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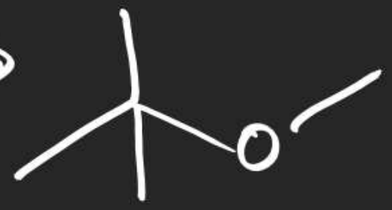
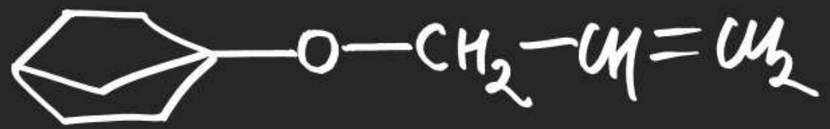
(11) $R-O^{\ominus}Na^{\oplus} + R'-X \longrightarrow$ 

$CH_3-O^{\ominus}Na^{\oplus} +$  $\longrightarrow$ NO RXN

(12) ? + ? $\longrightarrow$ 

(13) ? + ? $\longrightarrow$ 

(14) 

$\xrightarrow[\text{metal}]{Na}$

Soln 

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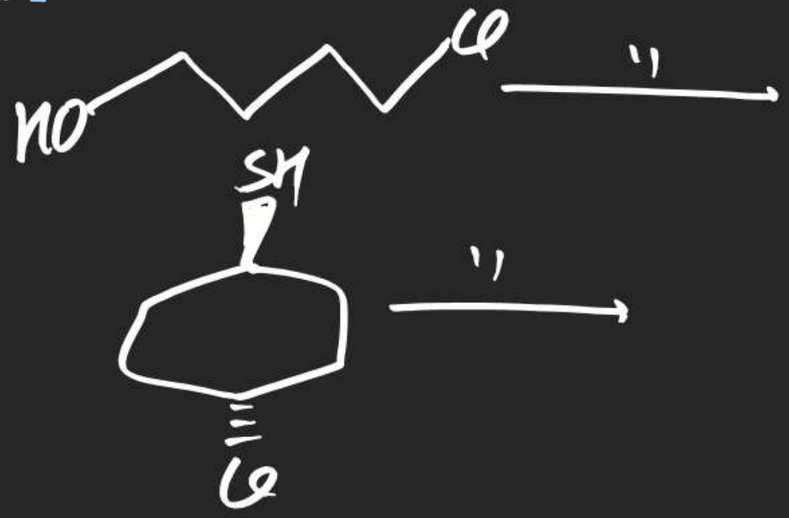
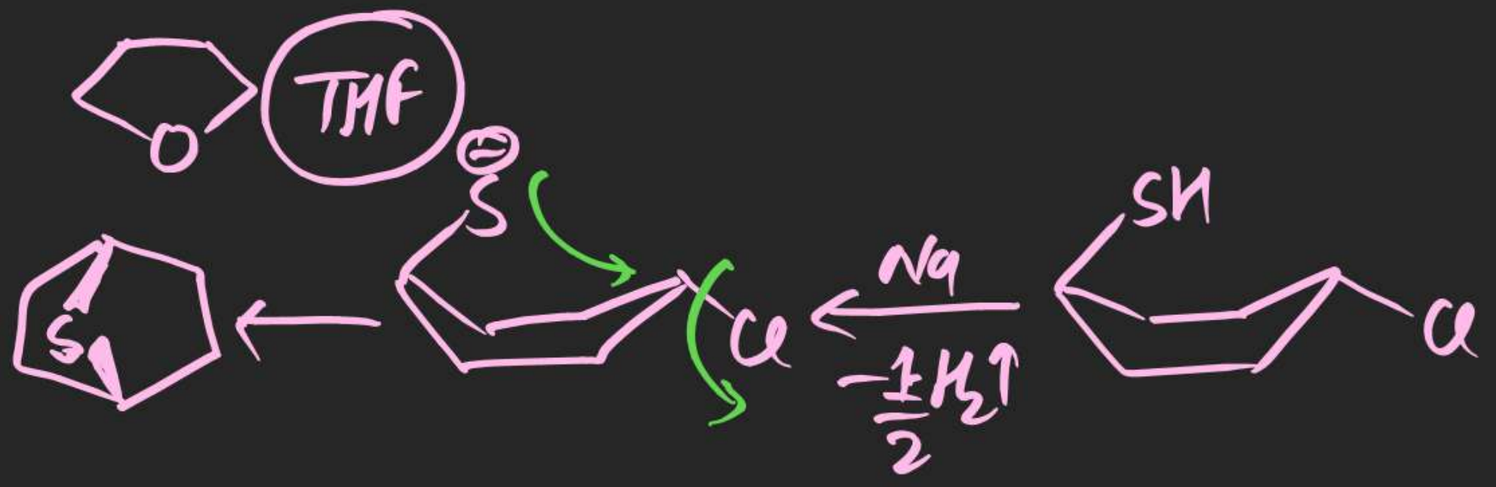
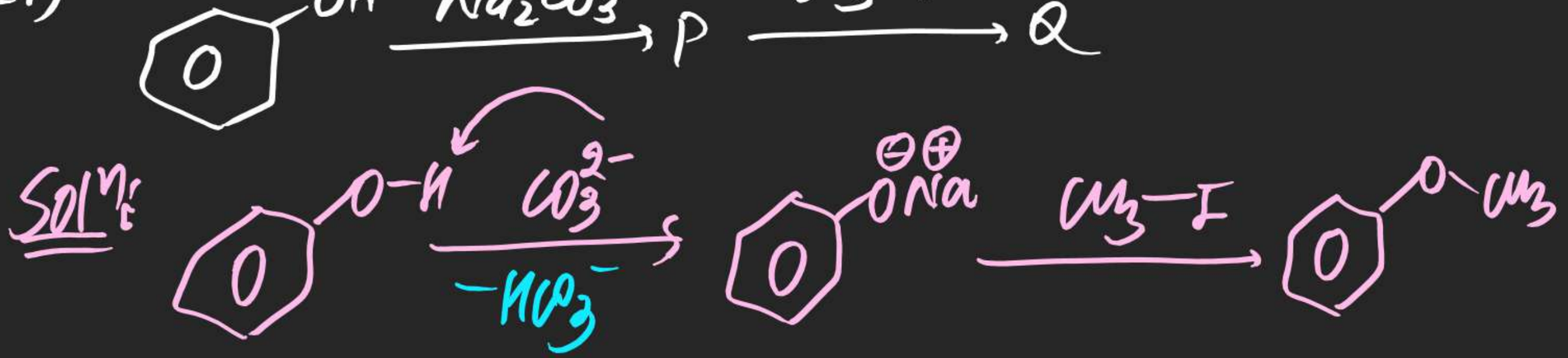
(15)



