



Alkyl Halide

Organic Chemistry Preparation Methods

- ✓ Halogenation of Alkane
- ✓ Hydrohalogenation of Alkene

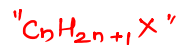
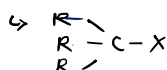
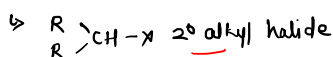
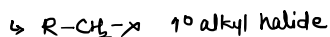
B.Pharm. | POC-I | U 3 | L4

Alkyl Halide Organic Chemistry

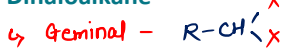


Classification

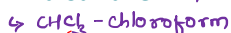
1. Mono Haloalkane (Alkyl Halide) → Contains only one halogen atom



2. Dihaloalkane



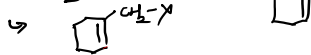
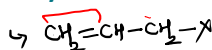
3. Trihaloalkane - Haloform



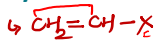
4. Tetrahaloalkane - CX_4



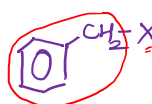
5. Allyl Halide



6. Vinyl Halide



7. Benzyl Halide



8. Haloarene



Preparation of Alkyl Halide



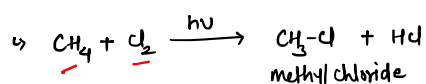
Methods

1. Halogenation of Alkane - $\text{CH}_4 + \text{X}_2$
2. Hydro-Halogenation of Alkene $\text{CH}_2=\text{CH}_2 + \text{HX}$
3. From Alcohol -
 - a) Lucas Reagent (Conc. HCl + Anh ZnCl₂)
 - b) PCl₅
 - c) PCl₃
 - d) SOCl₂ (Darzen's Method)
4. Halogen Exchange Methods
 - a) Finkelstein Reaction
 - b) Swartz Reaction
5. Hunsdiecker/Borodine-Hunsdiecker Reaction

Preparation of Alkyl Halide

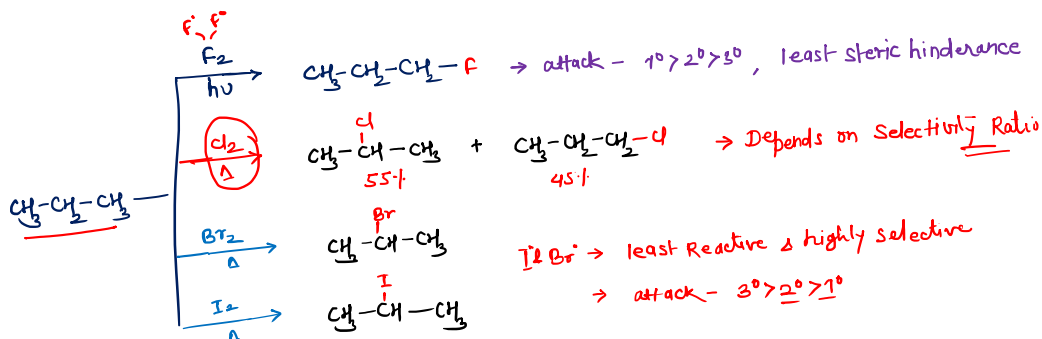
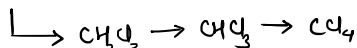


