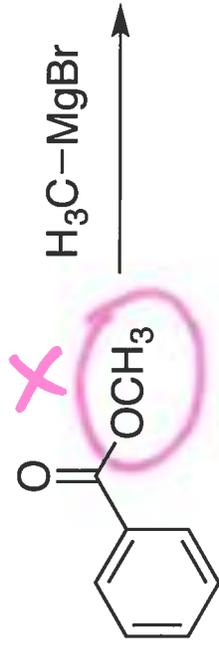


Discussion sections start today!
Quiz A in discussion (1st 5 min)

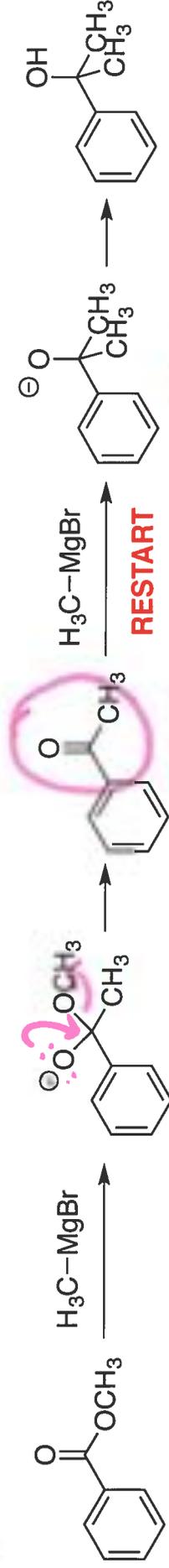
Full list of discussion and office hours:
see the website

Lecture 4: Grignard additions to carbonyls



Grignard adds twice

Mechanism:



♫ Ricominciamo (Adriano Pappalardo)

Ti amo.... Ricominciamo

I love you... let's start over again

SIMILAR ESTER +

Reduug
agent

Capercard question: Which reagent(s) will perform this reaction?



NaBH₄

A

OR
LiAlH₄

B

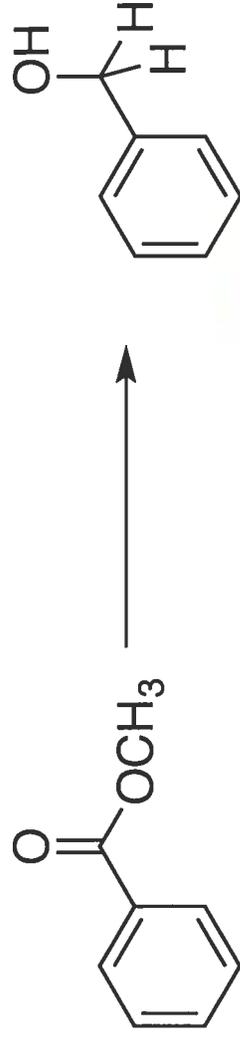
LiAlH₄

C

Dibal-H

D

Capercard question: Which reagent(s) will perform this reaction?



NaBH_4

A

NaBH_4
OR
 LiAlH_4

B

LiAlH_4

C

Dibal-H

D

LiAlH₄ = VERY STRONG Reducy

agent
- reduce all carbonylic acid derivative.

