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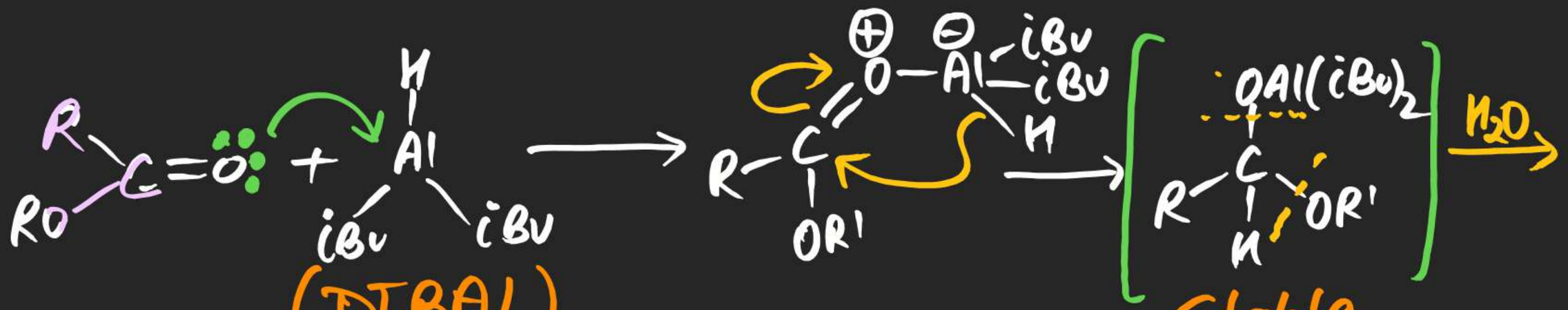
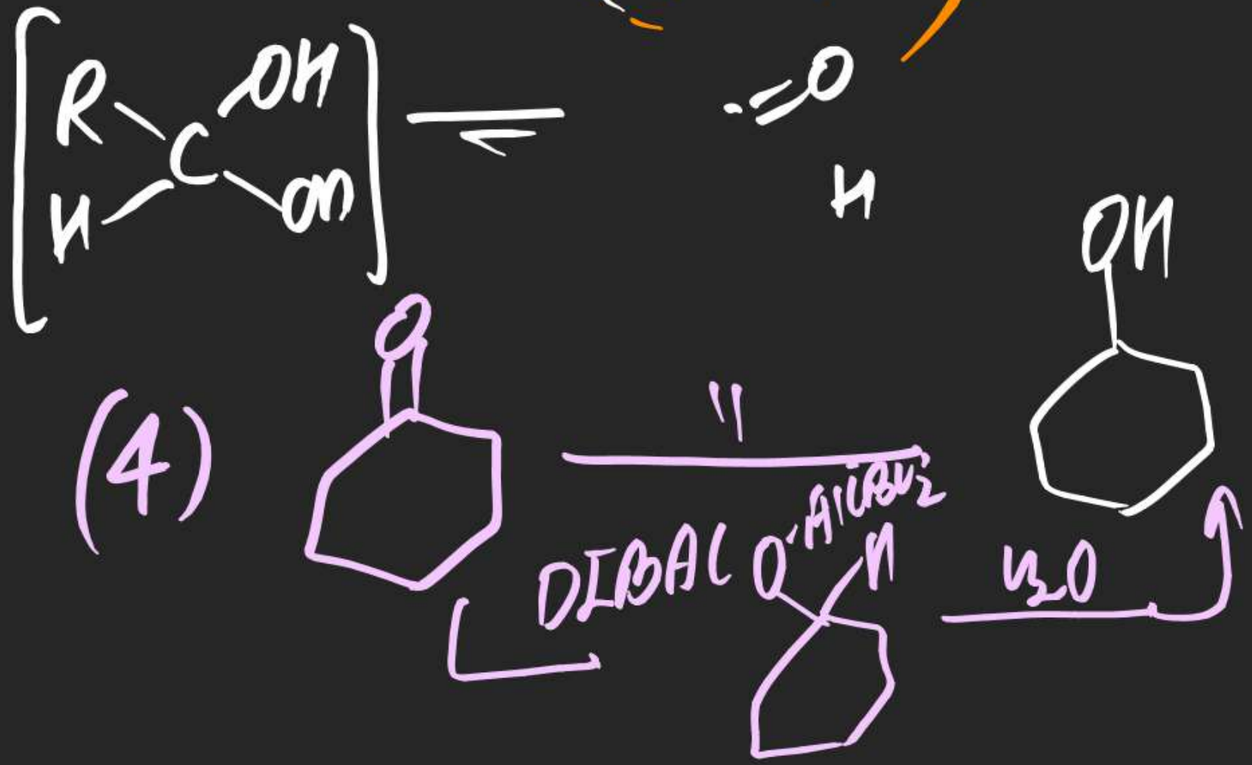
Mech:





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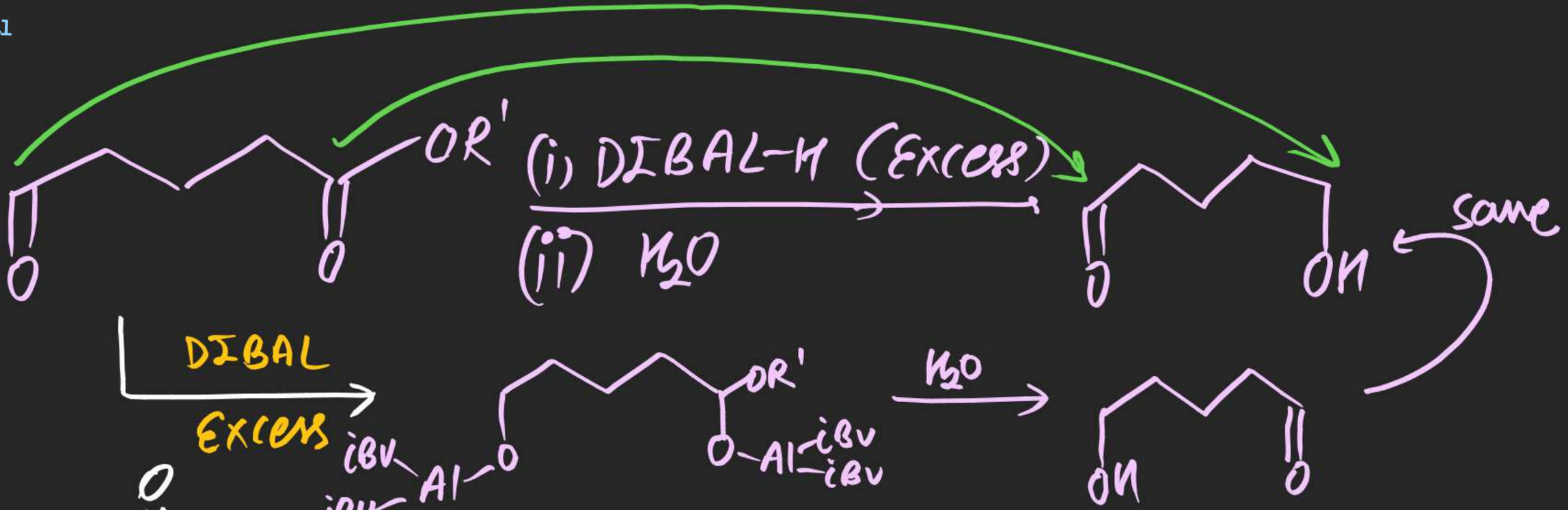

