

## What is Atomic bond?

An atomic bond is an attraction between atoms that allows the formation of chemical substances that contain two or more atoms. The bond is caused by the electrostatic force of attraction between opposite charges, either between electrons and nuclei, or as the result of a dipole attraction.

### Types of Atomic bonds:

There are major five types of atomic bonding:

1. Ionic Bond
2. Covalent Bond
3. Co-Ordinate Covalent Bond
4. London Dispersion Forces
5. Hydrogen Bonds

### Explanation of bonds:

#### Ionic Bond:

Ionic bonding is a type of electrostatic interaction between atoms which have a large electronegativity difference. There is no precise value that distinguishes ionic from covalent bonding, but a difference of electronegativity of over 1.7 is likely to be ionic, and a difference of less than 1.7 is likely to be covalent. Ionic bonding leads to separate positive and negative ions. Ionic charges are commonly between  $-3e$  to  $+3e$ . Ionic .

#### Covalent Bond:

Covalent bonding is a common type of bonding, in which the electronegativity difference between the bonded atoms is small or nonexistent. Bonds within most organic compounds are described as covalent.

A polar covalent bond is a covalent bond with a significant ionic character. This means that the electrons are closer to one of the atoms than the other, creating an imbalance of charge. They occur as a bond between two atoms with moderately different electronegativities, and give rise to dipole-dipole interactions. The electronegativity of these bonds is 0.3 to 1.7 .

Molecules which are formed primarily from non-polar covalent bonds are often immiscible in water or other polar solvents, but much more soluble in non-polar solvents such as hexane.

#### Co-Ordinate Covalent Bond:

A coordinate covalent bond is one where both bonding electrons are from one of the atoms involved in the bond. These bonds give rise to Lewis acids and bases. The electrons are shared roughly

equally between the atoms in contrast to ionic bonding. Such bonding occurs in molecules such as the ammonium ion ( $\text{NH}_4^+$ ) and are shown by an arrow pointing to the Lewis acid. Also known as non-polar covalent bond, the electronegativity of these bonds range from 0 to 0.3.

### **London dispersion forces:**

London dispersion forces (LDF, also known as dispersion forces, London forces, instantaneous dipole–induced dipole forces, or loosely van der Waals forces) are a type of force acting between atoms and molecules. They are part of the van der Waals forces. The LDF is named after the German-American physicist Fritz London.

The LDF is a weak intermolecular force arising from quantum-induced instantaneous polarization multipoles in molecules. They can therefore act between molecules without permanent multipole moments.

### **Hydrogen Bond:**

A hydrogen bond is the electrostatic attraction between polar molecules that occurs when a hydrogen (H) atom bound to a highly electronegative atom such as nitrogen (N), oxygen (O) or fluorine (F) experiences attraction to some other nearby highly electronegative atom. The name *hydrogen bond* is something of a misnomer, as it is not a true bond but a particularly strong dipole-dipole attraction, and should not be confused with a covalent bond.

These hydrogen-bond attractions can occur between molecules (*intermolecular*) or within different parts of a single molecule (*intramolecular*). The hydrogen bond (5 to 30 kJ/mole) is stronger than a van der Waals interaction, but weaker than covalent or ionic bonds. This type of bond can occur in inorganic molecules such as water and in organic molecules like DNA and proteins.

Intermolecular hydrogen bonding is responsible for the high boiling point of water (100 °C) compared to the other group 16 hydrides that have no hydrogen bonds.