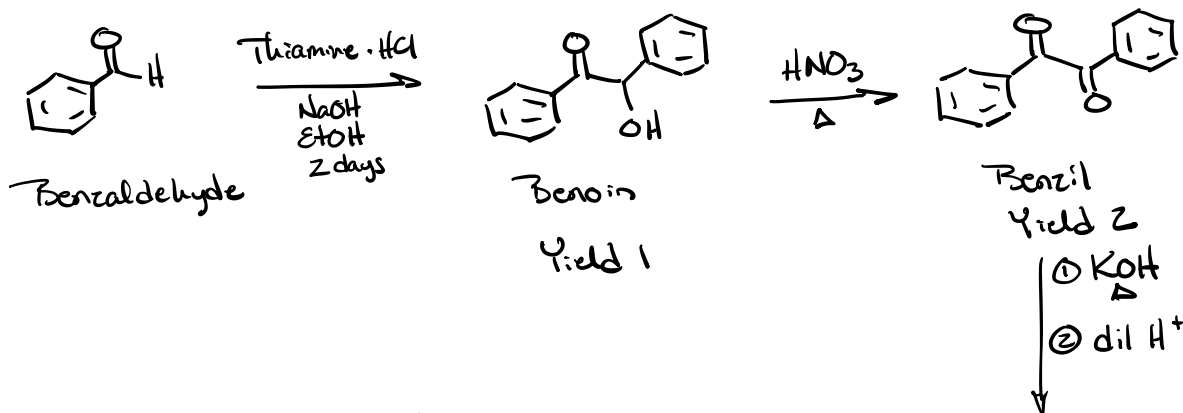


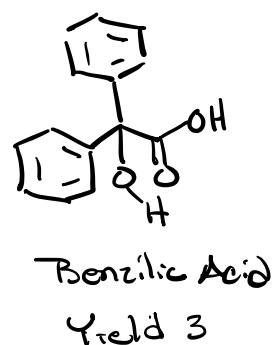
Multistep Synthesis



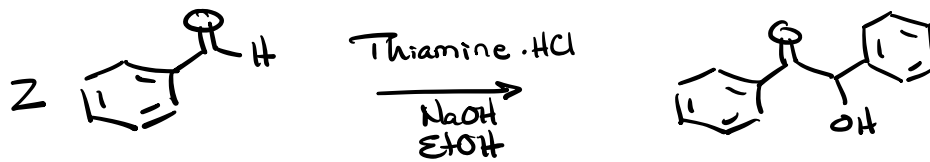
$$\text{Overall yield} = \text{Yield 1} \times \text{Yield 2} \times \text{Yield 3} \times 100$$

For example let's say 70% on all 3

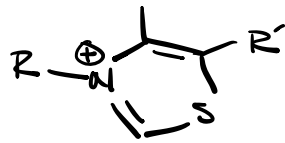
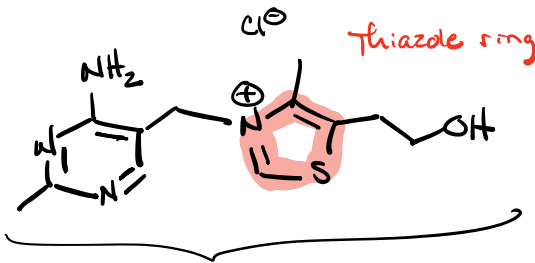
$$\begin{aligned} \text{Overall yield} &= 0.70 \times 0.70 \times 0.70 \times 100 \\ &= 34.3\% \text{ overall} \end{aligned}$$



Synthesis of Benzoin from Benzaldehyde

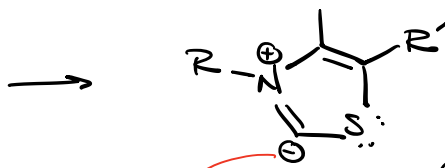
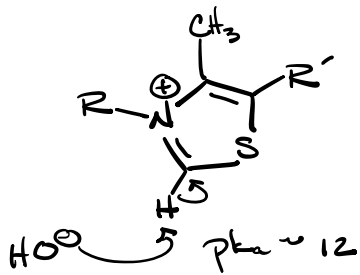


