

1

Midterm scores uploaded in EEE

Your midterms are being scanned and will be returned to you electronically

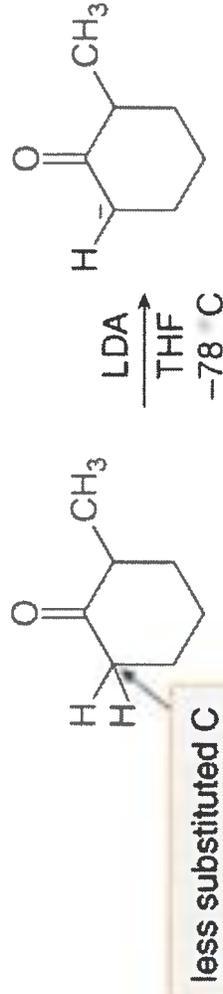
Floating office hours this week:

Thursday 10-11, NS1 4114

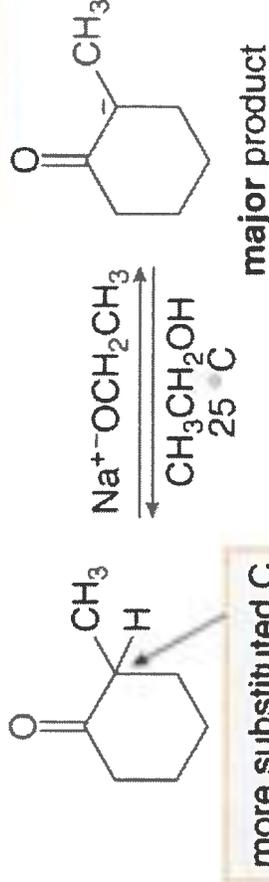
## Lecture 16: Ch 23, Enolates

♪ If I can't have you (Shawn Mendez)  
"I can't write one song that's not about you"

We keep going back to pKa's to explain new reactions that we encounter



kinetic enolate



thermodynamic enolate

Capercard question:



Reaction conditions:

PBr<sub>3</sub>  
pyridine

A

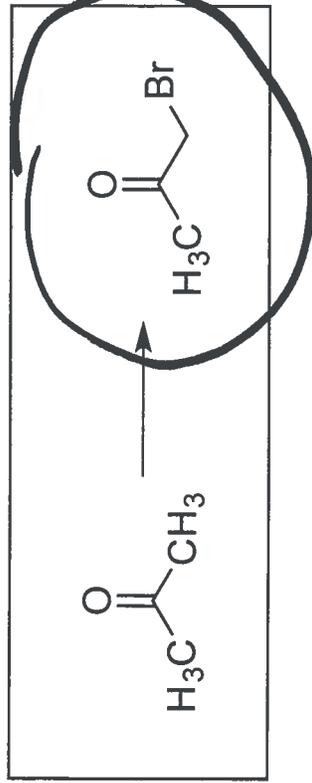
Br<sub>2</sub>  
HOAc

B

Br<sub>2</sub>  
NaOH

C

# Capercard question:



PBr<sub>3</sub>  
pyridine  
A

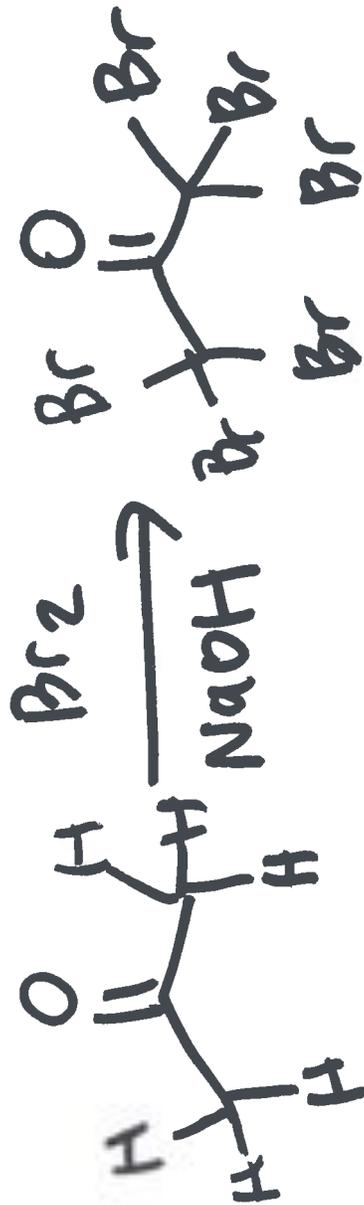
Reaction conditions:

Br<sub>2</sub>  
HOAc  
B

Br<sub>2</sub>  
NaOH  
C

basic  
per

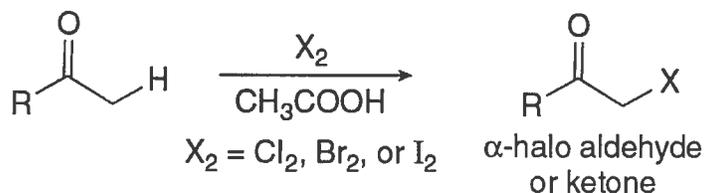
acidic  
mono





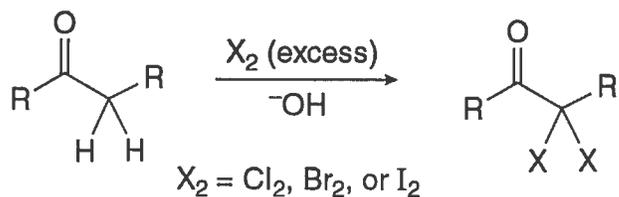
## Ch 23: Reactions of Enolates (and Enols)

[1] Halogenation in acid (23.7A)



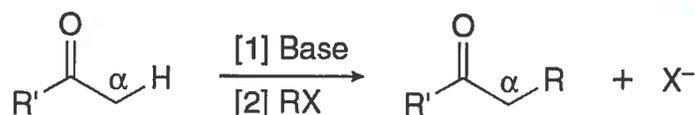
*acidic*

[2] Halogenation in base (23.7B)

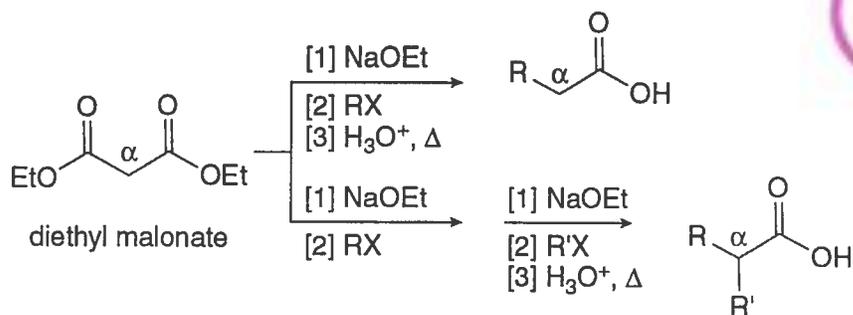


*basic*

[1] Direct alkylation at the  $\alpha$  carbon (23.8)

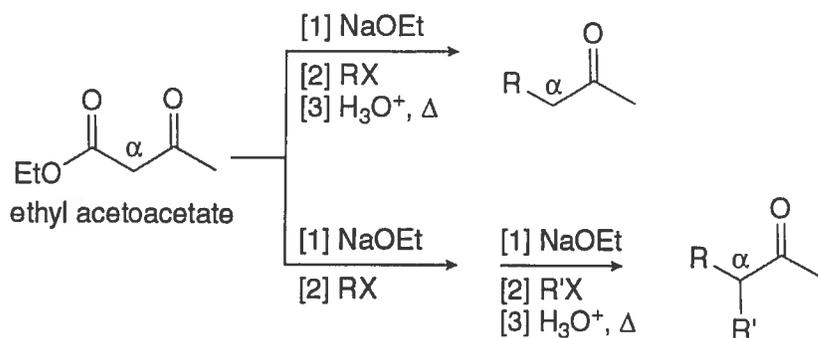


[2] Malonic ester synthesis (23.9)