(16)



(17)



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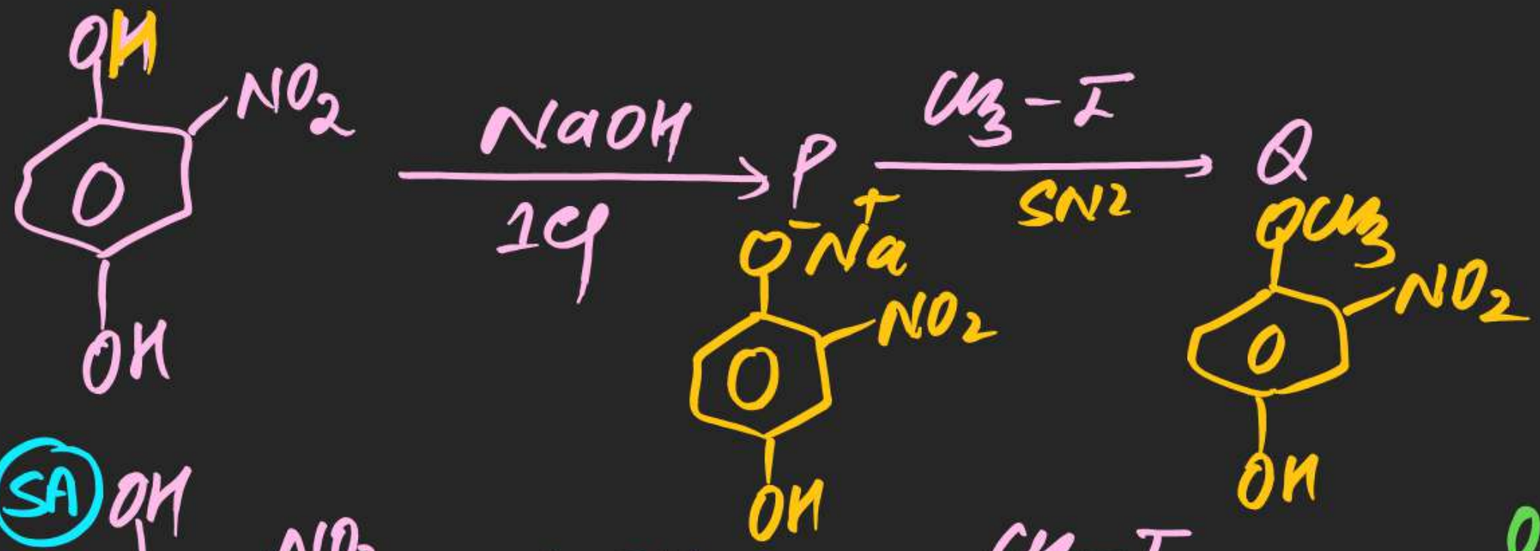
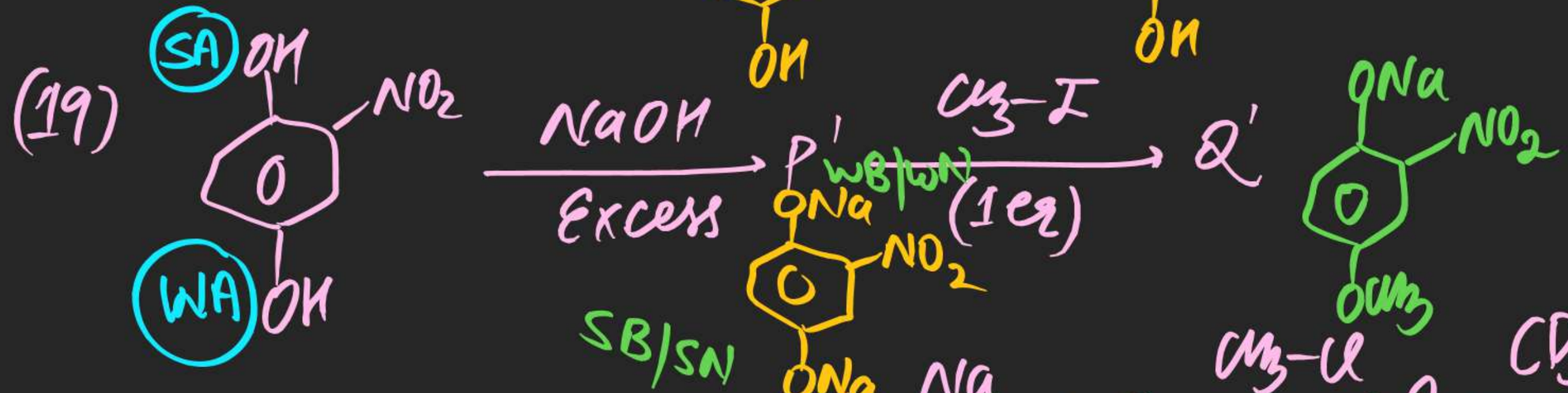
(18) 

(19) 

(20) $H-C\equiv C-CH_2-CH_2-OH \xrightarrow[\text{Excess}]{Na} P \xrightarrow[(1eq)]{CH_3-Cl} Q \xrightarrow{CD_3-Br} R$

Mech:- $H-C\equiv C-CH_2-CH_2-OH \xrightarrow[-H_2\uparrow]{Na}$ $Na^{\oplus}\,{}^{\ominus}C\equiv C-CH_2-CH_2-O^{\ominus}Na^{\oplus} \xrightarrow{CH_3-Cl}$

WA SA SB WB (P)