Thiamine · HCl
Coenzyme in vit B

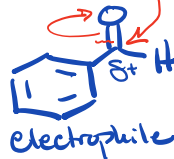


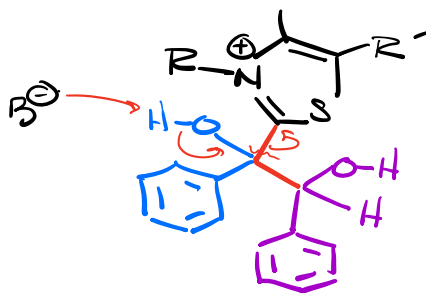
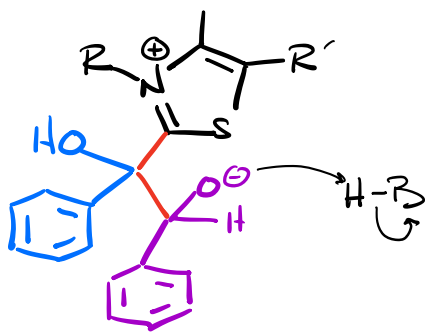
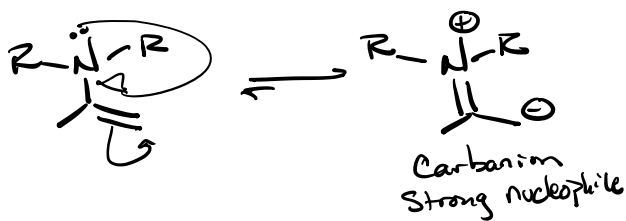
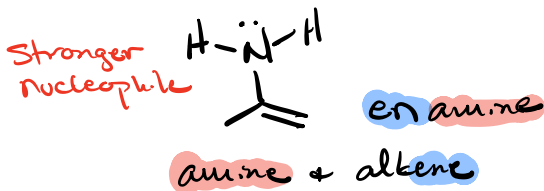
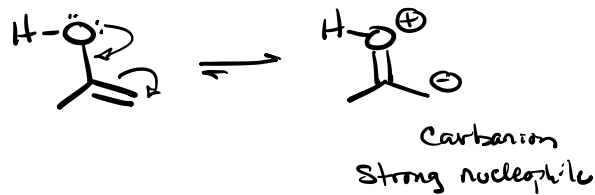
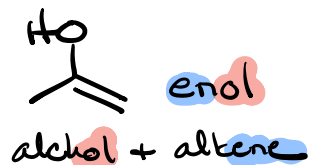
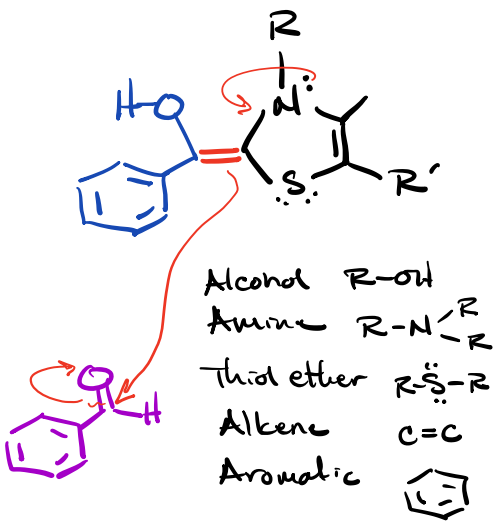
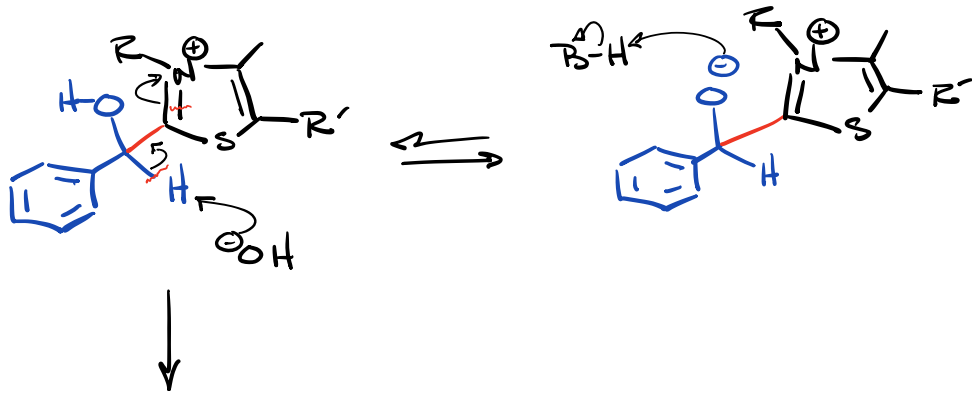
Mechanism