1. Halogenation of Alkane



Preferred in Industries in control manner
Not in Laboratory

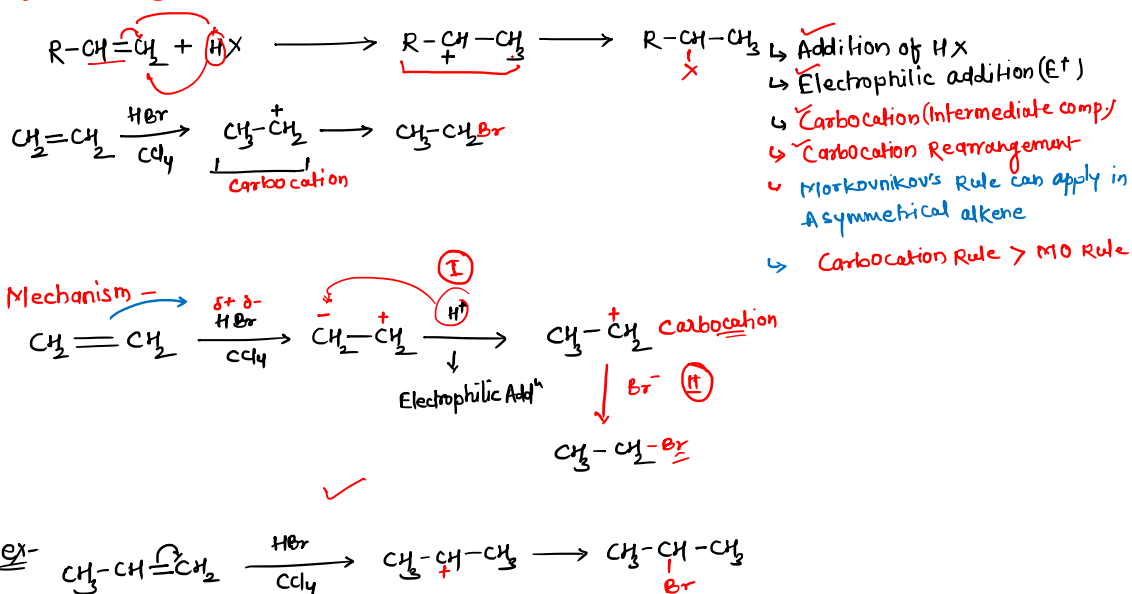
Free Radical mechanism -



Preparation of Alkyl Halide



2. Hydro-Halogenation of Alkene



Alkyl Halide

Organic Chemistry Preparation Methods

From Alcohol

- Lucas Reagent (Conc. HCl + Anh ZnCl₂)
- PCl₅
- PCl₃
- SOCl₂ (Darzen's Method)

B.Pharm. | POC-I | U 3 | L5

Preparation of Alkyl Halide



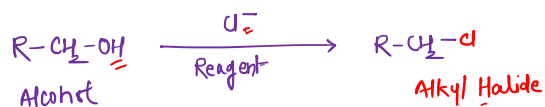
Methods

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Preparation Alkyl Halide



2. From Alcohol



Reaction Mechanism- Nucleophilic Substitution Reaction

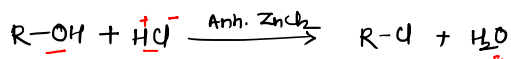
Reagent Used

- ✓ a) Luca's Reagent (Conc. HCl + Anh ZnCl₂)
- b) PCl₅ ✓
- c) PCl₃ ✓
- d) SOCl₂ (Darzen's Method)

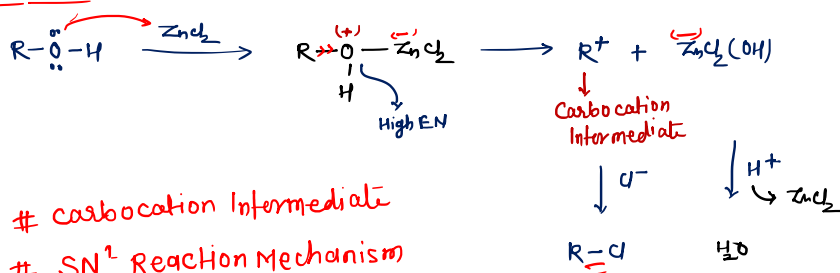
Preparation Alkyl Halide



From Alcohol

A. By Conc. HCl + Anhydrous ZnCl₂ - Luca's Reagent

Mechanism -

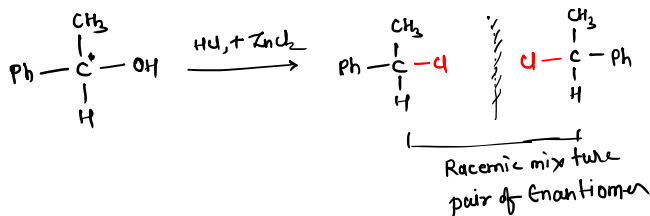


- # carbocation Intermediate
- # S_N¹ Reaction Mechanism
- # Preferred in - 3° alcohol
- # Retention & Inversion attack

Preparation Alkyl Halide



From Alcohol

A. By Conc. HCl + Anhydrous ZnCl₂ - Luca's Reagent

- # carbocation Intermediate
 - # S_N¹ Reaction Mechanism
 - # Preferred in - 3° alcohol
 - # Retention & Inversion attack
- 3° > 2° > 1°

