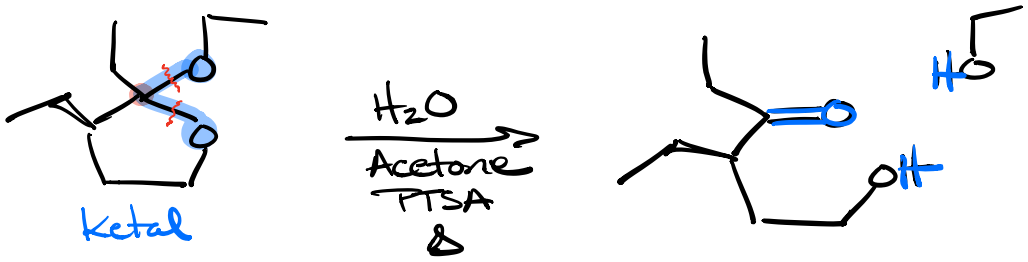
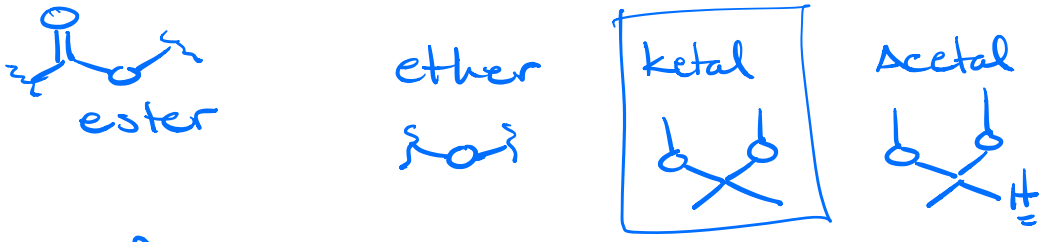


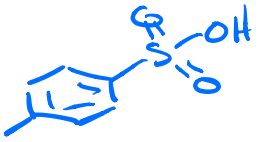
- Functional Groups



- Type of Reaction

H_2O
Acid - PTSA
Δ - Heat

Hydrolysis



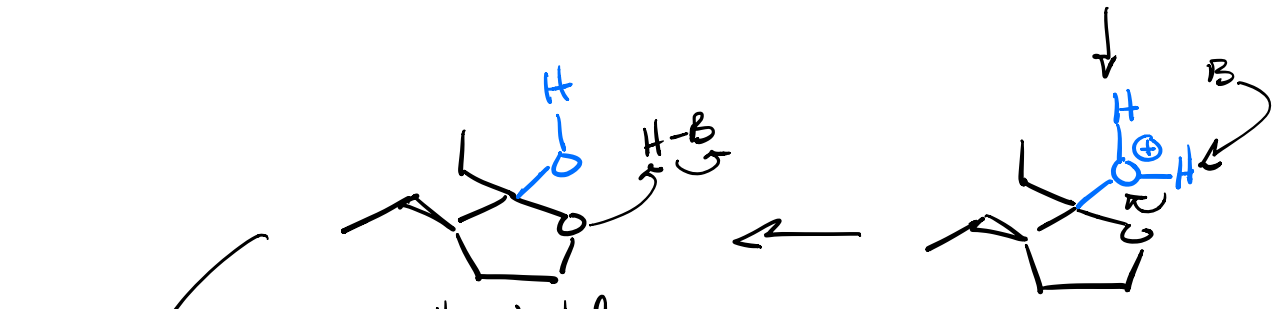
~ H_2SO_4 in strength

Hydrolysis - bond breaking with the addition of H_2O

① protonate an oxygen
-it doesn't matter which one.