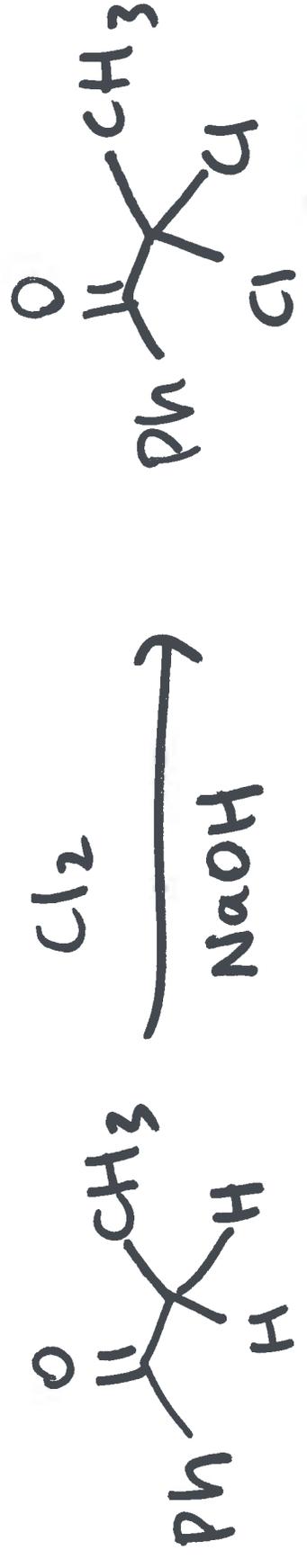


*alkylation*

[3] Acetoacetic ester synthesis (23.10)

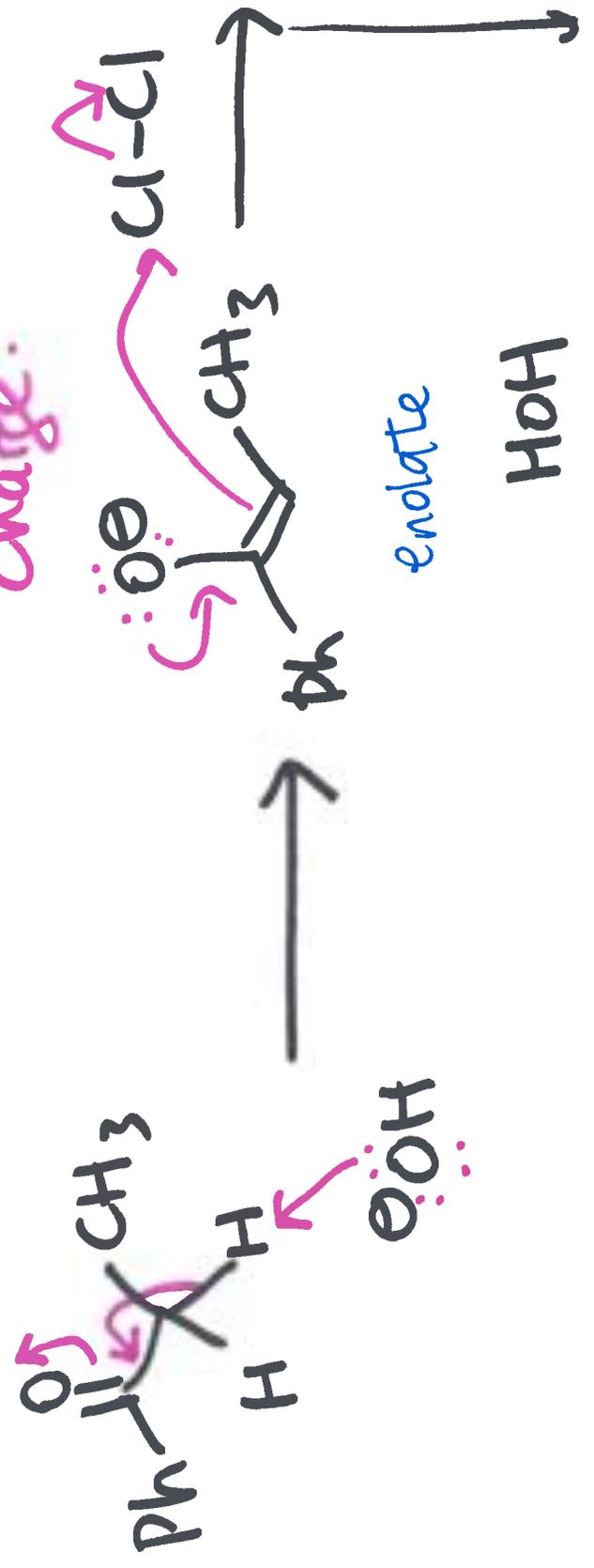


# Basic conditions

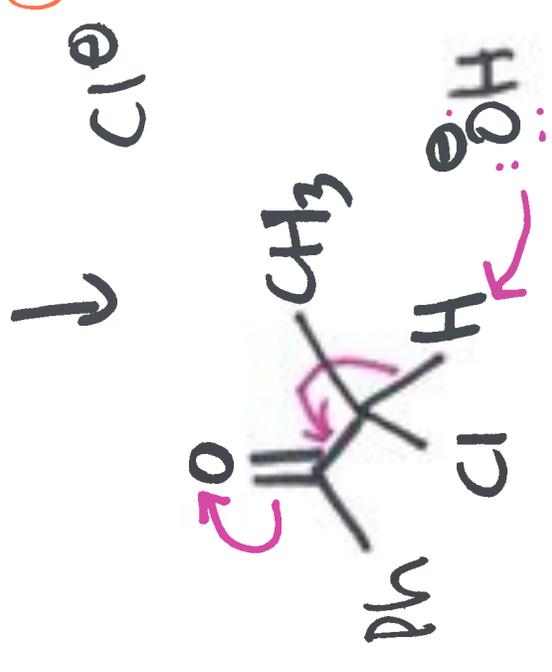


BASIC: organic intermediates

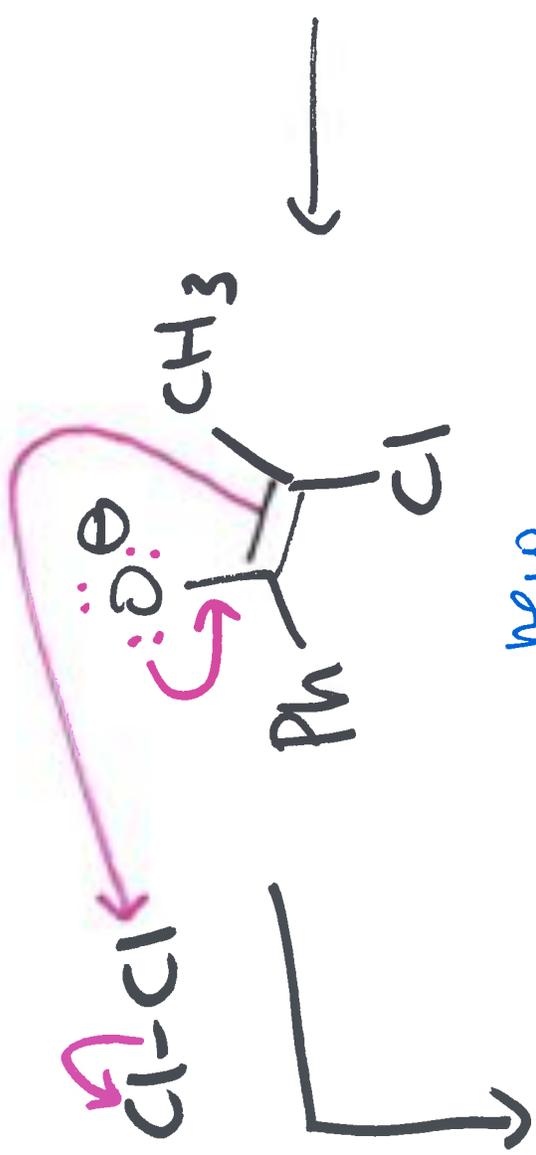
neutral or  $\ominus$ ve charge.



