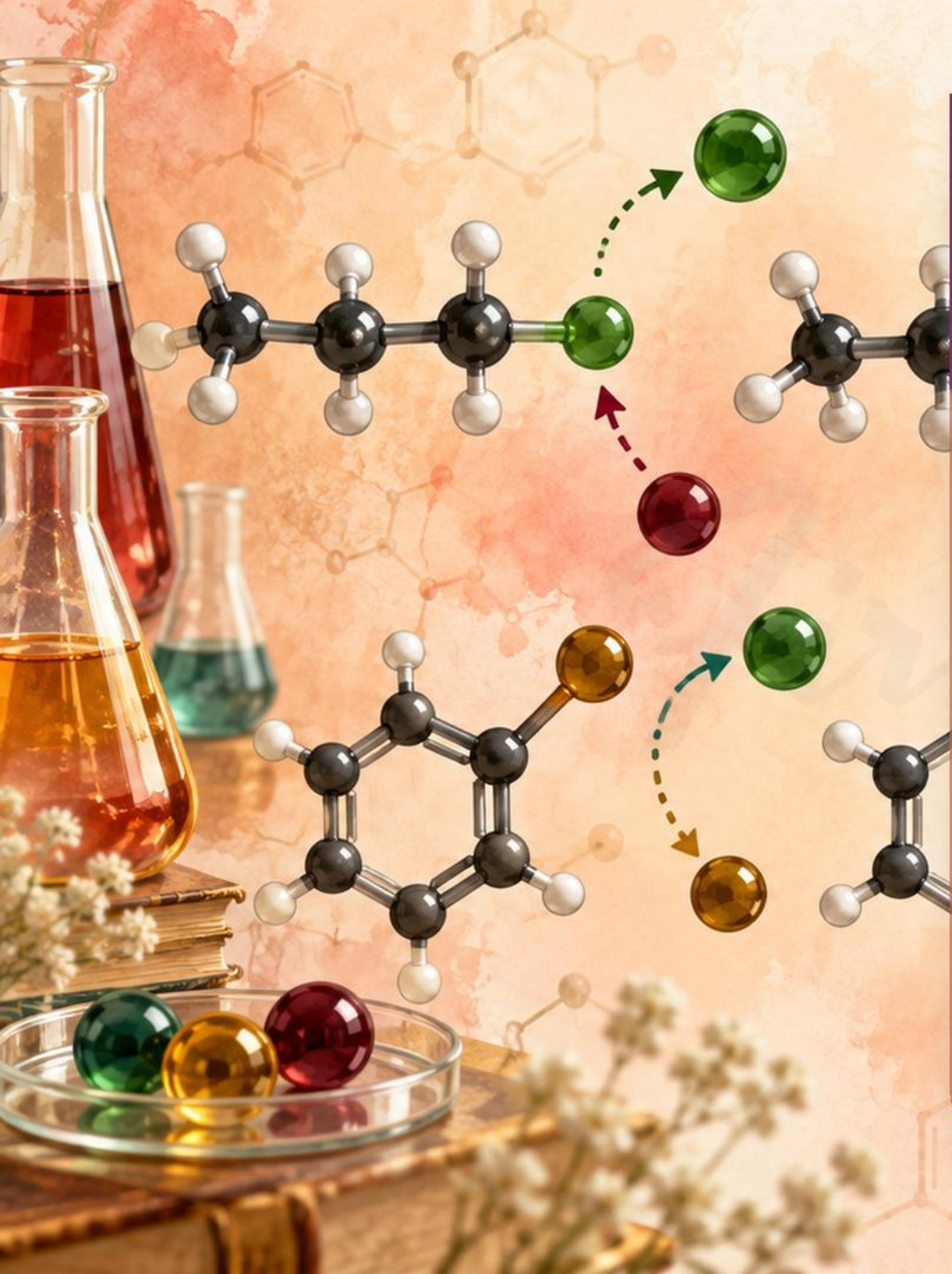




CHEMISTRY • CLASS 12

CHAPTER 6

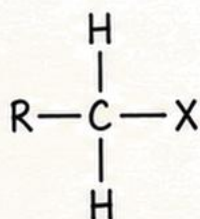
Haloalkanes and Haloarenes

CHAPTER NOTES

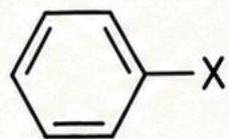
HALOALKANES AND HALOARENES — OVERVIEW

A) WHAT ARE THEY?

Haloalkanes and haloarenes are organic compounds in which one or more hydrogen atoms of a hydrocarbon are replaced by a halogen (F, Cl, Br or I).



- Haloalkane:
General formula $\text{R}-\text{X}$,
where $\text{X} = \text{F}, \text{Cl}, \text{Br}, \text{I}$.
Here, X is attached to an sp^3 carbon (saturated carbon).



- Haloarene:
General formula $\text{Ar}-\text{X}$,
where $\text{X} = \text{F}, \text{Cl}, \text{Br}, \text{I}$.
Here, X is directly attached to an sp^2 aromatic carbon.