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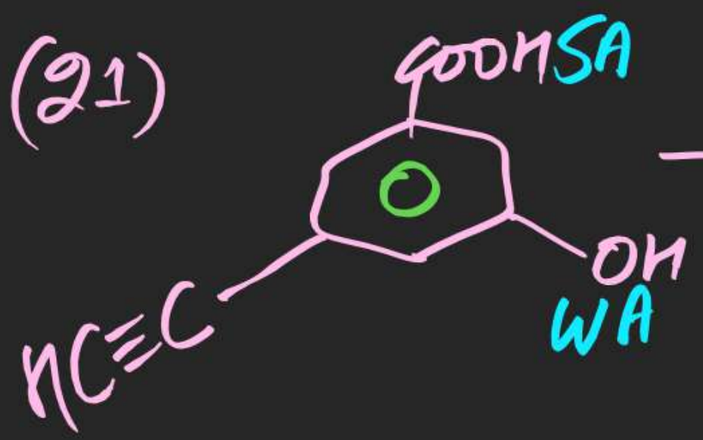
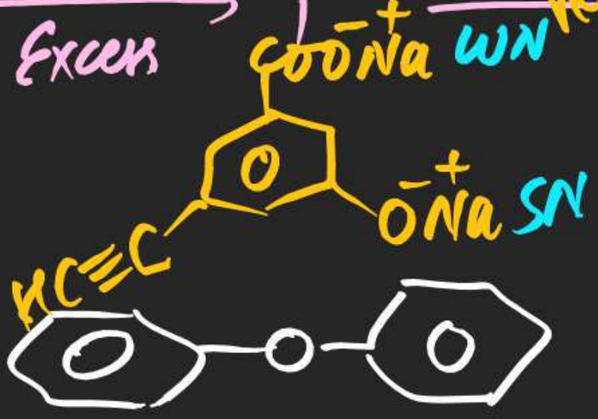
$H_3C-C\equiv C-CH_2-CH_2-\overset{\oplus}{O}\overset{\ominus}{Na}$ + CD_3-Br → $H_3C-C\equiv C-CH_2-CH_2-OCD_3$

(Q) (R)

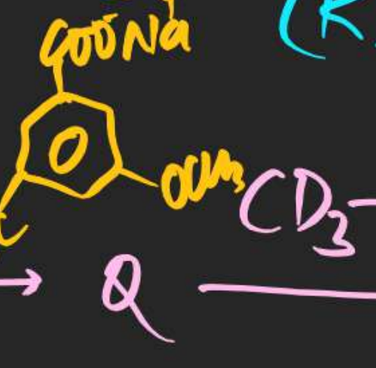
$En-H + Na \rightarrow \overset{\oplus}{Na}\overset{\ominus}{En} + \frac{1}{2}H_2\uparrow$

(21) 

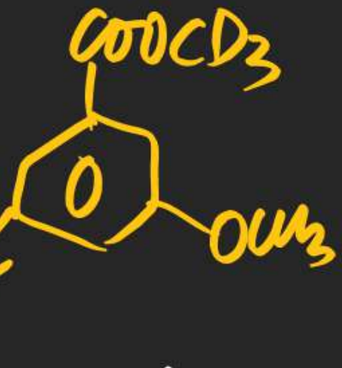
NaOH, Excess → P

P: 

P + CH_3-Cl → Q

Q: 

Q + CD_3-Br → R

R: 

(22) ? + ? → NO Such pair

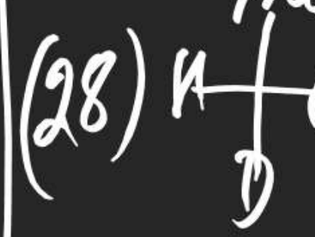
(23) " → 

(24) " → 

(25) " → 

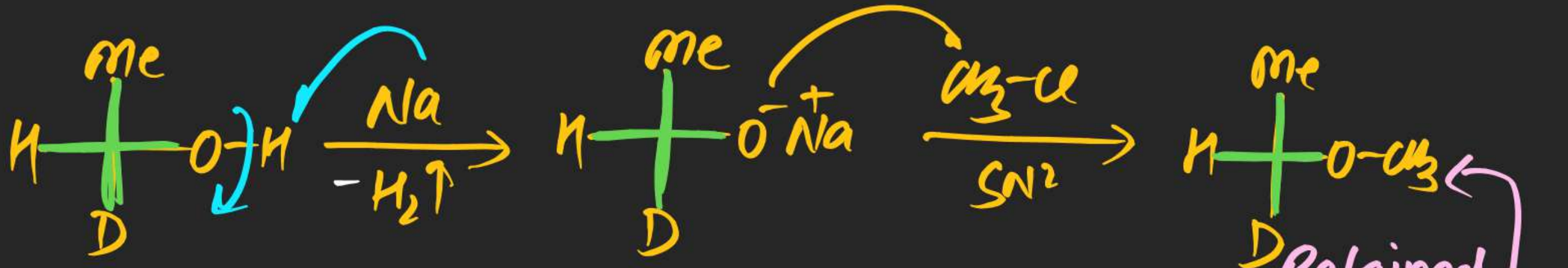
(26) ? + ? → 

(27) ? + ? → 

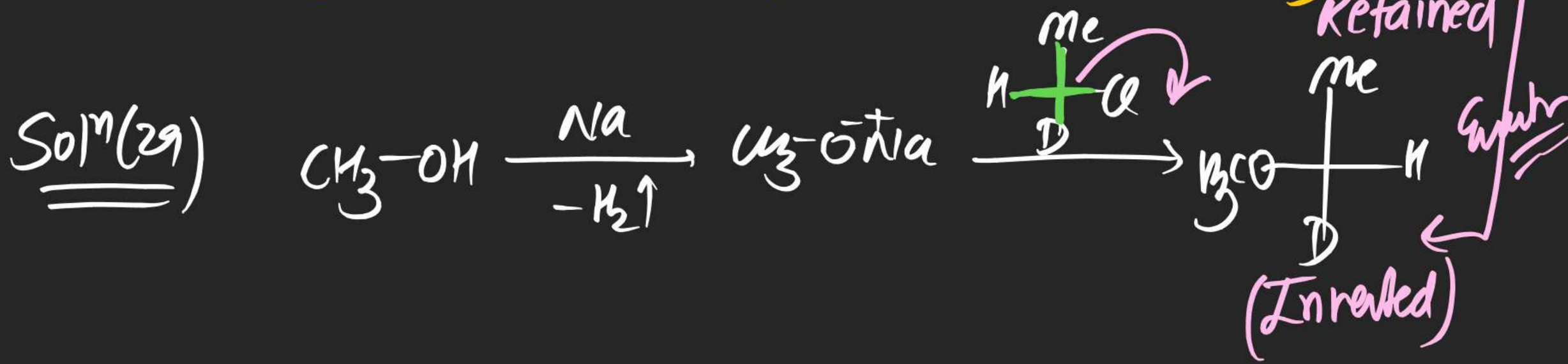
(28) 