5



MORE  
ACIDIC!



new  
enolate

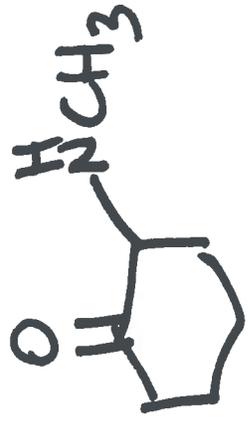
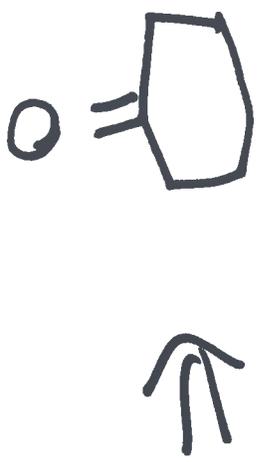


+  $\text{Cl}^\ominus$

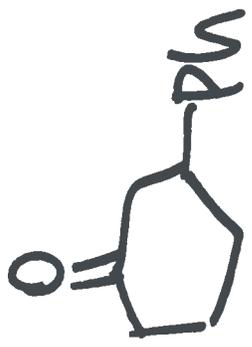
WILL REPLACE ALL  $\text{C}_\alpha\text{-H}$ 's  
with Cl

(SKIP: haloform reaction)

USEFUL in SYNTHESIS:



Target B

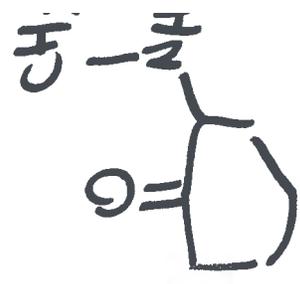
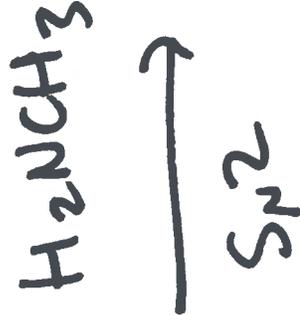
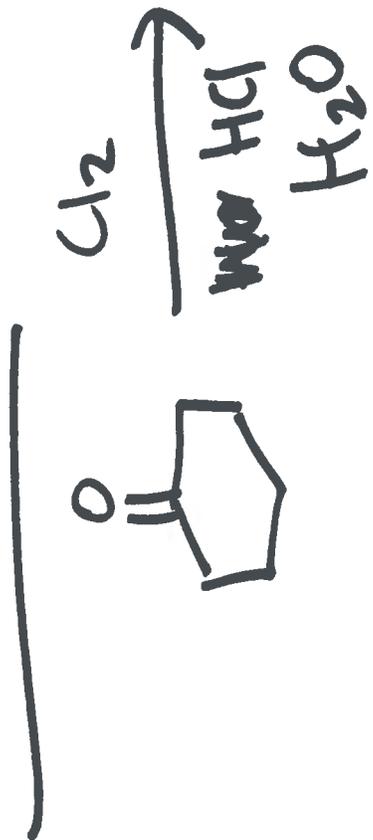


or

Target A

- new bond
- ketone in product

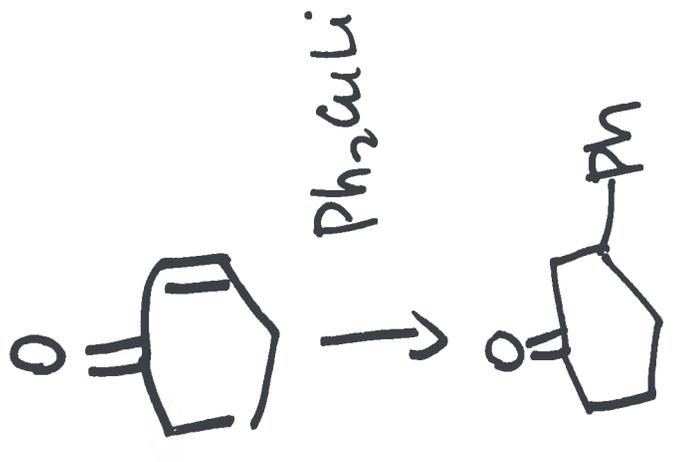
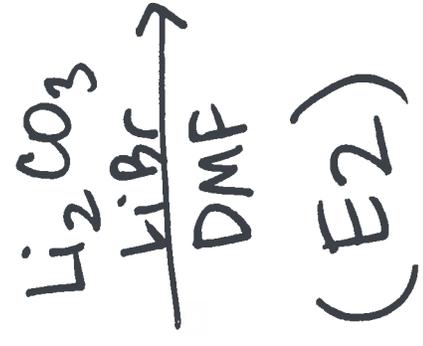
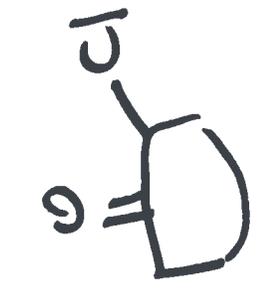
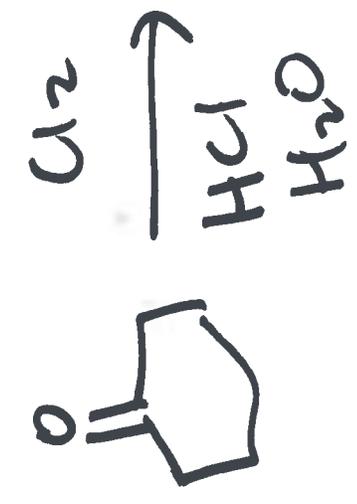
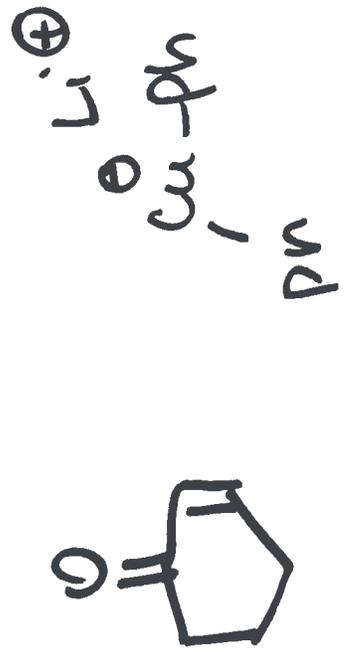
Target B:



Target A:



added to β-carbon!  
 use a cuprate!

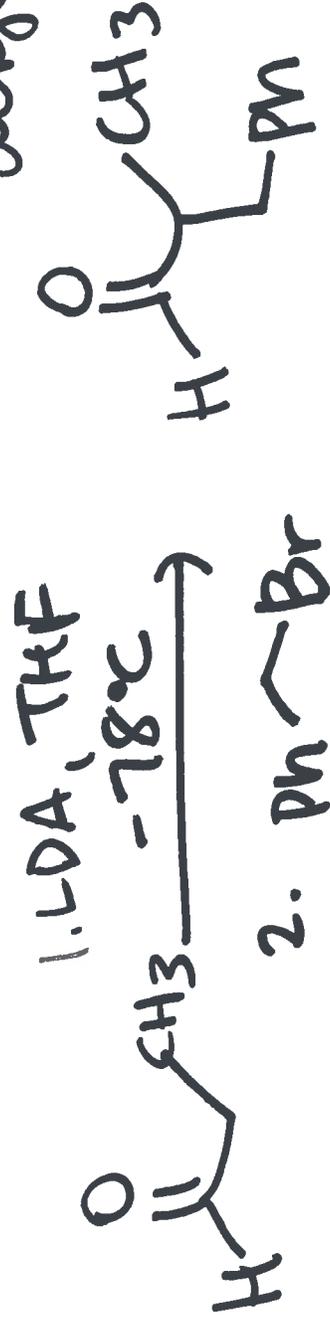


# Enolate alkylation

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Enolate = nucleophile

Electrophile = alkyl bromide or  
alkyl iodide or  
alkyl chloride



new C-C  
bond

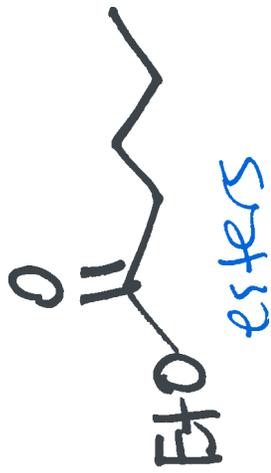
aldehydes



on  
C $\alpha$ !