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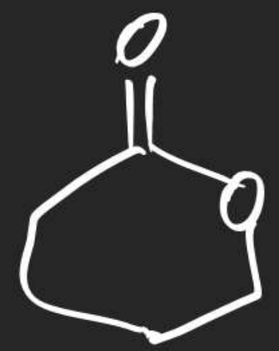

DIBAL → P → H^+ / Δ → Q

(7)

→ P' → H^+ / Δ → Q'

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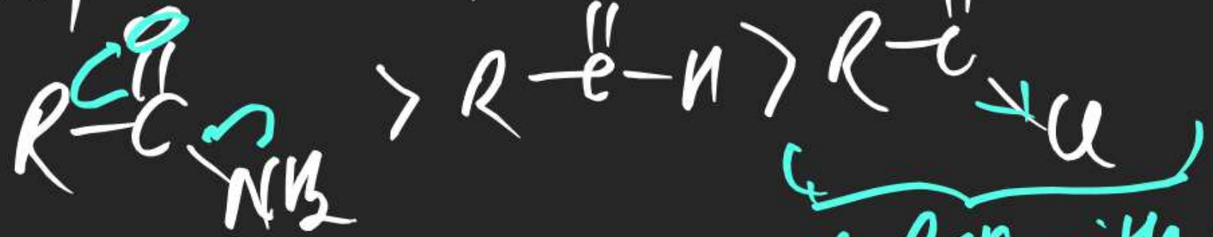
(#) Borane / Di Borane:

⇒ BH_3 or B_2H_6

⇒ Electrophilic Reducing agent

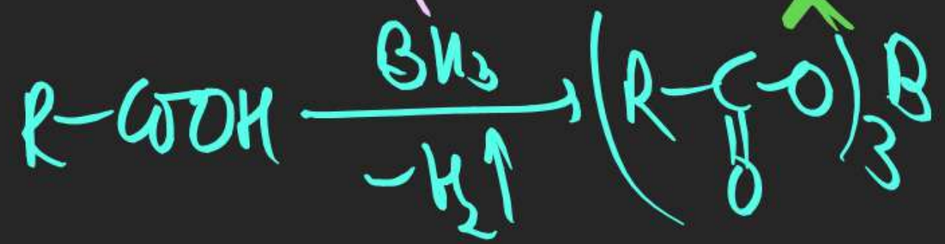
⇒ order of Reactivity

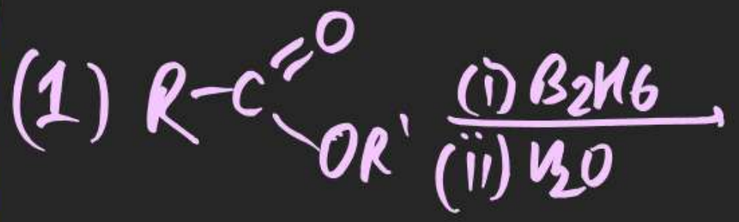


IMP

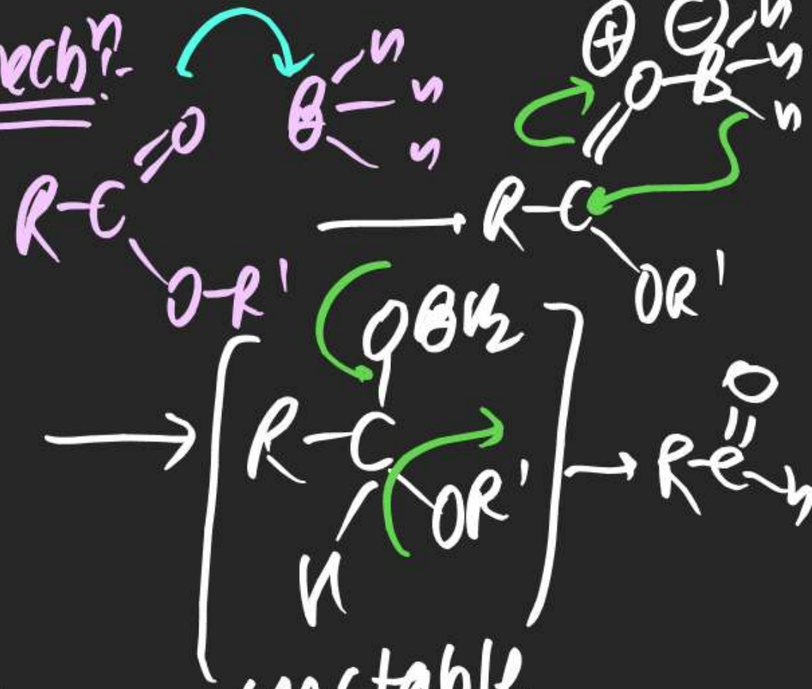
⇒ order of Reactivity with B_2H_6

R-COOH > R-COOR



(1) 

mechn:-



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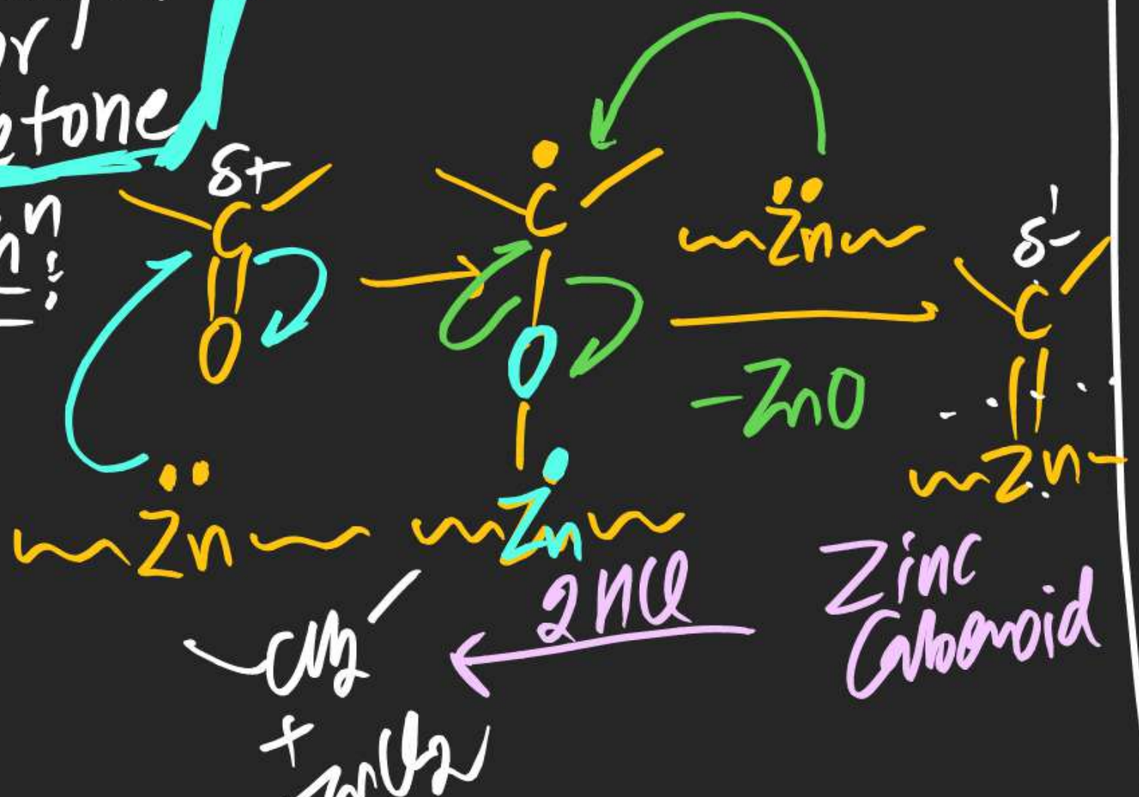
(#) Clemenson Reduction:

(1) 

Aldehyde or Ketone

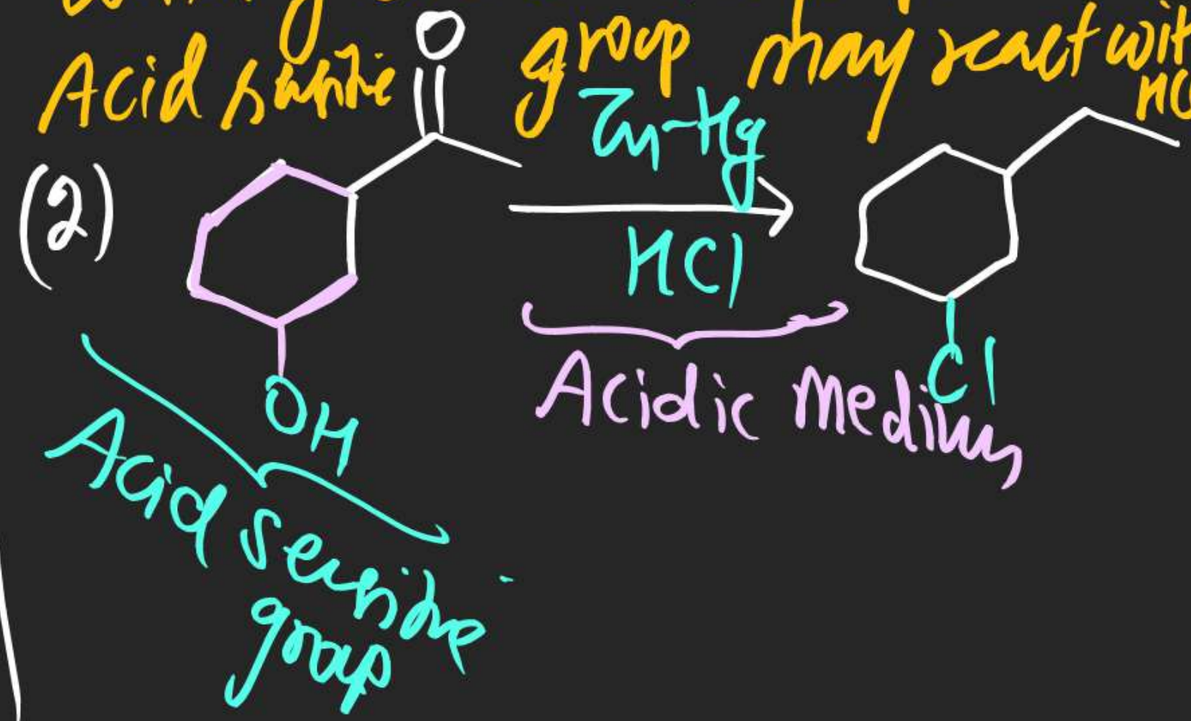
mechⁿ:



Note (i) It Reduces only Aldehyde & Ketones in to Hydrocarbon.

(ii) It never Reduces Alcohol.

(iii) Clemenson Reduction is more appropriate for Carbonyl Compounds Containing Base sensitive group: because Acid halide group may react with HCl

(2) 

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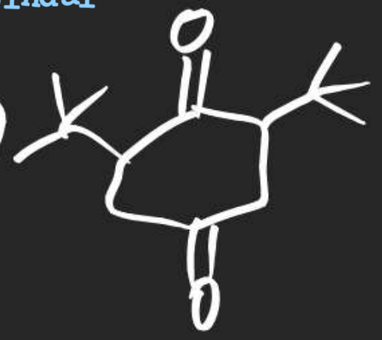
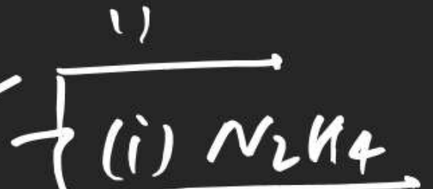
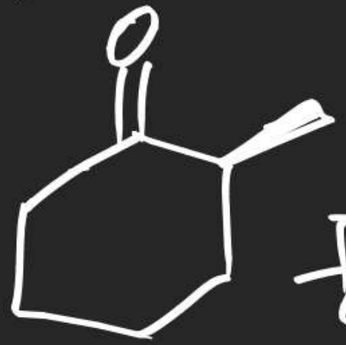
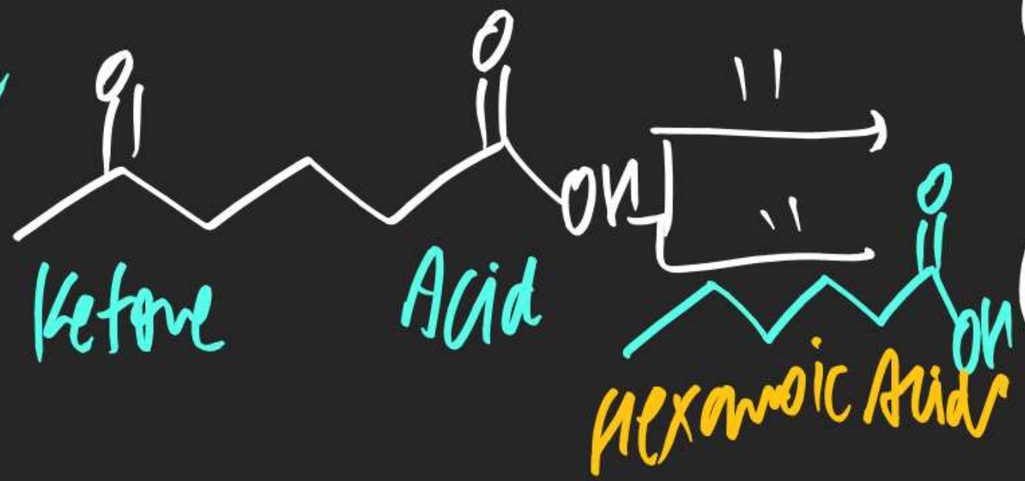
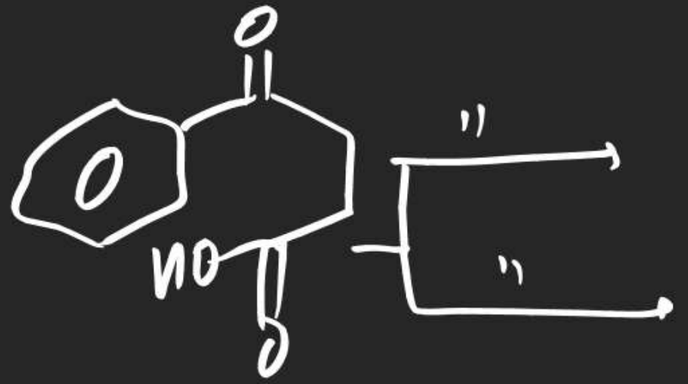
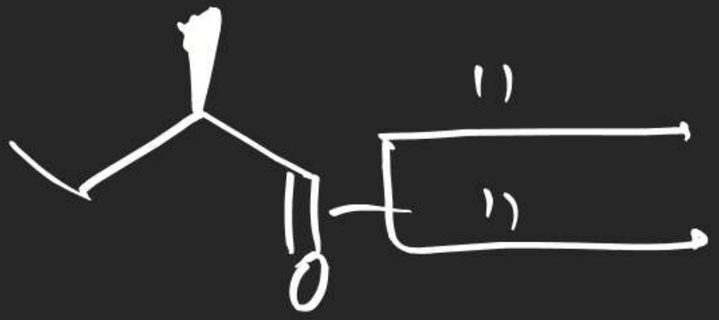
(3)  $\xrightarrow[HCl]{Zn\text{-}Hg}$