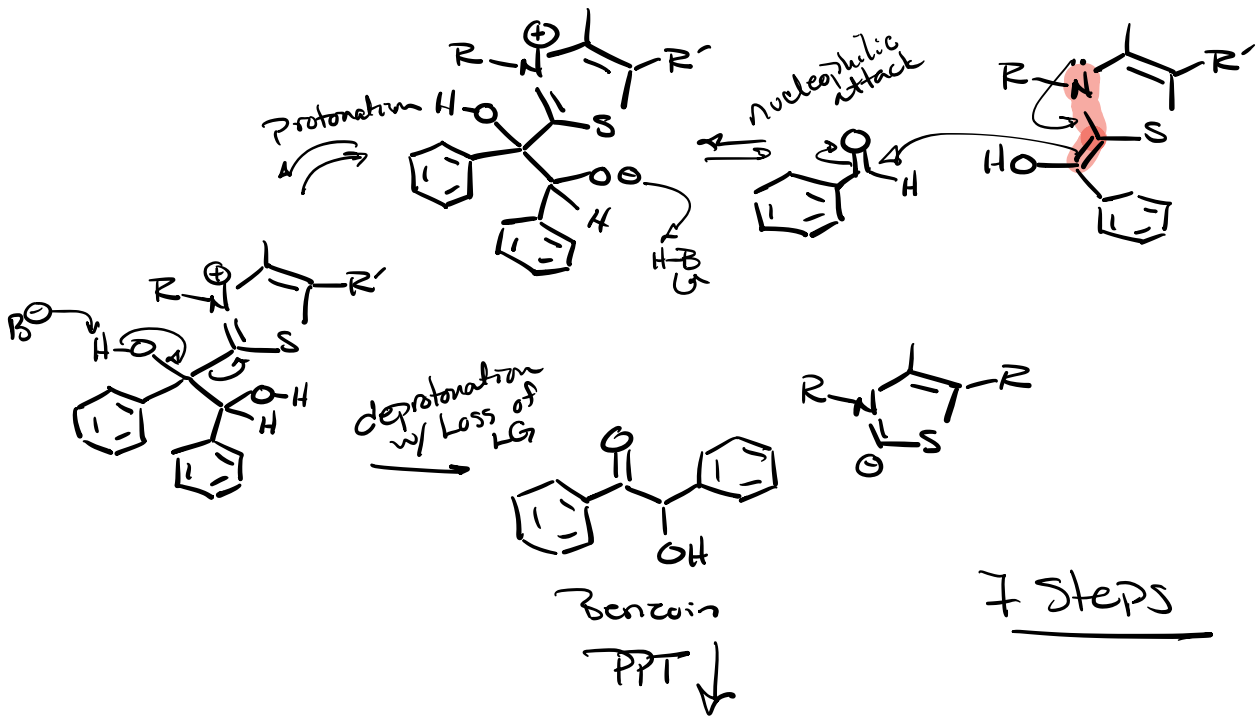
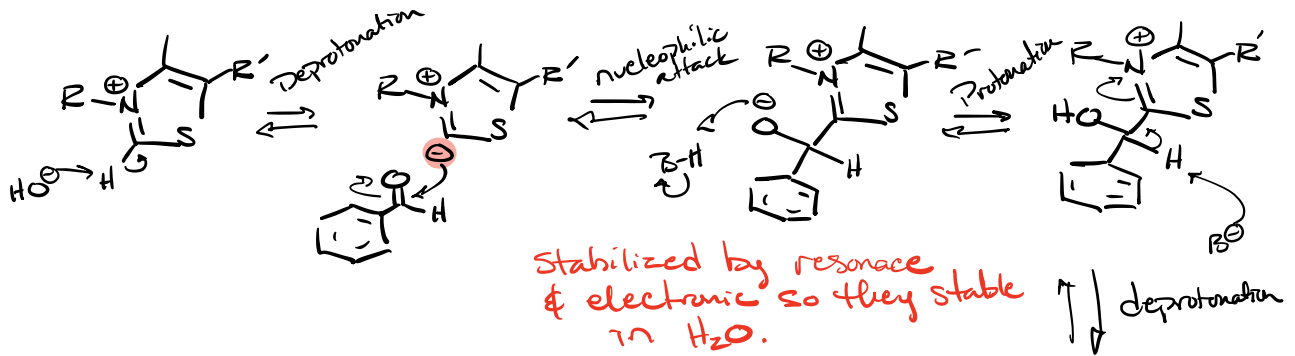
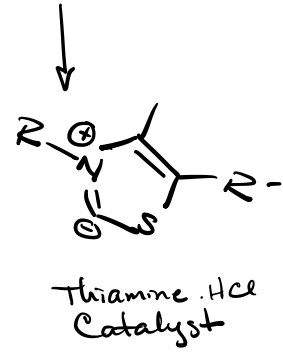
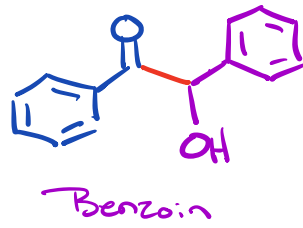
- Reaction is base catalyzed
 \Rightarrow 1st Step is deprotonation



