SAWA UNIVERSITY

University of sawa

College of engineering technology

Department of healthy physic and radation

therapy technical engineering

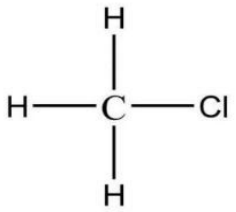
First stage

Number of lecture:5,6

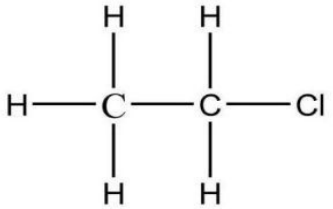
M.SC Noor Taher

Alkyl halides

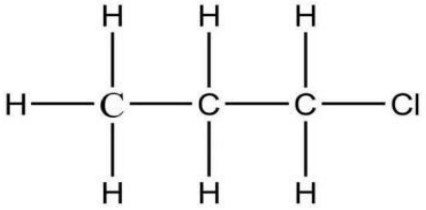
- Alkyl halides are the derivatives of alkanes in which hydrogen atom is replaced by a halogen atom F, Cl, Br or I
- Alkyl halides are represented by R-X, R-alkyl group, X- halogen like chloro, Fluoro, Bromo, and Iodo group.



Methyl chloride



ethtyl chloride



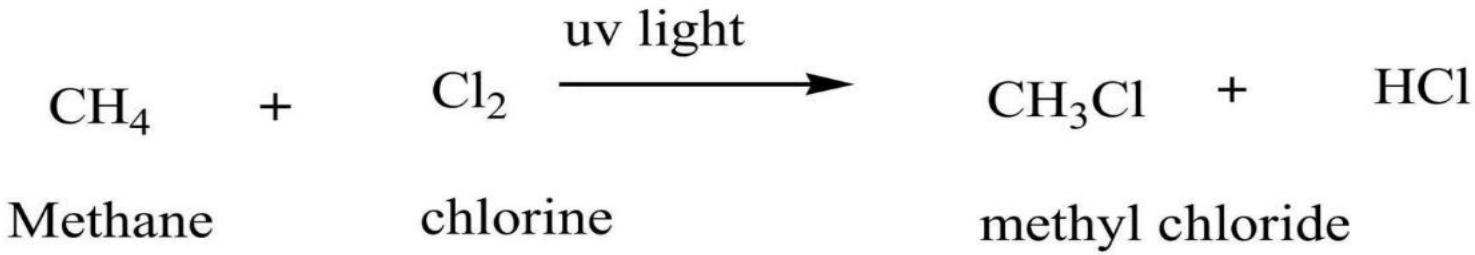
propyl chloride

Preparation methods of alkyl halides

1. Direct Halogenations of alkanes.
2. Addition of hydrogen halides to alkenes and alkynes.
3. Action of Hydrogen halides on alcohol.
4. Action of Phosphorus halides on alcohols.
5. Action of Thionyl chloride on alcohols.
6. Halogen Exchange.
7. The Hunsdiecker Reaction.

