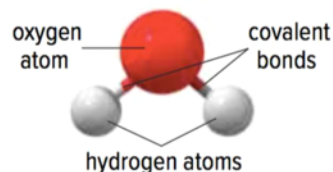


Figure 2.27: Water molecules consist of two hydrogen atoms bonded to one oxygen atom.

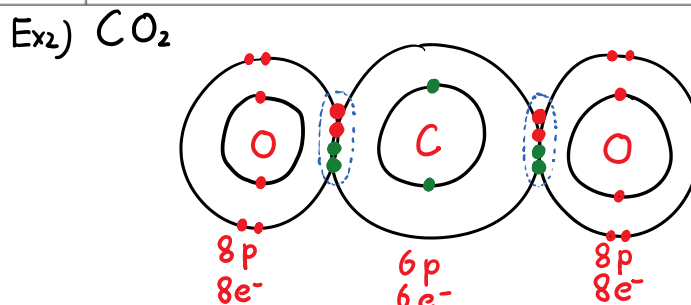
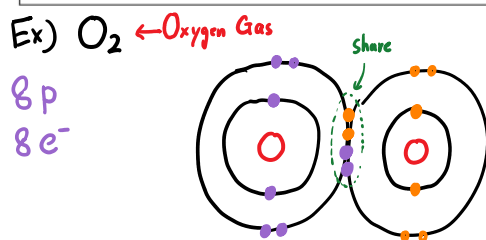
PART B: Formation of Covalent Compounds. Why are the neutral atoms attracted to one another?

- Non-metals in Covalent Compounds achieves stability by sharing electrons to get a full valence shell
- Covalent bonds are similar to a game of tug of war
 - Each team (atom) tries to pull the rope (shared electrons) toward itself
 - Neither side wins, and the bond is the rope that connects them



Example: Water

Two or more neutral Non-metals	A water molecule is formed when the Oxygen atom and the two hydrogen atoms share two pairs of electrons.
<ul style="list-style-type: none"> Neither one of them wants to give up their electron so they decided to <u>share</u> The oxygen atom shares one <u>electron</u> with each of the hydrogen atoms. 	<ul style="list-style-type: none"> Hydrogen atoms achieve a full valence shell of <u>2</u> electrons (⌘) Oxygen atom achieves a full valence shell of <u>8</u> electrons (⌘)



PART C: Three Ways That Atoms Become Stable (Achieve a Full Valence Shell)

- Metal atoms can lose electrons to achieve a full valence shell – Ionic bond

PART C: Three Ways That Atoms Become Stable (Achieve a Full Valence Shell)

1. Metal atoms can lose electrons to achieve a full valence shell – ionic bond

Metals form positive ions because they lose electrons

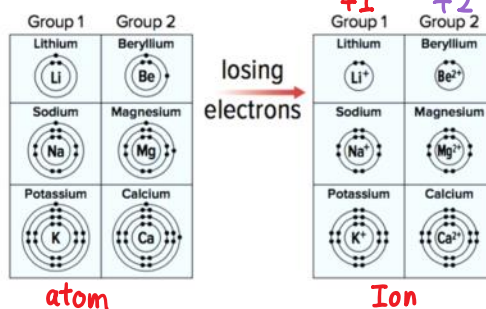
Retain the same number of protons in the nucleus

Example:

Group 1 metal ions have a 1+ charge because they have lost one electron

Group 2 metal ions charge: 2+

Group 3 metal ions charge: 3+



2. Non-metal atoms can gain electrons to achieve a full valence shell – ionic bond

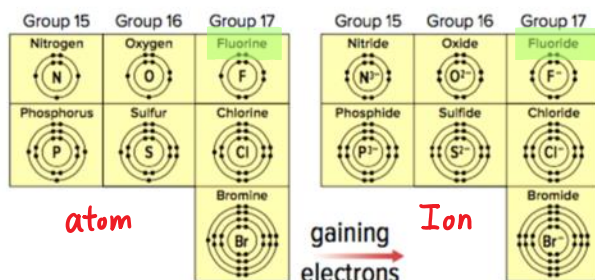
Non-metal form negative ions because they gain electrons

Example:

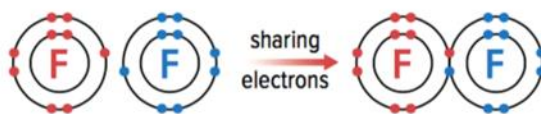
Group 17 non-metals ion charge is 1- because they have gained one electron

Group 16 non-metal ions charge: 2-

Group 15 non-metal ion charge: 3-

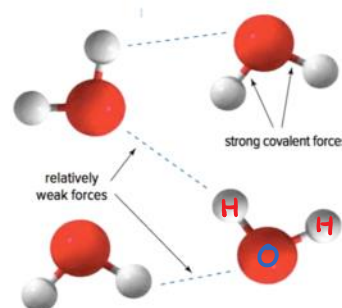


3. Non-metal atoms can also share electrons with other non-metal atoms to achieve a full valence shell – covalent bond



PART D: Properties of Covalent Compounds

- Low melting points:** the bonds that attract one molecule to another in a covalent compound are relatively weak. It takes less energy to separate the molecules apart. (ex, from Solid → Liquid)
- Relatively soft:** weak forces between molecules mean that it's easier for molecules to move and shift
- Poor conductors:** covalent compounds do not have free electrons, and they are poor conductors of electric current and heat



Read Textbook : P.148-149
Do Q1-3 on P.149.

Topic 2.3 / 2.4 Quiz on Friday.