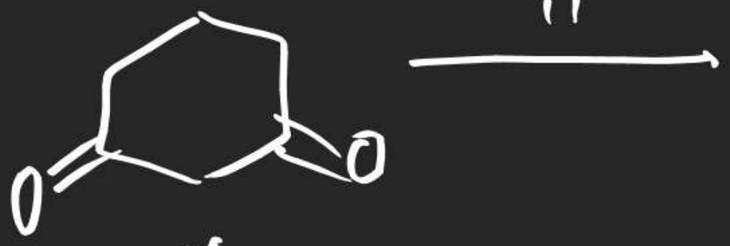
(4)  $\xrightarrow[(ii)\ KOH,\Delta]{(i)\ N_2H_4}$ 

(5)  

(6) 

(7) 

(8) 

(9) 

(10) 

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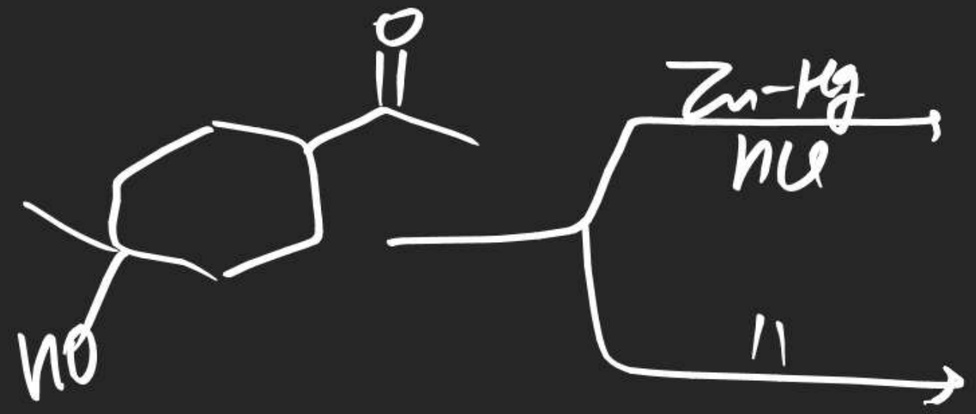
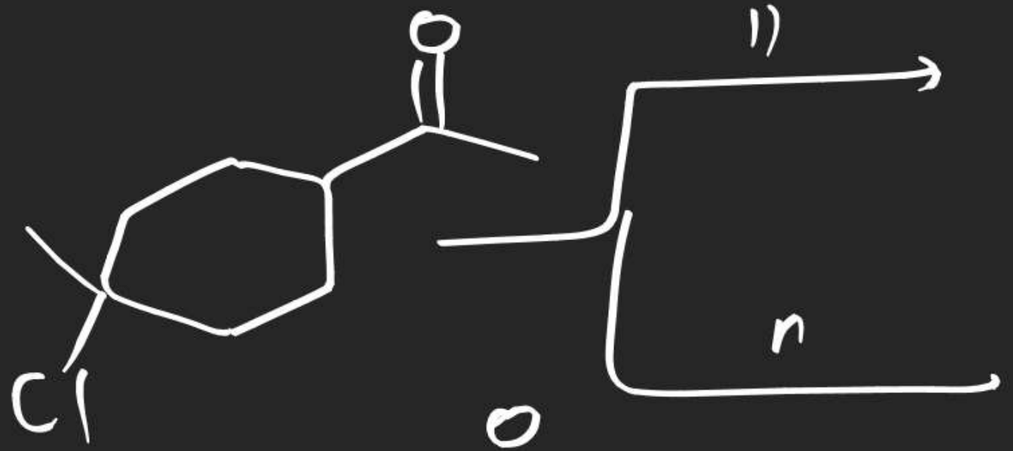
(11)



(12)



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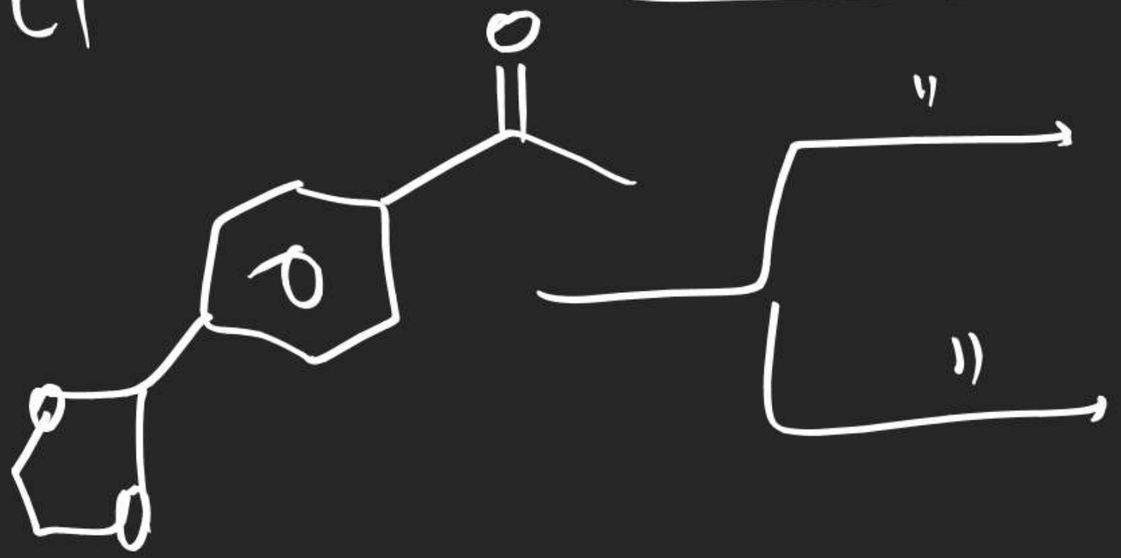