(29) $CH_3-OH \xrightarrow[(ii)\ H\overset{me}{\underset{D}{C}}Cl]{(i)\ Na}$

Soln (28)



Soln (29)



(3) $R-O-R' + PCl_5 \longrightarrow R-Cl + R'-Cl + POCl_3$

(4) $R-\overset{\overset{O}{\|}}{C}-O-H + PCl_5 \longrightarrow R-\overset{\overset{O}{\|}}{C}-Cl + HCl + POCl_3$

(5) $R-\overset{\overset{O}{\|}}{C}-O-R' + PCl_5 \longrightarrow R-\overset{\overset{O}{\|}}{C}-Cl + R'-Cl + POCl_3$

(6) $R-\overset{\overset{O}{\|}}{C}-O-\overset{\overset{O}{\|}}{C}-R' + PCl_5 \longrightarrow R-\overset{\overset{O}{\|}}{C}-Cl + Cl-\overset{\overset{O}{\|}}{C}-R' + POCl_3$

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(7) $R-C(=O)-Cl$ + PCl_5 ⟶ No Rx^n

Electrophile Electrophile

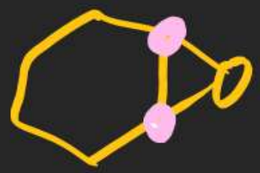
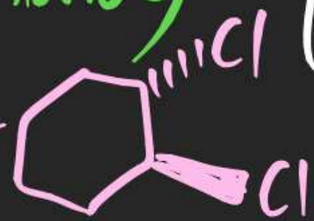
(8) $R-C(=O)-NH_2$ + PCl_5 ⟶ $R-C\equiv N$

dehydrating agent

$R-C\equiv N$ ⟵ $-HCl$ ⟵ $R-C(Cl)=N-H$ ⟵ $R-C(Cl)_2-NH_2$

(9)  + PCl_5 ⟶ 

(vicinal dichloride)

(10)  + PCl_5 ⟶  + 

$-HCl$

(11)  + PCl_5 ⟶  + 

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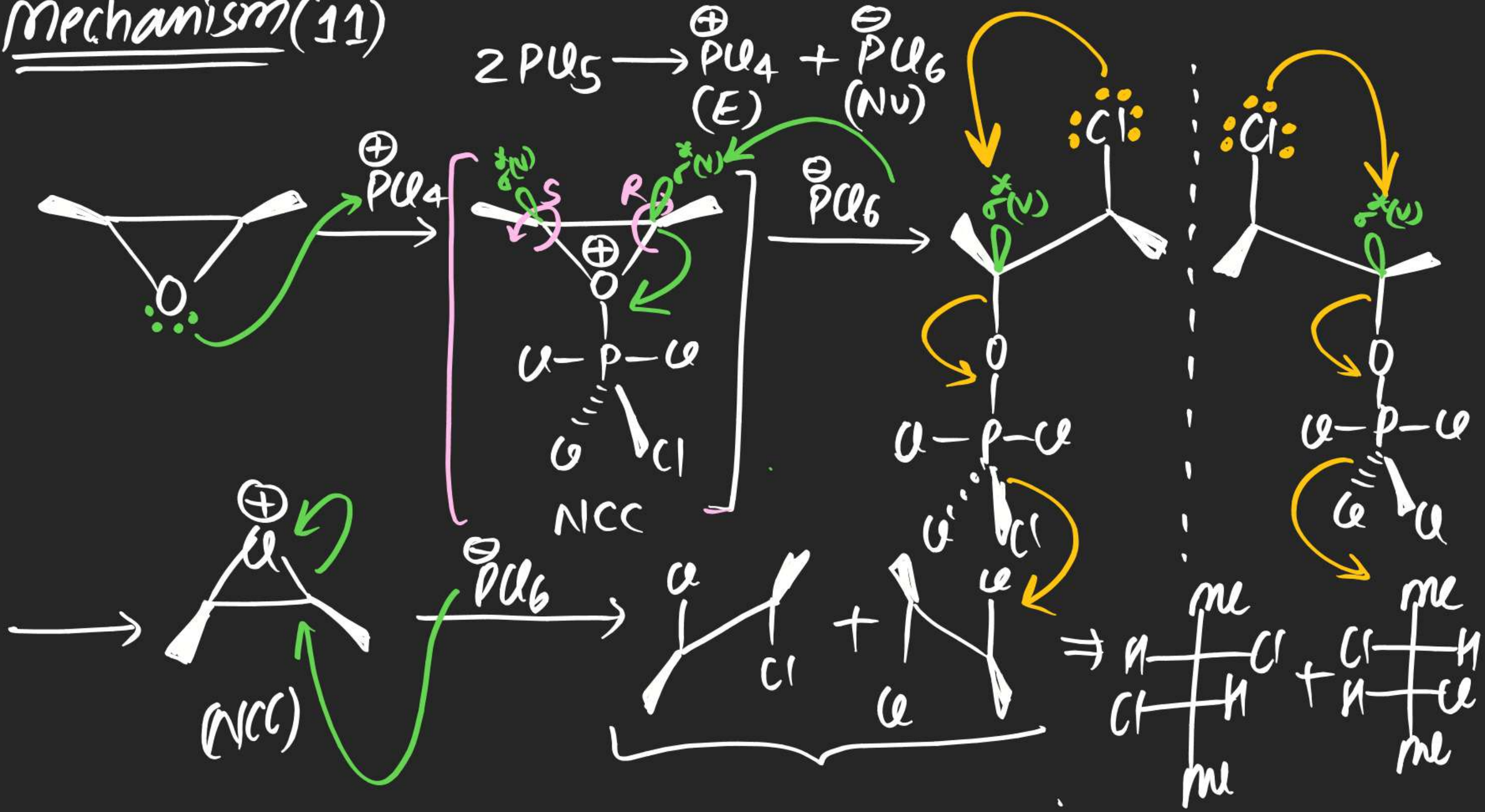
Mechanism (11)



