CLASS 10- SCIENCE

CHAPTER 4 – CARBON AND ITS COMPOUNDS

PART 1 – COVALENT BONDING

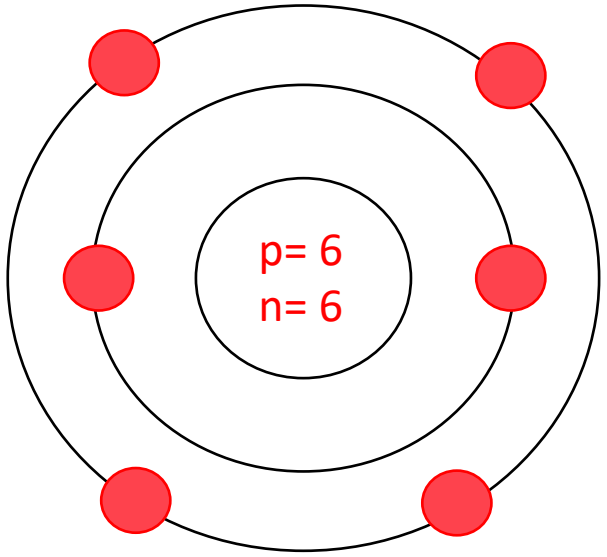
INTRODUCTION

- The element carbon is very significant to us in the elemental as well as in the combined form, in spite of its small amount being present in nature.
- All our day to day items like food, clothes, medicines, books, etc. are based on carbon itself.
- All living structures are also carbon based.
- The earth's crust has only 0.02% carbon in the form of minerals like carbonates, hydrogen carbonates etc.

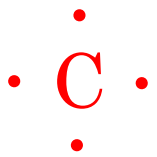
INTRODUCTION (contd.)

- Carbon is present in fuels like wood, coal, charcoal, coke, petroleum, natural gas, biogas, marsh gas etc.
- Fossil fuels also contain a high percentage of carbon.
- Carbon is found in free state as diamond, graphite, fullerenes etc.
- Likewise, the atmosphere has only 0.03% of carbon-dioxide.

BASIC ATOMIC STRUCTURE OF CARBON



No. of protons = 6
No. of electrons = 6
No. of neutrons = 6
Electronic configuration = 2,4
Electron dot structure of Carbon-



LEWIS ELECTRON DOT STRUCTURE

→ Almost all chemical bonds are formed by interactions of valence electrons in atoms.

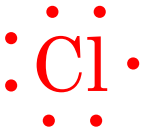
→ Lewis electron dot diagram is a simple representation of the valence electrons of an atom using dots around the symbol of the element.

→ The number of dots equals the number of valence electrons in the atom.

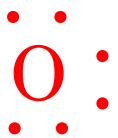
→ The dots are arranged to the right, left, above and below the symbol of the element.

→ Examples

Magnesium



Chlorine



Oxygen

BONDING IN CARBON

- The atomic number of carbon is 6 and its electronic configuration is 2,4.
- It requires four more electrons in its valence shell to attain the nearest noble gas electronic configuration.
- If it gains four electrons to become C^{4-} anion, then it would be difficult for the nucleus with six protons to hold ten electrons.
- Similarly, if it loses four electrons to become C^{4+} cation, then it would require a large amount of energy to remove four electrons.
- Carbon overcomes this problem by sharing its valence electrons with other carbon atoms or with atoms of other elements.

COVALENT BONDING

- Definition- The bond formed by mutual sharing of electron pairs between two atoms in a molecule is known as covalent bond.
- The covalent bond can be formed between two similar or dissimilar atoms by mutual sharing of electrons.
- Examples- H-H, C-C (bonding between similar atoms)

  C-H, C-O (bonding between dissimilar atoms)
- Through this mutual sharing, both the atoms become stable by acquiring the nearest noble gas electronic configuration.
- The compounds formed due to covalent bonding are called covalent compounds.

PHYSICAL PROPERTIES OF COVALENT COMPOUNDS

1) Electrical Conductivity- Covalent compounds are poor conductors of electricity because they do not contain ions or free electrons for conduction of electricity.

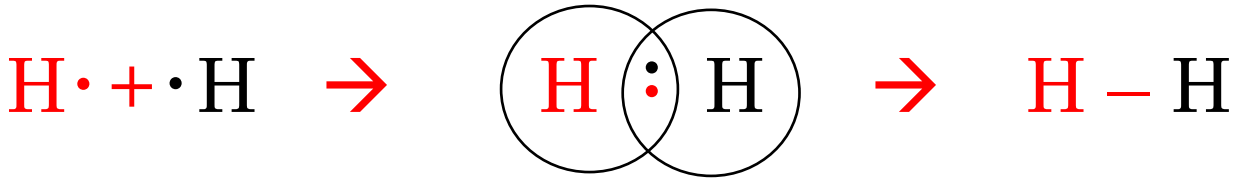
2) Melting and Boiling Points- Covalent compounds have low melting and boiling points due to weak forces of attraction between the molecules and so less amount of energy is required to overcome these forces of attraction.