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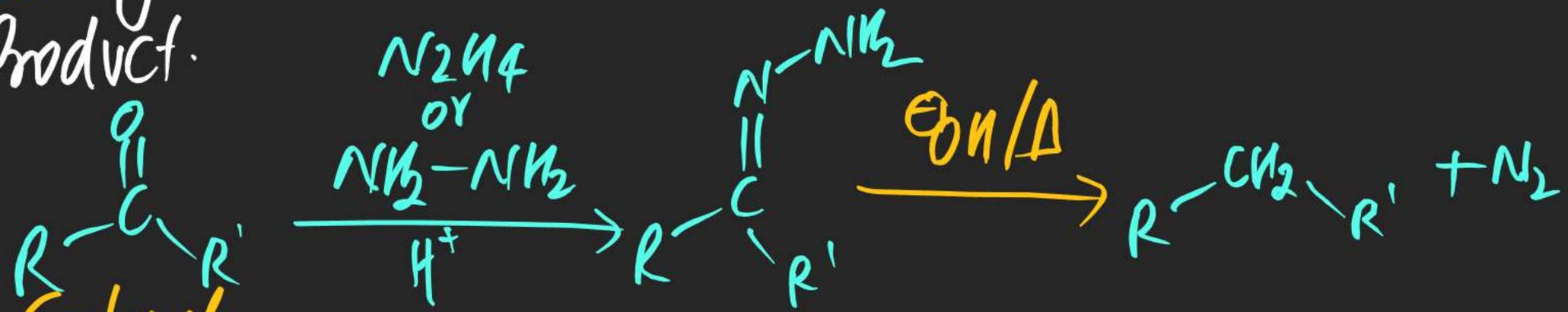
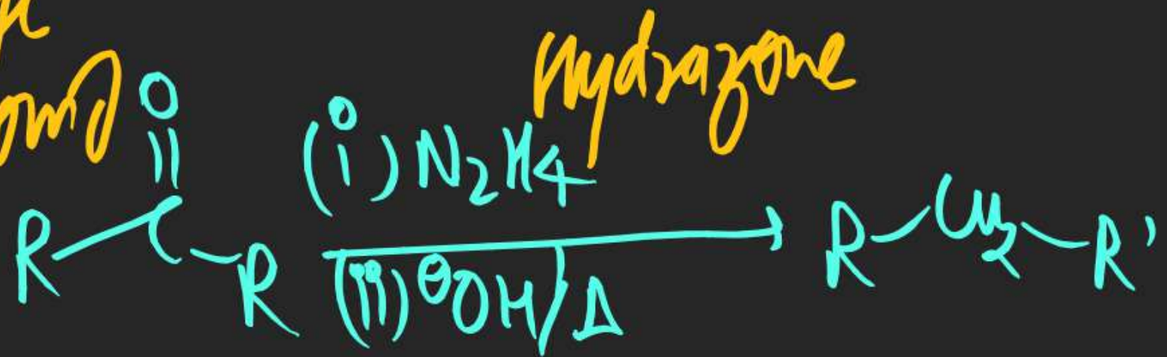
(#) WOLF KISHNER REDUCTION :-

⇒ In this Reduction Carbonyl compound (Aldehyde / Ketone) is converted into hydrazone or its derivative which on heating in alkaline condition gives Hydrocarbon as a Product.

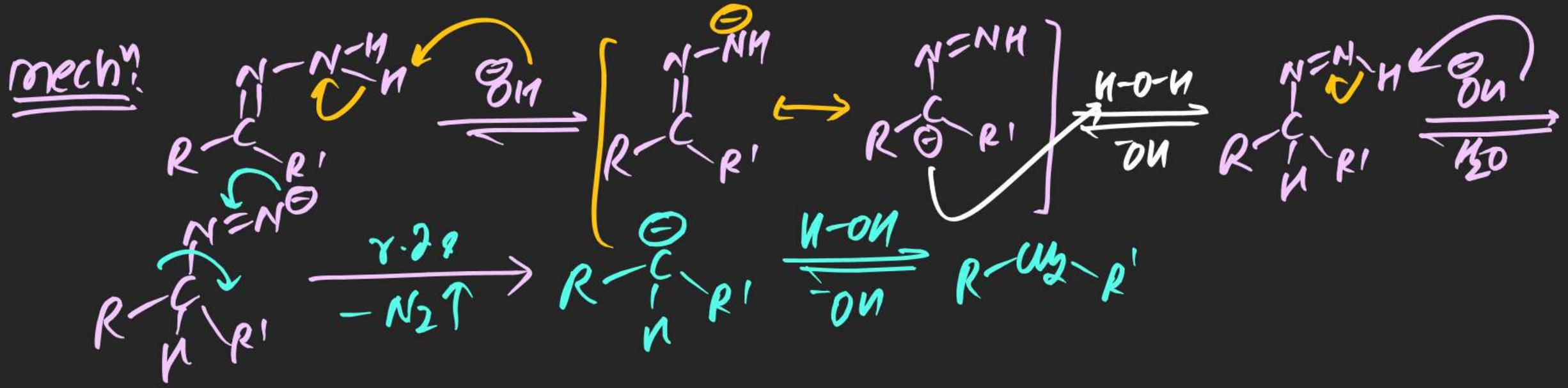
(1)



(2)