NaBH₄ - very weak

only with Very reactive

carbonyls

Most
Reactive



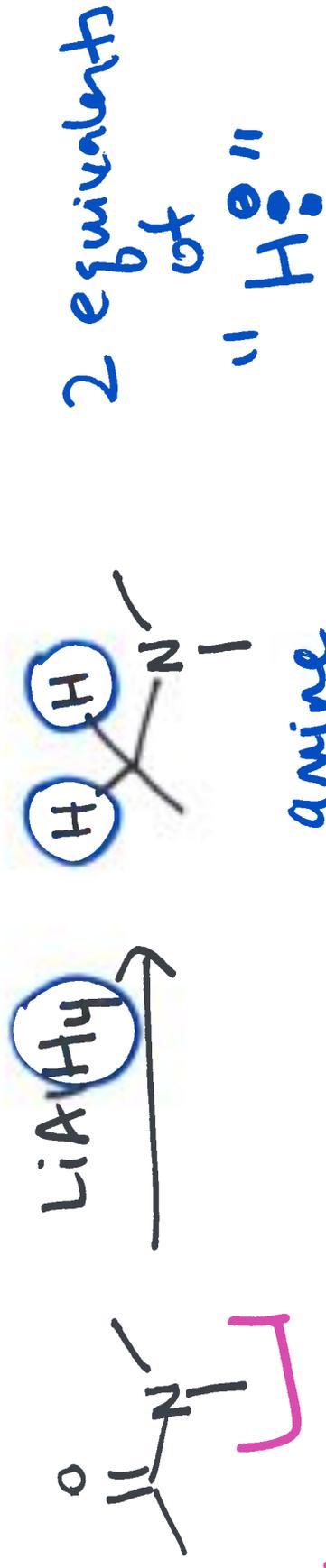
NaBH₄

Least
Reactive



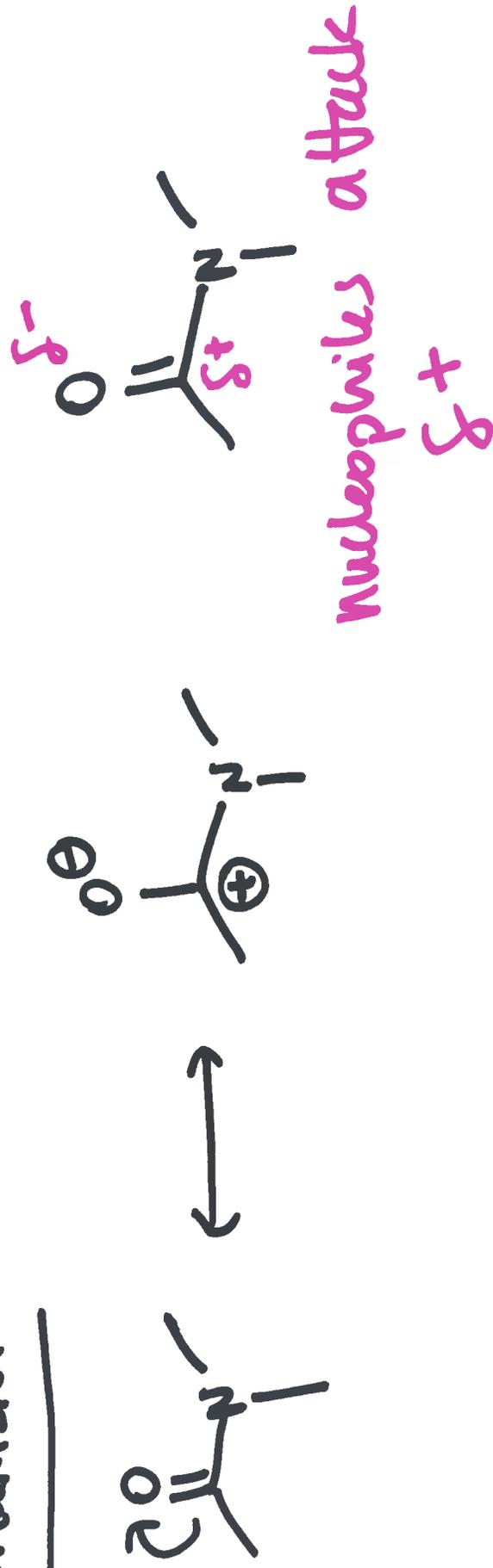
LiAlH₄

Reduction of amides with LiAlH_4