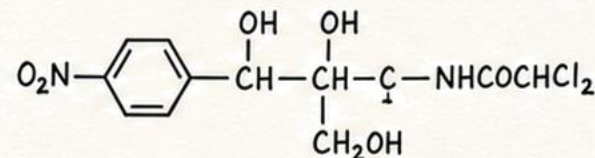
In short: substitution (replacement) of one or more H atoms in a hydrocarbon by F, Cl, Br or I.

B) WHY THEY MATTER

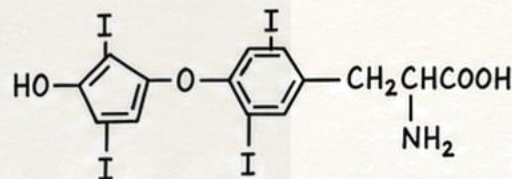
- Synthesis intermediates:
Haloalkanes and haloarenes are versatile building blocks used to introduce functional groups and construct complex molecules.
- Solvents and materials:
Used as solvents, refrigerants, propellants, polymers and in formulating many useful products.
- Industrial and environmental chemistry:
Key in agrochemicals, pharmaceuticals, dyes, polymers and in understanding environmental fate of organohalogens.

C) CONTEXT EXAMPLES

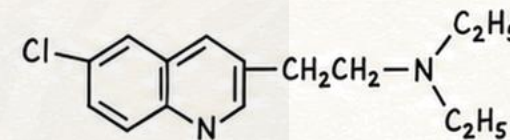
Some important organohalogens in historical/clinical context:



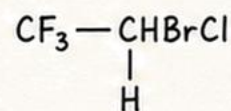
Chloramphenicol
(antibiotic; historical clinical use)



Thyroxine
(thyroid hormone)



Chloroquine
(antimalarial; historical clinical use)



Halothane
(anaesthetic; historical clinical use)

Natural organohalogen: Marine algae produce many organohalogen compounds (e.g., bromoform).



- Medical examples are prescription/clinical context only — not treatment advice.
- Perfluorocarbon blood substitutes remain specialised research/limited-use technology, not a routine approved blood replacement.

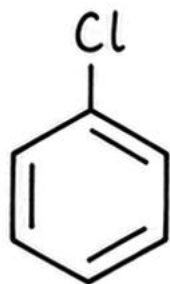
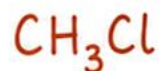
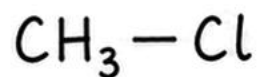
CLASSIFICATION BY NUMBER OF HALOGENS

$X = \text{F, Cl, Br or I}$

① MONOHALO: one X

Compounds containing one halogen atom.

Examples:

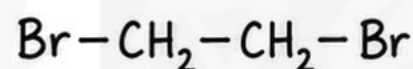
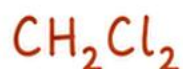
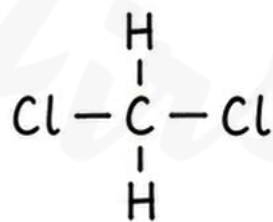


chlorobenzene

② DIHALO: two X

Compounds containing two halogen atoms.

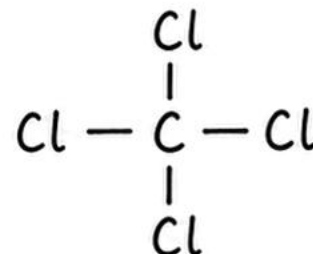
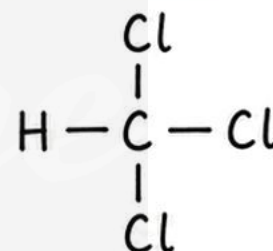
Examples:



③ POLYHALO: three or more X

Compounds containing three or more halogen atoms.

Examples:



COUNT RULE (based on number of halogen atoms):

mono = 1
(one halogen atom)

di = 2
(two halogen atoms)

tri = 3
(three halogen atoms)

tetra = 4
(four halogen atoms)

poly = 3 or more
(three or more
halogen atoms)

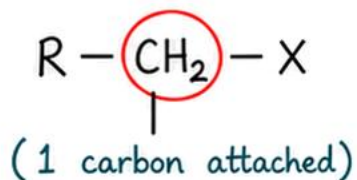
* Classification here counts halogen atoms, not carbon atoms.

ALKYL HALIDES: PRIMARY, SECONDARY & TERTIARY

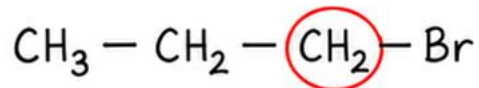
Alkyl halides (haloalkanes) are classified according to the number of carbon atoms directly attached to the carbon atom which is bonded to the halogen (X).

1° (PRIMARY) ALKYL HALIDE

The C-X carbon is attached to 1 carbon atom.