TYPES OF COVALENT BOND

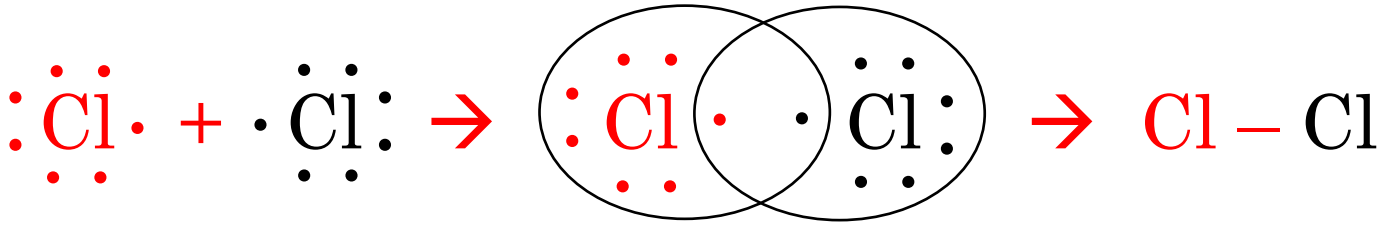
- Single covalent bond- When a covalent bond is formed by mutual sharing of two electrons i.e. one pair of electrons, it is called single covalent bond.

Examples

Hydrogen Molecule



Chlorine Molecule

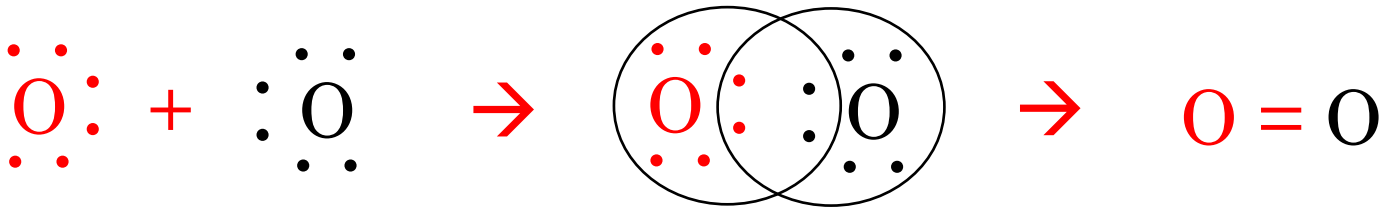


TYPES OF COVALENT BOND (contd.)

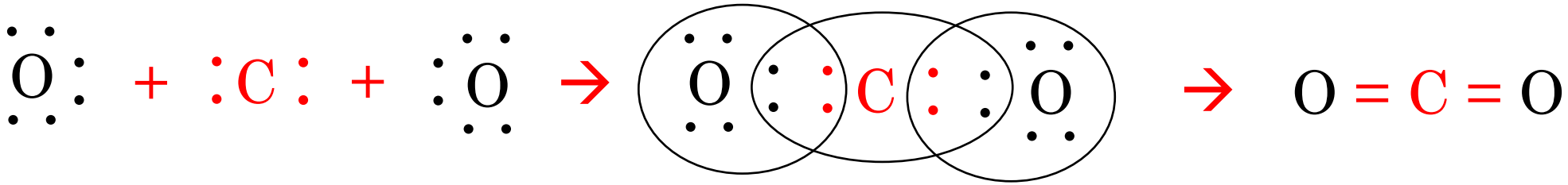
- Double covalent bond- When a covalent bond is formed by mutual sharing of four electrons i.e. two pairs of electrons, it is called double covalent bond.

Examples

Oxygen Molecule



Carbon-dioxide Molecule

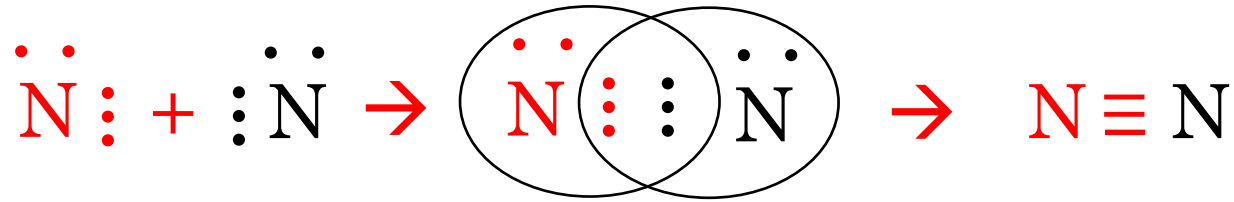


TYPES OF COVALENT BOND (contd.)

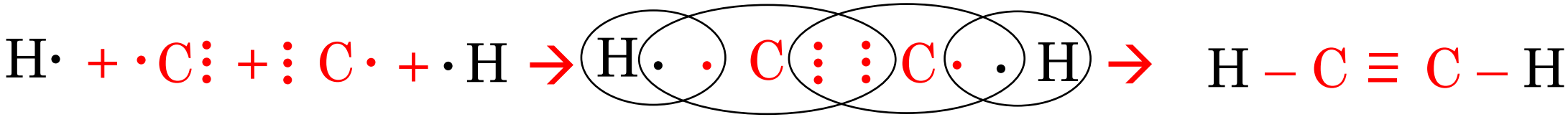
- Triple covalent bond- When a covalent bond is formed by mutual sharing of six electrons i.e. three pairs of electrons, it is called triple covalent bond.

Examples

Nitrogen Molecule



Acetylene (Ethyne) Molecule



THANK YOU