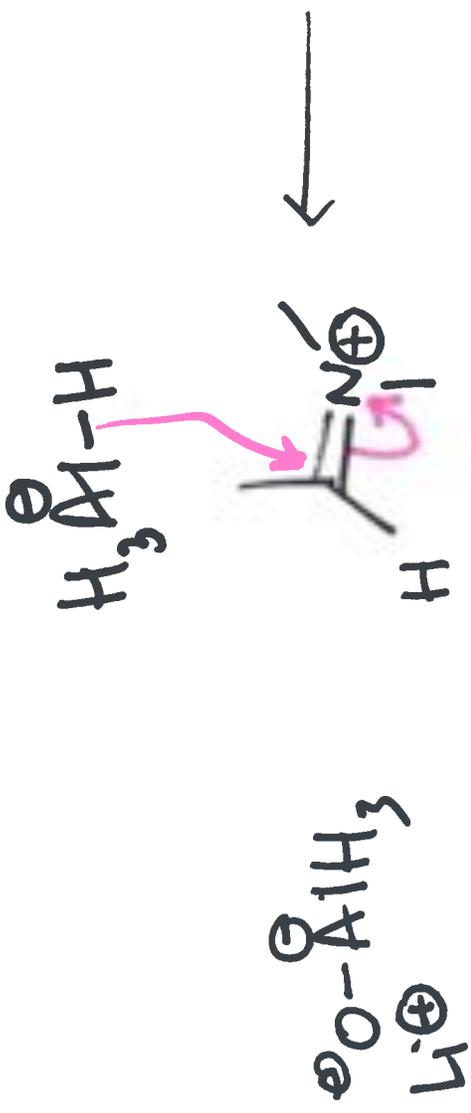
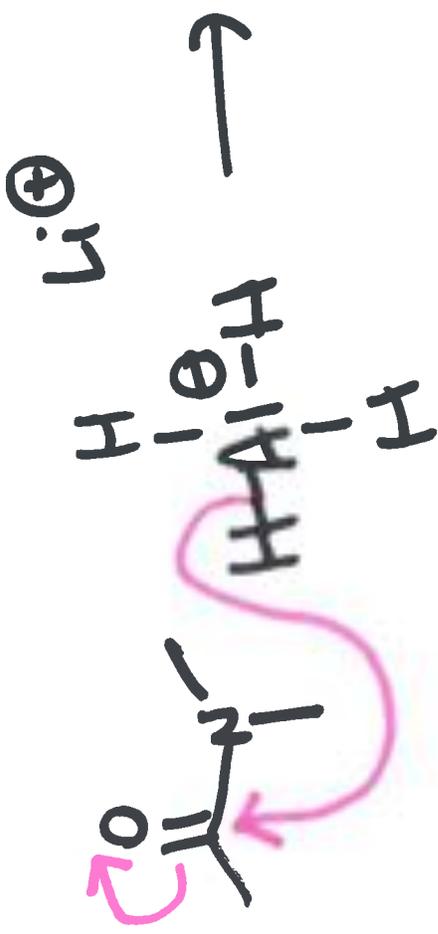
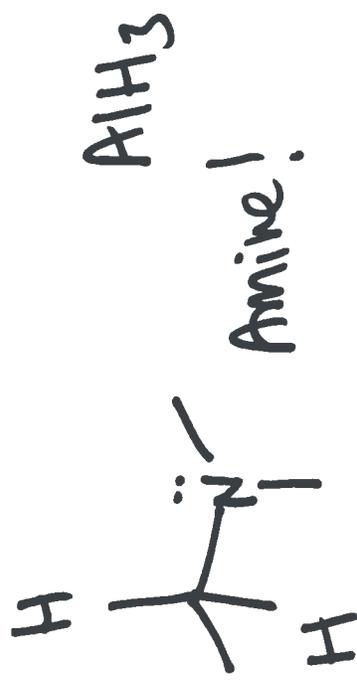
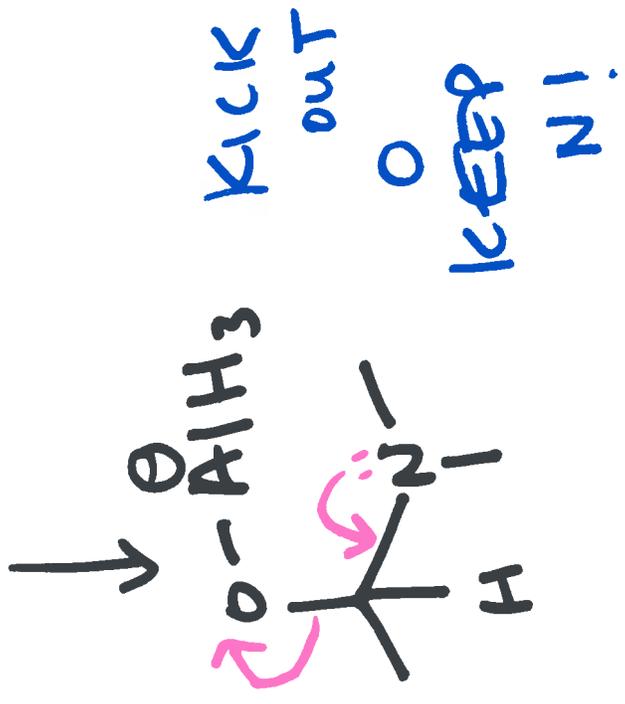
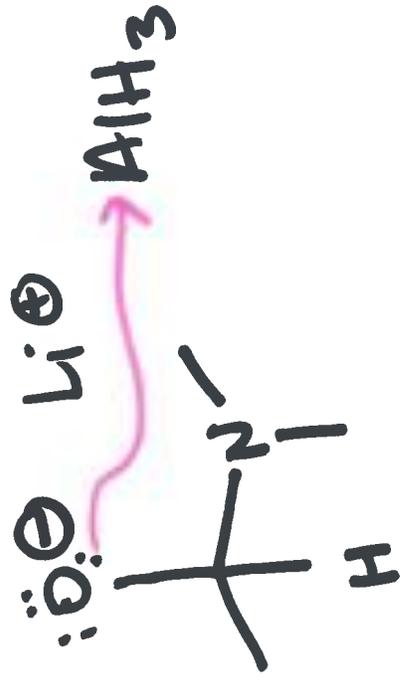