ketone

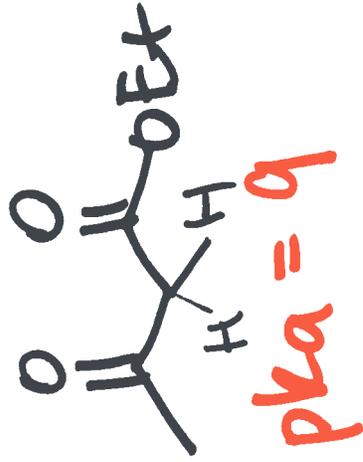
9



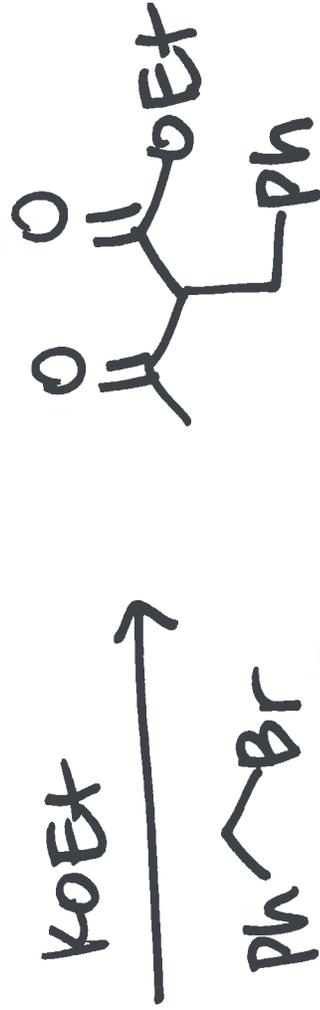
pKa ~ 25

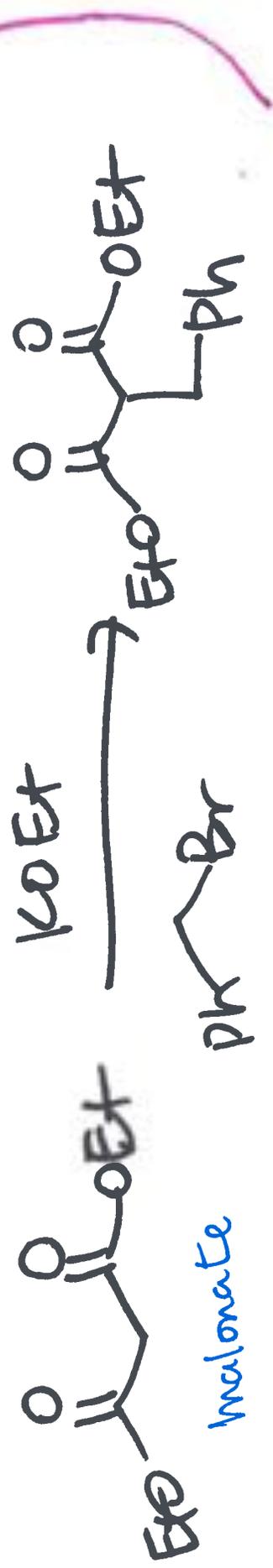


pKa = 25

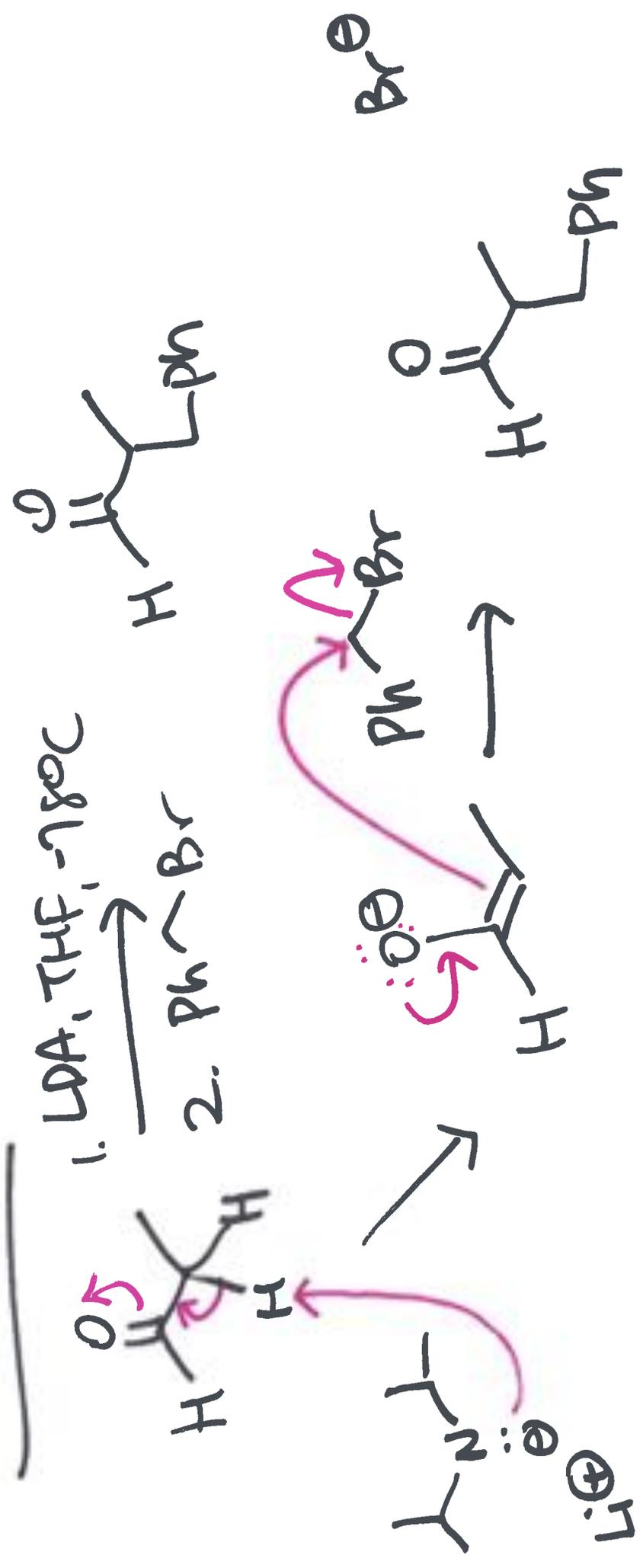


pKa = 9

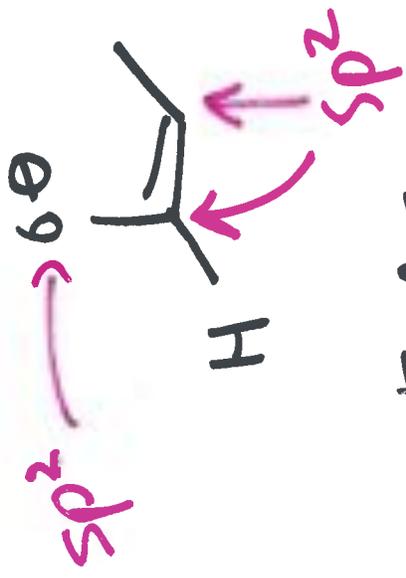




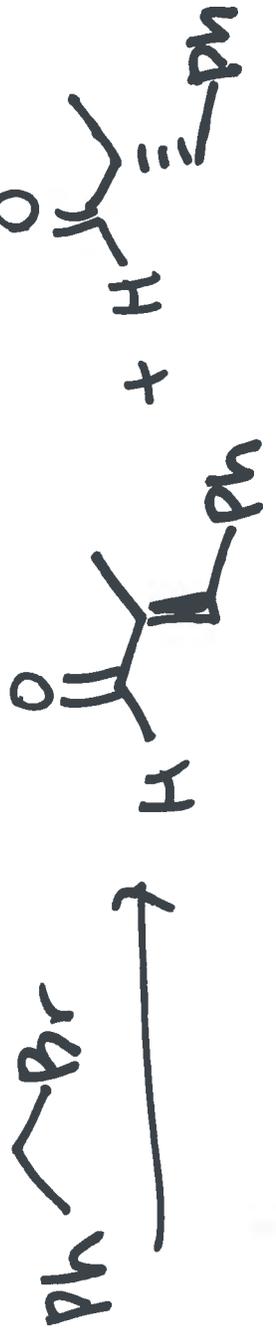
Mechanism:



Stereochemistry:

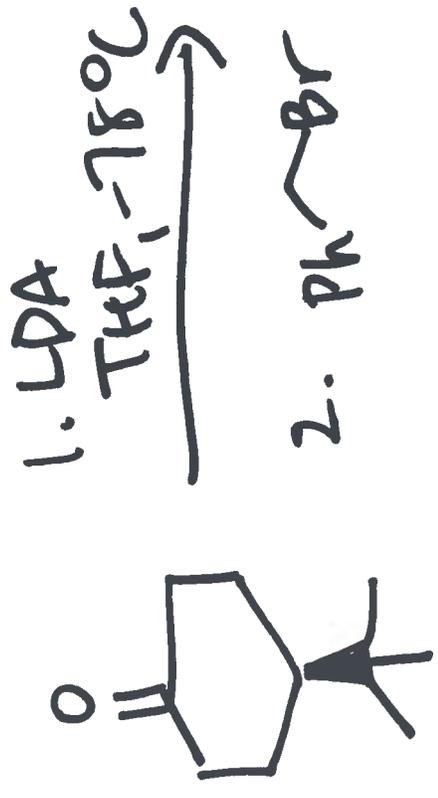


FLAT



racemic mixture

take home:

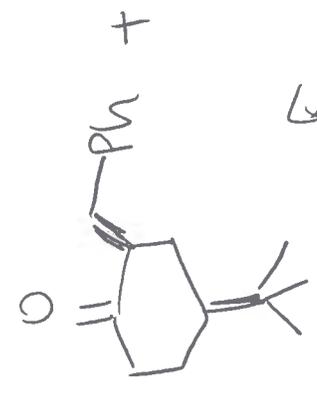
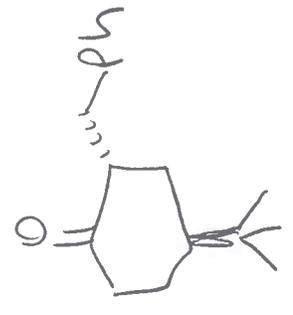
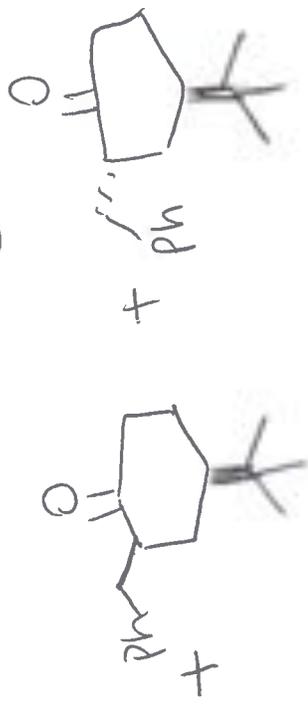


Predict the Products!

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take home problem

enantiomers

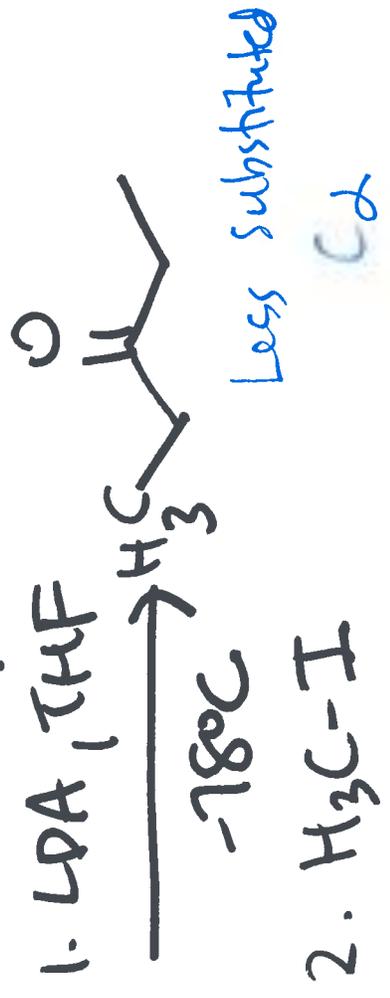


R

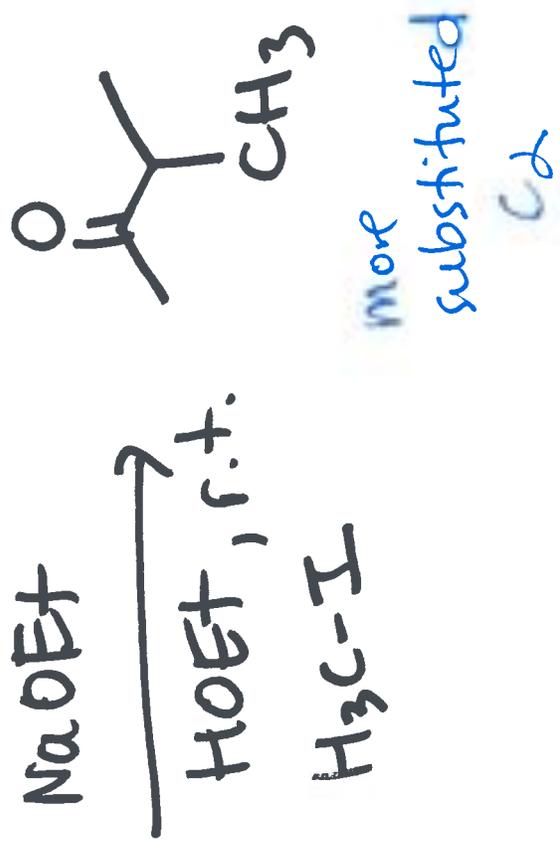
diastereomers

# Unsymmetrical Carbonyls

"Kinetic" conditions  
LESS sub.  
Enolate!

