

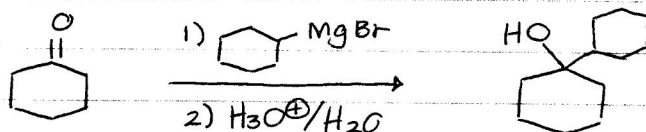
# CH310N - Lecture 9

2/15/11

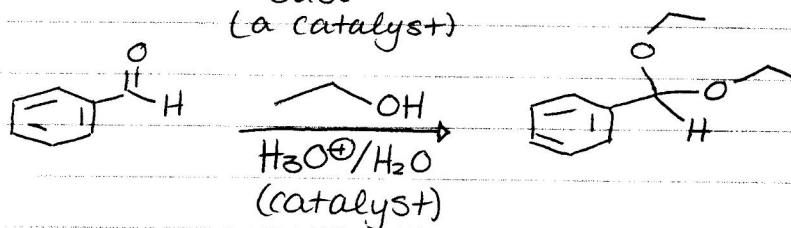
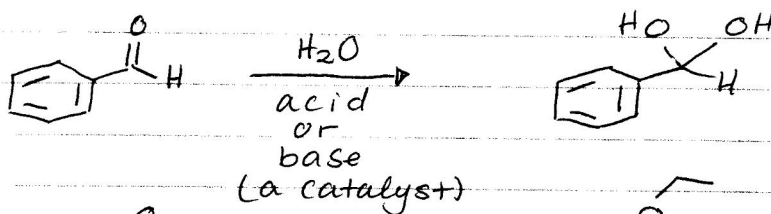
Will finish Ch. 16 today

Homework will be due ~~Thursday~~ <sup>next</sup> Tuesday

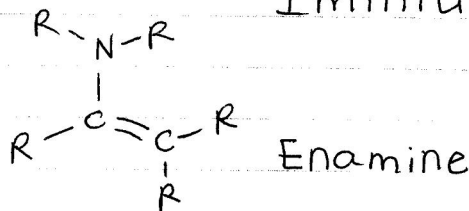
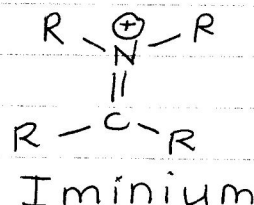
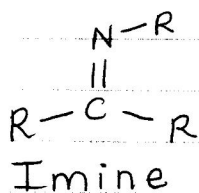
Review:

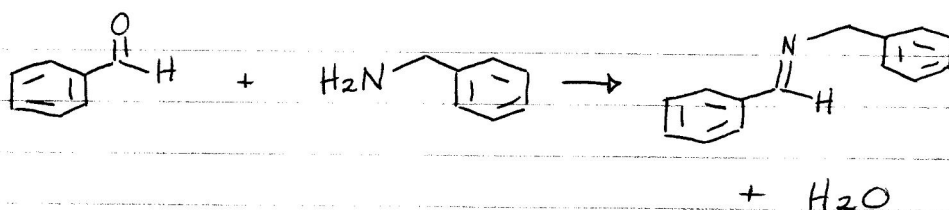


-no catalysis

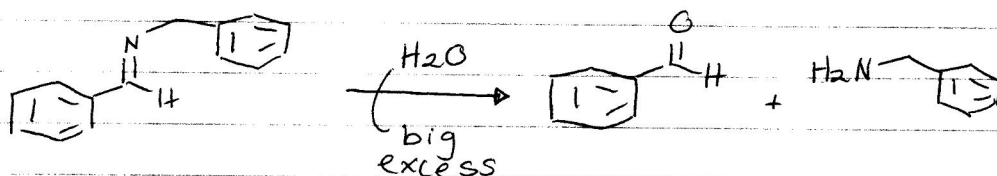


## Addition of Amines





Also reversible:

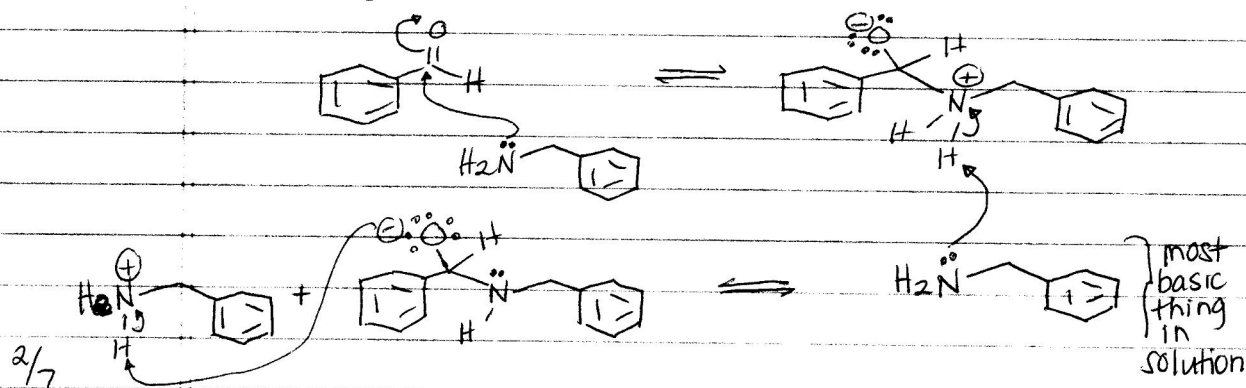


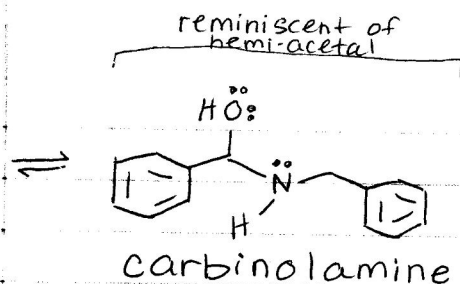
- Water formed as a product in rxn, could reform starting materials

↳ so to shift equilibrium to product  $\Rightarrow$  we remove the  $\text{H}_2\text{O}$

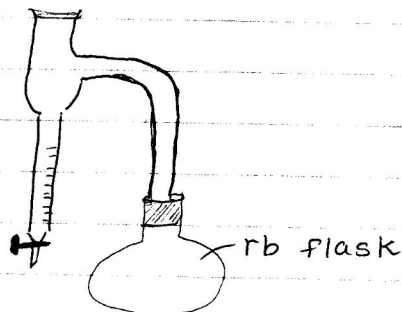
↓  
with a dean stark apparatus

Amines are nucleophilic enough to add directly

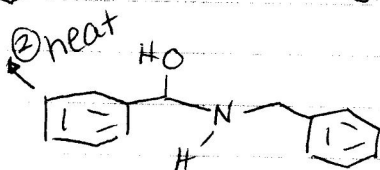
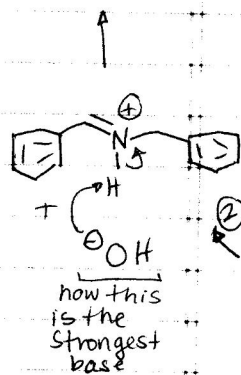
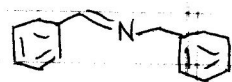




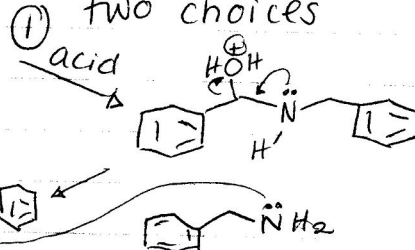
To Remove  $H_2O$  From Rxn -  
Dean-Stark Apparatus



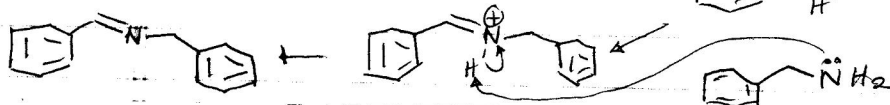
- Refluxing (boiling) rxn
- $H_2O$  created in rxn
- $H_2O$  and solvent condense in side chamber
- $H_2O$  and solvent not miscible ( $H_2O$  is heavier)
- ↳  $H_2O$  removed by opening stopcock



