Organic Chemistry Terms

Organic Chemistry Basic Principles
Terms and definitions

Organic Chemistry Basic Principles: Terms and Definitions

1. **Organic Chemistry**: The branch of chemistry that deals with the structure, properties, and reactions of compounds that contain carbon.
2. **Hydrocarbons**: Compounds composed entirely of carbon and hydrogen atoms.
    - **Alkanes**: Saturated hydrocarbons with single bonds (C-C).
    - **Alkenes**: Unsaturated hydrocarbons with at least one double bond (C=C).
    - **Alkynes**: Unsaturated hydrocarbons with at least one triple bond (C≡C).
    - **Aromatic Hydrocarbons**: Compounds that contain benzene rings or similar structures.
3. **Functional Groups**: Specific groups of atoms within molecules that determine the characteristics and chemical reactivity of those molecules.
    - **Alcohols**: -OH group.
    - **Aldehydes**: -CHO group.
    - **Ketones**: >C=O group within the carbon chain.
    - **Carboxylic Acids**: -COOH group.
    - **Esters**: -COO- group.
    - **Ethers**: -O- group.
    - **Amines**: $-NH_2$, -NHR, $-NR_2$ groups.
    - **Amides**: $-CONH_2$ group.
4. **Isomerism**: Compounds with the same molecular formula but different structural formulas.
    - **Structural Isomerism**: Different connectivity of atoms.
    - **Stereoisomerism**: Same connectivity, different spatial arrangement.
        - **Geometric (cis-trans) Isomerism**: Different spatial arrangement around a double bond or ring.
        - **Optical Isomerism**: Non-superimposable mirror images (chiral molecules).
5. **Nucleophiles and Electrophiles**:
    - **Nucleophile**: A species that donates an electron pair to form a chemical bond.
    - **Electrophile**: A species that accepts an electron pair to form a chemical bond.
6. **Reaction Mechanisms**: Step-by-step sequence of elementary reactions by which overall chemical change occurs.
    - **Addition Reactions**: Two or more molecules combine to form a larger molecule.
    - **Elimination Reactions**: A single molecule splits into two or more smaller molecules.
    - **Substitution Reactions**: One atom or group of atoms in a molecule is replaced by another atom or group of atoms.
    - **Rearrangement Reactions**: The structure of a molecule is rearranged to form a new molecule.
7. **Hybridization**: The concept of mixing atomic orbitals to form new hybrid orbitals suitable for the pairing of electrons.

    - **sp**: Linear, 180° bond angles.
    - **sp^2**: Trigonal planar, 120° bond angles.
    - **sp^3**: Tetrahedral, 109.5° bond angles.
8. **Resonance**: The concept where a molecule can be represented by two or more valid Lewis structures (resonance structures).
9. **Inductive Effect**: The polarization of sigma bonds within a molecule due to electronegativity differences between atoms.
10. **Hyperconjugation**: Delocalization of electrons by the overlap of a sigma orbital with an adjacent empty or partially filled p-orbital or a π-orbital.
11. **Aromaticity**: A property of cyclic compounds with conjugated π-electron systems that results in unusual stability (Hückel's rule: 4n + 2 π electrons).
12. **Electronegativity**: The tendency of an atom to attract electrons towards itself in a chemical bond.
13. **Acidity and Basicity**:
    - **Acids**: Proton donors (Brønsted-Lowry) or electron pair acceptors (Lewis).
    - **Bases**: Proton acceptors (Brønsted-Lowry) or electron pair donors (Lewis).
14. **Tautomerism**: The equilibrium between two structural isomers that differ in the position of a proton and a double bond (e.g., keto-enol tautomerism).