Answer on the question #66377, Chemistry / Other

Question:

State and explain covalent bond with suitable example?

Answer:

Covalent bond is the bond that is formed by sharing of one or more pairs of electrons. This type of bonding is characteristic for non-metallic elements, like oxygen, chlorine, hydrogen etc.

As one can know, atoms of the second and third periods of periodic table combine according to the octet rule. This means, the outer shell of electrons (i.e. valence electrons) of the atom should finally reach the state with eight electrons. Metallic atoms, e.g. sodium Na, have one to three valence electrons, and they are prone to form ionic bonds, donating their electrons to stay with the previous complete shell of electrons.

Contrarily, non-metallic atoms are prone to form covalent bonds between each other, i.e. share electron pairs.

Let's consider an example, hydrogen atom, that consists of proton and electron. To get the shell completed, he needs one more electron (as H is situated in the 1^{st} period, its shell has $1S^1$ electronic structure). Then, in gas phase hydrogen exists as two-atom molecules, where each hydrogen shares the electron pair: H:H, or H_2.

One more example. Let's look at fluorine atom. Its electronic structure is:
$1S^2 2S^2 2P^5$
As fluorine F is situated in the second period, he needs in sum 8 electrons to complete the outer shell. For the moment there are 2+5=7. Thus, fluorine atom combines with other fluorine atom and they share one electronic pair, forming a covalent bond:

$$\begin{array}{c} \cdot\cdot\ \cdot\cdot \\ :F:F: \\ \cdot\cdot\ \cdot\cdot \end{array}$$

Let's consider one heteroatomic molecule, i.e. a molecule with different elements in it. Let's take methane, CH_4. There, carbon has $1S^2 2S^2 2P^2$ electronic structure, so needs 4 additional electrons. As we saw before, each hydrogen also needs one electron to complete the electron shell. Thus, 1 atom of carbon combines with 4 atoms of hydrogen to form covalent bonds and share electron pairs:

$$\begin{array}{c} H \\ \cdot\cdot \\ H:C:H \\ \cdot\cdot \\ H \end{array}$$