Carboxylic acid derivative

Mechanism



5



"iminium"
 C=N is electrophilic,
 like C=O



6

2] Addition of carbanions to Carbonyls.

Carbanions = organo metallic Reagents
 Carbon metal.

Prior (SIB)

acetylide anions.



Organolithium reagent

Can attack electrophiles

like R-Br or Δ

New Reagents

7

① Organo lithium reagents. $[M = Li]$



VERY STRONG BASE, VERY POTENT NUCLEOPHILE

Reacts with water ~~poorly~~ violently.

② Grignard reagent. (Victor Grignard).

capital

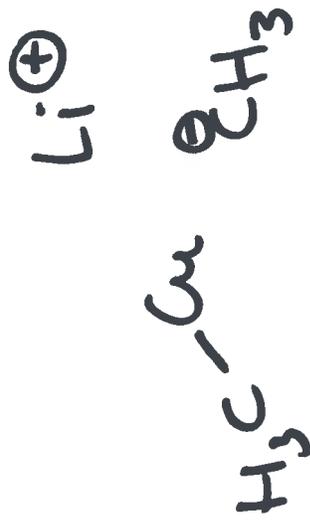
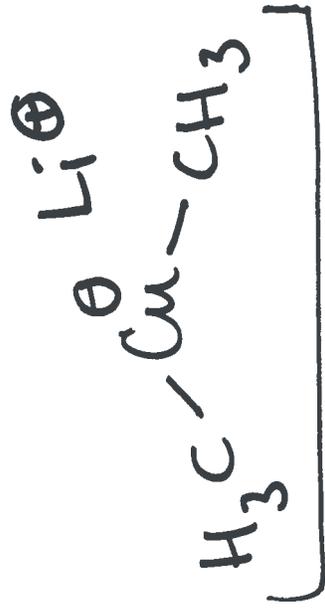


Less reactive than organolithium

Slightly milder.

③ Organocuprate reagents $[M=Cu]$

Gillman reagents.



LEAST REACTIVE!

VERY MILD. SPECIAL REACTIONS
(conjugate additions)

ALL of these
Reagents $R_3\text{C}-M$



Carbon is
Nucleophilic

attracted to δ^+ in $C=O$

Synthesis of organo metallic Reagents.