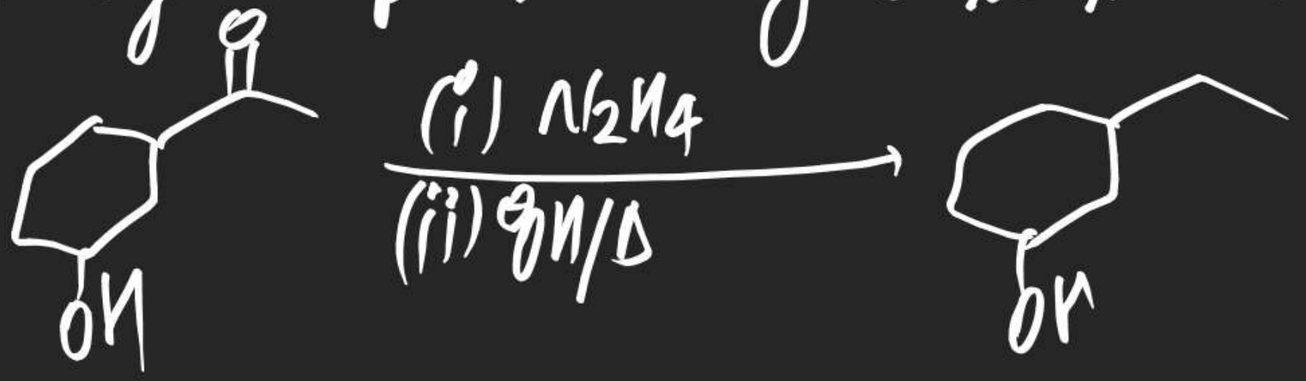
Nishant Jindal

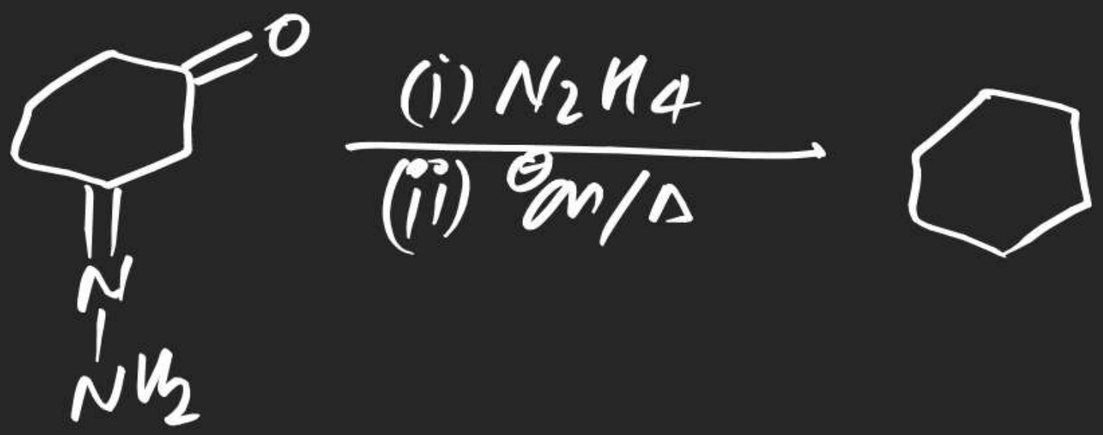


Note: (i) Carbanion intermidiate

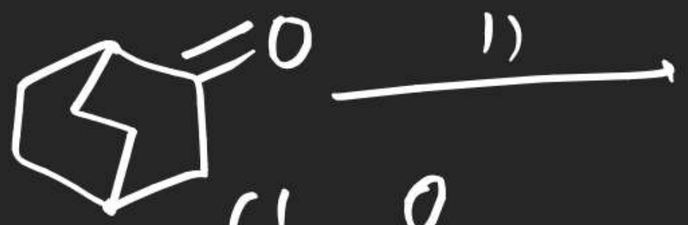
(ii) W.K. Reduction takes place in Basic cond so not appropriate for Carbonyl Compounds having Base sensitive group.

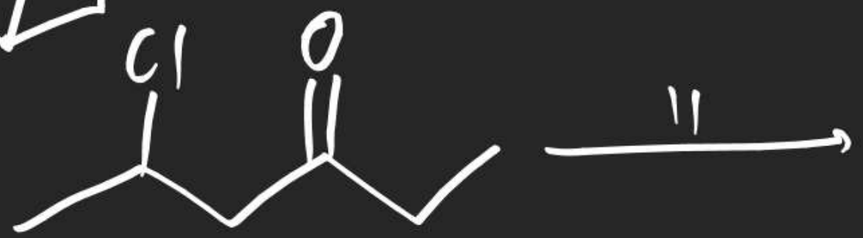
(3)



(4) 

(5) 

(6) 

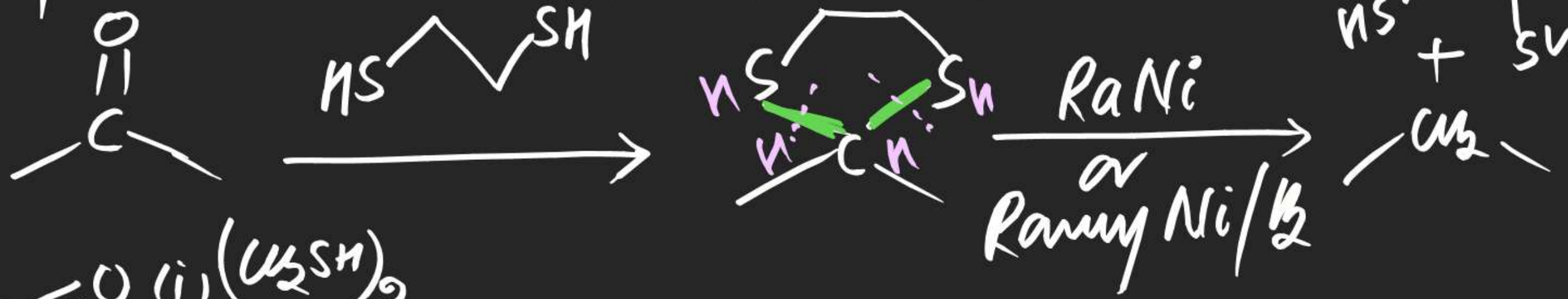
(7) 

Nishant Jindal

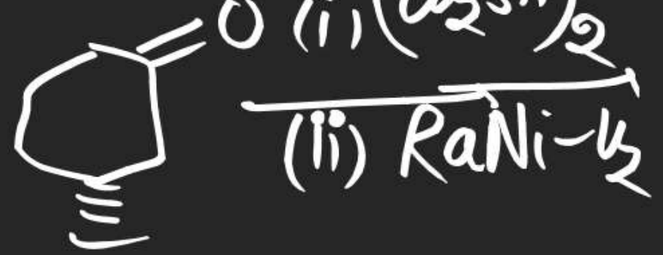
(#) Mozingo Reduction :-

⟹ In this Reaction C=O Compound is Converted in to thio Acetal / Ketal which on hydrogenlysis gives alkane as a Product

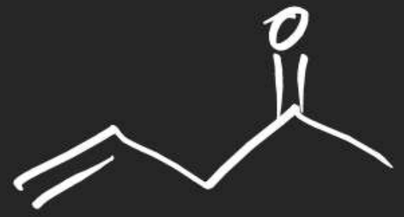
(1)

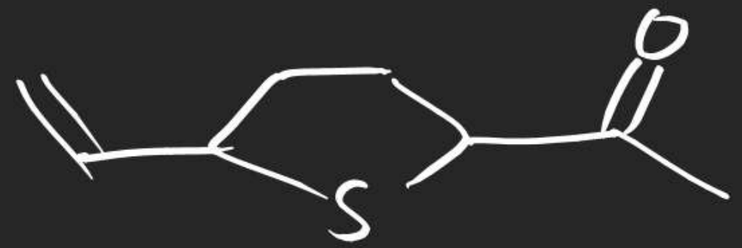


(2)



(3)