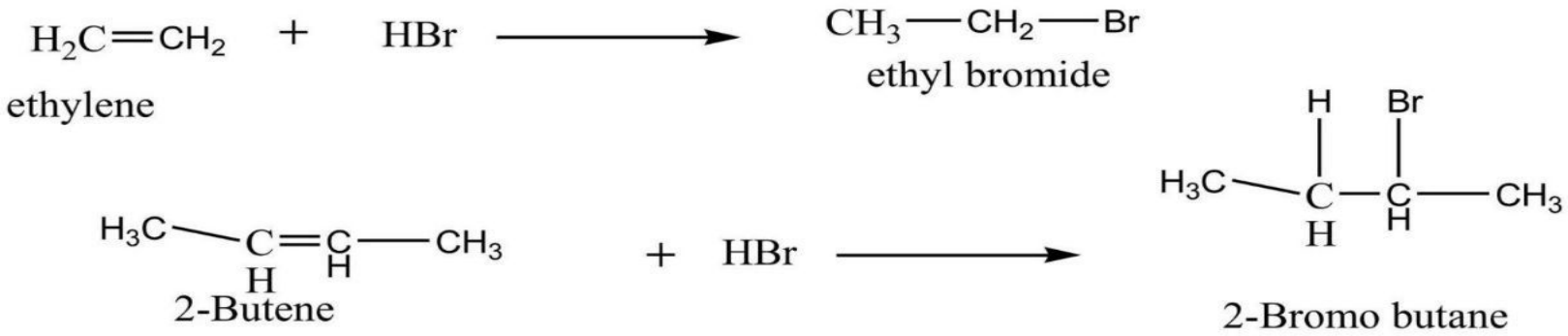
1. Halogenation of alkane

- It involves the substitution of H-atoms of alkanes by as many *halogen atoms i.e., by chlorine (chlorination) ; by bromine* ***(bromination) by iodine (iodination)*** or by fluorine ***(fluorination)***
- Methane reacts with chlorine in the presence of ultraviolet light or at high temperature (300°C) to yield methyl chloride or chloromethane and hydrogen chloride.



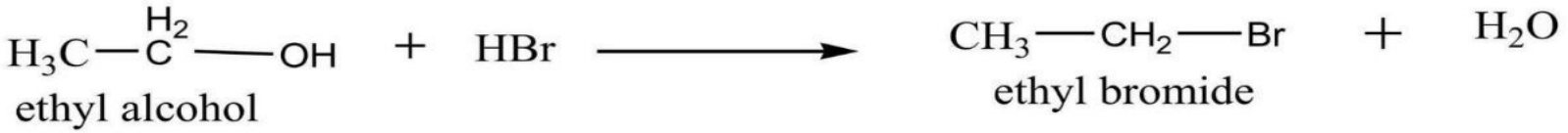
2. Addition of hydrogen halides

1. Alkenes react with hydrogen halides (HCl, HBr or HI) to form alkyl halides.

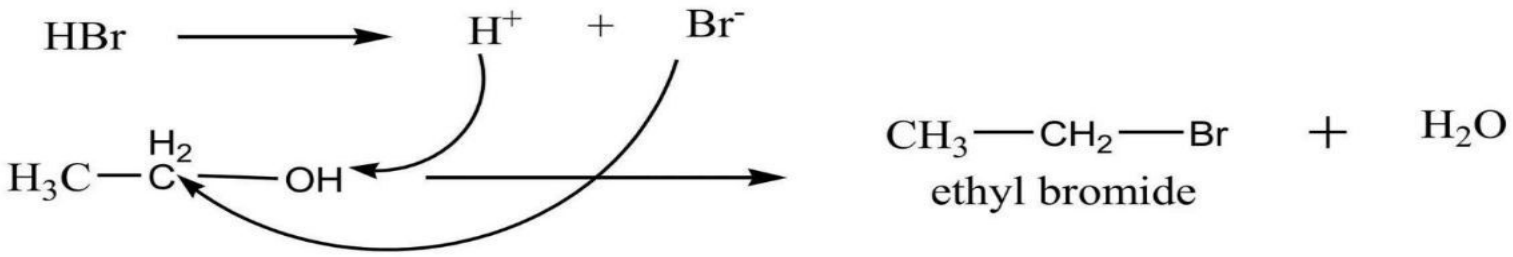


3. Action of halogen acids on alcohol

- Alcohols react with HBr or HI to produce alkyl bromides or alkyl halides.