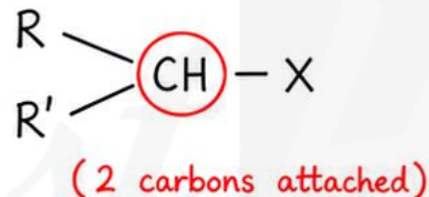


Example: 1-bromopropane

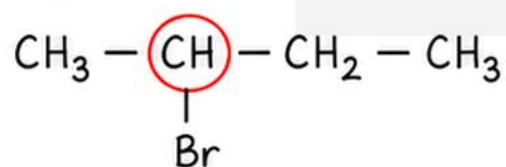


2° (SECONDARY) ALKYL HALIDE

The C-X carbon is attached to 2 carbon atoms.

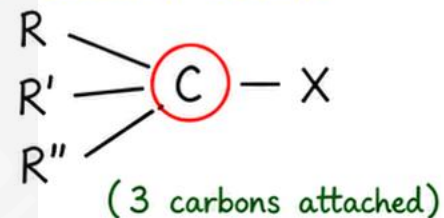


Example: 2-bromobutane

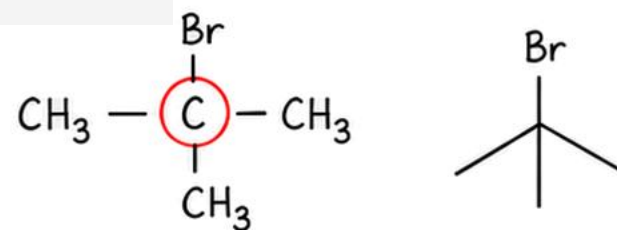


3° (TERTIARY) ALKYL HALIDE

The C-X carbon is attached to 3 carbon atoms.



Example: 2-bromo-2-methylpropane



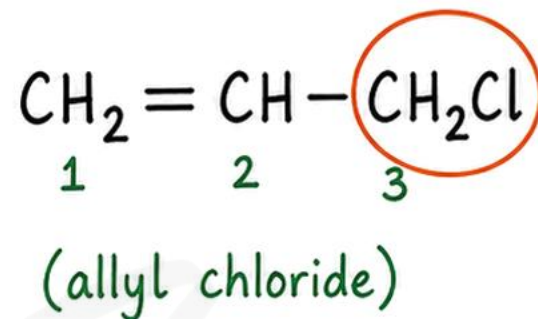
Homologous series (mono-haloalkanes): $\text{C}_n\text{H}_{2n+1}\text{X}$ ($n \geq 1$)

Classify the C-X carbon — not the overall molecule.

ALLYLIC, BENZYLIC, VINYLIC & ARYL HALIDES

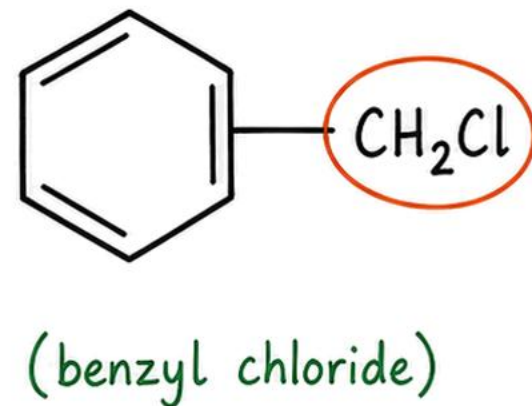
ALLYLIC:

X on an sp^3 carbon adjacent to a $C=C$.



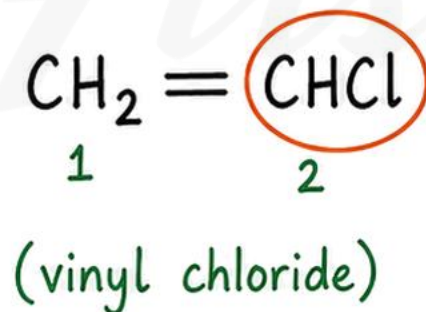
BENZYLIC:

X on an sp^3 carbon adjacent to an aromatic ring.



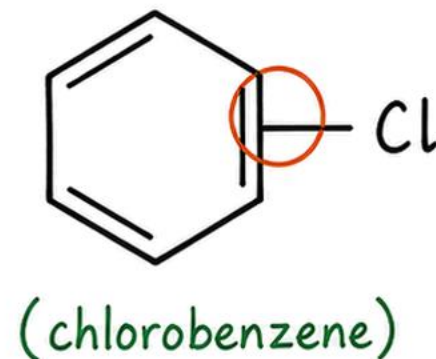
VINYLIC:

X directly on an sp^2 alkene carbon ($C=C$).



ARYL:

X directly on an sp^2 aromatic carbon (aromatic ring).



ALLYLIC & BENZYLIC



adjacent sp^3 attachment

VERSUS

VINYLIC & ARYL



direct sp^2 attachment

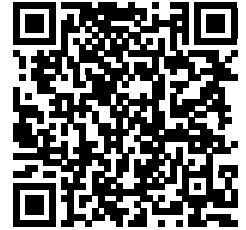


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