CHEMICAL BONDING

The force that holds atoms together to balance the pushing and pulling forces is called the chemical bond.

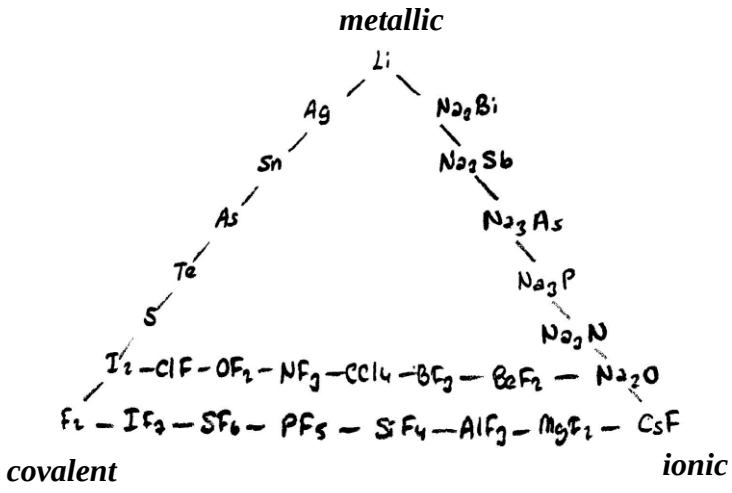
CHEMICAL BONDING

CHEMICAL BONDS IN MOLECULES	***CHEMICAL BONDS BETWEN MOLECULES***
1. *Ionic bonds*	***1.*** *Ion dipole bonds*
2. *Covalent bonds*	***2.*** *Dipole dipole bonds* — *van der*
2.1. Apolar covalent bonds	***3.*** *Ion induced dipole bonds* — *Waals*
2.2. Polar covalent bonds	***4.*** *Dipole induced dipole bonds*
2.3. Coordinate covalent bonds	***5.*** *Instantaneous dipole induced dipole bonds (London)*
3. *Metallic bonds*	***6.*** *Hydrogen bonds*
4. *Hydrogen bonds*	

There are three different bonds depending on whether the atoms are electropositive or electronegative.

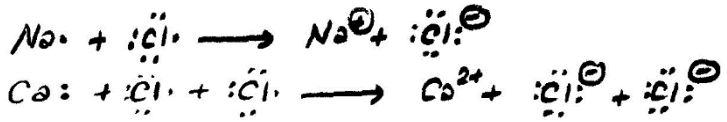
1. *Ionic bond: Electropositive element + electronegative element*
2. *Covalent bond: Electronegative element + electronegative element*
3. *Metallic bond: Electropositive element + electropositive element*

In ionic bond formation, electrons are transferred from one atom to the other. In the covalent bond, electrons are paired between two atoms. In the metallic bond, the valence electrons of atoms move freely throughout the crystal.



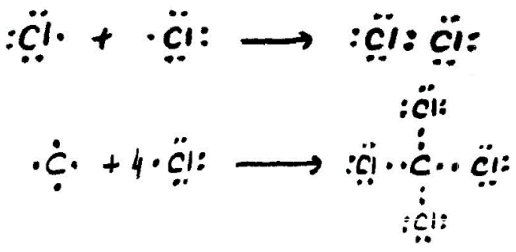
Ionic Bond

It is a bond based on the electron exchange between an atom that has a tendency to give electrons (electropositive) and an atom that has a tendency to receive electrons (electronegative). As a result, the electron-giving atom becomes the negative ion (anion) and the electron-receiving atom becomes the positive ion (cation). In this way, the atoms that form electrostatic pulling forces generate an ionic bonding compound. For example NaCl. The electropositive Na atom, when reacted, wants to reach the electron structure of the noble gas [Ne] which is closest to it. According to this, the Na atom, which its electron configuration is $1s^2 2s^2 2p^6 3s^1$ *reaches to the noble gas structure [Ne] by taking energy and losing an electron in the most outer layer and transformed into sodium ion with +1 charge. The Cl atom, which its electron configuration is* $1s^2 2s^2 2p^6 3s^2 3p^5$ *reaches to the noble gas structure [Ar], which is closest to it, by giving energy and gaining an electron transformed into chloride ion with -1 charge. When Na and Cl atoms react, the Na's outer layer electron is transferred to the outer layer of Cl. Thus* Na^+ *and* Cl^- *ions are formed. Electrostatic pulling between positive and negative ions keeps the ions together in the crystal lattice. This event is energy-related. Because both atoms reach stable noble gas structure. This event is desirable with regard to energy. Because both atoms reach stable noble gas structure.*



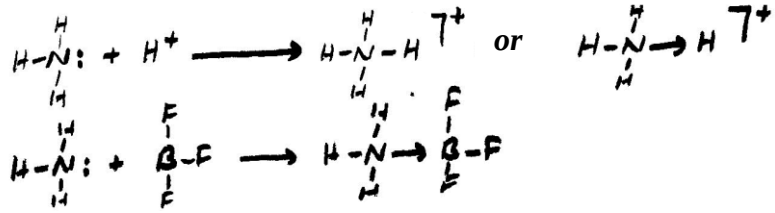
Covalent Bond

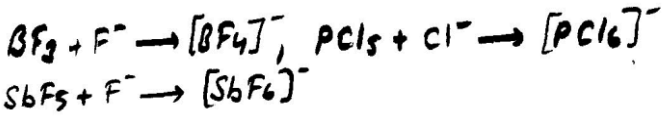
When the two electronegative atoms react with each other, they can only use their electrons jointly in order to achieve the electron structure of the noble gas as both want to gain electrons and none of them tend to give electrons. As a result, covalent bond is a bond formed by the joint use of electrons between two atoms.



Coordinated Covalent Bond

In a single covalent bond, a pair of electrons was joined between two atoms and each atom joined the bond with an electron. The pair of electrons can also be supplied from the same atom. This covalent bond is called as a coordinated covalent bond. The coordinated covalent bond is different from the normal covalent bond in terms of only its formation. There is no difference between the two bond types after they occur.





Metallic Bonds

Metals contain positively charged metal ions in the electron cloud (electron density or electron gas) formed by the valence electrons. Since the ionization energy of the metals is small, each metal atom gives the valence electrons to electron gas and the remaining positive charged metal ions are usually stacked to form three types of the crystal lattice.

1. *Frequent stacked cubic structure (face centered cubic)*
2. *Frequent stacked hexagonal structure*
3. *Body-centered cubic structure*

The electron gas generated by the negatively charged electrons holds the positively charged ions together. Positive and negative charges are exactly equal to each other. The electrostatic pulling between this electron gas and positive metal ions is called a metallic bond. The most important feature of metals is their heat and electrical conductivity. The reason for this conductivity is the moving electrons that are scattered across the entire crystal lattice.