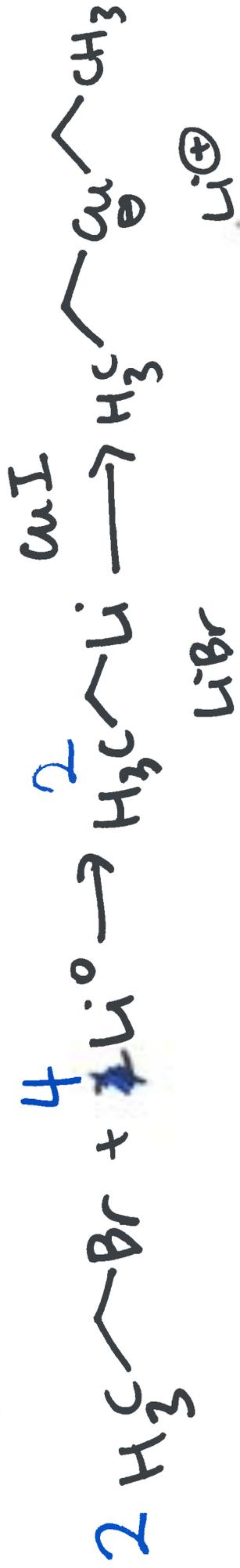
organolithiums:



Grignard reagents

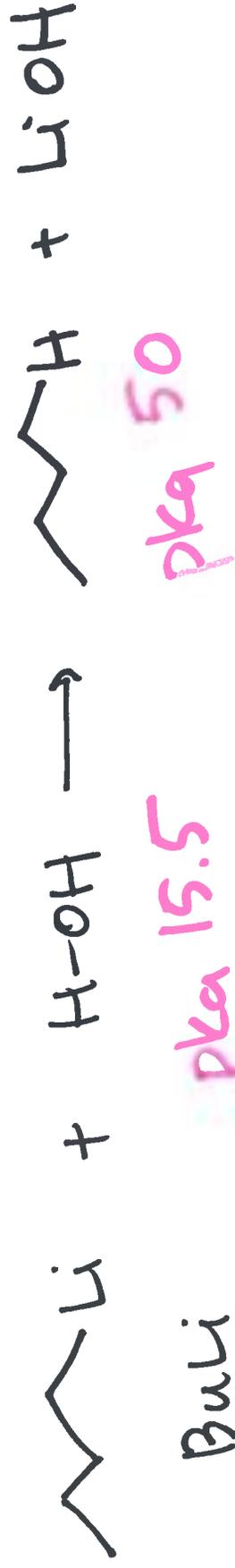


cuprates (from org. lithium)



Reactions of organometallic Reagents.

- They react with acids. (they are strong bases.)



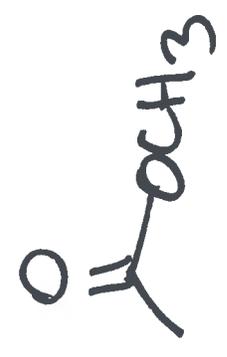
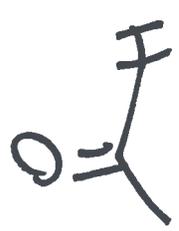
So: you can not mix an organometallic reagent with a molecule containing an acidic functional group.

Proton transfers are very FAST!
Quench the reagent (= protonate it)

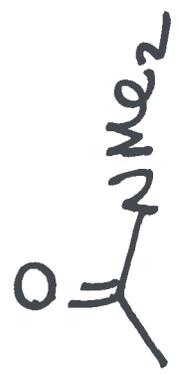
Other reactions of organometallic reagents.

With our carbonyls.