Zwitterion $\ominus \sim \oplus$
 - Type Ylid $\text{x}^\oplus\text{-y}^\ominus$ adjacent
 Sulfur can participate in Resonance
 Carbon nucleophile



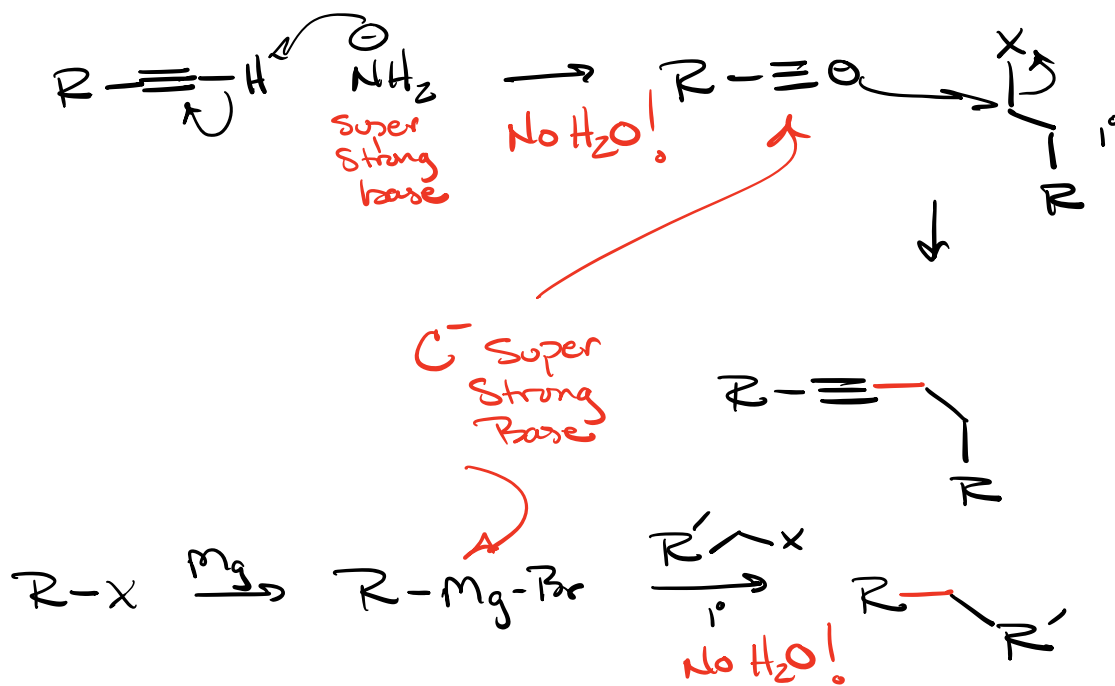




7 Steps

Reaction takes place in aqueous solution

⇒ Made new C-C bond in aqueous sol.!



Procedure

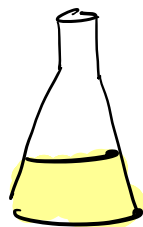


Catalyst

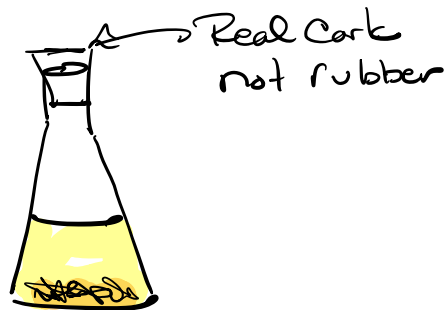
- Add ~ 0.30 g Thiamine \cdot HCl to flask
- Add 0.45 mL H_2O (~ 0.5 mL)
Swirl flask to dissolve Thiamine
- Add 3.0 mL 95% EtOH
Swirl flask to make homogeneous
- Add 0.90 mL of 2 M NaOH
Swirl flask to make homogeneous
 \Rightarrow Turns bright yellow & then fades over next 2 min

Starting material

- Tare flask & contents
- Add ~ 0.90 mL of benzaldehyde
- Reweigh flask to find mass of benzaldehyde
- Cork the flask & allow to sit in dark @ room temp 2 days - 4 days



$\xrightarrow{4 \text{ days}}$



Work up

- Ice Ran mixture for 10 min
(decrease solubility \rightarrow max precipitation)
 - Filter on hirsch funnel, Rinse w/ 1 mL DI H₂O
 - Take mass of Solid
 - Recrystallize from 95% EtOH
 - mass
 - IR
 - mp
 - % Yield
- } Characterization

Separation Scheme