(4)  $\xrightarrow[\text{(ii) RaNi-H}_2]{\text{(i)}(Me_3Sn)_2}$

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

(6)  $\xrightarrow[\Delta]{\text{RaNi-H}_2}$

(7)  $\xrightarrow[\text{(ii) RaNi-H}_2]{\text{(i) NaBH}_4}$

Nishant Jindal

(#) Reduction By HI / RedP-HI :-

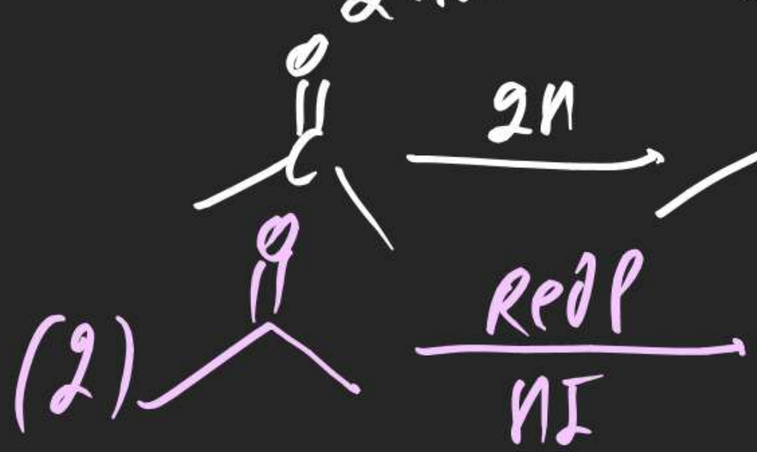
⇒ Very Strong Reducing agent

⇒ Reduces almost every group

Acid / Ester / Aldehyde / Ketone / Alcohol $\xrightarrow[HI]{RedP}$ Alkane

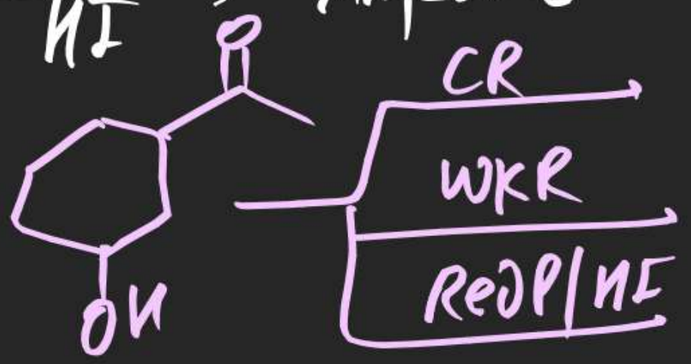
(1) 

$2HI \longrightarrow 2H + I_2$

(2) 

(3) 

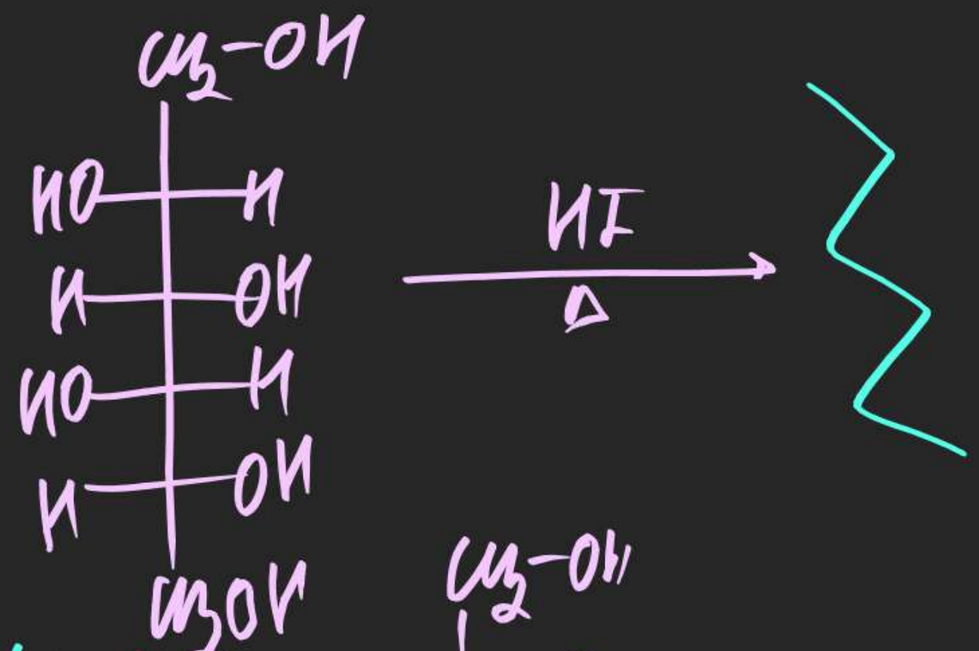
(4) 

(5) 

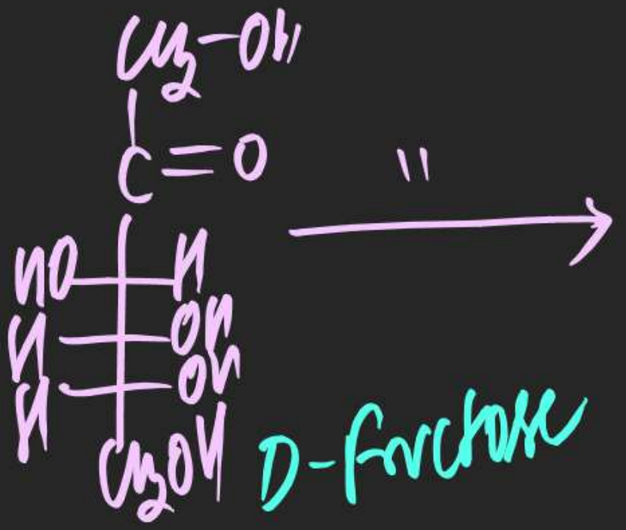
(6) 

Nishant Jindal

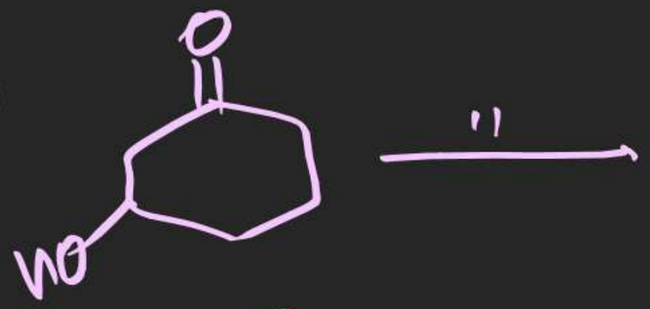
(7) 

(8) 

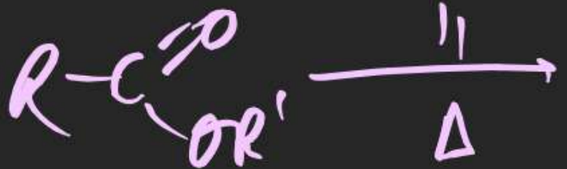
D-Glucose

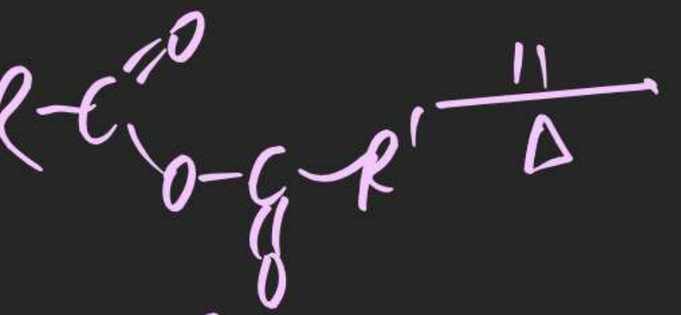
(9) 