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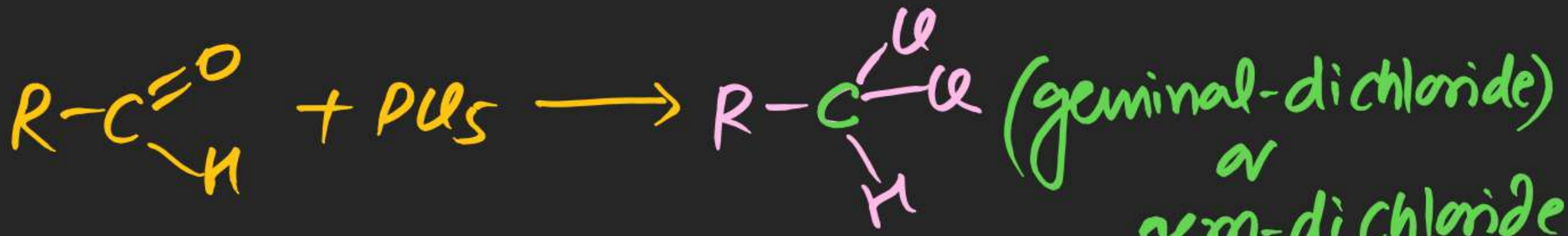
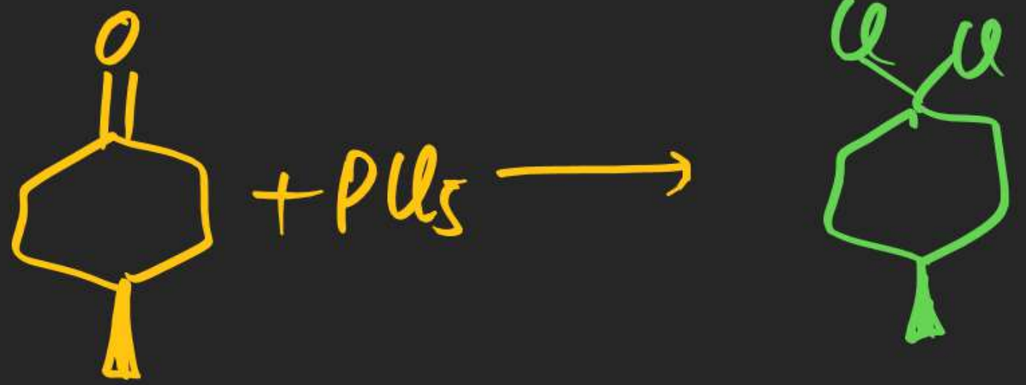
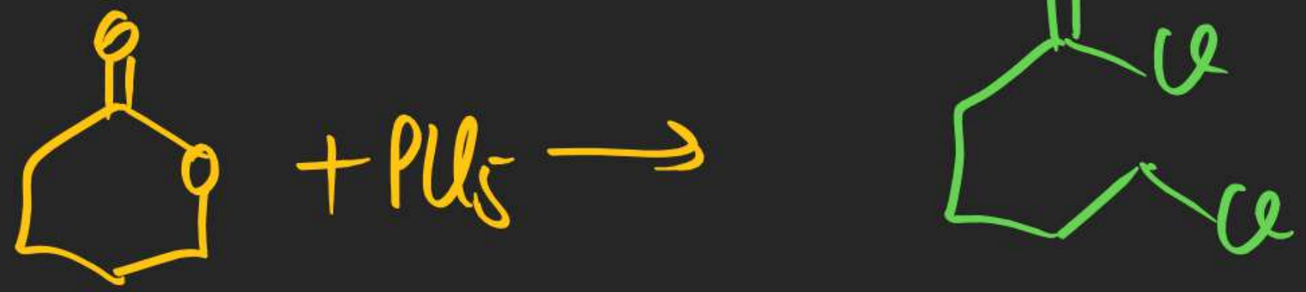
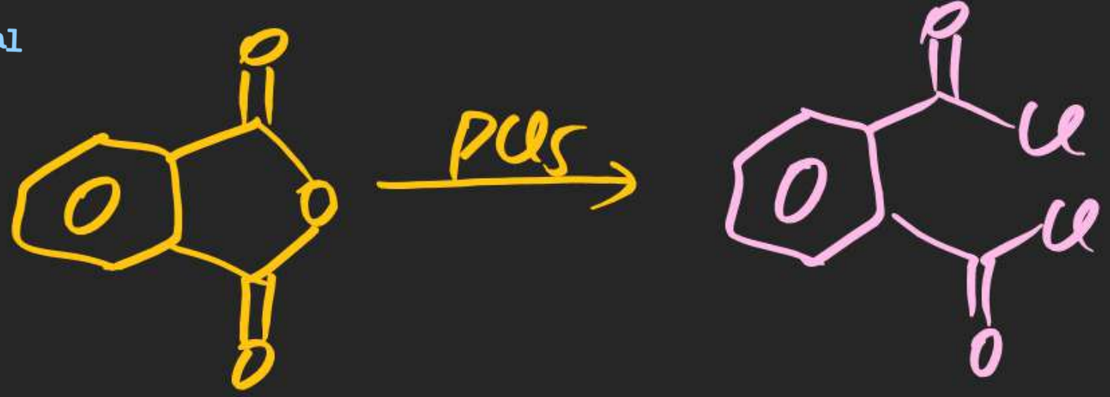
(12) 

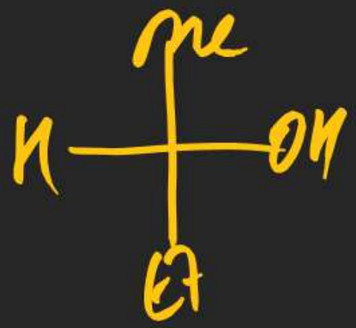
(13) 

(14) 

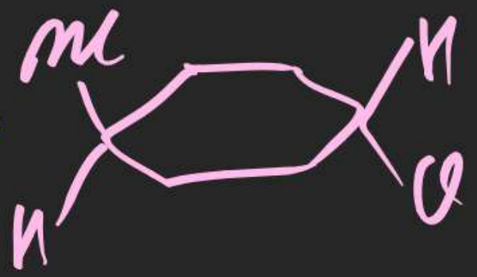
(15) 

(16)  PCl_5 →

(19)  PCl_5 → 

(17)  PCl_5 →  (Inverted)

(20) $R-C(=O)-H$ $\xrightarrow{SF_4}$

(18)  PCl_5 → 

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Darzen Reaction (Reaction of $SOCl_2$)

⟹ On Reaction of R–OH & $SOCl_2$, alkyl chloride is obtained as a Product.

