CHEMISTRY STUDY MATERIALS FOR CLASS 10
(NCERT Based notes of Chapter -04)

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CARBON AND ITS COMPOUND

CARBON: INTRODUCTION

Carbon is the fourth most abundant element in the universe by mass. It is also the second most abundant element in the human body after oxygen. It is the 15th most common element in the Earth's crust. Carbon was discovered in prehistory and it was known to the ancients. They used to manufacture charcoal by burning organic material.

Carbon is a non-metal. It belongs to the fourteenth group in the modern periodical table. The elements of this group have four electrons in the valence shell.

Atomic Number: 6

Electronic configuration: 2, 4

Valence electrons: 4

Property: Non-metal

Compounds having carbon atoms among the components are known as carbon compounds. Previously, carbon compounds could only be obtained from a living source; hence they are also known as organic compounds.

BONDING IN CARBON: COVALENT BOND

Bond formed by sharing of electrons is called covalent bond. Two of more atoms share electrons to make their configuration stable. In this type of bond, all the atoms have similar rights over shared electrons. Compounds which are formed because of covalent bond are called COVALENT COMPOUNDS.

FORMATION OF COVALENT BONDS

1. **Covalent band** is the chemical bond formed through the **sharing of electrons between two non-metal atoms**.
2. Compounds which have covalent bonds are called **covalent compounds**.
3. Examples of covalent compounds or molecules are

   Chlorine, Cl_2, Carbon dioxide, CO_2, Ammonia, NH3, Water, H2O
4. During the formation of covalent molecules, **each non-metal covalent atom** provides one, two or three electrons to be **shared** with other atoms. The bond formed is called a covalent bond.
5. Through this process, each non-metal atom in covalent molecules will achieve **stable electron arrangement**.
6. The type of covalent bond formed in a covalent compound depends on the number of electron pairs shared between non-metal atoms.

Covalent bonds are of three types: Single, double and triple covalent bond.

SINGLE COVALENT BOND

1. A single covalent bond is the covalent bond formed through the **sharing of a pair of electrons between two non-metal atoms**.
2. Each non-metal atom contributes one electron for sharing to achieve a **stable electron arrangement**.
3. Example of single covalent compound are chlorine gas, Cl_2, hydrogen chloride, HCl, water, H_2O, methane, CH_4, ammonia, NH_3, and tetrachloro methane, CCl_4.
4. Single covalent bonds can also be formed between different non-metal atoms.

Formation of hydrogen molecule (H_2)

Atomic Number of H = 1

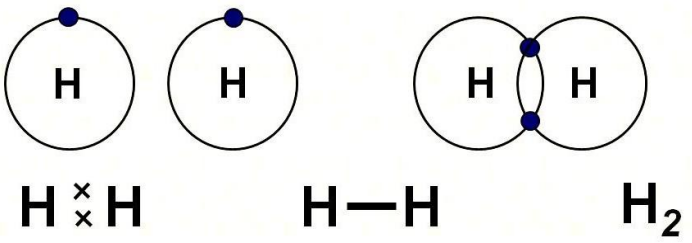
Electronic configuration of H = 1

Valence electron of H = 1

Hydrogen forms a duet, to obtain stable configuration.

This configuration is similar to helium (a noble gas).

Since, hydrogen has one electron in its valence shell, so it requires one more electron to form a duet. So, in the formation of hydrogen molecule; one electron from each of the hydrogen atoms is shared.



Formation of hydrogen chloride (HCl):

Valence electron of

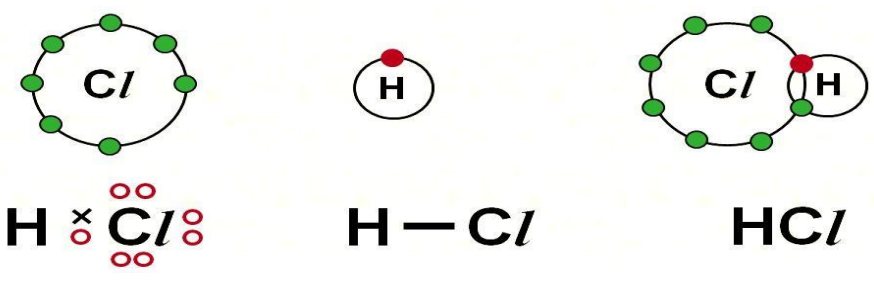
hydrogen = 1 Atomic

number of chlorine = 17

Electronic configuration of chlorine: 2, 8, 7

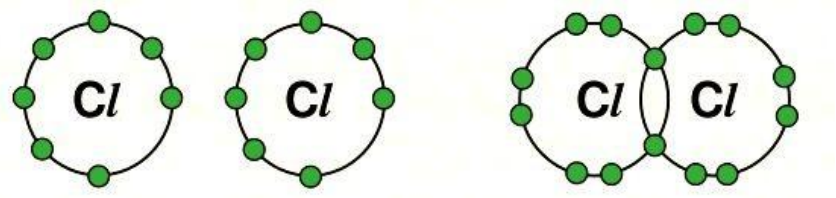
Electrons in outermost orbit = 7

Valence electron = 7



Formation of chlorine molecule (Cl_2):

Valence electron of chlorine = 7



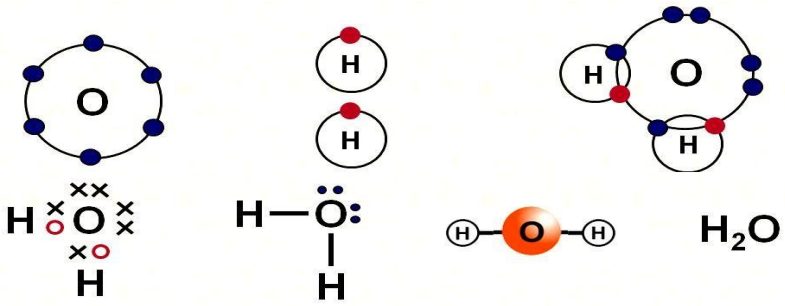
Formation of water (H_2O)

Valence electron of hydrogen = 1

Atomic number of oxygen = 8

Electronic configuration of oxygen = 2, 6

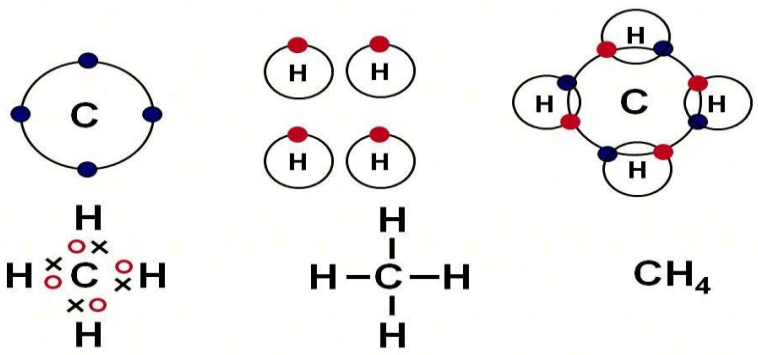
Valence electron = 6



Formation of Methane (CH_4)

Valence electron of carbon = 4

Valence electron of hydrogen = 1



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