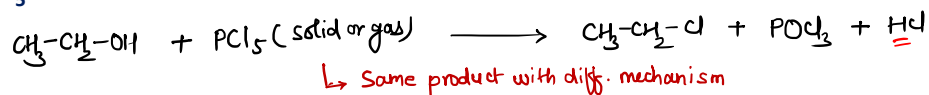
Luca's test for Alcohol - $\text{R-OH} + \text{HCl} \xrightarrow{\text{ZnCl}_2} \text{R-Cl} \downarrow \text{ppt (white)}$

- ① 3° Alcohol \longrightarrow R-Cl ↓ - immediately
- ② 2° Alcohol \longrightarrow R-Cl ↓ - After 5-10 min
- ③ 1° Alcohol \longrightarrow No Reactⁿ at Room temp

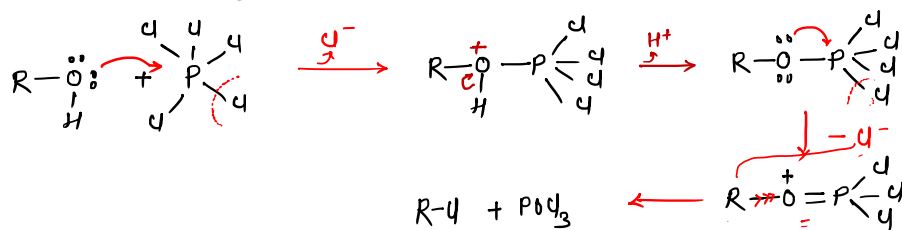
Preparation Alkyl Halide



From Alcohol

B. By PCl_5 

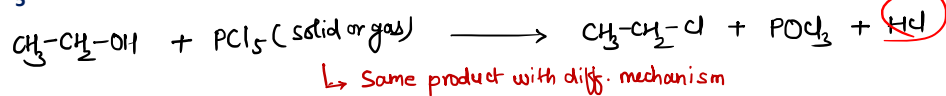
Mechanism — $\text{PCl}_5 (\text{gas}) \rightarrow \text{SN}^i$ — Intramolecular Reactⁿ — NO C^+ Intermediate



Preparation Alkyl Halide

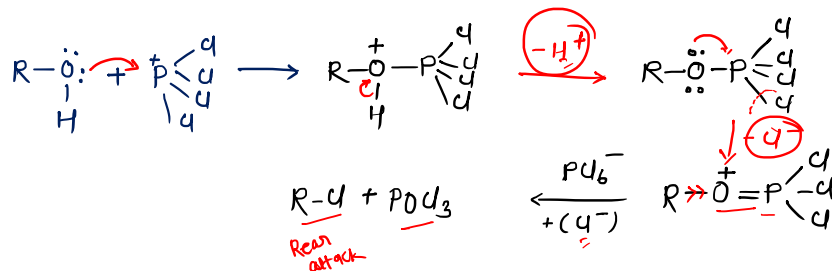


From Alcohol

B. By PCl_5 

Mechanism —

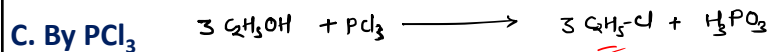
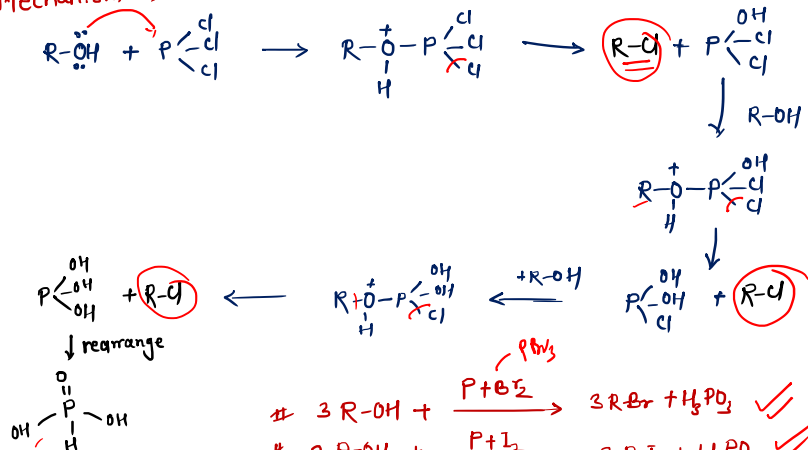
$\text{PCl}_5 (\text{solid}) \rightarrow \text{PCl}_4^+ / \text{PCl}_6^- \rightarrow \text{SN}^2$ Reactⁿ mechanism