⟹ Formation of R–Cl By Rxn of R–OH & $SOCl_2$ is most appropriate method due to formation of Escapable gases SO_2 & HCl

(1) $R-OH + SOCl_2 \longrightarrow R-Cl + H-Cl_{(g)} + SO_{2(g)}$

(2) 

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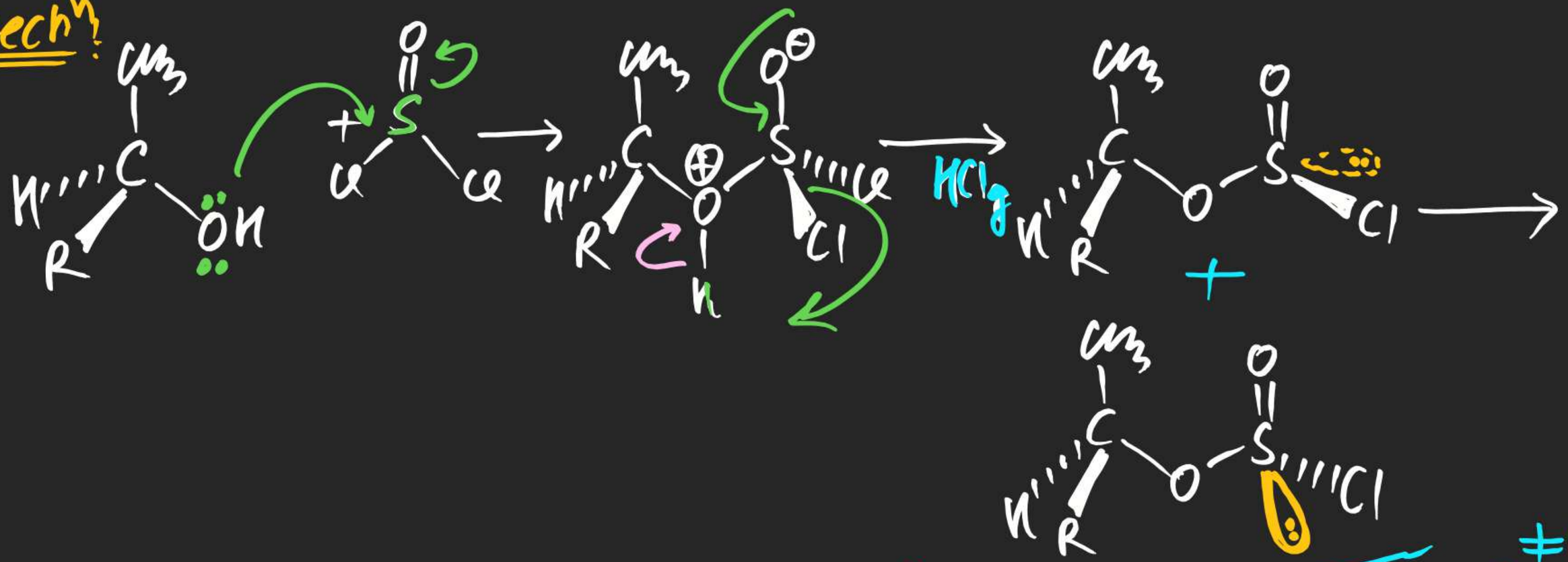
Mechⁿ:



(x) Diastereomeric mix $R \neq CH_3$

(x) Enantiomeric mix $R = H$ & $R = CH_3$

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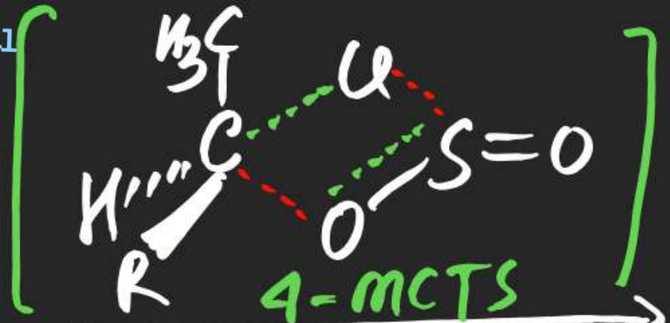
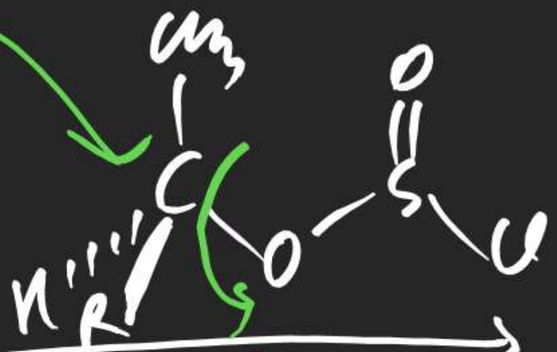


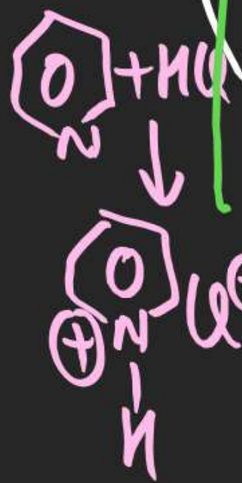
4-MCTS

S_Ni

(100% Retained)

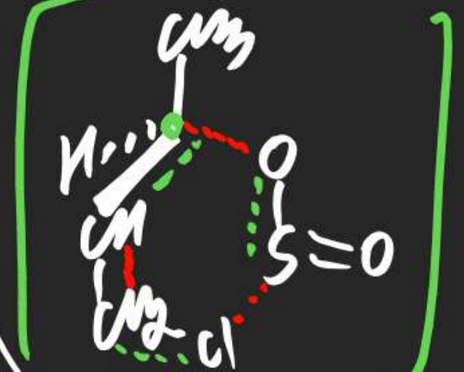


100% inverted



In Case of weak Base

S_Ni

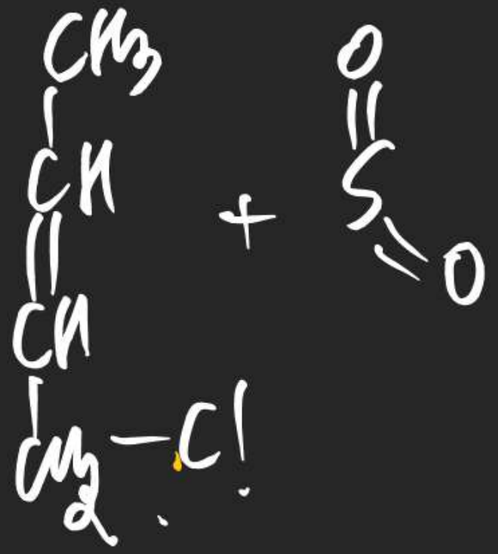


6-MCTS

(S_Ni' mechanism)

(R = -CH=CH₂)

In Case of Allylic alcohol



Note (i) Rxn of R-OH & $SOCl_2$ is SN^i mechanism & 100% Retained Product is obtained

(ii) Rxn of R-OH & $SOCl_2$ in presence of weak Base (like ) is SN^2 mechanism & Inverted product is obtained.

