

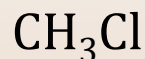
# **Organohalides (Haloalkanes)**

## **1 - Nomenclature and Properties**

Dr. Sapna Gupta

# Nomenclature - 1

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



chloromethane

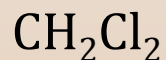


bromomethane



iodomethane

- Two and three substitutions of halide



Dichloromethane



dibromomethane



trichloromethane

- For ethane



Chloroethane



1,1-dichloroethane



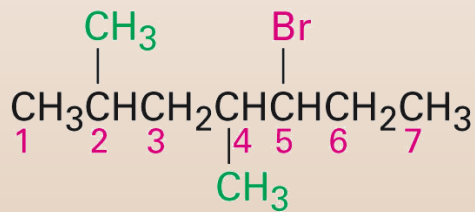
1,2-dichloroethane



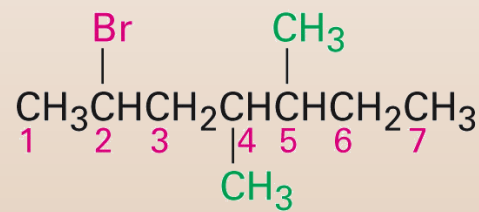
1-bromo-2-chloroethane

# 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

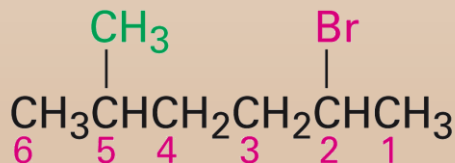


**5-Bromo-2,4-dimethylheptane**



**2-Bromo-4,5-dimethylheptane**

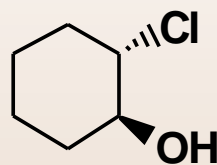
- If two substituents present with low numbers of carbon on either side of chain, then name and number alphabetically.



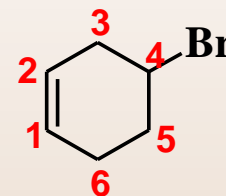
**2-Bromo-5-methylhexane**  
**(Not 5-bromo-2-methylhexane)**

# Nomenclature - Examples

- Alcohols and alkenes get precedence over halides.

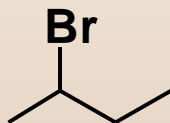


*trans*-2-Chloro-  
cyclohexanol

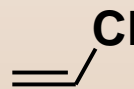


4-Bromo-  
cyclohexene

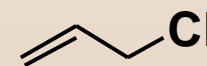
- Common Names



2-Bromobutane  
(*sec*-Butyl bromide)



Chloroethene  
(Vinyl chloride)



3-Chloropropene  
(Allyl chloride)

- Polyhaloalkanes



Dichloromethane  
(Methylene chloride)



Trichloromethane  
(Chloroform)



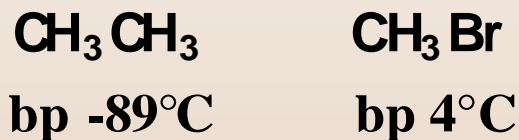
1,1,1-Trichloroethane  
(Methyl chloroform)



Trichloroethylene  
(Trichlor)

# Physical Properties - 1

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



- All haloalkanes have dipole moment depending on the halide.

<b>Halomethane</b>	<b>Electronegativity of Halogen</b>	<b>Carbon-Halogen Bond Length (pm)</b>	<b>Dipole Moment (debyes; D)</b>
<b>CH<sub>3</sub>F</b>	<b>4.0</b>	<b>139</b>	<b>1.85</b>
<b>CH<sub>3</sub>Cl</b>	<b>3.0</b>	<b>178</b>	<b>1.87</b>
<b>CH<sub>3</sub>Br</b>	<b>2.8</b>	<b>193</b>	<b>1.81</b>
<b>CH<sub>3</sub>I</b>	<b>2.5</b>	<b>214</b>	<b>1.62</b>

# Physical Properties - 2

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

Haloalkane	X=	Density (g/mL) at 25°C		
		Cl	Br	I
$\text{CH}_2\text{X}_2$		1.327	2.497	3.325
$\text{CHX}_3$		1.483	2.890	4.008
$\text{CX}_4$		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.
- Chlorofluorocarbons – 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