② Assited leaving

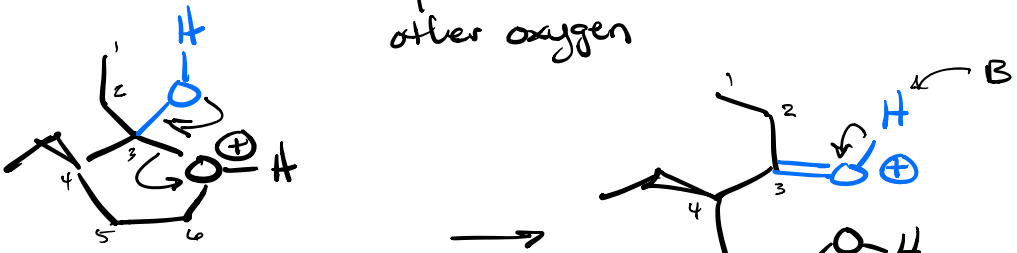
③ nucleophilic attack by H_2O



④ deprotonation

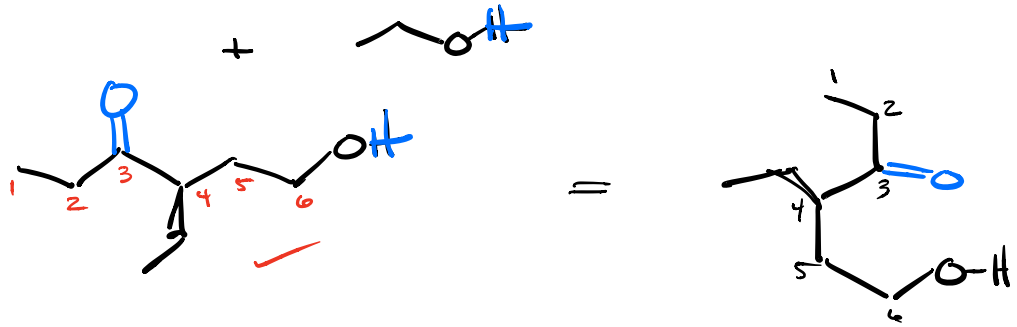
Hemiketal

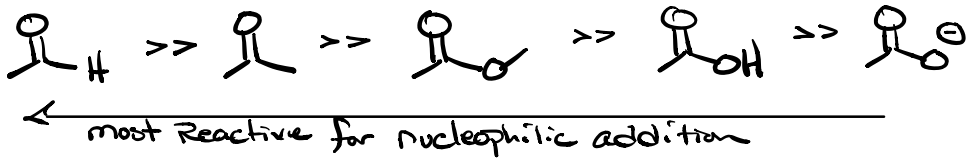
⑤ protonation of other oxygen

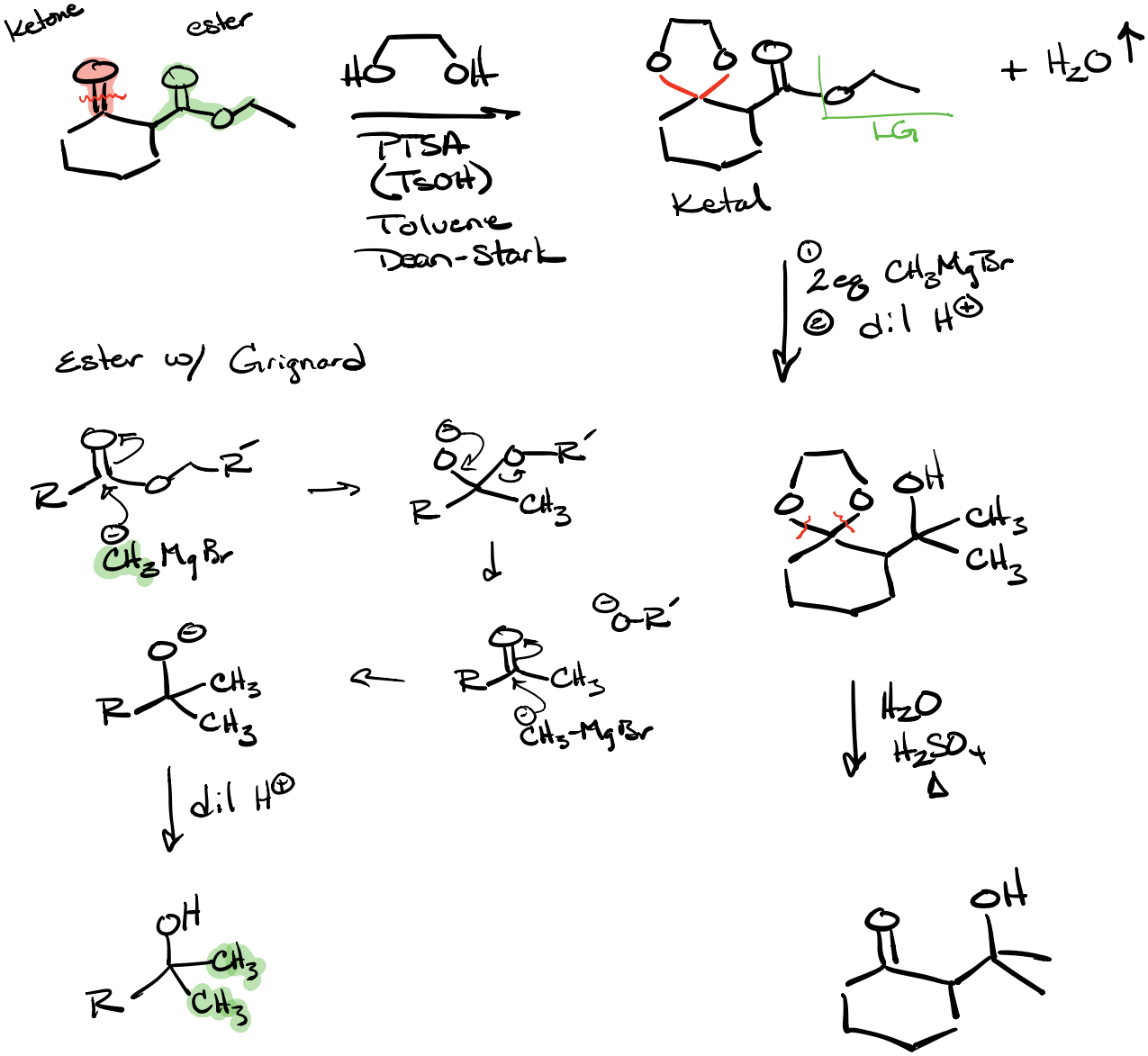


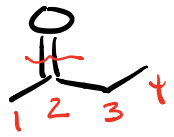
⑥ assisted leaving

⑦ deprotonation

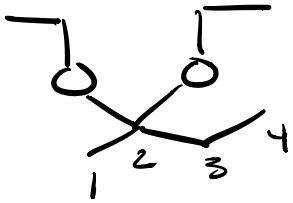



>>
>>
>>
most Reactive for nucleophilic addition


Ketone
ester
PTSA
(TsOH)
Toluene
Dean-Stark
LG
Ketal
+ H2O
1) 2eq CH3MgBr
2) dil H+
Ester w/ Grignard
CH3MgBr
dil H+
H2O
H2SO4
Δ