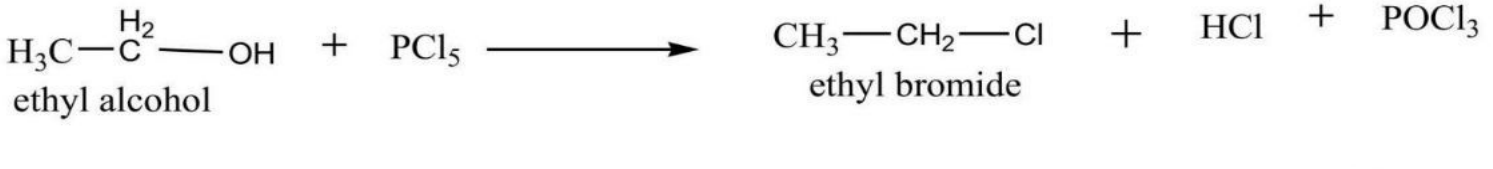


Mechanism:

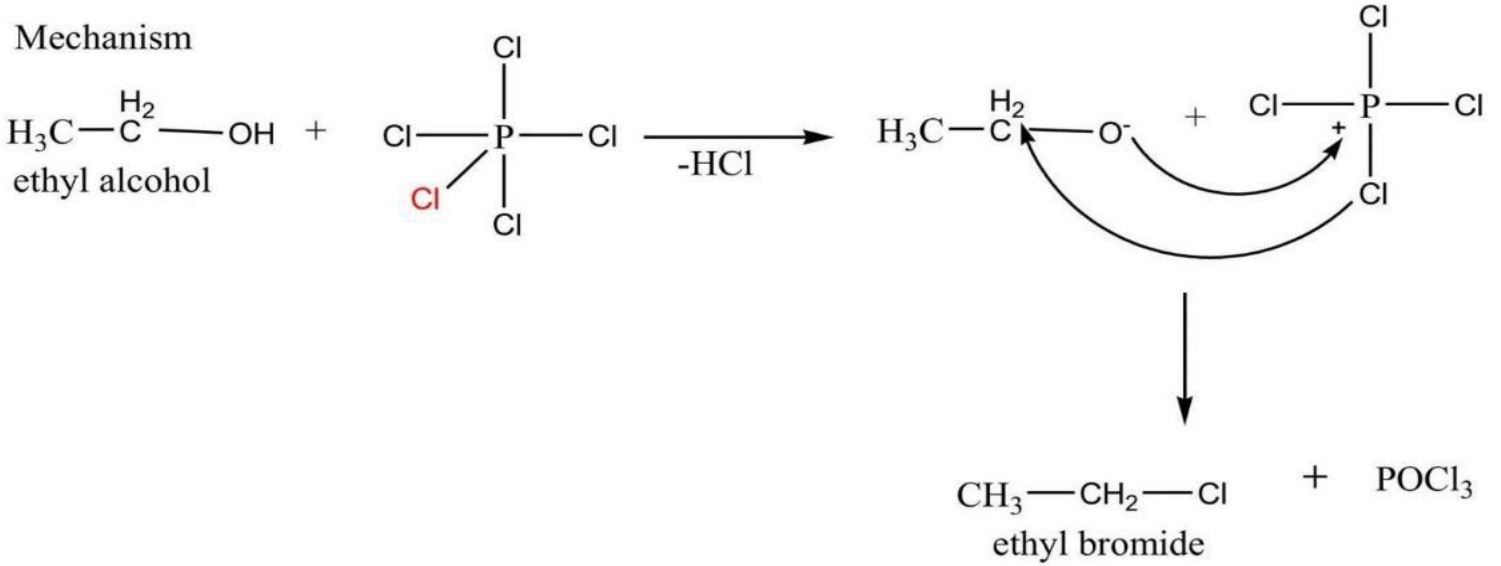


4. Action of Phosphorus halides on alcohol

- Alcohols react with phosphorus halides to produce alkyl halides.

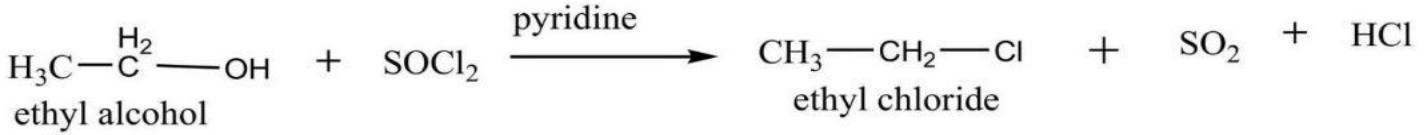


Mechanism

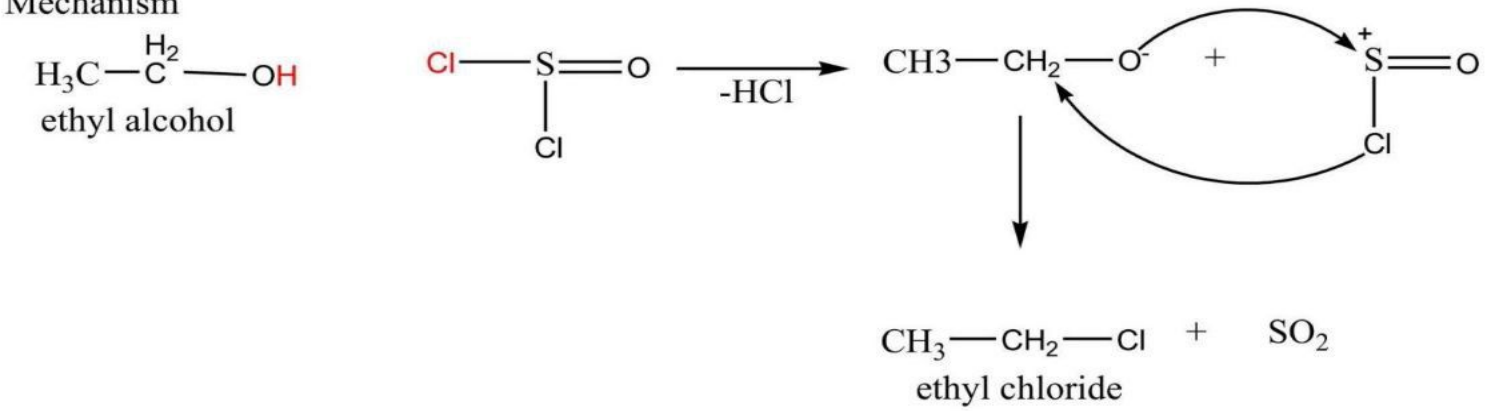


5. Action of thionyl chloride on alcohol

- Alcohols react with thionyl chloride in the presence of pyridine to produce alkyl halides.

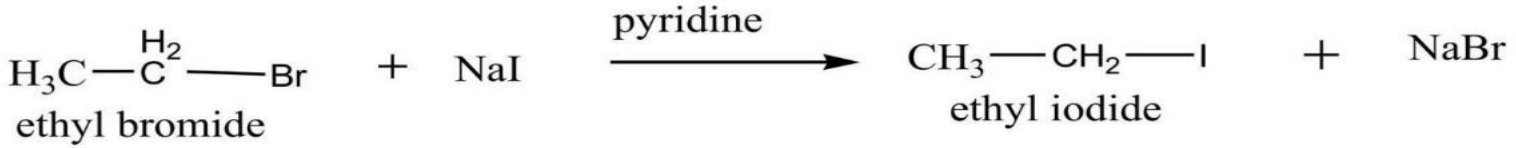


Mechanism



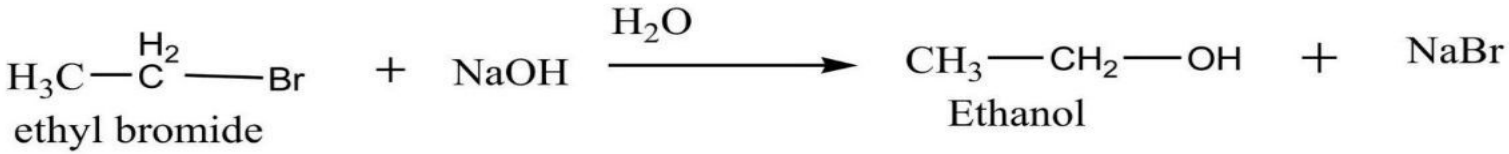
6. Halogen exchange reaction

- The alkyl bromide is heated with concentrated solution of sodium iodide in acetone to form alkyl iodide.