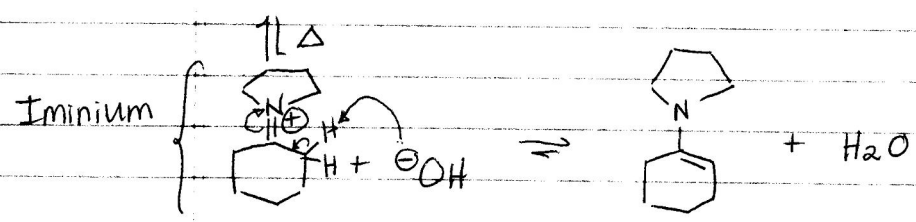
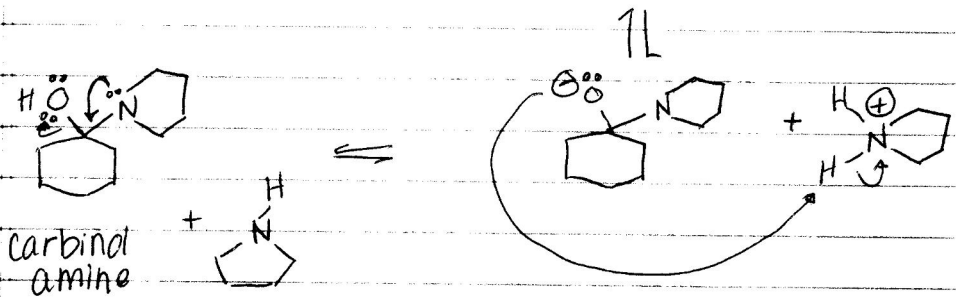
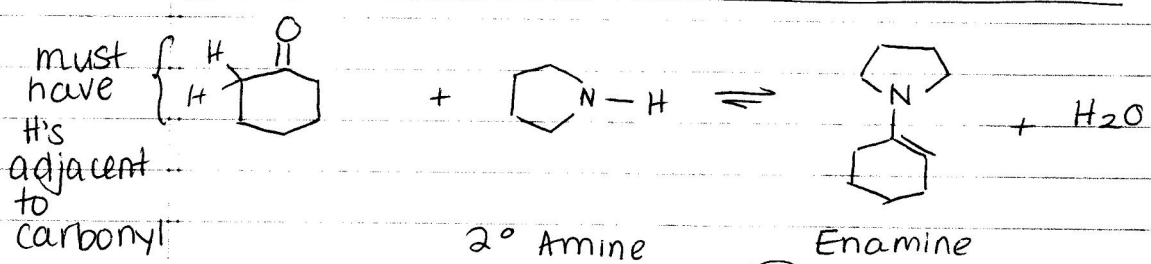
to get product  
two choices



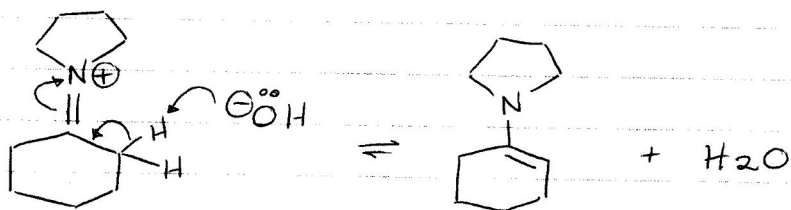
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- adding acid  $\Rightarrow$  dilemma = protonating amine and first step becomes very slow
- heating "the dickens" out of the rxn, the hydroxyl group (which usually is not a good leaving group) can be forced to leave



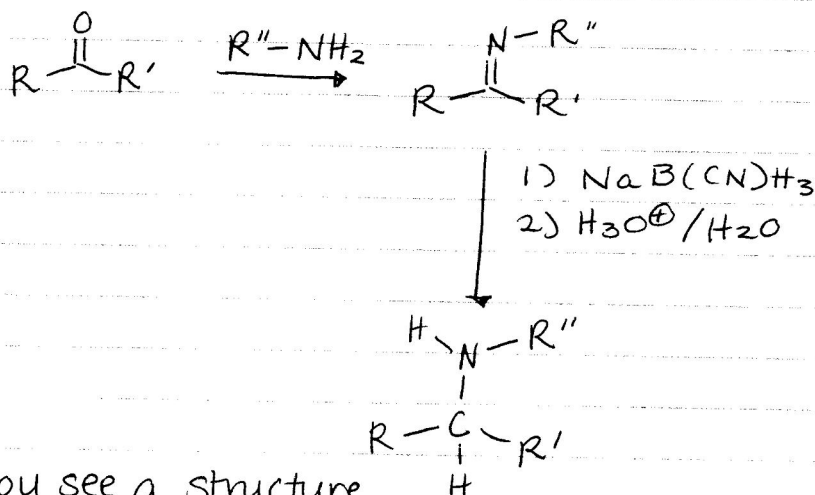
Arrow "zoom in" of last step:



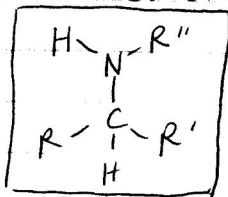
- Follow the notes here for the mechanism rather than the book

↳ We typically heat the reaction to force the  $\text{OH}^-$  to leave rather than add acid

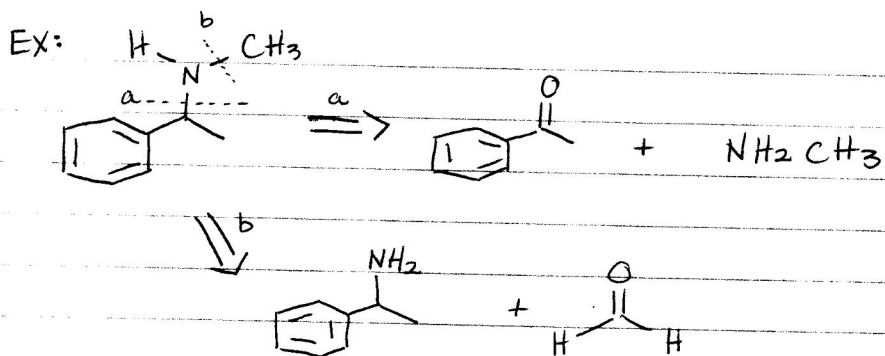
Why is addition of amines important?  
Reductive Amination:



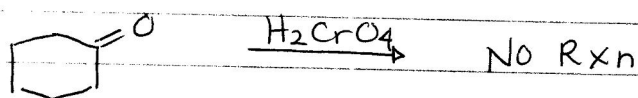
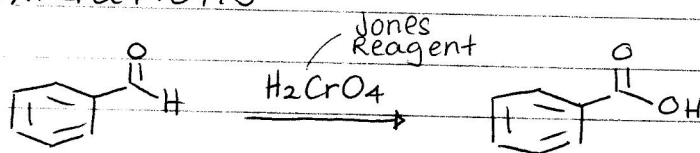
If you see a structure like



=> you could make this by reductive amination



## Oxidations

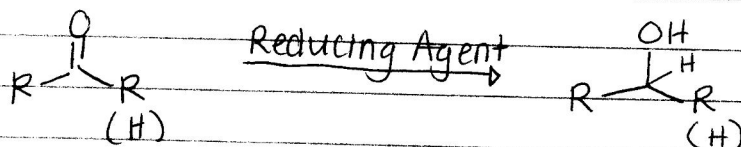


## Reductions

~~Reduction~~

Possible Reducing Agents:

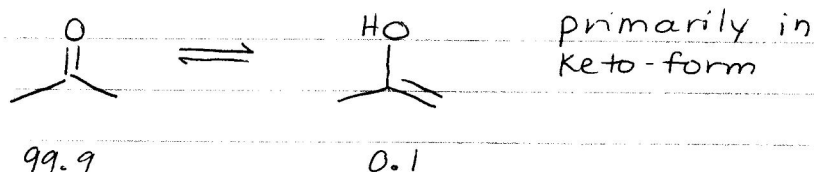
- ①  $\text{NaBH}_4$
- ②  $\text{LiAlH}_4$
- ③  $\text{H}_2/\text{Pt}$
- ④  $\text{H}_2/\text{Pd}$



# Keto-Enol Tautomerization



• H's moving in 1,3-shifts is called tautomerization



Exception:



Base Catalysis