(iii) Rxn of Allylic Alcohol & $SOCl_2$ is $SN^{i'}$ mechanism.

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(#) Rxn of R-OH with HX :

⟹ On Reaction Of R-OH & HX, alkyl halide is obtained as a Product.

(1) $R-OH + HX \longrightarrow R-X + H_2O$

Mechanism :-

$$H-X \longrightarrow H^{\oplus} + X^{\ominus}$$

$$R-\ddot{O}H \overset{H^{\oplus}}{\rightleftharpoons} R-\overset{\oplus}{O}(H)-H \xrightarrow[-H_2O]{\text{r.d.s}} R^{\oplus} \xrightarrow{X^{\ominus}} R-X + X-R$$

Note (i) Carbocation int.
(ii) Rearrangement possible

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(iii) Formation of Carbocation is r.d.s

(iv) order of rate of Reaction for R-OH

$3^{\circ} > 2^{\circ} > 1^{\circ} < CH_3-OH$

(v) order of rate of Reaction for HX

H-I > HBr > HCl > HF

(vi) mechanism used By Alcohols

3° R-OH	2° R-OH	1° R-OH	CH_3-OH
⇓	⇓	⇓	⇓
SN^1	SN^1	SN^2	SN^2

(vii) Catalyst Used

H-F

Conc. H-Cl + Anhy $ZnCl_2$

H-Br + H_2SO_4

H-I

(viii) (:R gives Turbidity of R-Cl whenever treated with R-OH

MIP

Luca's Reagent

(ix) This Reaction of R-OH & LR is used in POC for distinguishion b/w 1°, 2° & 3° Alcohols By noticing time taken to appear turbidity.

Allylic 1°/2° ⇒ 3° ⟶ Immidiate turbidity
Benzylic

2° ⟶ 5 to 7 min

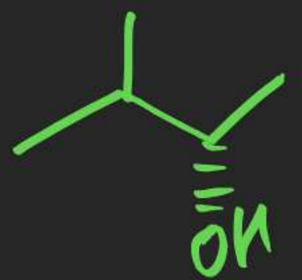
1° ⟶ No Turbidity
(gives turbidity on heating)

Ex: Complete following & also predict time taken to appear turbidity.

(1) 

$\xrightarrow[ZnCl_2]{HCl}$ (5 to 7 min)


2(±)

(2) 

$\xrightarrow{}$ (immediate)

(3) 

$\xrightarrow{}$ (immediate)

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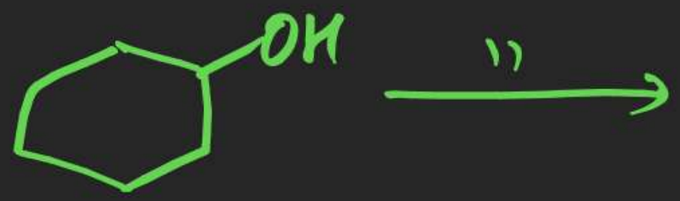
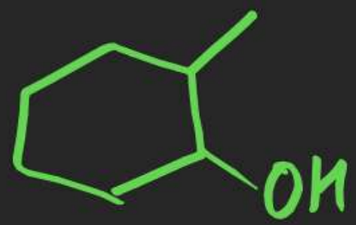
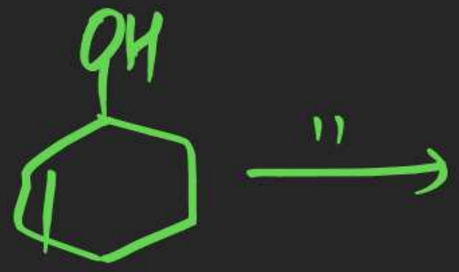
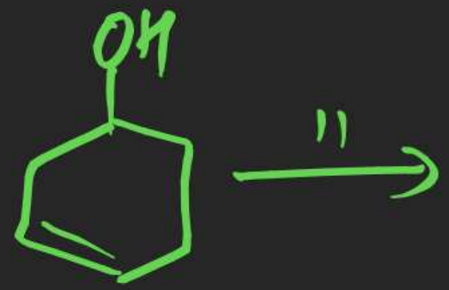
(4)  $\xrightarrow{\text{''}}$