① 

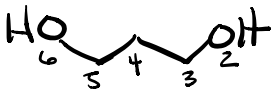
EtOH
PTSA
Toluene
Dean Stark



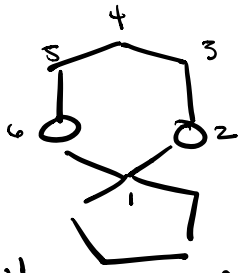
Ketal + H_2O

② 

diol

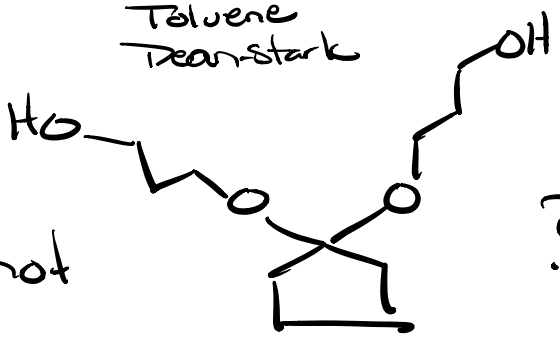


PTSA
Toluene
Dean-Stark

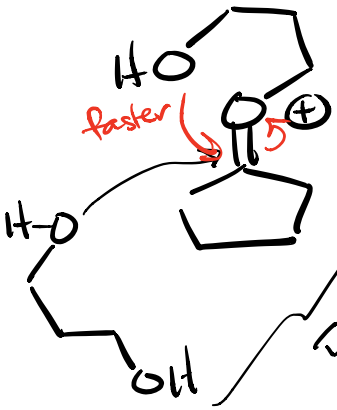


Ketal

why not



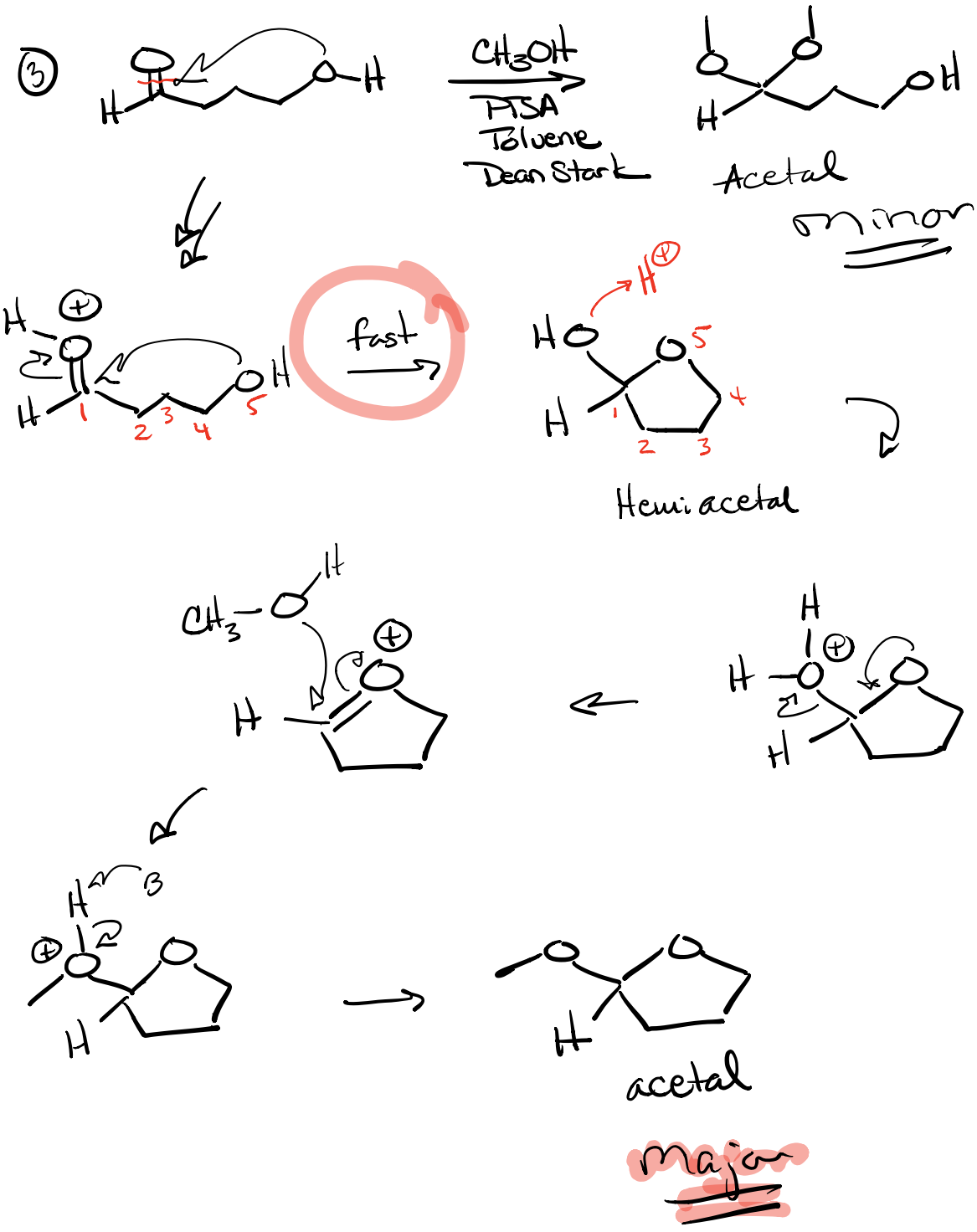
?



takes a collision between two molecules

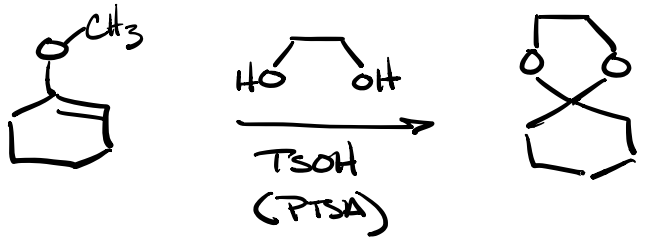
