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CHEMISTRY

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CLASS 11 & 12th



Learning Inquiry
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CLASS 12th

Haloalkanes & Haloarenes

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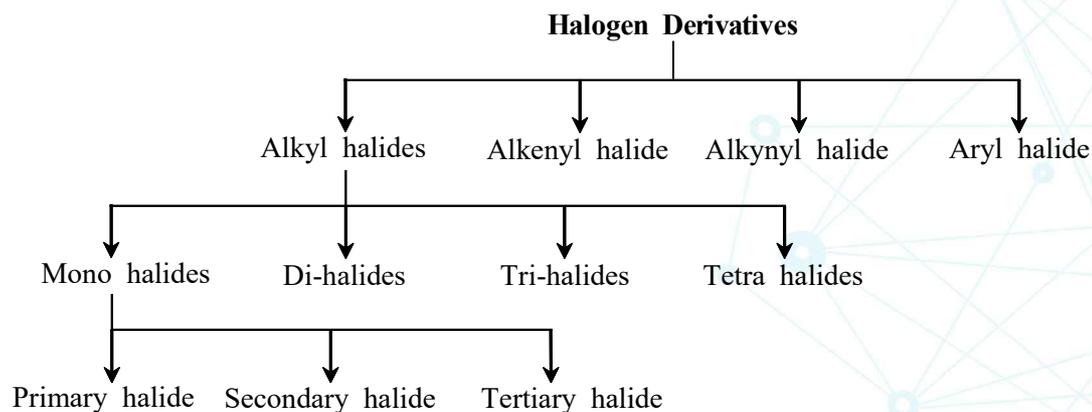


01. Introduction

Compounds derived from hydrocarbons by replacement of one or more H-atoms by corresponding no. of halogen atoms are known as halogen derivatives.

Classification :

On the basis of nature of hydrocarbon from which they are obtained, hydrocarbon derivatives can be classified as :



- (i) **Mono halides** : These involves replacement of one H-atom by halogen atom.

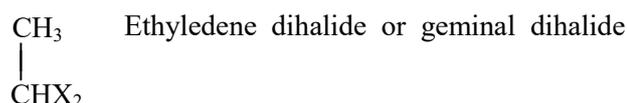
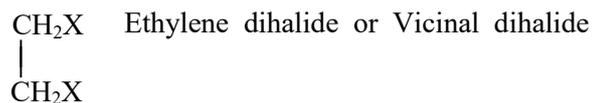
General formula $C_nH_{2n+1}X$, where $X = F, Cl, Br, I$.

Example : CH_3Cl Methyl chloride (Chloro methane)
 CH_3CH_2Br Ethyl bromide (Bromo ethane)

- (ii) **Dihalides** : Replacement of two H-atom by halogen atoms.

General formula $C_nH_{2n}X_2$,

Example :



- (iii) **Trihalides** : Replacement of three H-atoms by halogen atoms.

General formula $C_nH_{2n-1}X_3$.

Example : CHX_3 Trihalo methane or haloform

- (iv) **Tetra halide and Perhalo compounds** : Replacement of 4 H-atoms by halogen atom (in

$CH_4 \rightarrow CCl_4$) \rightarrow Tetrahalides.

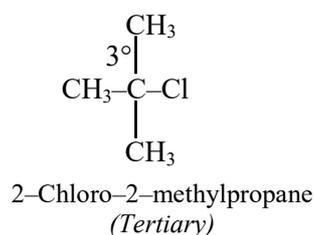
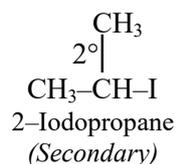
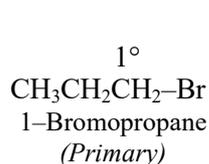
When all the H-atoms from an alkene are replaced by halogen atoms, then the compounds are called as perhalo compound.

General formula $C_nH_{2n-2}X_4$ (tetra halide).