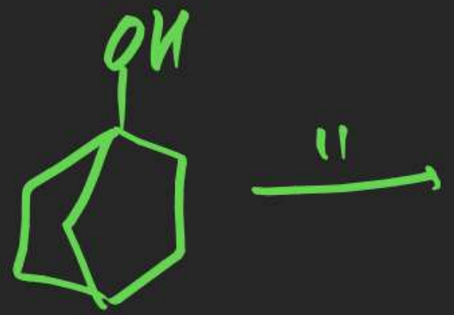
(5)  $\xrightarrow{\text{''}}$

(6)  $\xrightarrow{\text{''}}$

(7)  $\xrightarrow[ZnCl_2, \Delta]{HCl}$

(8)  $\xrightarrow{\text{''}}$

(9)  $\xrightarrow{\text{''}}$

(10)  $\xrightarrow{\text{''}}$

(11)  $\xrightarrow{\text{''}}$

Complete following :-

(12) $CH_3-CH_2-OH + NaCl \longrightarrow$

(13) $CH_3-CH_2-OH + NaI \longrightarrow$

(14) $CH_3-CH_2-OH + NaI + H_2SO_4 \longrightarrow$

(15) $CH_3-CH_2-OH + NaI + H_3PO_4 \longrightarrow$

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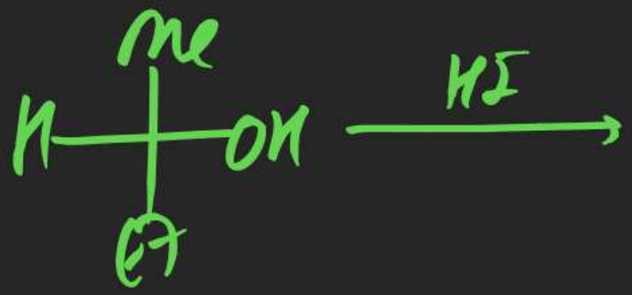
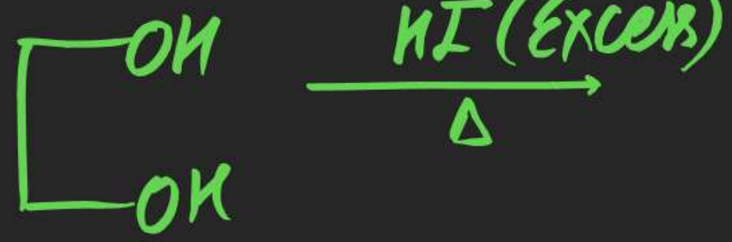
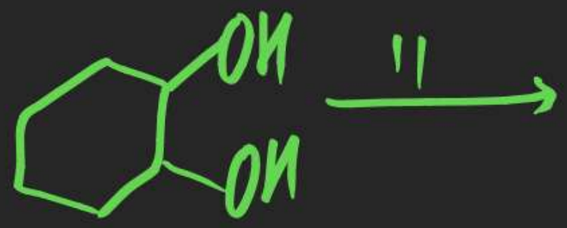
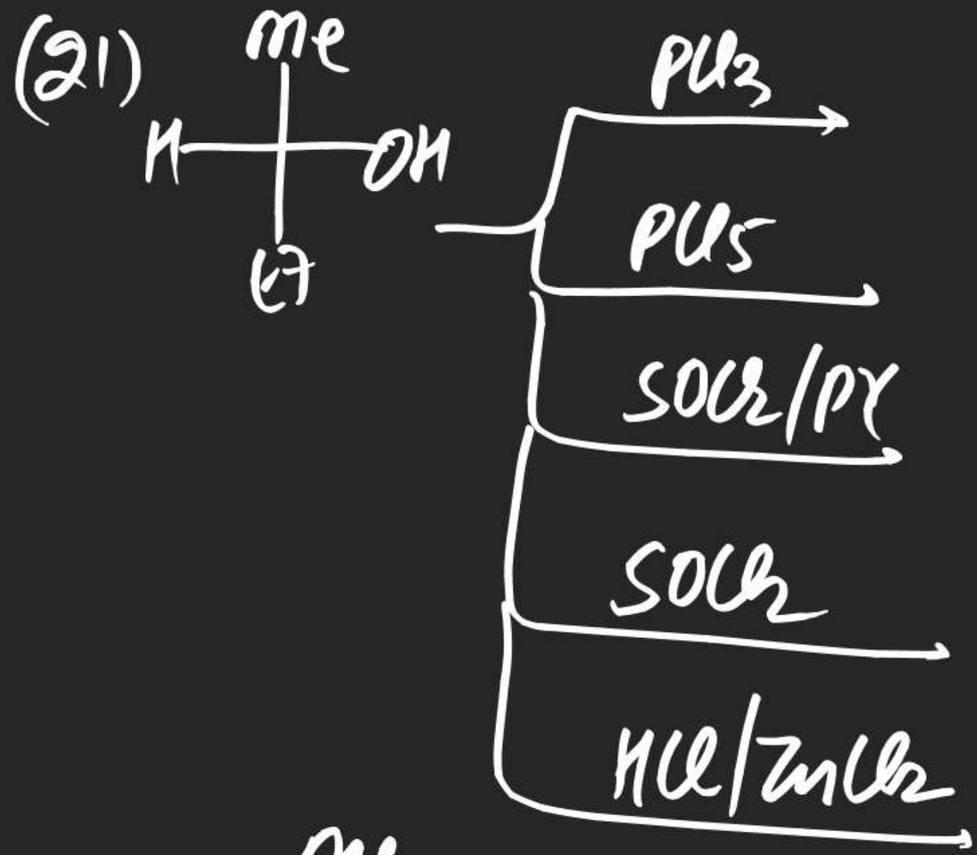
(16) 

(17) 

(18) 

(19) 

(20) 

(21) 

(22) 

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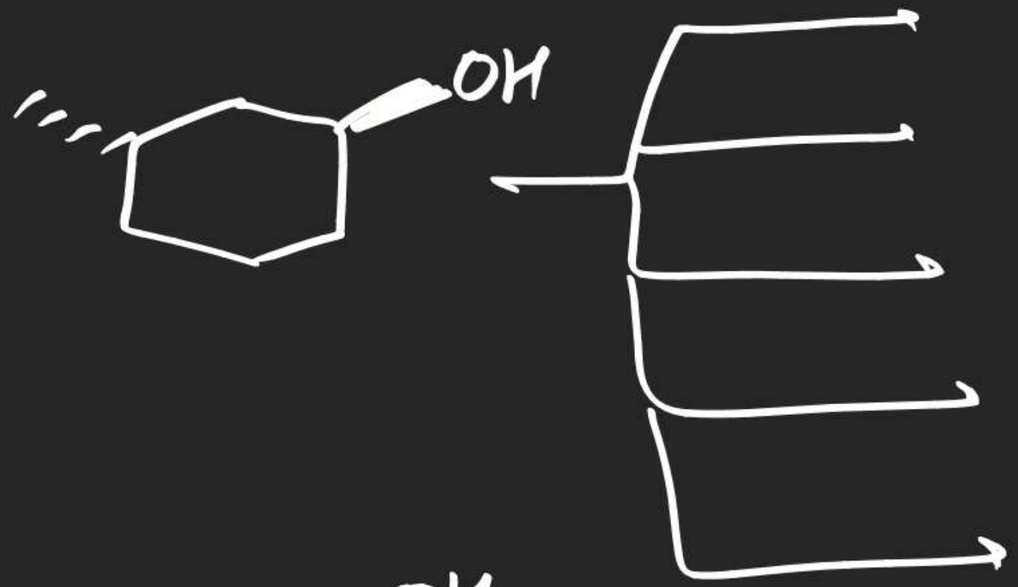
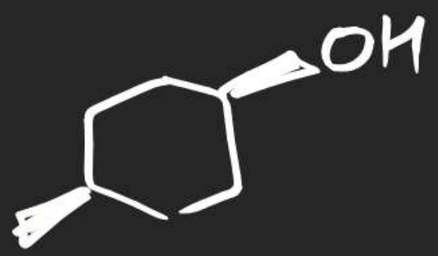
(23) 

(24) 

(25) 

(26) 

(27) 

(28)