

Module 3 Alkanes and Alkyl Halides

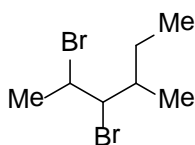
Lecture 5 Alkyl Halides

3.6 Introduction

Alkyl halides are compounds containing one or more halogen atoms. They resemble the alkanes in structure but contain one or more halogen atoms instead of hydrogen atoms. The linear alkyl halides having one halogen atom have formula $C_nH_{2n+1}X$ where X is a halogen atom. Similarly, the cyclohaloalkanes have general formula $C_nH_{2n-1}X$.

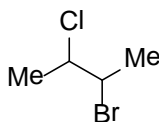
3.7 Nomenclature

Alkyl halides can also be named by following the rules of IUPAC nomenclature. The generic name for alkyl halides is haloalkanes according to IUPAC. Thus, the name of haloalkane constitutes of two parts-the prefix which contain the number and identity of the halogen atom attached and the suffix which states from what alkane is the name derived. Thus, for an alkyl halide of formula C_2H_5Cl , IUPAC name is chloroethane. If more than one halogen atom is attached, then the prefixes *di*, *tri*, *tetra*, *penta* etc are added to denote the number of halogen atoms. The rule of lowest locants is also valid here.



2,3-Dibromo-4-methylhexane

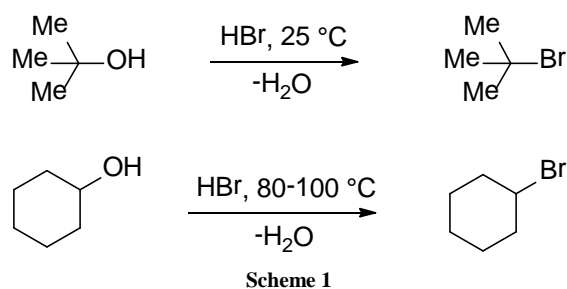
If the alkyl halide contains more than one type of halogen, the halogen names are prefixed in an alphabetical order. Thus, the IUPAC name for compound **6** should be 2-bromo-3-chlorobutane.



6
2-Bromo-3-chlorobutane

3.8 Preparation of Alkyl Halides

The most common method for preparation of alkyl halides is by treatment of alcohols with hydrogen halides. The order of reactivity hydrogen halides parallels their acid strength i.e. $\text{HI} > \text{HBr} > \text{HCl} \gg \text{HF}$. Thus, this method cannot be used for making alkyl fluorides. Among primary, secondary and tertiary alcohols, it is found that tertiary alcohols are most reactive (Scheme 1). Instead of using the hydrogen halides, phosphorus halides may also be used.



Another method that can be used for preparation of only certain alkyl halides is the direct halogenation of alkanes using molecular chlorine or bromine under photochemical conditions (Scheme 2).