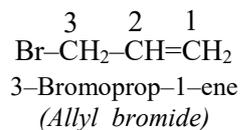
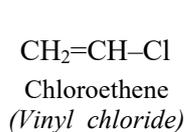
$CH_4 \rightarrow CX_4$ (per halo methane)

02. IUPAC Nomenclature

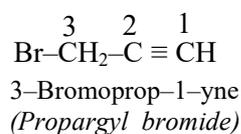
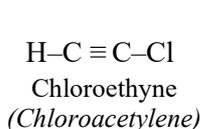
Classification of alkyl halides



Haloalkenes or Alkenyl halides

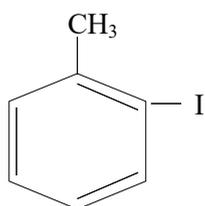


Haloalkynes or Alkynyl halides



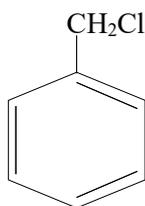
Aromatic halogen compounds

(i) Nuclear halogen derivatives

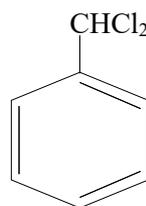


2-Iodo-1-methylbenzene or
2-Iodotoluene (*o*-Iodotoluene)

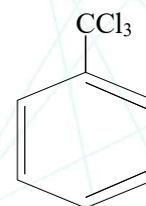
(ii) Side chain halogen derivatives alkyl halides :



1-chloro-1-phenylmethane
(Benzyl chloride)

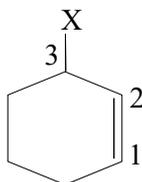
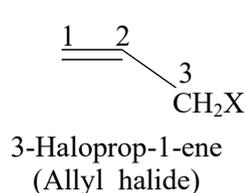


1,1-Dichloro-1-phenylmethane
(Benzal dichloride)

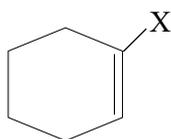


1,1,1-Trichloro-1-phenylmethane
(Benzotrichloride)

Allylic halides



Vinylic halides

 Haloethene
(*Vinyl halide*)

 1-Halocyclohex-1-ene
(*A Vinyl halide*)

Alkylidene dihalides

 1,1-Dibromoethane
(*Ethylidene dibromide*)

 2,2-Dichloropropane
(*Isopropylidene dichloride*)

Alkylene dihalides

 1,2-Dibromoethane
(*Ethylene dibromide*)

 1,2-Dichloropropane
(*Propylene dichloride*)

Polyhaloalkanes

 Trichloromethane
(*Chloroform*)

 Triiodomethane
(*Iodoform*)

 Tetrachloromethane
(*Carbon tetrachloride*)

 Octafluoropropane
or Perfluoropropane

03. Nature of C-X Bond

Alkyl halides are generally more reactive than the corresponding alkanes due to the presence

of polar covalent $\left(\overset{\delta+}{\text{C}}-\overset{\delta-}{\text{X}}\right)$ bond. So alkyl halides (R-X) undergo nucleophilic substitution reaction.

The center for attacking Nu^\ominus is $\overset{\oplus}{\text{C}}$ atom.

Since the size of halogen atom increases as we move down the group in the periodic table, fluorine atom is the smallest and iodine the largest. Consequently, the carbon-halogen bond length increases and bond enthalpy decreases from C-F to C-I.

Further, as we move from F to I, the electronegativity of the halogen decreases, therefore, the polarity of the C-X bond and hence the dipole moment of the haloalkane should also decrease accordingly. But the dipole moment of CH₃F is slightly lower than that of CH₃Cl.

The reason being that although the magnitude of -ve charge on the F atom is much higher than that on the Cl atom but due to small size of F as compared to Cl the C - F bond distance, i.e. dipole moment of CH₃F turns out to be slightly lower than that of CH₃Cl.