Chapter 9

Haloalkanes and Haloarenes

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CLASSIFICATION OF HALOARENES

Introduction of Haloalkanes and Haloarenes

Alkyl halides, also known as haloalkanes, and aryl halides, also known as haloarenes, are organic compounds derived from aliphatic and aromatic hydrocarbons, respectively, through the substitution of one or more hydrogen atoms with halogen atoms. In haloalkanes, each halogen atom is bonded to a sp^3 hybridized carbon atom within the alkyl group. Conversely, in haloarenes, each halogen atom is attached to a sp^2 hybridized carbon atom within the aryl group.

Classification of Haloalkanes

The classification of haloalkanes, also known as alkyl halides, is based on the type of carbon atom to which the halogen atom is bonded. Haloalkanes can be categorized into three main classes:

(i) Primary halide: When the carbon atom bearing the halogen is either connected to just one other carbon atom or not connected to any carbon atom.

Example:

$$CH_3 - X, R - CH_2 - X$$

(ii) Secondary halide: If two carbon atoms are bonded to the halogen bearing carbon.

Example:

(iii) Tertiary halide: Three other carbon atom bonded to the halogen bearing carbon atom.

Example:

- Chemical Properties of Haloarenes (Electrophilic substitution reaction)
- Physical Properties
  - Physical Properties of Haloalkanes
- Polyhalogen Compounds
  - Formation of Alcohols & Preparation of Amines
  - Williamson's synthesis (preparation of ethers)
  - Preparation of Cyanides & Isocyanides
  - Preparation of Ester
  - Optical Activity
  - R-S Configuration and Nomenclature

Classification of Haloalkanes

Haloalkanes can be categorized into the following three distinct groups:

(i) Mon haloalkanes: These are haloalkanes that contain only one halogen atom bonded to the alkane structure.

(ii) Dihaloalkanes: Dihaloalkanes are a class of haloalkanes in which there are two halogen atoms bonded to the alkane structure.

(iii) Polyhaloalkanes: This category comprises haloalkanes with more than two halogen atoms attached to the alkane structure, making them highly halogenated compounds.

These classifications help us differentiate haloalkanes based on the number of halogen substituents they possess, which can significantly affect their chemical properties and reactivity.

Classification of Mono Halocompounds (Alkylic, Benzylic)

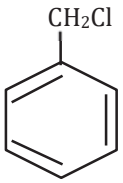
Mono halocompounds, also known as alkyl halides or haloalkanes, can be further classified based on the position of the halogen atom relative to the functional groups present in the molecule.

The two main classifications are:

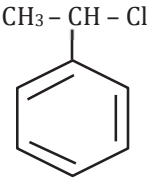
(a) **Allylic halides** are organic compounds wherein a halogen atom is attached to a carbon atom that is sp^3 hybridized and located adjacent to a carbon-carbon double bond.

$CH_2 = CH–CH_2–Cl$	$CH_3–CH=CH–CH_2–Cl$
3–Chloropropene (1°)	1–Chlorobut–2–ene (1°)

(b) **Benzylic halides**, on the other hand, are organic compounds where a halogen atom is bonded to a carbon atom that is sp^3 hybridized and situated next to an aromatic ring.



Benzyl chloride (1°)



1-Chloro-1-phenylethane (2°)

Classification of Mono Halocompounds (Vinyl, Aryl)

Mono halocompounds type of carbon atom to which the halogen atom is bonded.

Two common classifications are:

(i) **Vinyl Halides** are compounds where the halogen atom is directly bonded to a sp^2-hybridized carbon atom that is part of a carbon-carbon double bond. These compounds are commonly found in organic synthesis and are important intermediates in various chemical reactions.

(ii) **Aryl Halides** are compounds where the halogen atom is bonded to a carbon atom that is part of an aromatic ring, also known as an aryl group. These compounds are widely used in organic synthesis and are often found in pharmaceuticals, agrochemicals, and materials science.