Organohalides (Haloalkanes) Nomenclature and Properties

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Nomenclature - 1

- Smallest alkyl halides are from methane. Substitute a hydrogen with a halide.

CH_3Cl	CH_3Br	CH_3I
chloromethane	bromomethane	iodomethane

- Two and three substitutions of halide

CH_2Cl_2	CH_2Br_2	$CHCl_3$
Dichloromethane	dibromomethane	trichloromethane

- For ethane

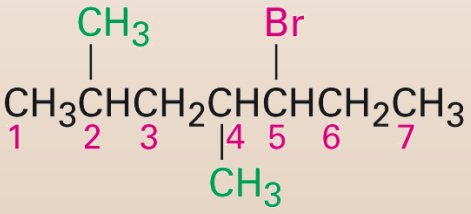
CH_3CH_2Cl	CH_3CHCl_2	CH_2ClCH_2Cl
Chloroethane	1,1-dichloroethane	1,2-dichloroethane

CH_2ClCH_2Br

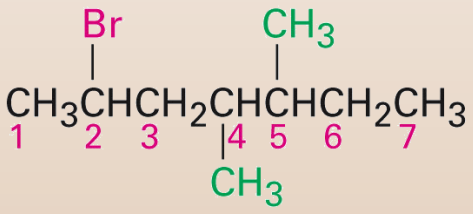
1-bromo-2-chloroethane

Nomenclature - 2

- For long chain alkanes: find longest chain, name it as parent chain
  - Number from end nearest any substituent (alkyl or halogen)
  - Branching gets preference (not substituent)
  - Name alphabetically

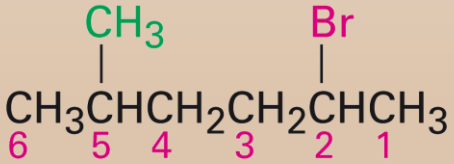


5-Bromo-2,4-dimethylheptane



2-Bromo-4,5-dimethylheptane

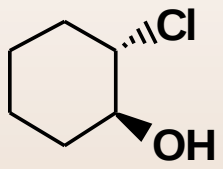
- If two substituents present with low numbers of carbon on either side of chain, then name and number alphabetically.



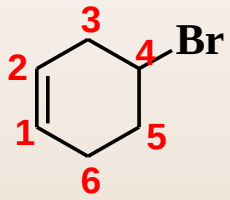
2-Bromo-5-methylhexane
(*Not* 5-bromo-2-methylhexane)

Nomenclature - Examples

- Alcohols and alkenes get precedence over halides.

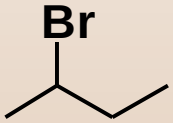


***trans*-2-Chloro-cyclohexanol**

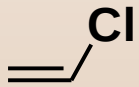


4-Bromo-cyclohexene

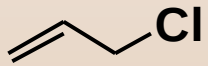
- Common Names



2-Bromobutane (*sec*-Butyl bromide)



Chloroethene (Vinyl chloride)



3-Chloropropene (Allyl chloride)

- Polyhaloalkanes

CH_2Cl_2	$CHCl_3$	CH_3CCl_3	$CCl_2{=}CHCl$
Dichloromethane (Methylene chloride)	**Trichloromethane (Chloroform)**	**1,1,1-Trichloroethane (Methyl chloroform)**	**Trichloroethylene (Trichlor)**

Physical Properties - 1

- Boiling points – higher than alkanes because of dipole-dipole interacations and dispersion forces because of higher mass of halogens.

CH_3CH_3	CH_3Br
bp -89°C	bp 4°C

- All haloalkanes have dipole moment depending on the halide.

Halomethane	Electronegativity of Halogen	Carbon-Halogen Bond Length (pm)	Dipole Moment (debyes; D)
CH_3F	4.0	139	1.85
CH_3Cl	3.0	178	1.87
CH_3Br	2.8	193	1.81
CH_3I	2.5	214	1.62

Physical Properties - 2

- Density – haloalkanes have higher density than alkanes because of higher molecular weight of the halogens.

		Density (g/mL) at 25°C		
Haloalkane	X=	Cl	Br	I
CH_2X_2		1.327	2.497	3.325
CHX_3		1.483	2.890	4.008
CX_4		1.594	3.273	4.23

- Solubility in Water – very little. The only intermolecular force common is dipole-dipole which also is not very much in alkyl halides. Solubility decreases as mol wt gets higher.

Applications of Alkyl Halides

- Solvents
- Good starting materials for substitution reactions.
- Chloroflurocarbons – used as refrigerants, propellants for aerosols
- Dry cleaning (chlorofluorocarbons) as solvents for dry cleaning and for
- General degreasing agent
- Starting material for polymers (vinylchloride, tetrafluorethane)
- Fire retardant

Key Concepts

- Nomenclature
- Physical properties