

Chapter-4

Chemical Bonding

Electronegativity

Electronegativity of atom is ability of bonding atom to attract shared pair (bond pair) of electron toward itself.

Factors Affecting electronegativity

1. Nuclear charge

Atoms in the same period with a greater (positive) nuclear charge are more likely to attract the bonding pair of electrons.

2. number of shell or size.

Atoms in the same group in which the outer electrons are further from the nucleus are less likely to attract the bonding pair of electrons because the pull of the positive nucleus on the electron pair is lower.

3. shielding effect.

The greater the number of inner electron shells and sub-shells, the lower the effective nuclear charge on the bonding electrons.

Variation in a period

- Electronegativity increase from left to right on a period.
- This is due to increased nuclear charge and insignificant shielding, nuclear pull to shared pair of electron increased.

Variation in a group

- Decreased on down the group because
- Number of shell and shielding both increases which overcome increased nuclear charge.
- Nuclear pull decreases.

Application of electronegativity

Pauling's electronegativity value helps in predicting:

• **Type of bonds**

Electronegativity difference	Type of bond	remarks
0	Covalent	No ionic character
0-1	Covalent	Non-polar
1-2	Covalent/ionic	Polar/significant ionic character
Above 2	Ionic bond	-

• **Polarity of bonds**

When covalent bond is formed between atoms with different electronegativity, more electronegative atoms attract share pair of electrons toward itself (electron distribution is unsymmetric).

Two bonding atom develop partial charge, atoms with less electronegativity contain $\delta+$ charge and atom with higher electronegativity contain $\delta-$ charge. These bonds are known as polar bond.

Types of Chemical bond

1. Covalent bond

- Covalent bond is formed by sharing numbers of electron by bonding atoms, which is achieved by overlapping of orbitals.
- The force of attraction is between shared pair of electrons and nuclei of bonding atoms

2. Coordinate covalent bond/ dative bond

- Dative bond is formed by sharing of pair of electrons between two atoms by one of the bonding atoms.
- The donor atoms must be covalently bonded to other atoms.
- The receiver atoms must lack two electrons for duplet/octet.

3. Ionic bond

- The strong force of attraction between positive and negative ions in ionic crystal lattice results in an ionic bond.
- Formed by transfer of electron when metal combines with non-metal.

4. Metallic bond

- In metals, positive metal ions are fixed in a crystal lattice and surrounded by mobile delocalised (sea of) electrons.
- Metallic bond is strong electrostatic attraction between the positive metal ions and sea of negative delocalised electrons.

Factors affecting metallic bond strength

- Number of valence electrons
- Metallic radius

Characteristic of metallic bond/metals

- High melting and boiling points
- Good conductor of heat and electricity
- Malleability and ductility