D-Fructose

(10) 

(11) 

(12) 

(13) 

(14) 

Nishant Jindal

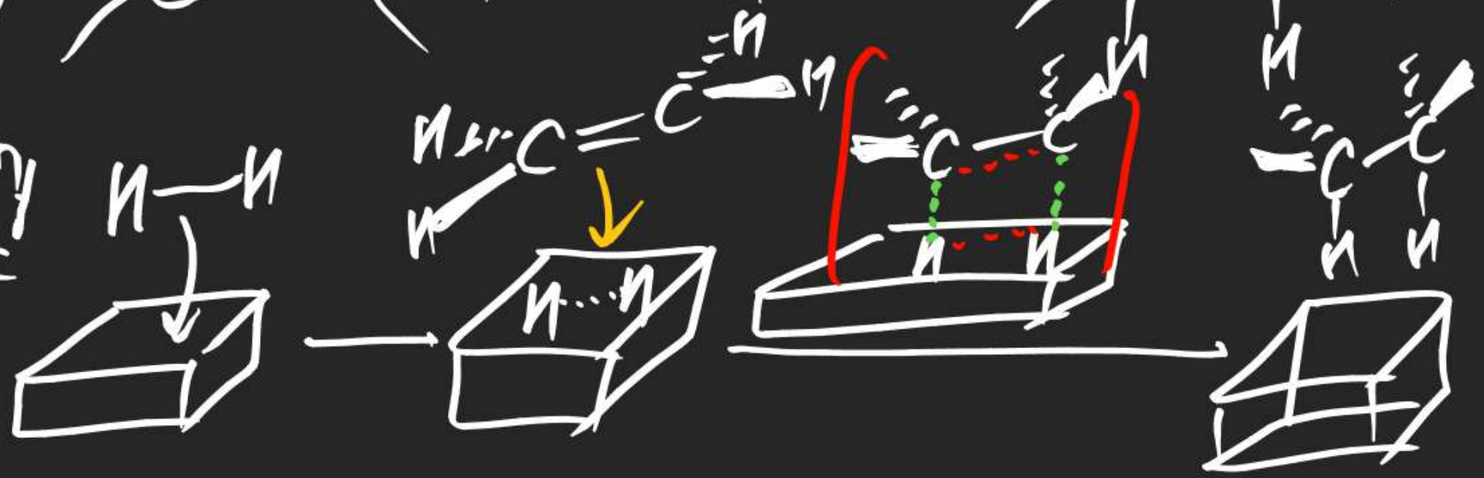
(#) Hydrogenation:-

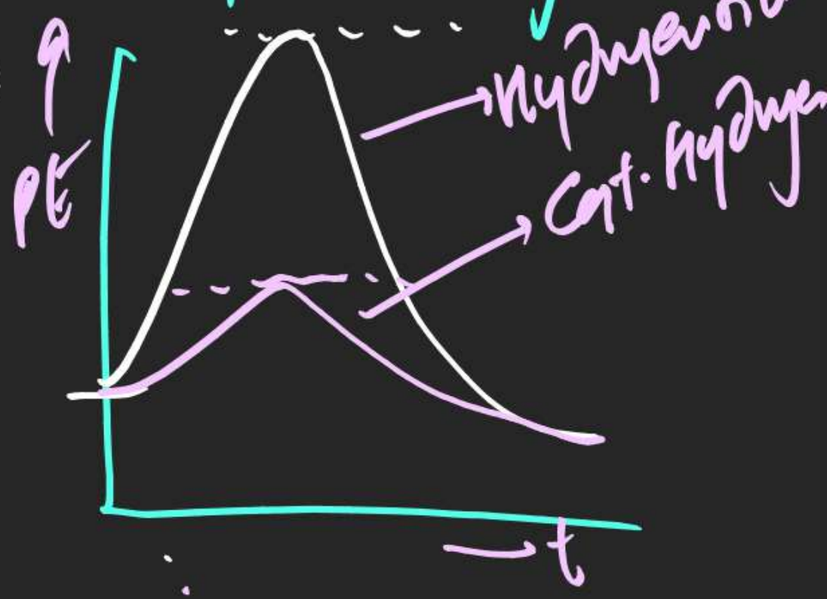
⇒ Rxⁿ of unsaturated Compound [Compound with pi bond] with H_2 is known as Hydrogenation

(1) $A=B + H-H \longrightarrow A(H)-B(H)$ Direct Hydrogenation

(2) $>C=C< + H-H \xrightarrow{\text{Catalyst}} >C(H)-C(H)<$ Catalytic Hydrogenation

Mechⁿ





Note (i) with metal catalyst Syn phenomenon.

(ii) 4-MCTS involved

(iii) Surface phenomenon.

(iv) rate of hydrogenation $\propto \frac{1}{\text{Steric crowding}}$

(v) There are two type of Catalyst.

Heterolytic Catalyst

⇒ diff physical state than Reactant

⇒ Can be easily separated

⇒ Can be easily Poisoned

Homolytic Catalyst

⇒ same physical state

⇒ Not easy separation

⇒ Not easy to poison

Ex!

Ni

Ni_2B [P_2-Catalyst]

Ranny Ni

Pt

PtO_2 [Adam's Catalyst]

Ru

Rh

Pd

Pd-$BaSO_4$ [Lindlar's Catalyst

Ex!- $RhCl(Ph_3P)_3$

Wilkinson's Catalyst

(3) $CH_2=CH_2$ — H_2/Ni / D_2/Ni

(4) 

(5) 

(6) 

(7) 

(8) 

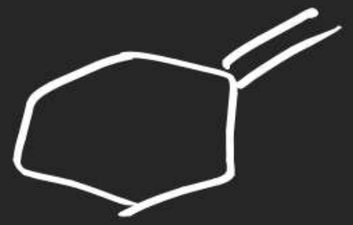
(9) 

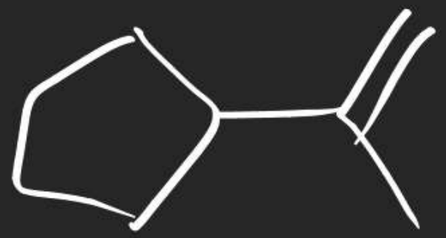
(10) 

(11) 

(12) 

(13) 

(14) 

(15) 

(16) $R-CH=O \xrightarrow{H_2\text{-}Pd}$

(17) $R-CH=NH \xrightarrow{''}$

(18) $R-CH=CH-R \xrightarrow{''}$

(19) $R-C\equiv C-R' \xrightarrow[(excess)]{H_2\text{-}Pd}$

(20) $R-C\equiv N \xrightarrow{''}$

(21) $R-C(=O)-Cl \xrightarrow{''}$