most reactive



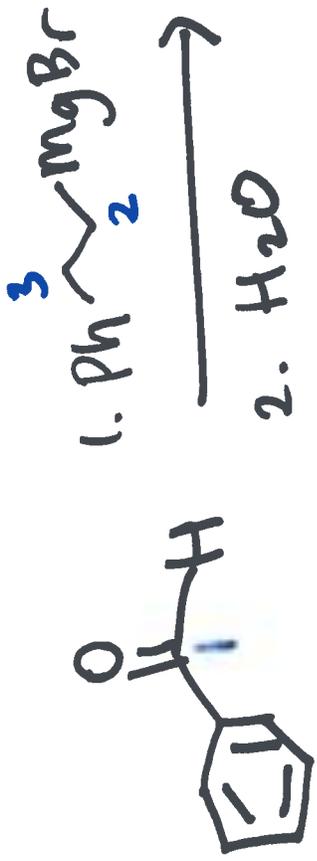
least reactive



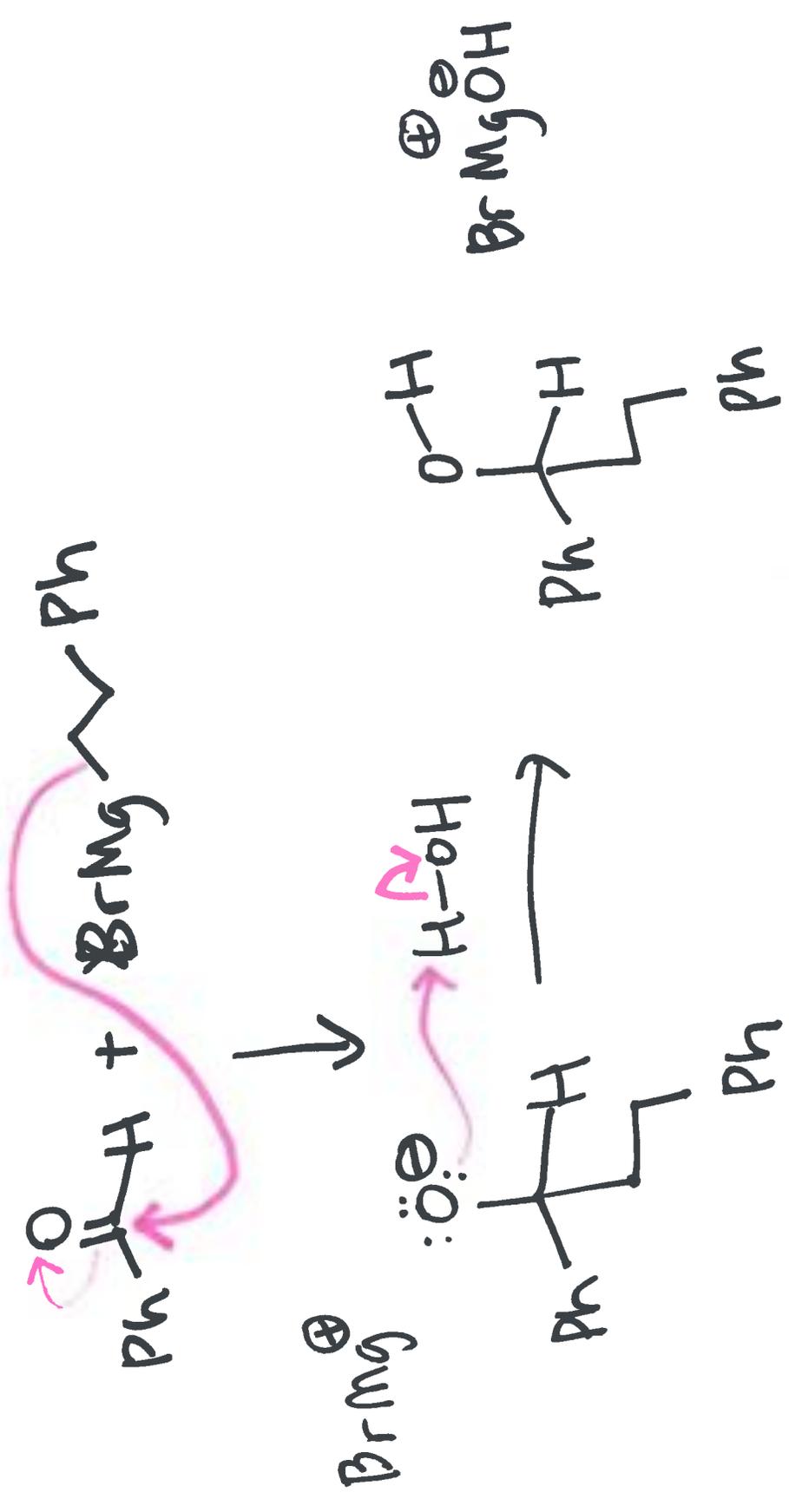
2a

Addition to aldehyde + ketone

• RLi and RMgX are interchangeable.



Mechanism: Same for both



Draw RLi to ketone!

Stereochemistry:

