CHEMISTRY STUDY MATERIALS FOR CLASS 10
(NCERT Based notes of Chapter -03)

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METALS AND NON-METALS

IONIC BONDS

Ionic bonding is the complete transfer of valence electron(s) between atoms. It is a type of chemical bond that generates two oppositely charged ions. In ionic bonds, the metal loses electrons to become a positively charged cation, whereas the nonmetal accepts those electrons to become a negatively charged anion. Ionic bonds require an electron donor, often a metal, and an electron acceptor, a nonmetal.

Ionic bonding is observed because metals have few electrons in their outer-most orbitals. By losing those electrons, these metals can achieve noble gas configuration and satisfy the octet rule. Similarly, nonmetals that have close to 8 electrons in their valence shells tend to readily accept electrons to achieve noble gas configuration. In ionic bonding, more than 1 electron can be donated or received to satisfy the octet rule. The charges on the anion and cation correspond to the number of electrons donated or received. In ionic bonds, the net charge of the compound must be zero.

FORMATION OF IONIC BOND:

The positive ions (cations) and negative ions (anions) that are formed experience the electrostatic forces and get attracted to form chemical bond. As this bond is between charged particles known as ions, it is called *ionic bond*. Sometimes based on the forces being electrostatic, the bond is also called *the electrostatic bond.*

As the valence concept has been explained in terms of electrons, it is also called the *electrovalent bond*.

Thus, we can define ionic bond as follows: The electrostatic attractive force that keeps cation and anion together to form a new electrically neutral entity is called ***'ionic bond'*.**

EXAMPLES

FORMATION OF SODIUM CHLORIDE (NaCl):

In sodium chloride; sodium is a metal (alkali metal) and chlorine is non-metal.

Atomic number of sodium = 11

Electronic configuration of sodium: 2, 8, 1

Number of electrons in outermost orbit = 1

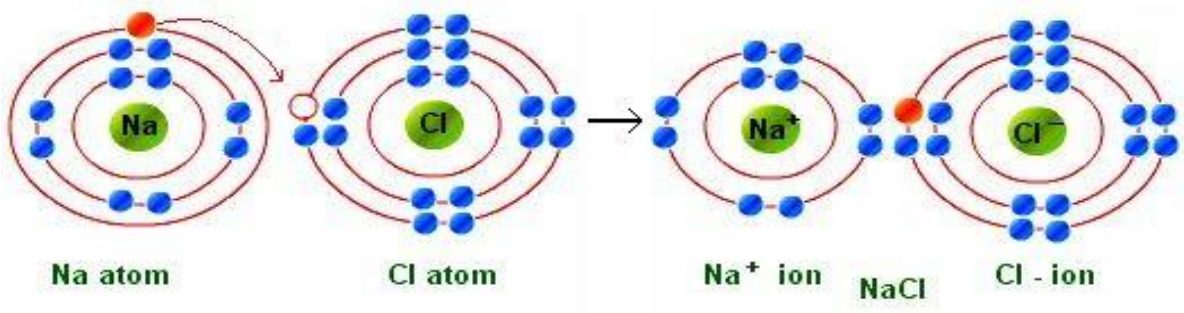
Valence electrons = Electrons in outermost orbit = 1

Atomic number of chlorine = 17

Electronic configuration of chlorine: 2, 8, 7

Electrons in outermost orbit = 7

Therefore, valence electrons = 7



Sodium has one valence electron and chlorine has seven valence electrons. Sodium requires losing one electron to obtain stable configuration and chlorine requires gaining one electron in order to obtain stable electronic configuration. Thus, in order to obtain stable configuration sodium transfers one electron to chlorine.

After loss of one electron sodium gets one positive charge (+) and chlorine gets one negative charge after gain of one electron. Sodium chloride is formed because of transfer of electrons. Thus, ionic bond is formed between sodium and chlorine. Since, sodium chloride is formed because of ionic bond, thus it is called ionic compound. In similar way; potassium chloride (KCl) is formed.

FORMATION OF MAGNESIUM CHLORIDE ($MgCl_2$):

The atomic number of magnesium is 12

Electronic configuration of magnesium: 2, 8, 2

Number of electrons in outermost orbit = 2

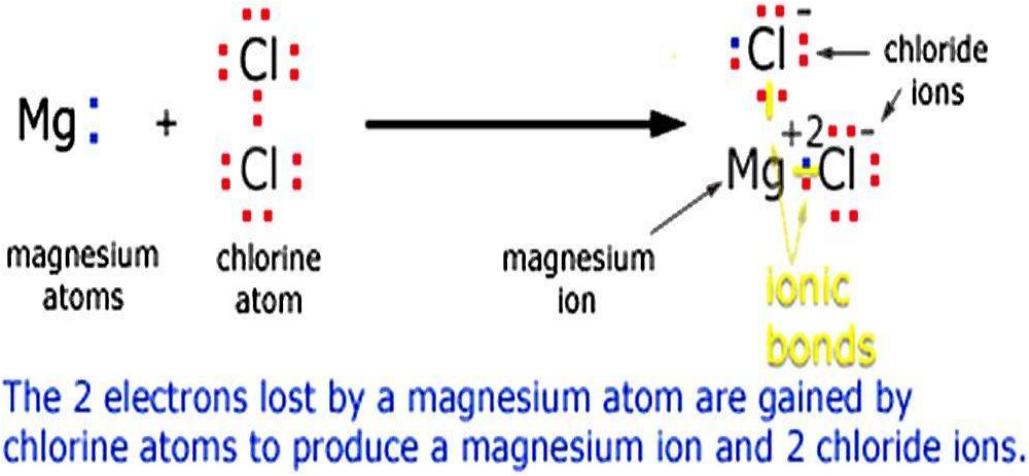
Valence electron = 2

Atomic number of chlorine = 17

Electronic configuration of chlorine: 2, 8, 7

Electrons in outermost orbit = 7

Therefore, valence electrons = 7



Magnesium loses two electrons in order to obtain stable electronic configuration. Each of the two chlorine atoms gains one electron lost by magnesium to obtain stable electronic configuration. The bonds so formed between magnesium and chlorine are ionic bonds and compound (magnesium chloride) is an ionic compound.

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