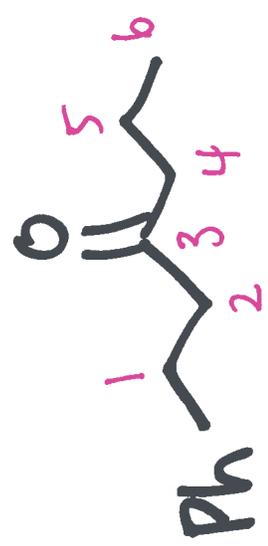
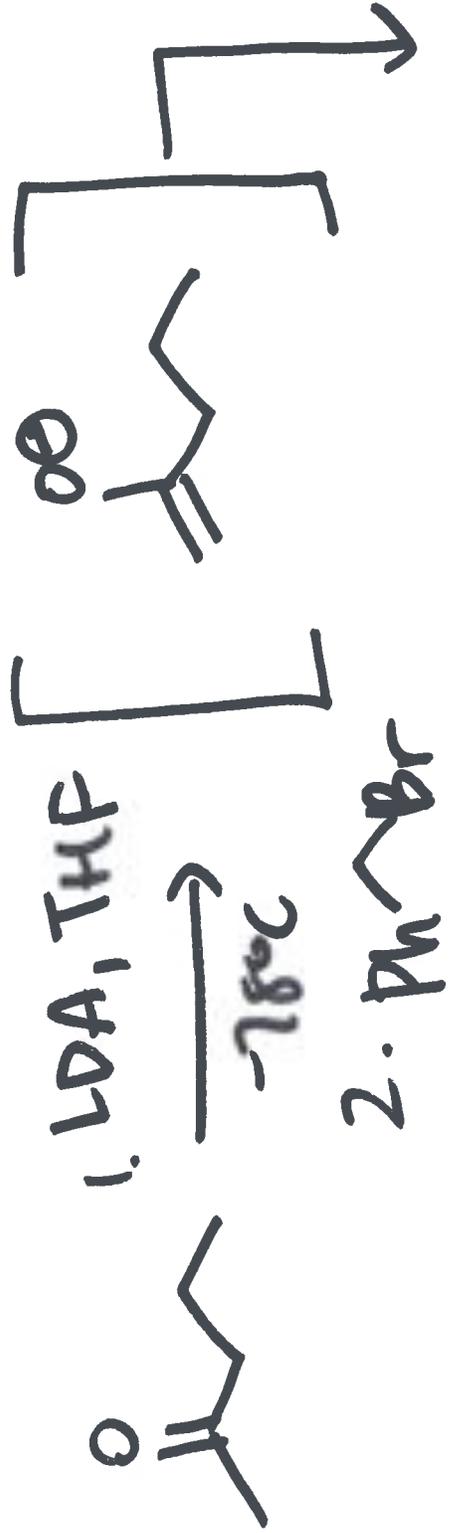


"thermodynamic" conditions  
MORE Sub.  
enolate

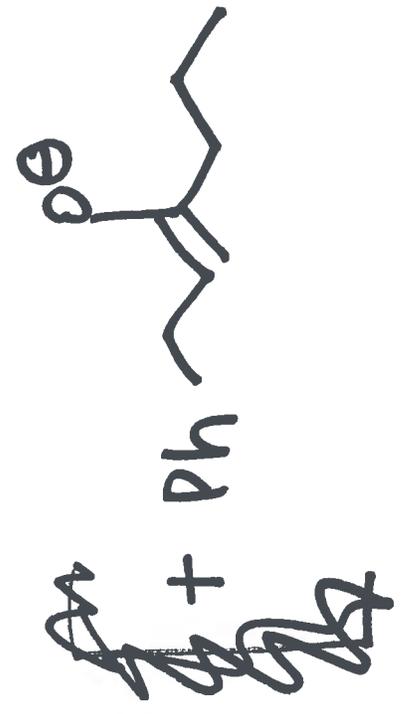
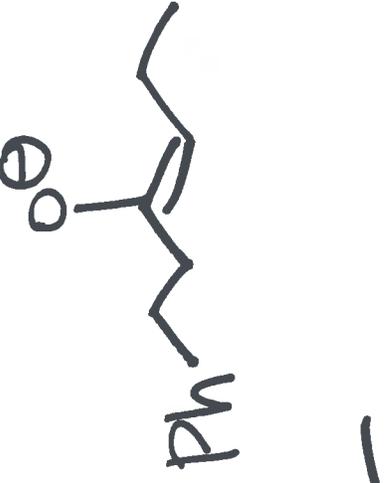
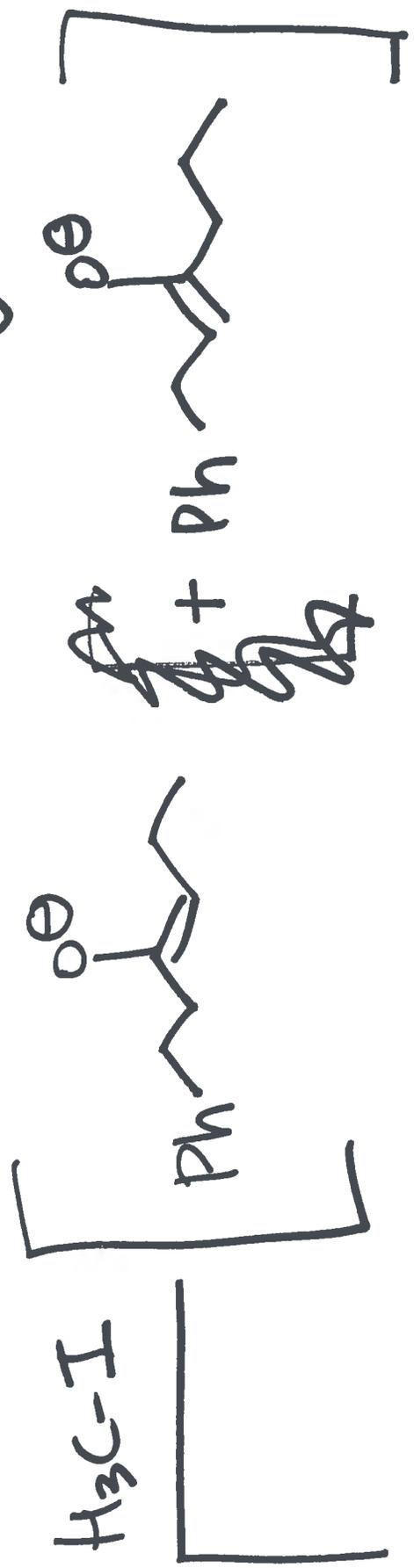


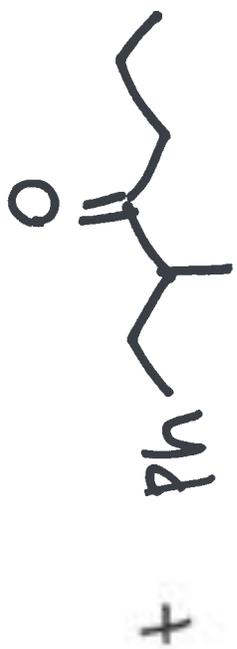


15

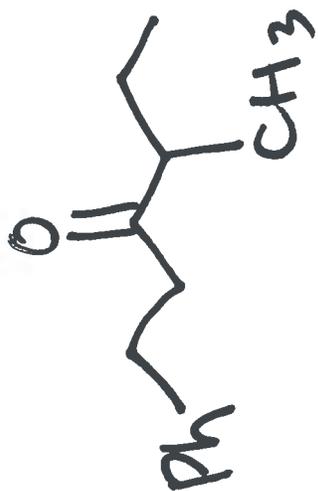


NaOMe  
↓  
HOMe





MIXTURE!



17

Try again:

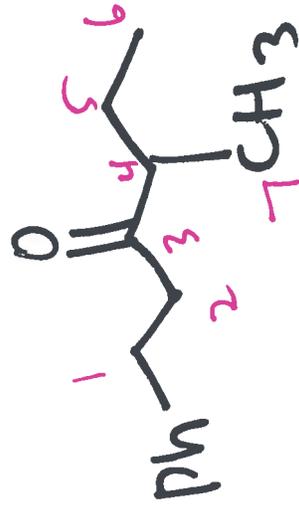
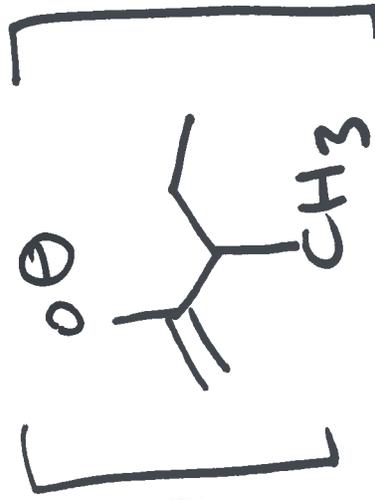
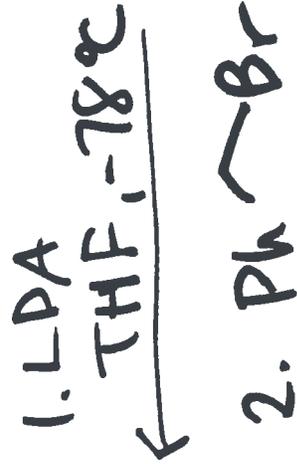
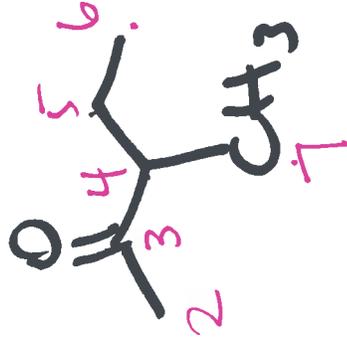
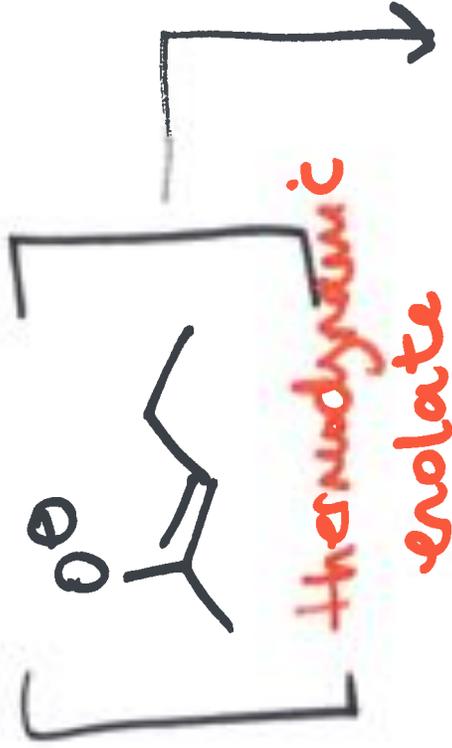


NaOMe



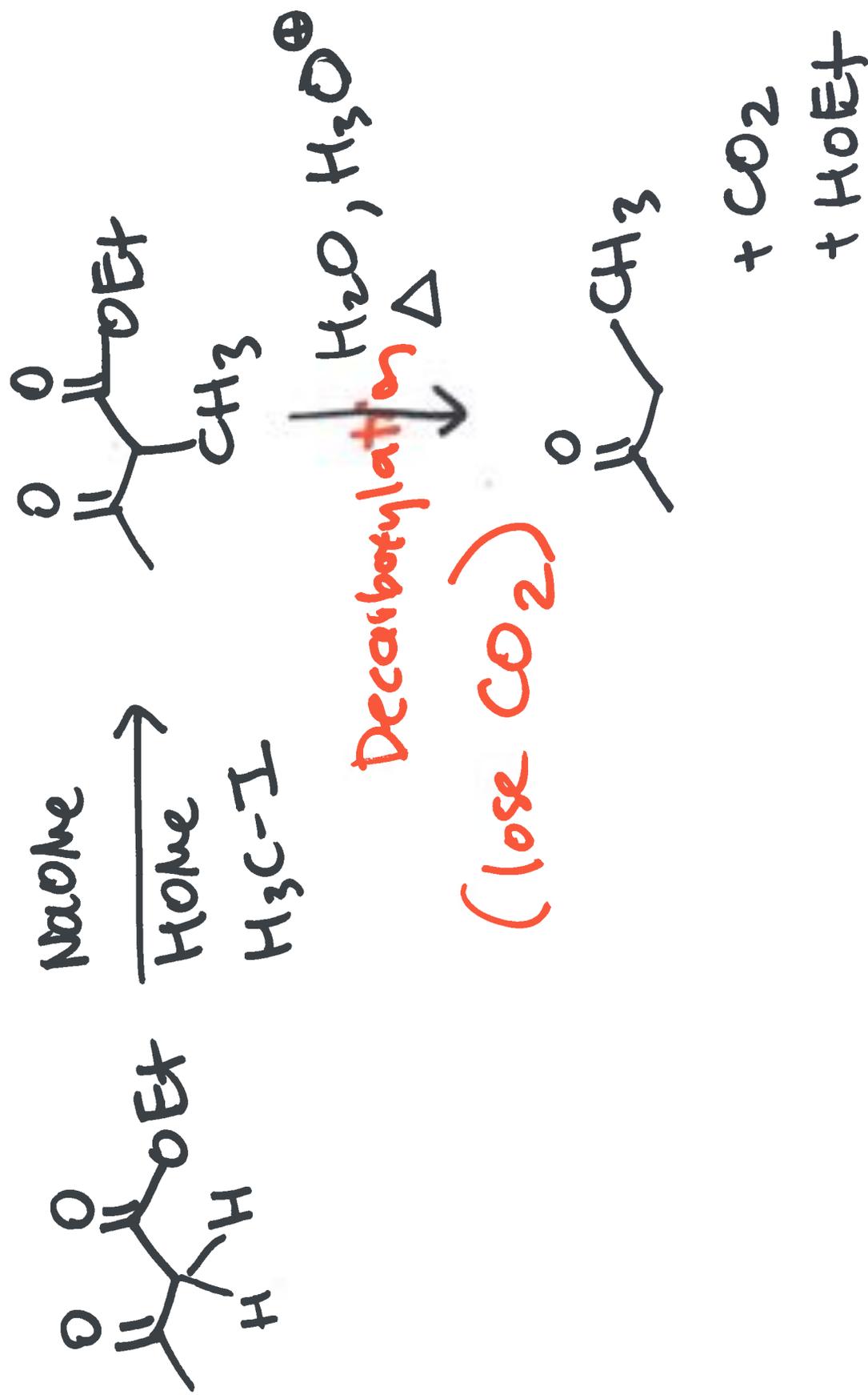
H<sub>3</sub>C-I

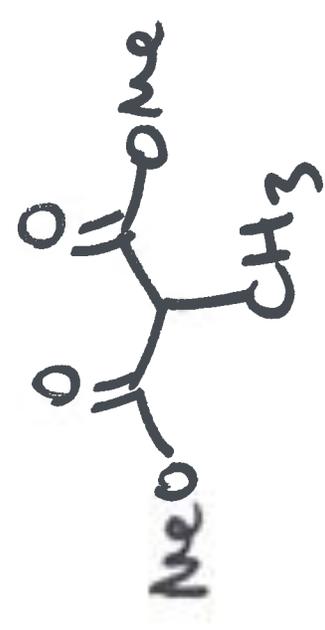
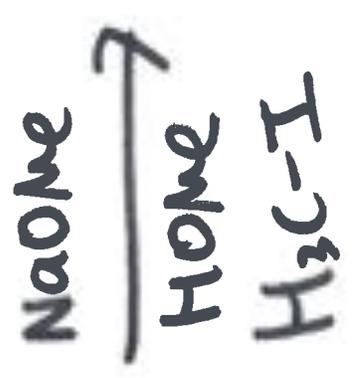
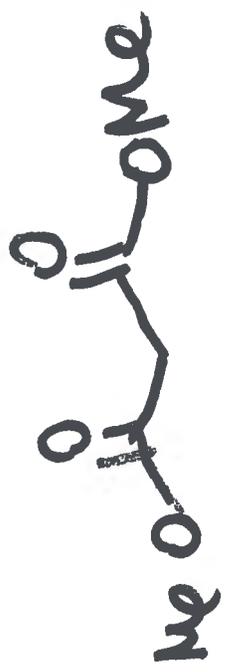
H<sub>3</sub>C-I



New reaction for synthetic toolbox:

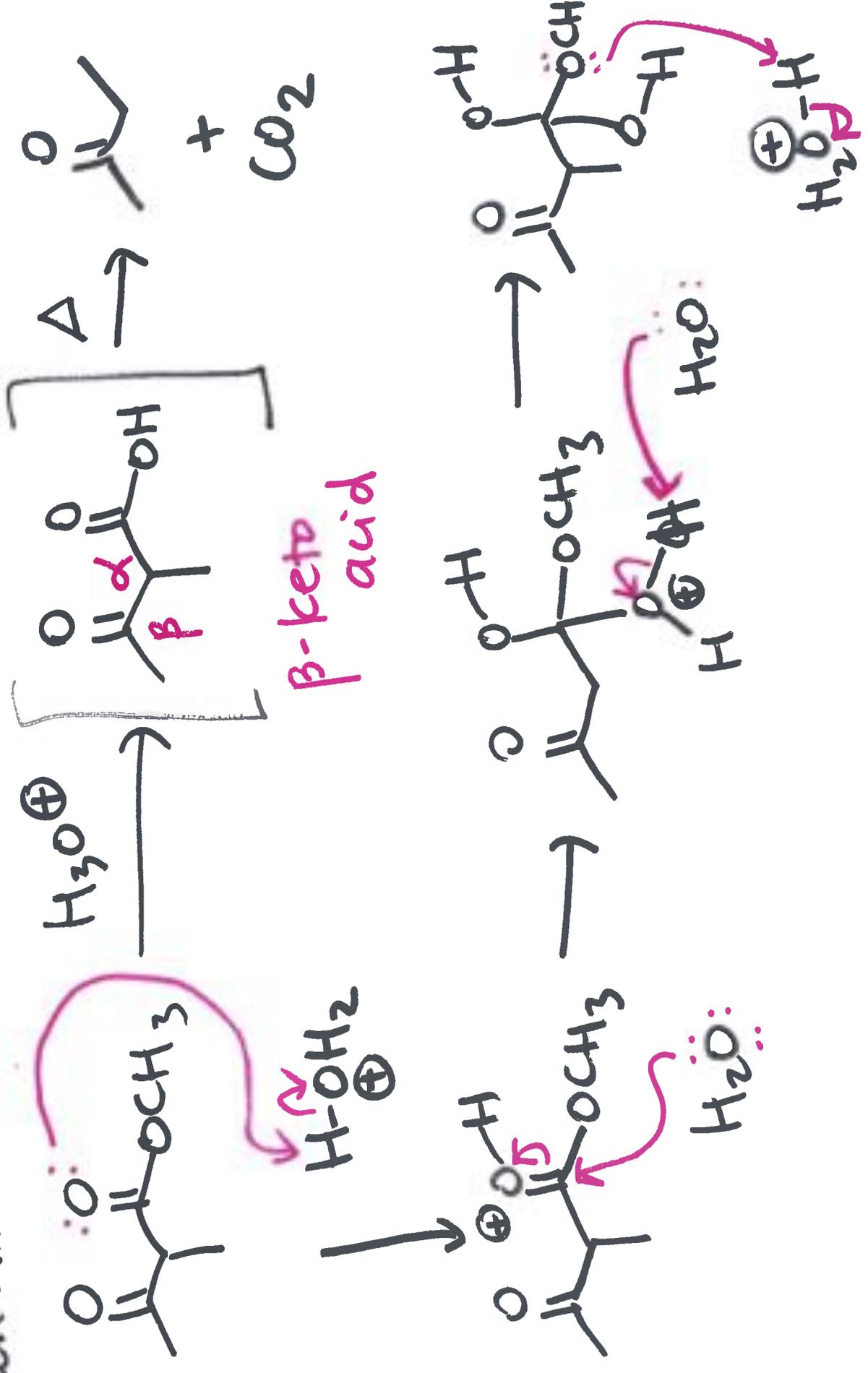
### Decarboxylation



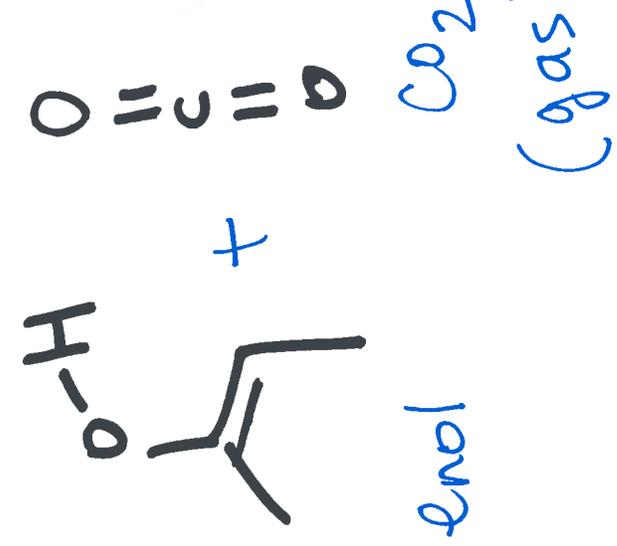
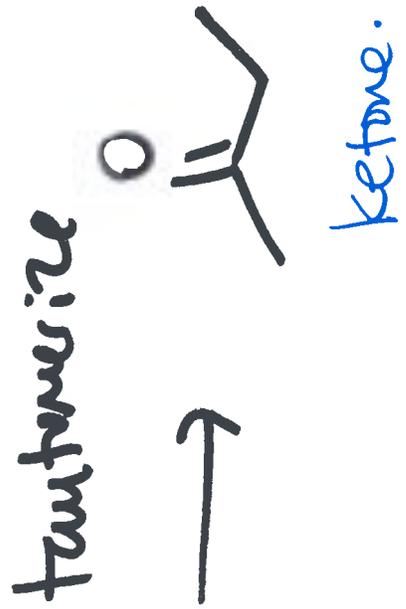
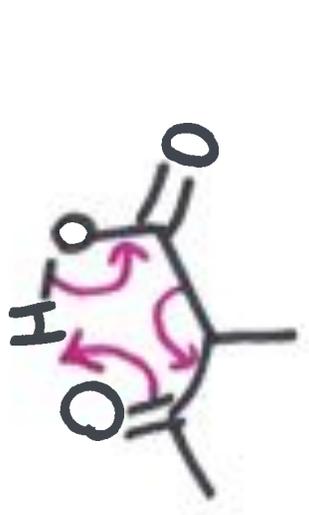
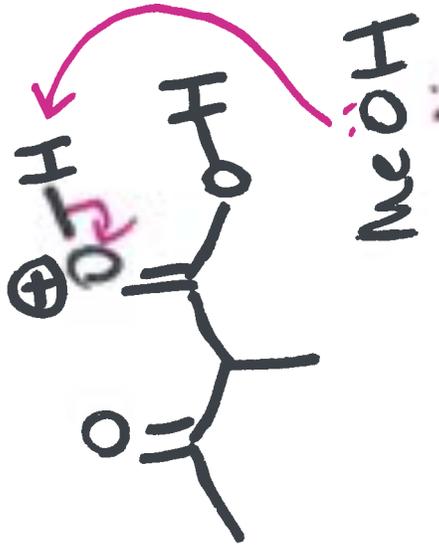
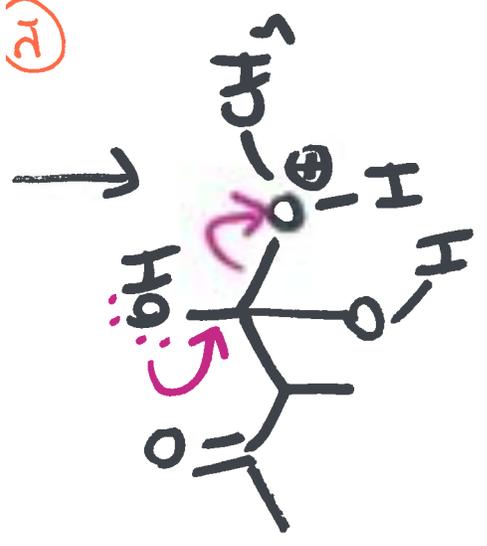


- hydrolyze both esters
- decarboxylate

Mechanism:



(21)



\* not into normal carboxylic acids!  
 ONLY when  $\beta$ -carbonyl