Preparation Alkyl Halide



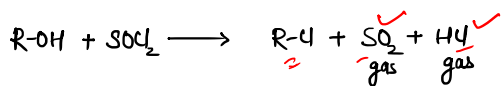
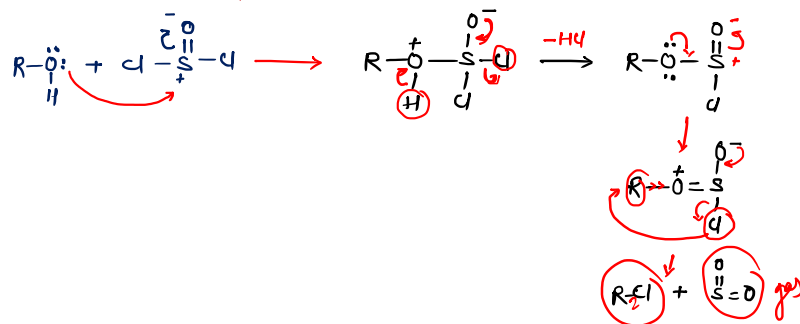
From Alcohol

Mechanism \rightarrow 

Preparation Alkyl Halide



From Alcohol

D. By SOCl_2 (Darzen's Method)- Best methodMechanism \rightarrow $\text{S}_\text{N}2$ Reaction Mechanism



Alkyl Halide

Organic Chemistry

Preparation Methods

Halogen Exchange Methods

- a) Finkelstein Reaction
- b) Swartz Reaction

Hunsdiecker/Borodine-Hunsdiecker Reaction

B.Pharm. | POC-I | U 3 | L6

Preparation of Alkyl Halide



Methods

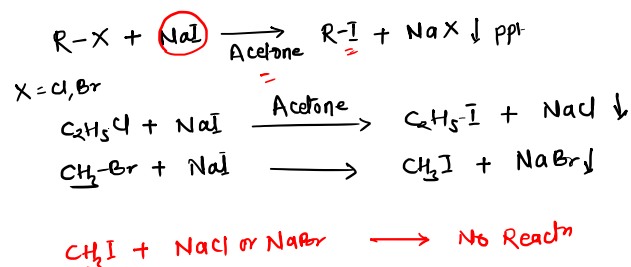
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Preparation Alkyl Halide



4. Halogen Exchange Method

a) **Finkelstein Reaction**- exclusively for preparation of alkyl iodide (RI)



* Acetone - covalent solvent

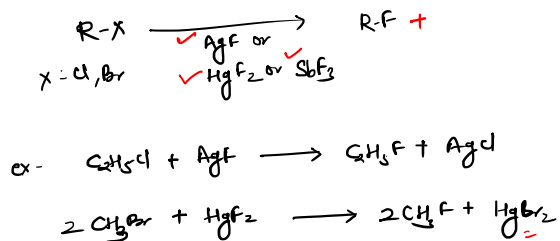
± Fajans' Rule - $\oplus \ominus \rightarrow \uparrow$ Covalent character in ionic bond
 $\hookrightarrow NaI \rightarrow$ have good covalent character and soluble in acetone

Preparation Alkyl Halide



4. Halogen Exchange Method

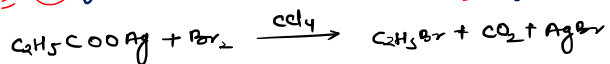
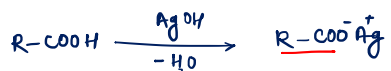
a) **Swartz Reaction**- exclusively for preparation of alkyl fluoride (RF)



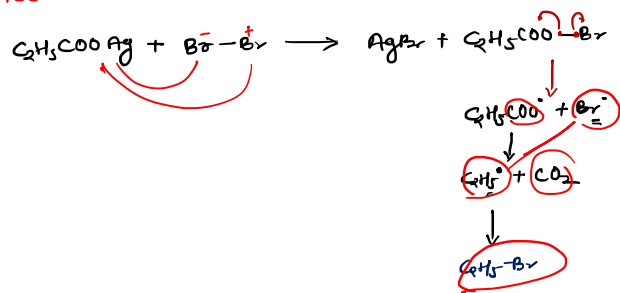
Preparation Alkyl Halide



5. Hunsdiecker/Borodine-Hunsdiecker Reaction



Mechanism - Free Radical mechanism



For prep. of alkyl Bromide

Descent of chain

silver salt of carboxylic acid is used

Bimbaum Simonini Reactⁿ

