



GPAT

GRADUATE PHARMACY APTITUDE TEST

NATIONAL TESTING AGENCY (NTA)

VOLUME – I PART - 2

PHARMACUETICAL CHEMISTRY

ORGANIC AND INORGANIC
CHEMISTRY



CONTENT

ORGANIC & INORGANIC CHEMISTRY

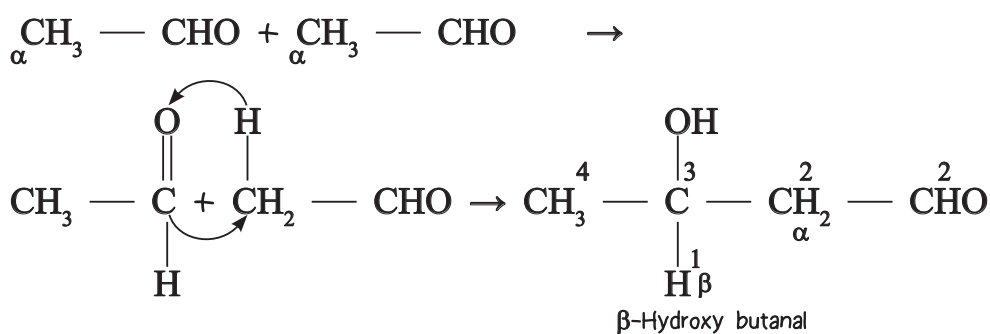
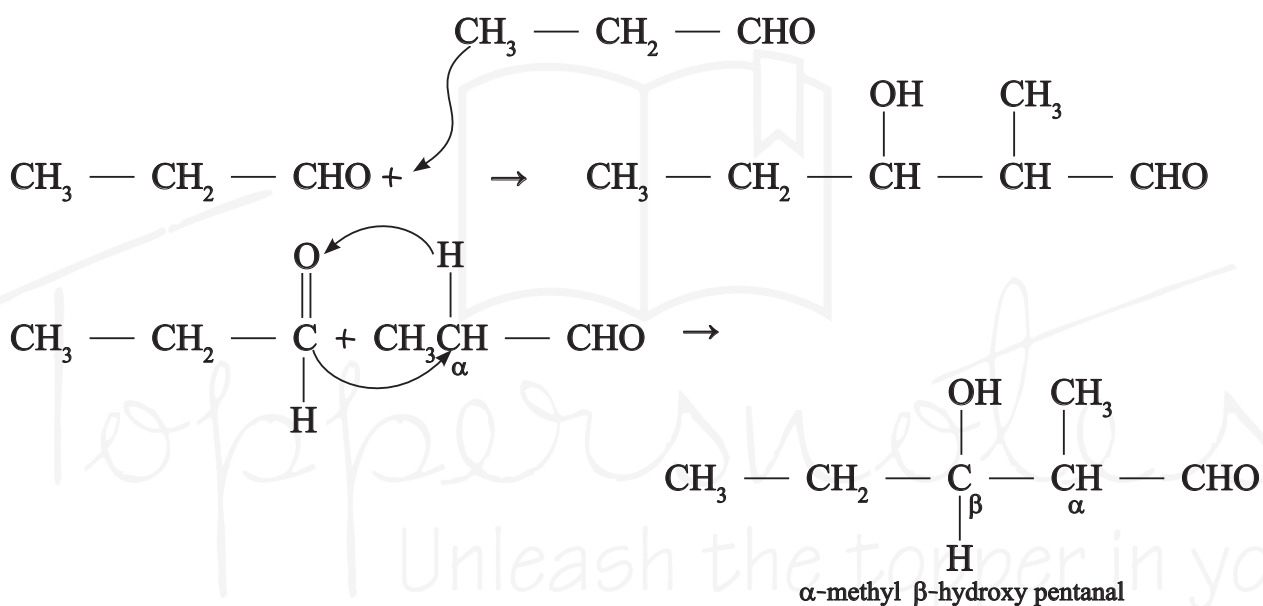
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ORGANIC CHEMISTRY

Important Name: (Reaction)

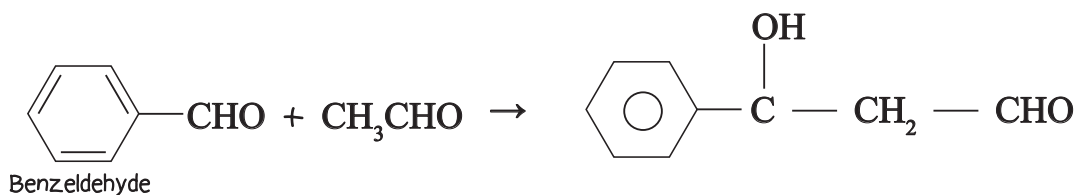
1. Aldol Condensation: (Aldol Reaction)

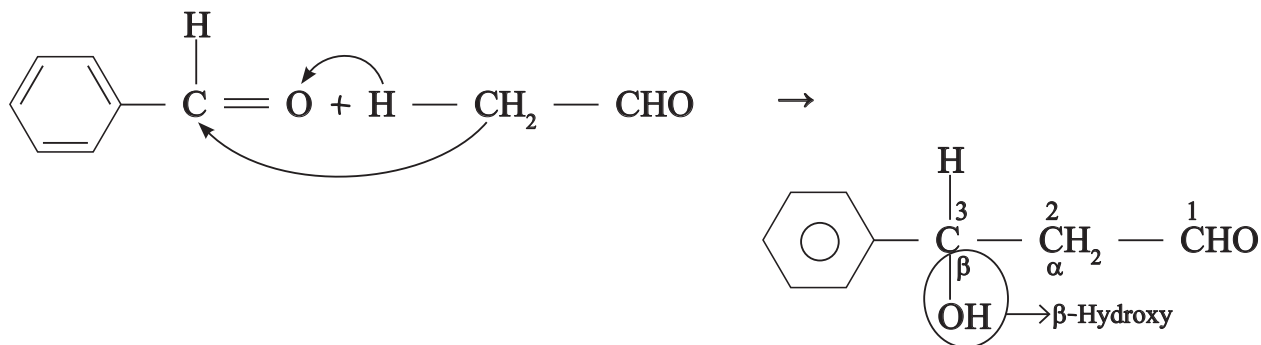
- * Aldehyde ($R - \overset{\overset{O}{\parallel}}{C} - H$)/Keton ($R - \overset{\overset{O}{\parallel}}{C} - R$) have α -H. In the present of strong base (NaOH/KOH) or strong acid (HCl) form, β -Hydroxy aldehyde.