Rate = k[Carbonyl][alcohol]

Rate of internal reaction = k[Carbonyl]


③
CH_3OH
PTSA
Toluene
Dean Stark
Acetal
minor
fast
Hemi acetal
major
acetal

Internal 5 & 6 member rings are fast and major products when possible.

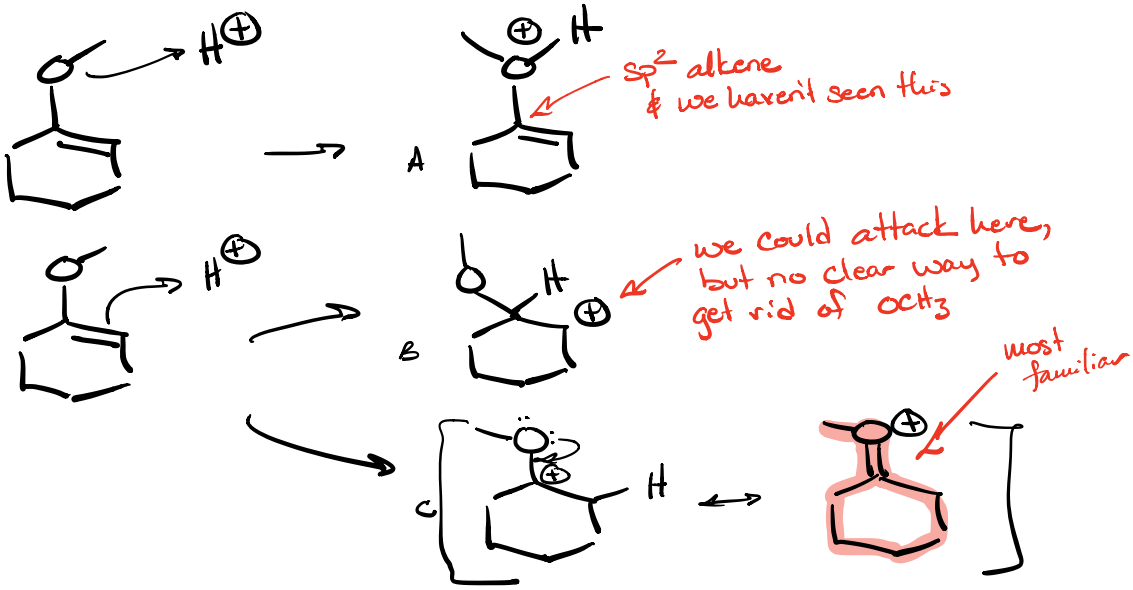
- 4 & 3 rings less likely due to strain
- 7 & 8 & up also less likely due to less favorible bond angle & less likely productive collisions.

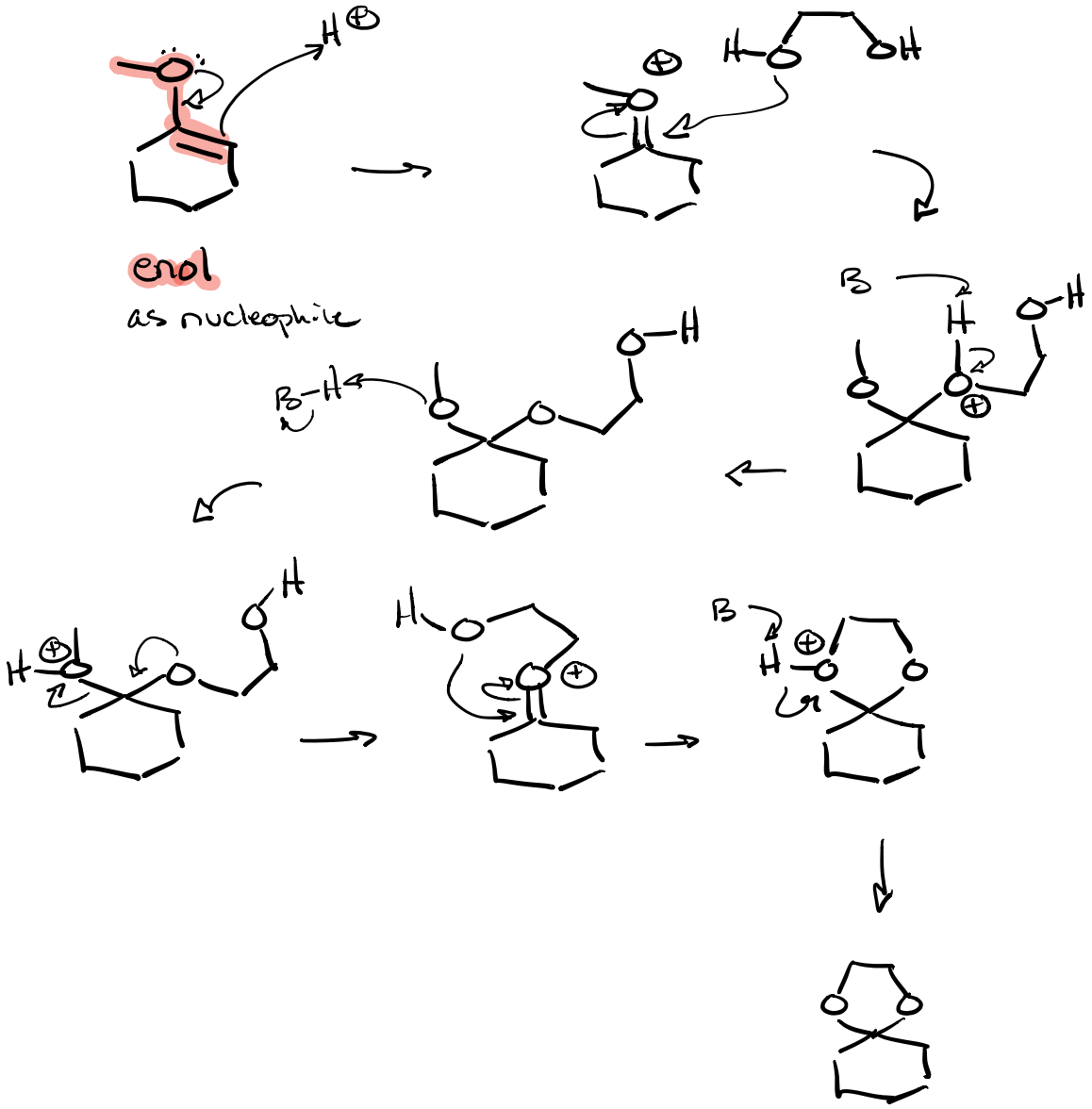


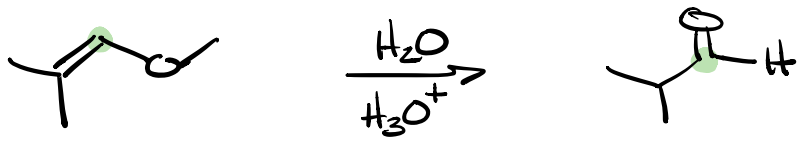
Give mechanism

Acid cat ⇒ 1st Step protonation (find location that takes mechanism forward)

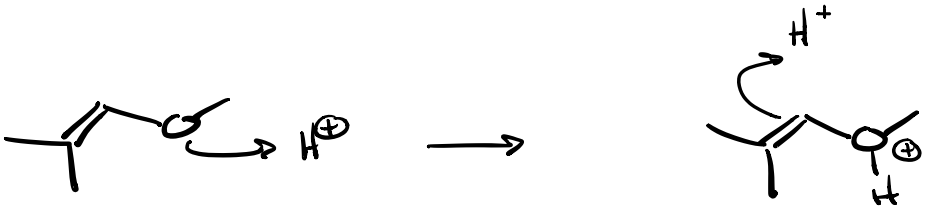
Base Cat ⇒ 1st Step deprotonation (find most acidic)

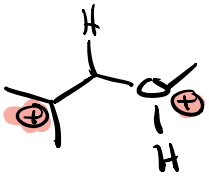



enol
as nucleophile

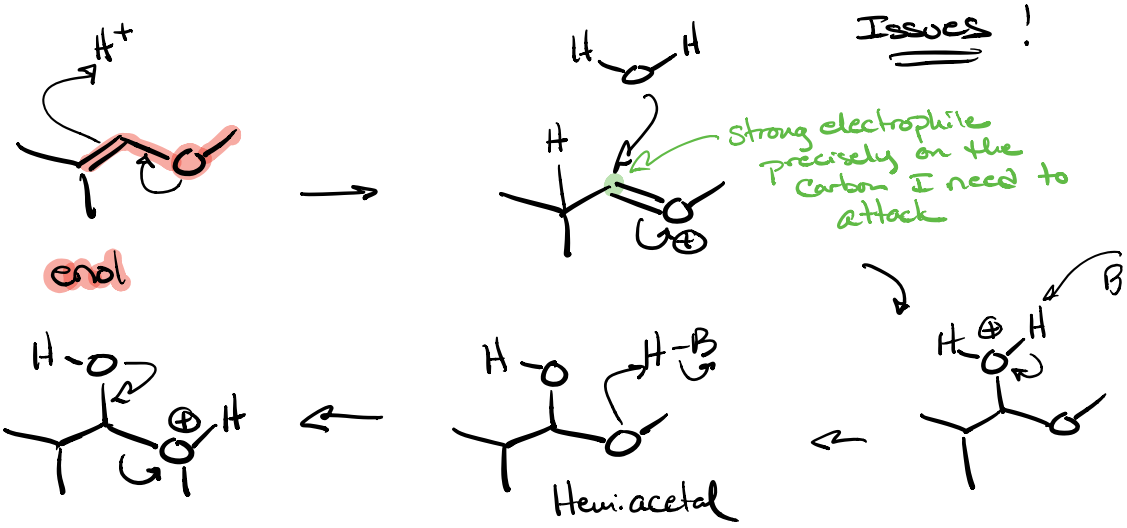


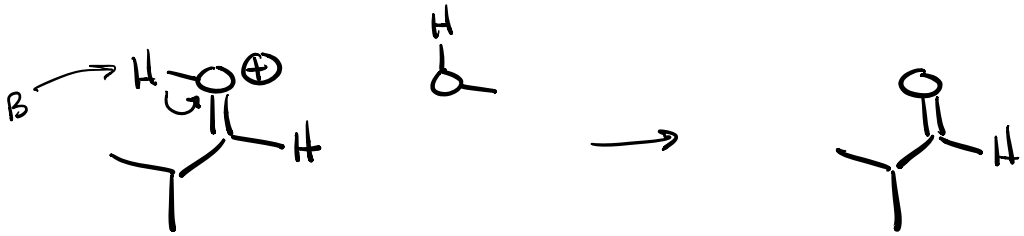
Give Mechanism

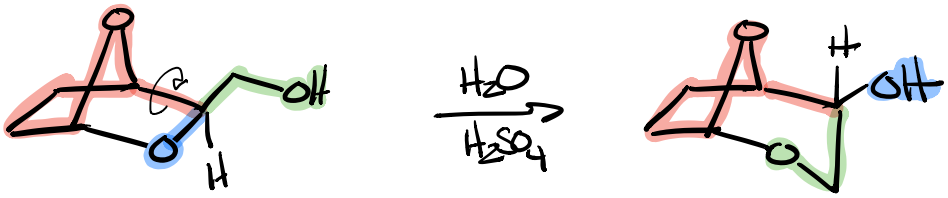




Issues !