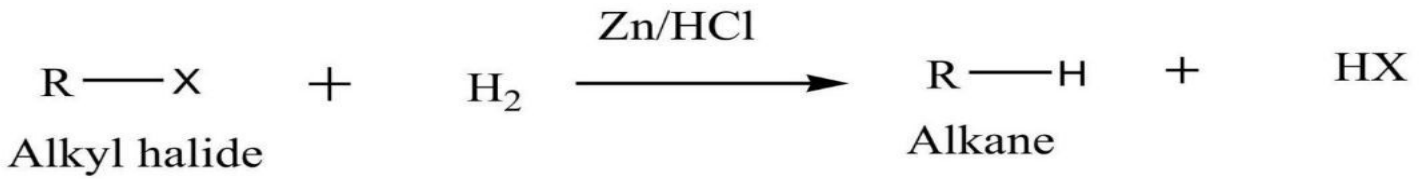
I. Substitution by hydroxyl group

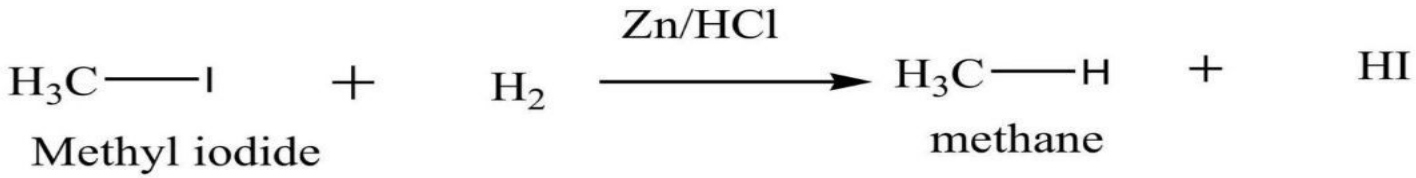
- Alkyl halides react with aqueous potassium hydroxide to form alcohol.



2. Reduction of alkyl halides

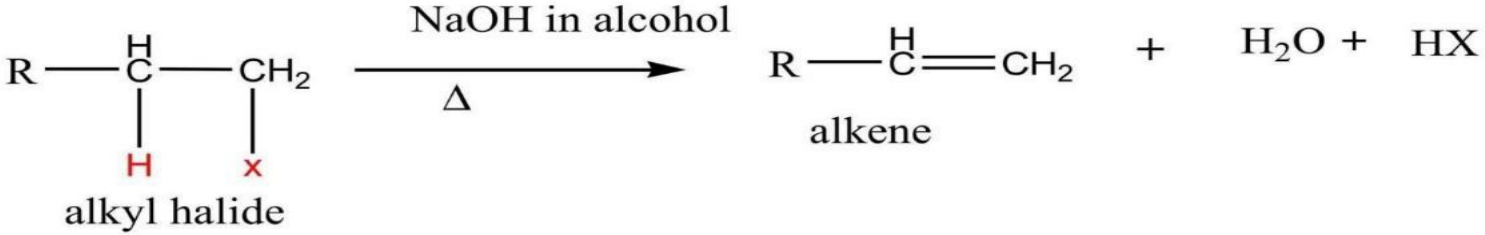
- Alkyl halide undergo reduction with nascent hydrogen in presence of reducing agent like Zn/HCl to form alkanes.

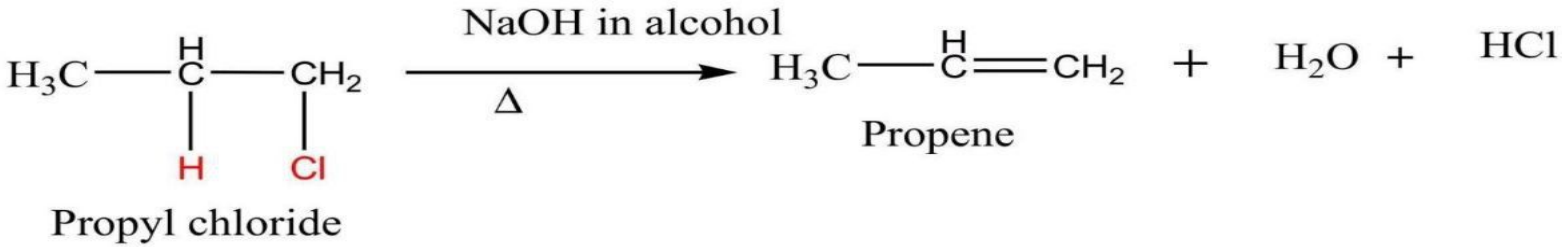




3. Elimination reaction: dehydrohalogenation of alkyl halides

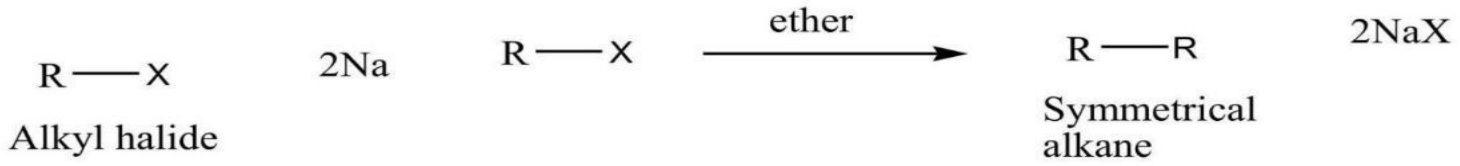
- When alkyl halide is heated with alcoholic solution of sodium hydroxide to form alkene and hydrogen halide.

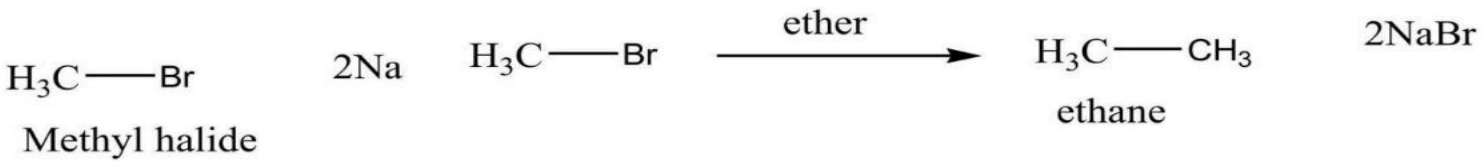




4. Wurtz reaction

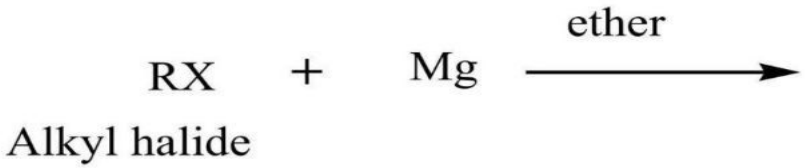
- Higher alkanes are produced by heating an alkyl halide with sodium metal in dry ether. Two molecules of alkyl halide lose their halogen atoms as NaX. These net result is the joining of two alkyl group to yield symmetrical alkane having even number of carbon atoms.



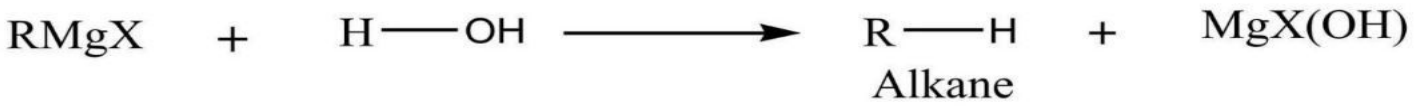


5. Reaction with metal: formation of Grignard reagents

- Alkyl magnesium halides(Grignard reagent) are obtained by treating alkyl halides with magnesium in anhydrous ether to give alkanes.



Alkyl halide — Alkyl magnesium halide



Alkane

Methyl magnesium iodide — Methane