Cross aldol Reaction \rightarrow

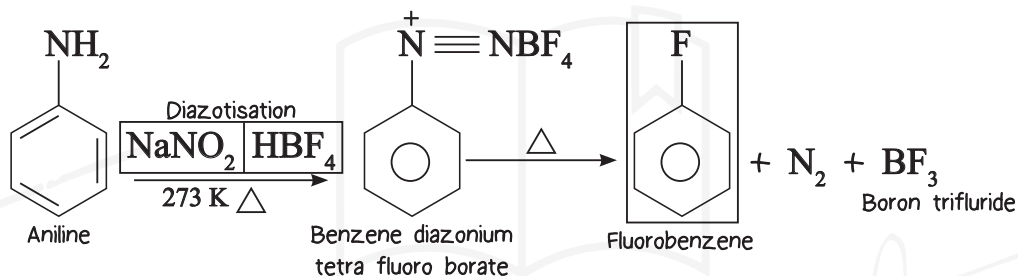
जब α -H present नहीं हो



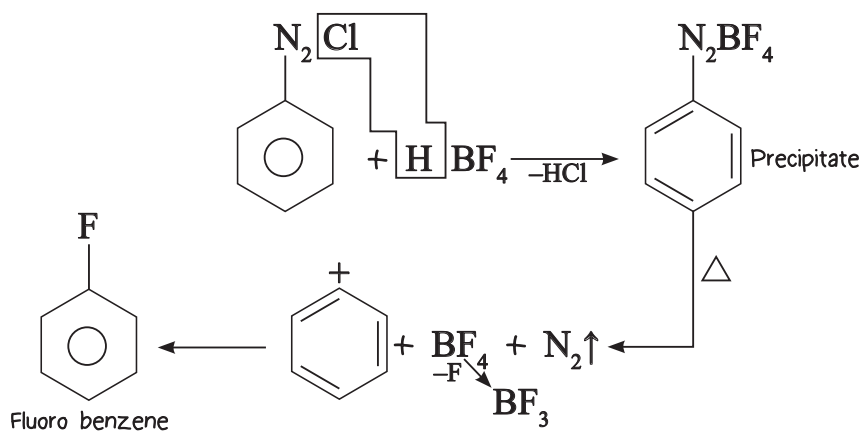


2. Belz-Schiemann Reaction:

* When Diazonium salt treated with Fluoro Boric Acid it form fluorobenzene.

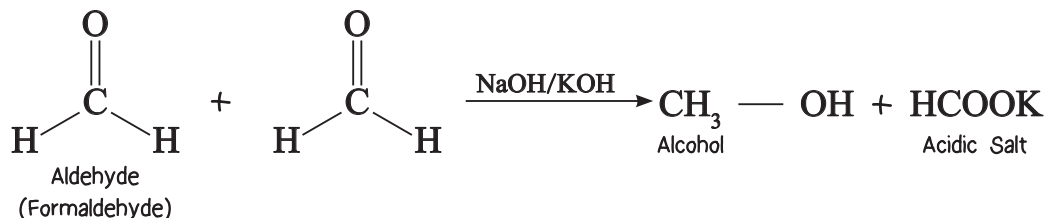


Mechanism:



3. Cannizzro Reaction:

- * When an aldehyde without any (α -H) undergoes Redox Reaction presence of strong base. It give alcohol & acidic salt.

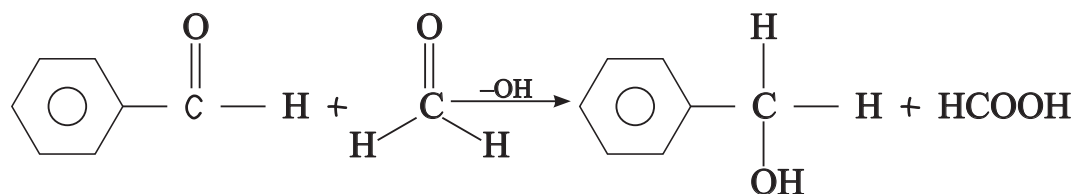
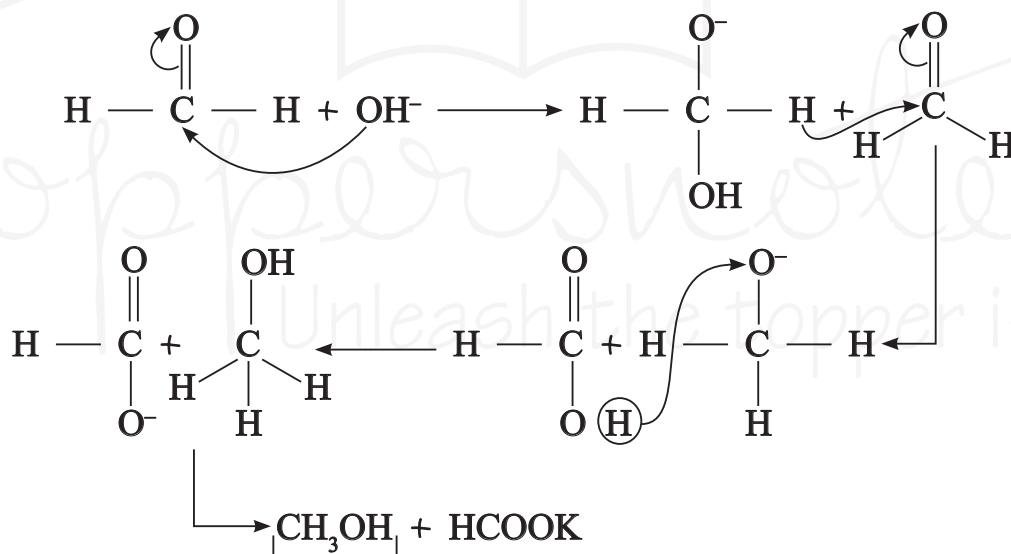


2 Aldehyd without ($\alpha - \text{H}$) $\xrightarrow[\text{of Strong Base}]{\text{In the presence}}$ (KOH) $\xrightarrow{\text{Form}}$ Alcohol + Acidic Salt

Mechanism:



Step II: Attack of nucleophile



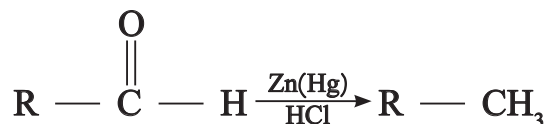
Trick:

SOA \rightarrow Smaller Oxidized Acid

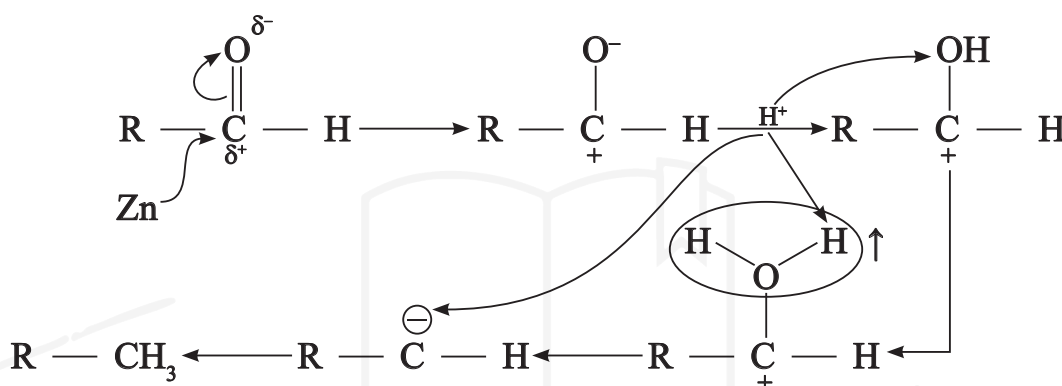
Bra \rightarrow Bigger Reduced Alcohol

4. Clemmensen Reaction:


- * Carbonyl compound reduced into the alkane in the presence of Acidic Zinc Amalgam [Zn(Hg)].

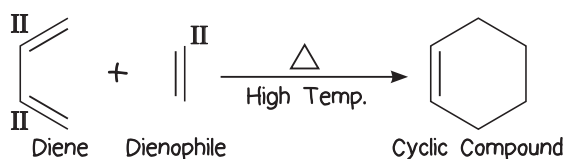


Mechanism:

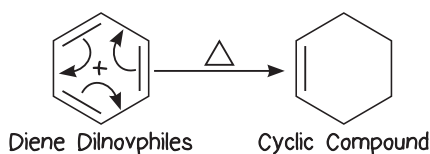


5. Diels-Alder Reaction:

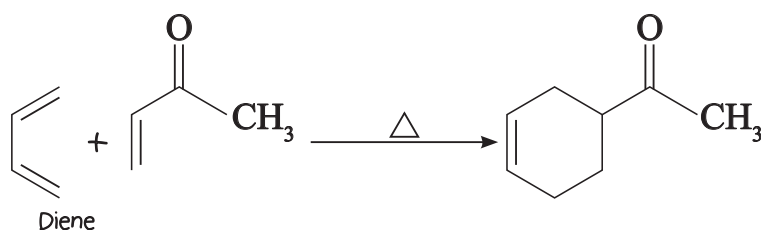
- * Cyclo-addition (4 + 2 addition) Diene & Alkene (Dienophile) React to form cyclic  compound.
- * Diels-Alder is a favourable synthetic method for unsaturated six membered ring.



Mechanism:

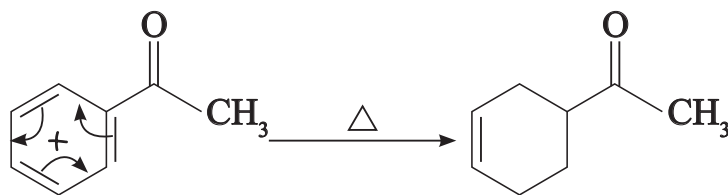


Example:

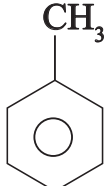
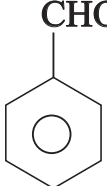


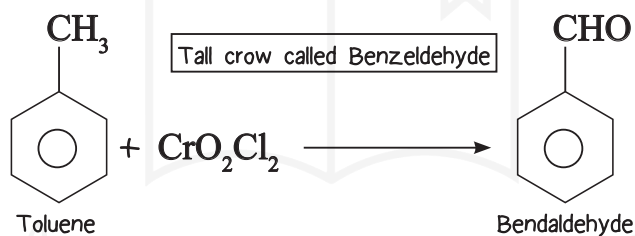
Organic Chemistry

Mechanism:

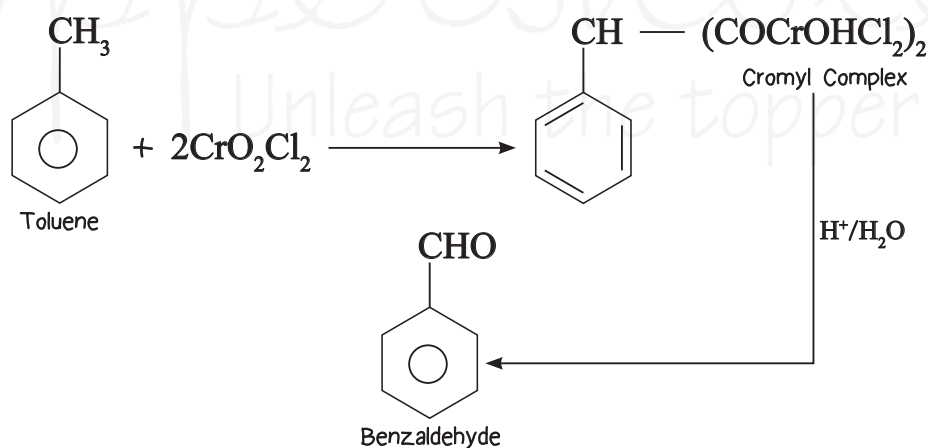


6. Etard Reaction:

* Toluene  when treated with chromyl chloride: it will produce  Benzaldehyde.

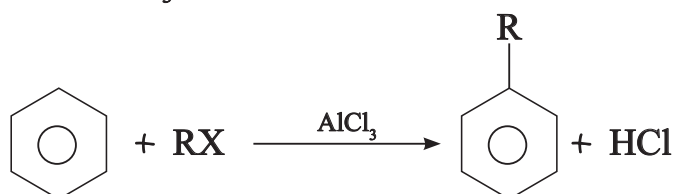


Mechanism:

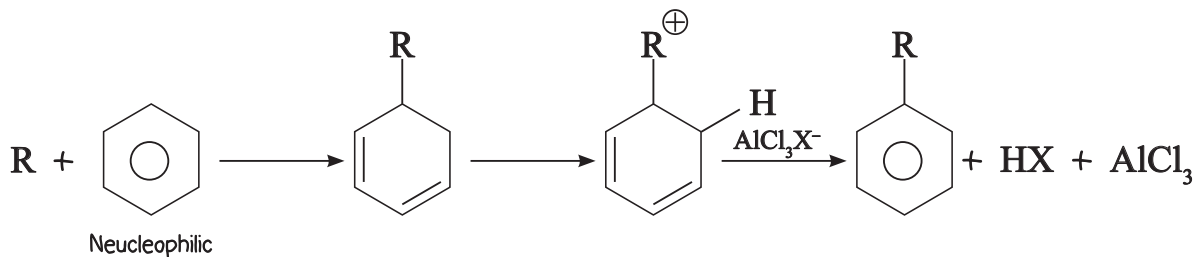
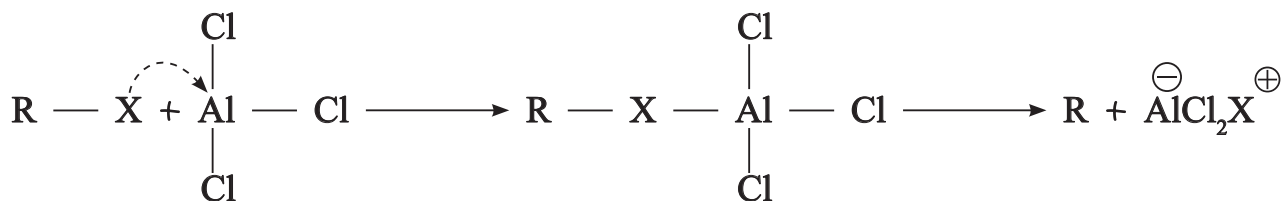


7. Friedel Craft Alkylation:

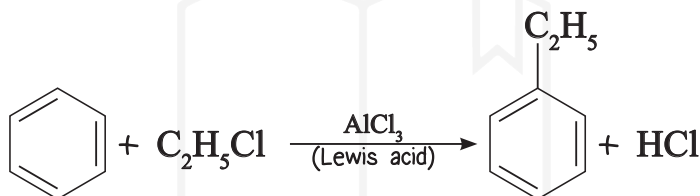
* It is electrophilic substitution Reaction Alkylation of aromatic compound in the presence of Lewis Acid (FeCl_3) as a catalysis.



Mechanism:



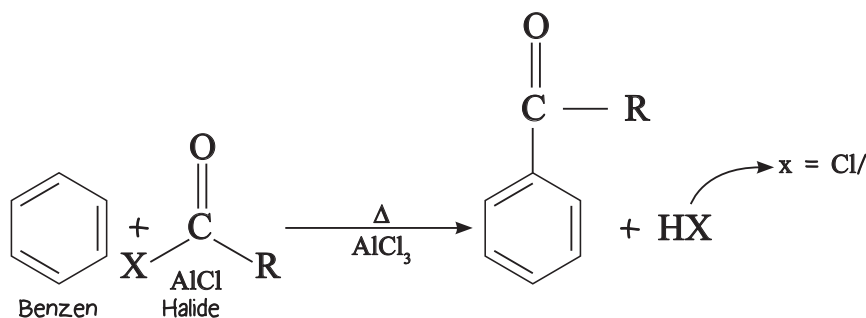
Example:



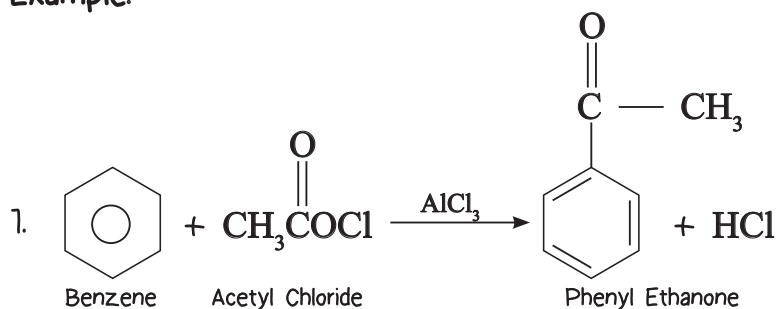
8. Friedel Craft's Acylation:

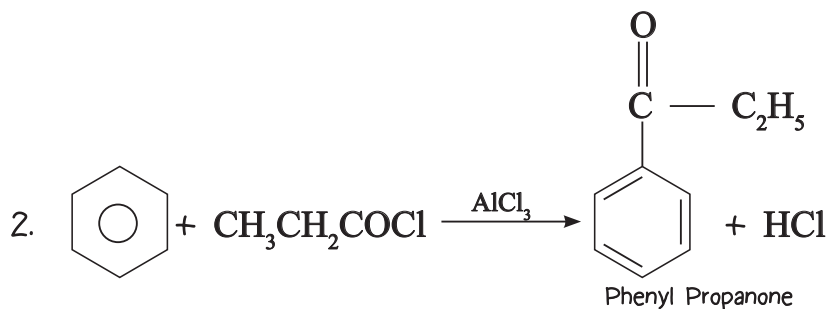
- * It is electrophilic substitution reaction.
- * Acylation of aromatic compound & produce aromatic ketone via reaction between benzene & acyl chloride or anhydride.

- * **Acylation:** Adding of Acyl group ($\text{R} - \overset{\text{X}}{\text{C}} = \text{O}$)



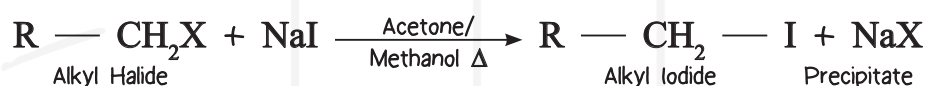
Example:



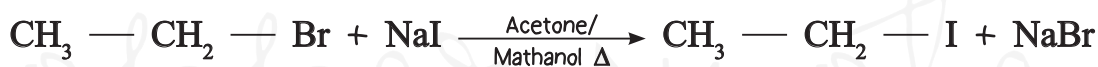


9. Finkelstein Reaction:

- * When Alkyl Halide ($\text{C} - \text{C} - \text{Br}$) react with Sodium Iodide (NaI) in the presence of Acetone ($\text{CH}_3 - \overset{\text{O}}{\parallel}{\text{C}} - \text{CH}_3$) or methanol ($\text{CH}_3 - \text{OH}$) it form Alkyl Iodide.

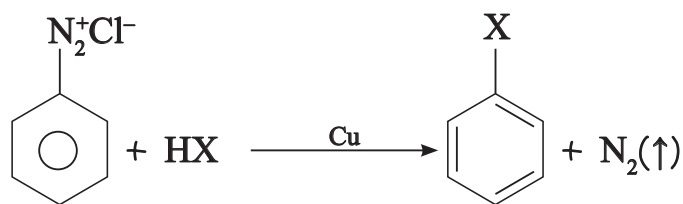


Example:

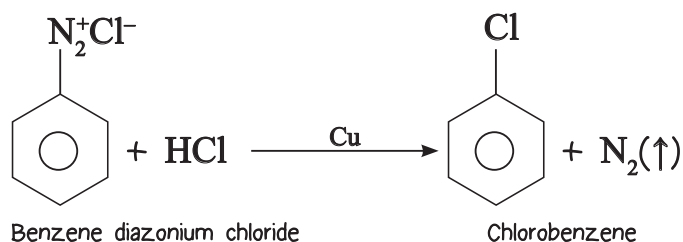


10. Gattermann Reaction:

- * Diazonium salt is treated with HX with Cu to form Haloarene ($\text{C}_6\text{H}_5\text{X}$).

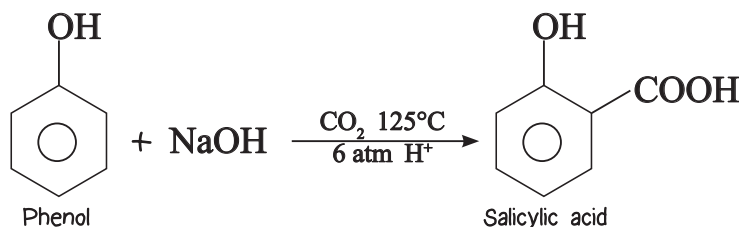


Example:



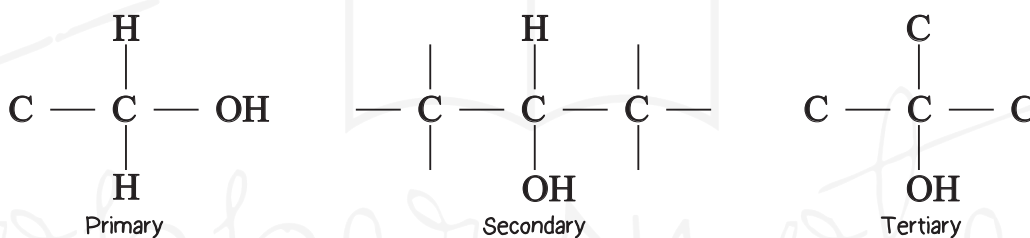
11. Kolbe's Schmitt Reaction:

- * When phenol (C_6H_5OH) is treated with $NaOH$ & reacted with CO_2 at $400^\circ K/125^\circ C$ & 6 atm pressure followed by Acidification \rightarrow Salicylic acid will be form [In the presence of Base($NaOH$)]

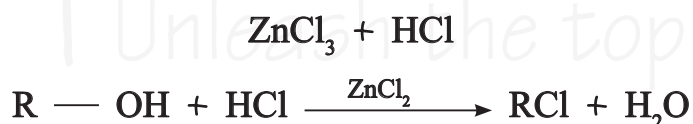


12. Lucas Test:

- * It is used to distinguish (different) between primary, secondary & tertiary aliphatic alcohol.



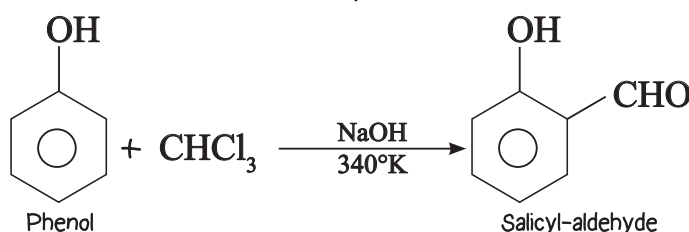
Lucas Reagent: Anhydrous zinc chloride in conc. HCl



- * When present tert alcohol \rightarrow RX^n immediately (Turbid)
- Sec. alcohol \rightarrow Turbid in 6-7 min
- Primary alcohol \rightarrow take more time to form turbid.

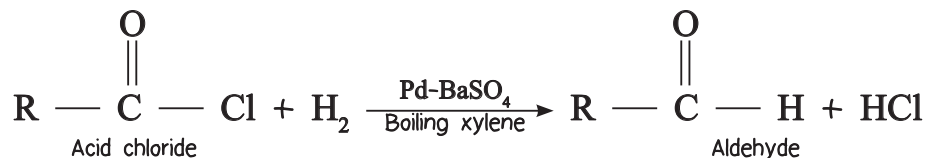
13. Riemer Tiemann Reaction:

- * When phenol react with chloroform ($CHCl_3$) in the presence of $NaOH$ then $-CHO$ (aldehyde) group introduce at ortho (O) position & form salicylaldehyde.

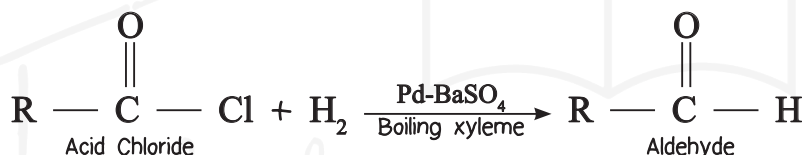
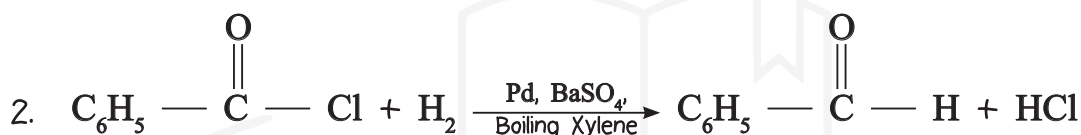
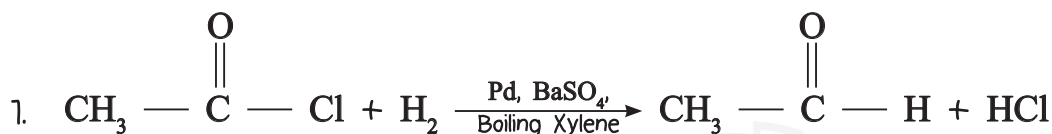


14. Rosenmund Reduction Reaction:

- * Hydrogenation of Acyl Chloride into aldehyde catalysed by Lindlar Regent ($H_2 + Pd - BaSO_4$)

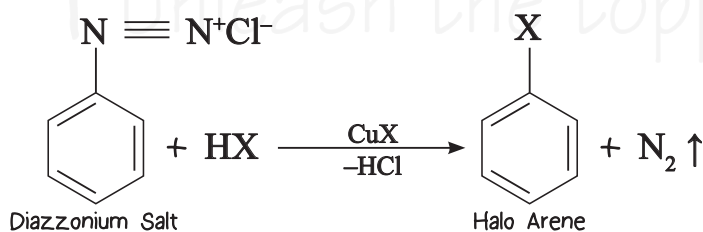


Example:

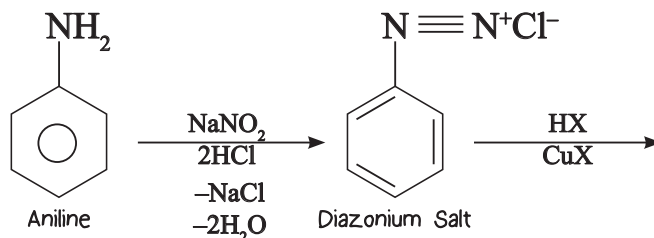


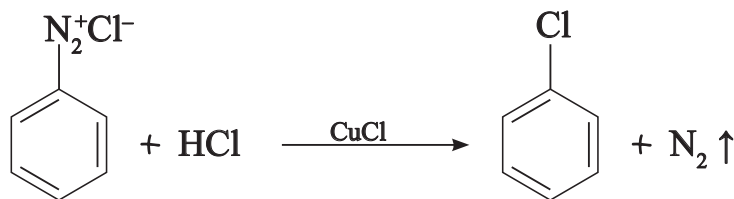
15. Sand-Meyer's Reaction:

- * Diazonium salt is treated with HX/CuX to form Halo Arene.



Example:





16. Swarts Reaction:

- * Halide exchange reaction (N^2)
- * When alkyl halide react with transition metal fluoride compound it form Alkyl fluoride.



Isomerism will be change in swart reaction e.g. $\text{R} \rightarrow \text{S}$, $\text{S} \rightarrow \text{R}$

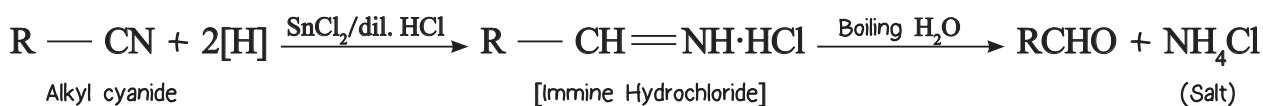
Example:



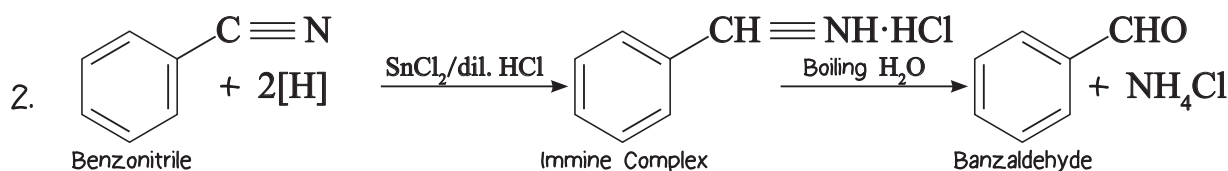
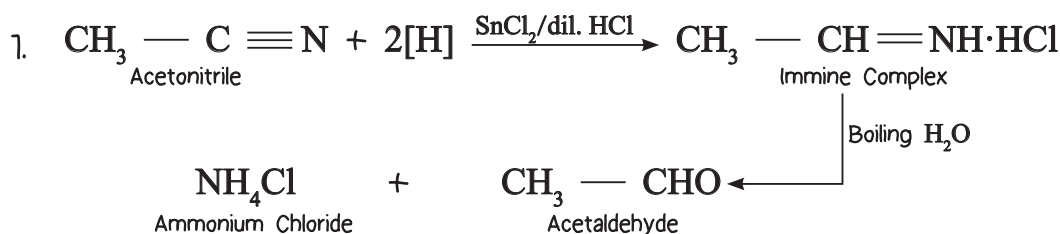
17. Stephen Reaction:

- * This R_x^n involve the preparation of Aldehyde $[\text{R} - \overset{\text{O}}{\parallel}{\text{C}} - \text{H}]$ from Nitrites $[\text{R} - \text{CN}]$ using tin [II] Chloride $[\text{SnCl}_2]$, Hydrochloric acid $[\text{HCl}]$ & quenching (cooling) the resulting iminium salt $[(\text{RCH} = \text{NH}_2) + \text{Cl}^-]$ with water (H_2O).

Reaction:



Example:

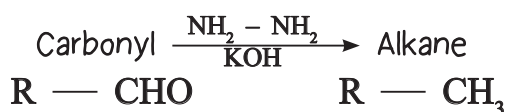
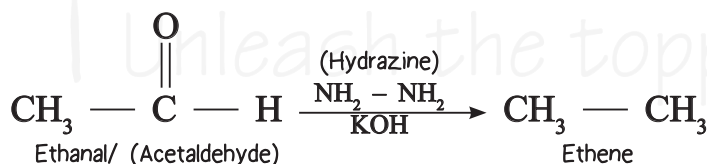
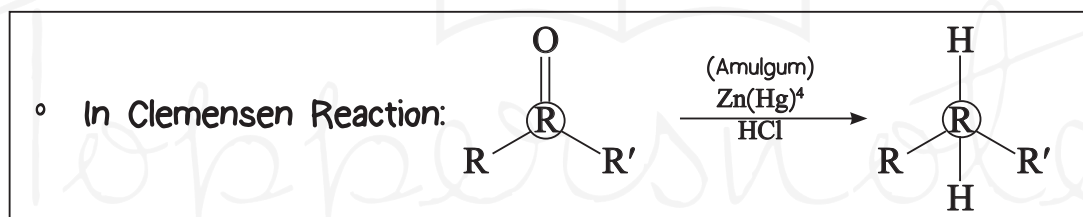
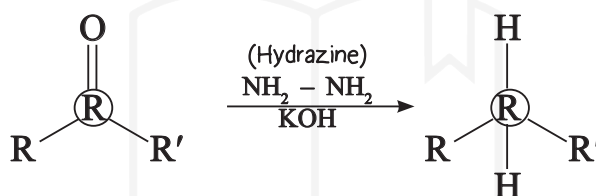


18. Victor Meyers Test:

- * This test is used to distinguish between 1°, 2°, 3° alcohol (reagent used P + I₂, AgNO₂, HNO₂, NaOH)
 - 1° alcohol → Red colour (Blood Red Colour)
 - 2° alcohol → Blue colour
 - 3° alcohol → It does not give victor mayer test.

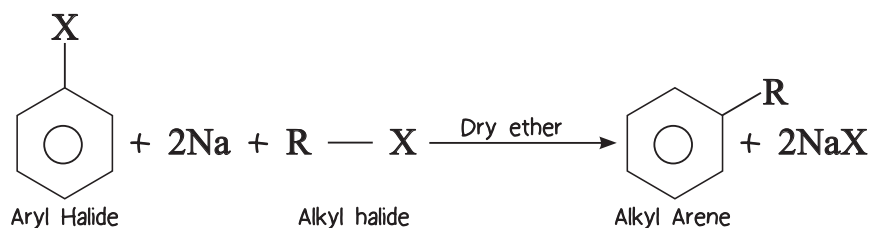
19. Wolf Kishner Reaction:

- * Reduction of carbonyl compound in the presence of Hydrazine/KOH to alkene.

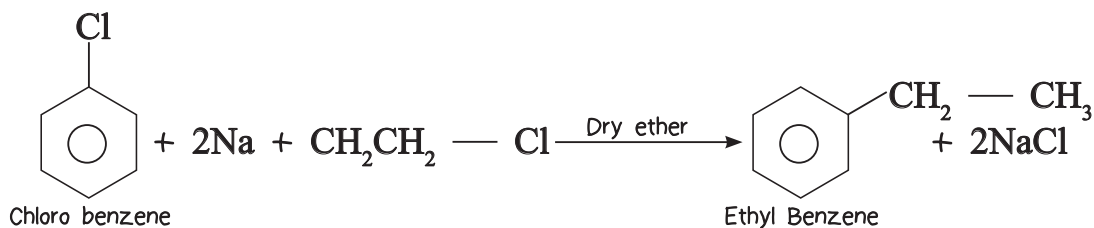


20. Wurtz-Fitting Reaction:

- * When aryl halide & alkyl halide react with sodium in the present of dry ether alkyl arene compound formed.

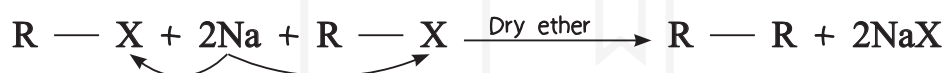


Example:



21. Wurtz Reaction:

- * When alkyl halide (Haloalkane) react with metallic Na^+ (sodium) in the presence of dry ether it will form alkane.



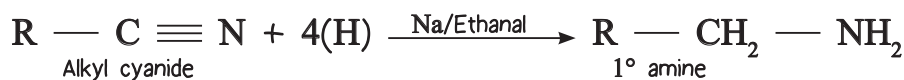
Example:



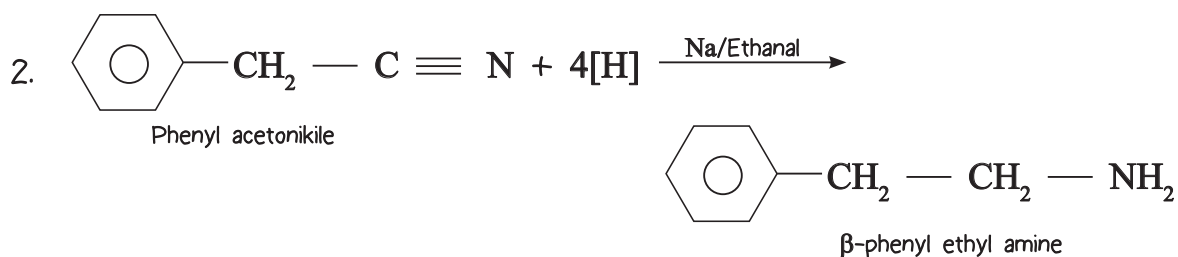
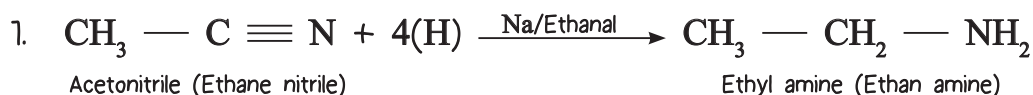
(Carbon no. will be double \rightarrow (4))

22. Mendius Reduction Reaction:

- * In mendius reaction nitriles on reduction with Na in ethanol give primary amines.
- * The reaction is used for prepⁿ of amines containing one carbon atom more than the starting amine.

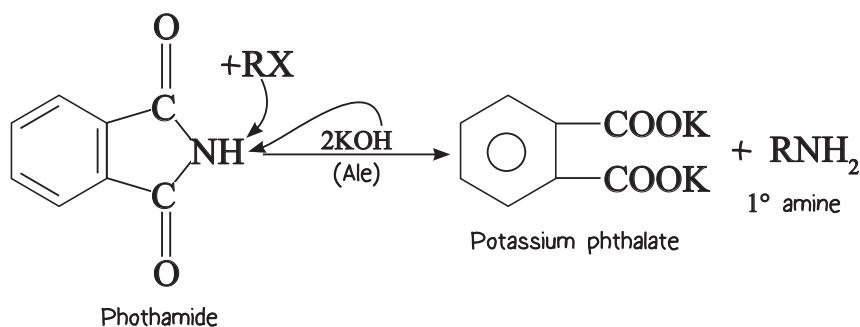


Example:



23. Gabriel Phthalamide Reaction:

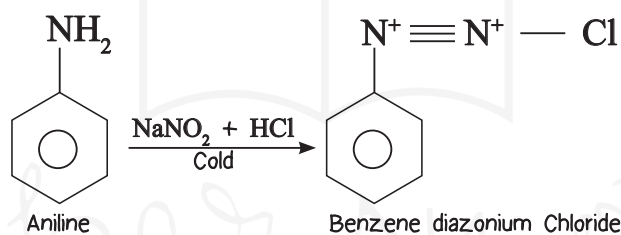
- * Used for prepⁿ of aliphatic primary amine.



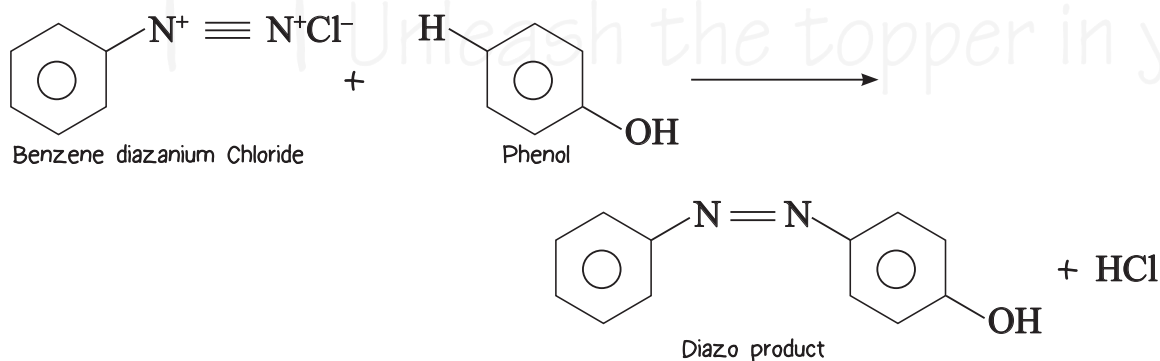
24. Azo Coupling:

- * Diazo means two nitrogen ($\text{— N} \equiv \text{N}$)

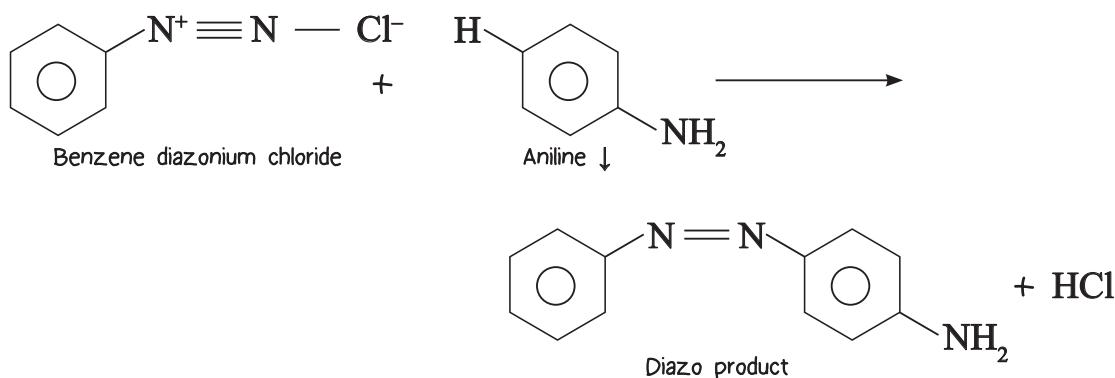
Prepn of diazonium salt:



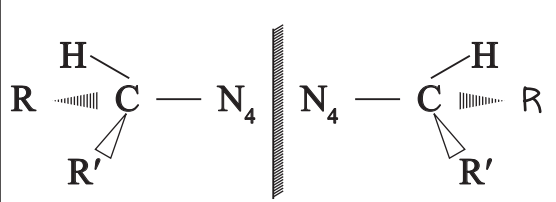
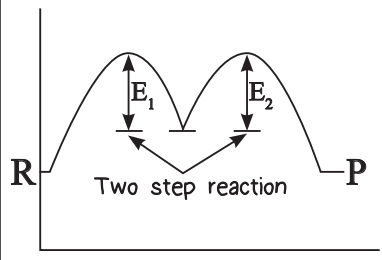
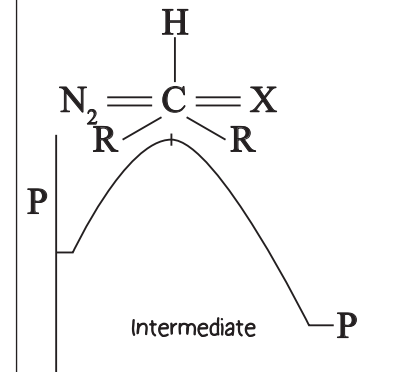
Coupling reaction with Phenol (Electron Riched Aromatic Compound)



Coupling reaction with aniline:



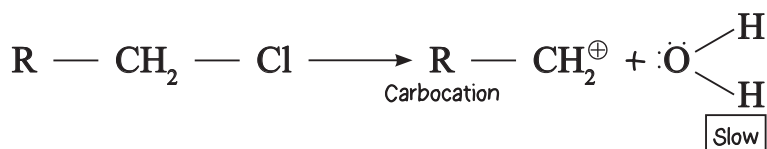
- * Substitution occur at P-position (Ele-rich a.c.)
- * Used in productin of dye & pigment

SN ¹		SN ²	
1.	Unimolecular Nucleophilic reaction	1.	Bimolecular nucleophilic reaction
2.	Rate = $K[R - \alpha]^1$	2.	Rate = $K[R - X]^1[N_4]^1$
3.	Molecularity = Order = 1	3.	Molecularity = order = 2
4.	2-step reaction	4.	Single Step = reaction
5.	Nu [⊖] weak (Rate of reaction)	5.	Nu [⊖] strong
6.	Order of Rx ⁿ with substrate (R — X) 3° > 2° > 1° > CH ₃ — X ROR ∝ Stability of carbocation	6.	Order of ROR with respect of substract CH ₃ — X > 1° > 2° > 3° ROR ∝ $\frac{1}{\text{Steric hindrance}}$
7.	Solvent → polar protic (Heb, CH ₃ COOH)	7.	Polar aprotic solvent (Acetene) CH ₃ — C(=O) — CH ₃
8.	Order of rate of reaction (leaving group) Halogen R — I > R — Ir > R — Cl > R — F	8.	Order of rate of reaction R — > R — Br > R — Cl > R — F
9.	If substract is optically active then → Recemic mixture is form 	9.	If substract is optically active then → Inversion form is formed (Walder form)
10.		10.	

Organic Chemistry

1. SN¹

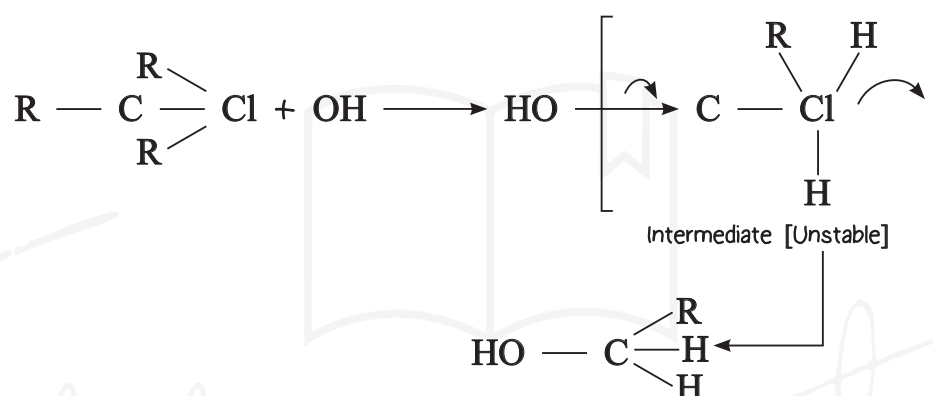
Step-1:



Step 2:



2. SN²



Order:



Reactivity Order:



क्योंकि $\text{C} \begin{matrix} \diagup \text{R} \\ | \text{R} \\ \diagdown \text{R} \end{matrix}$ R group ज्यादा है तो OH easily attack नहीं कर पाएगा

Elimination Reaction:

E ₁		E ₂	
1.	Unimolecular Elimination Reaction	1.	Bimolecular Elimination Reaction
2.	2 Step Reaction	2.	Single Step Reaction
3.	Rate = K[R — X] ¹ (Substrate)	3.	Rate = K[R — X][OH ⁻] Base
4.	Order = Molecularity = 1	4.	Order = Molecularity = 2
5.	Weak Base + Δ	5.	Strong Base
6.	C ₂ H ₅ OH + Δ, E + OH + Δ	6.	Alcoholic KOH, NaNH ₂ , C ₂ H ₅ O ⁻ /alcohol
7.	Carbocation form	7.	No Carbocation form
8.	Rearrangement Possible	8.	Rearrangement not possible