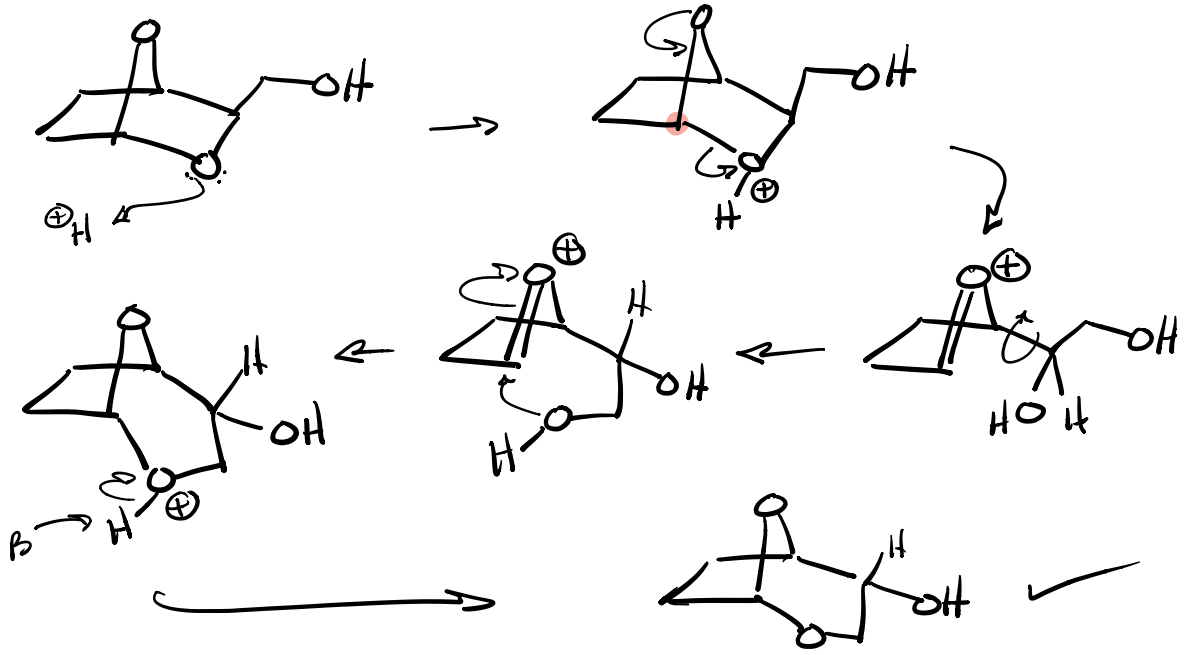


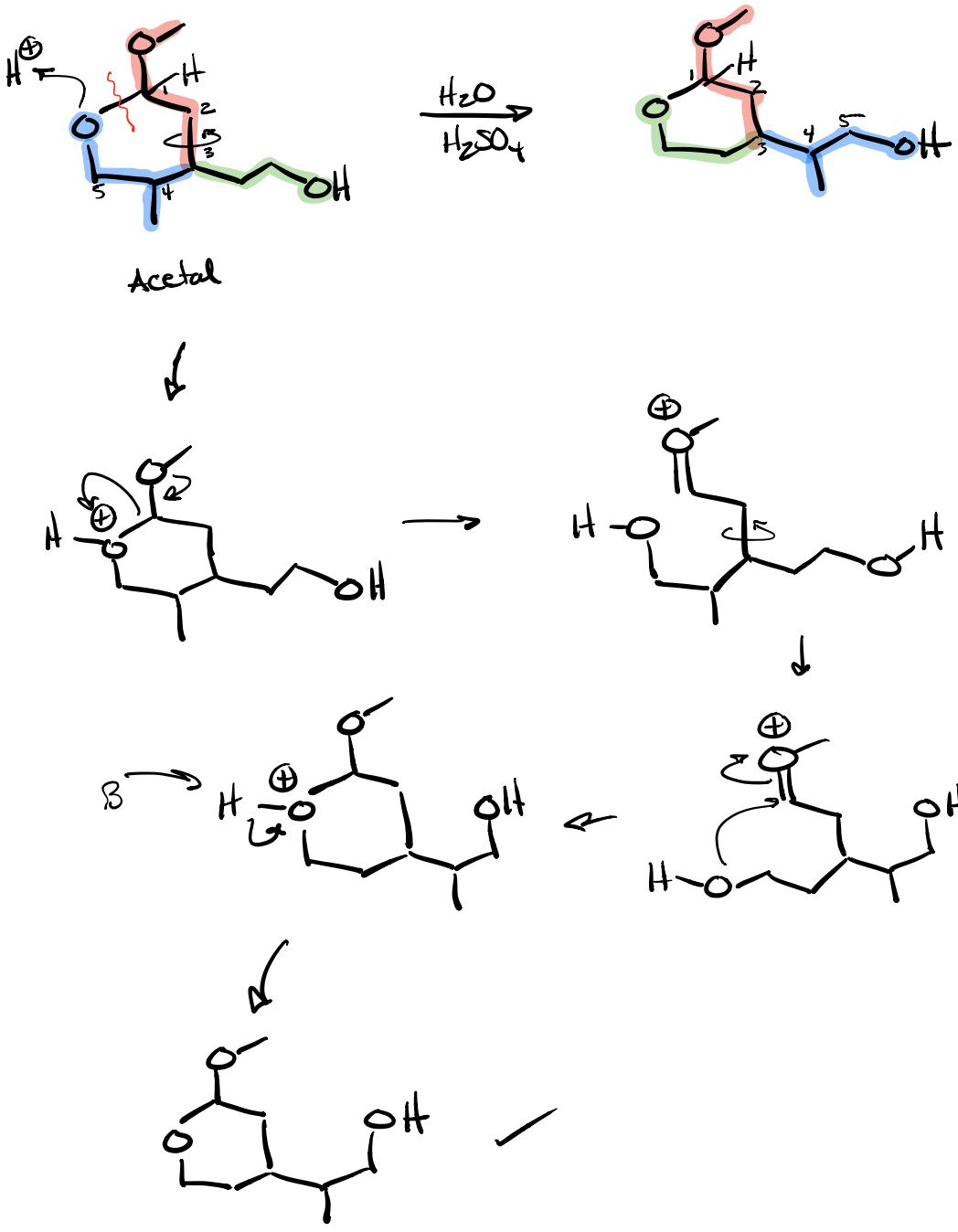


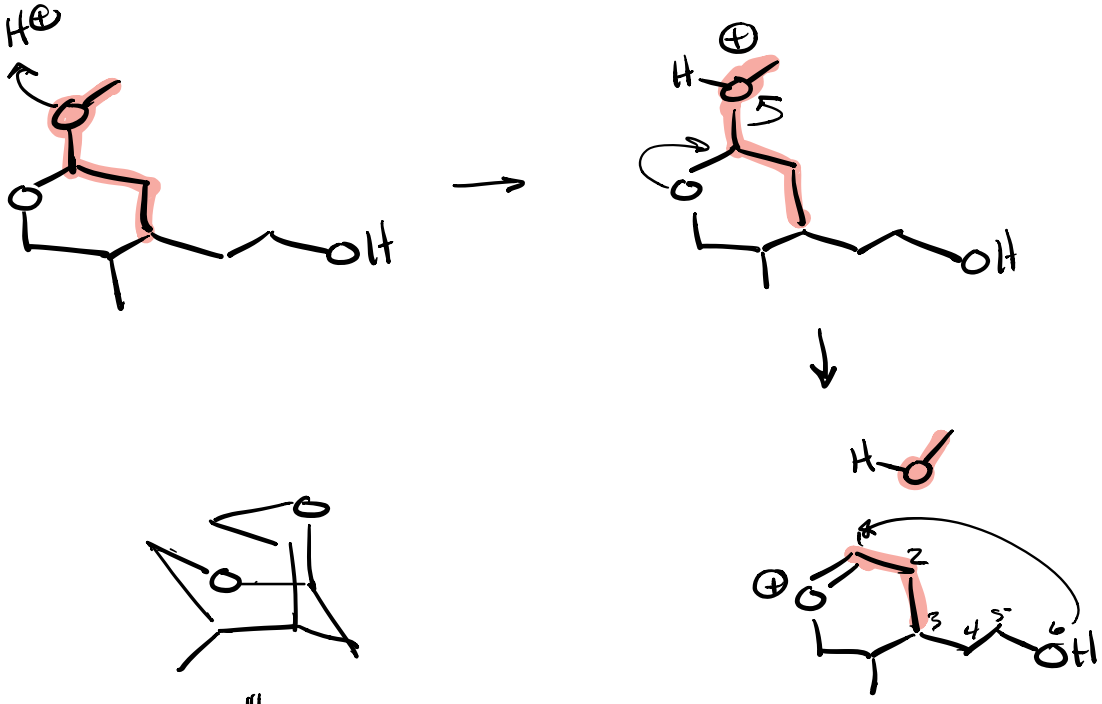


Propose a mechanism

Plan → protonate blue
create good LG
blue oxygen leaves
bond rotation
green oxygen attacks




H_2O
H_2SO_4
Acetal
B


H⊕
OH
H
⊕
5
OH
H
⊕
2
3
4
5
6
OH