Final Exam
Friday, 12:30 pm
Stevens

~40-50% new material
~50-60% comprehensive
Carbonyl Chemistry

\[
\begin{align*}
&\text{aldehydes} & \text{carboxylic acid and derivatives} \\
&\text{ketones} & \\
\end{align*}
\]
Electrophiles (e.g. $H^+$)

Nucleophiles (e.g. $CH_3MgBr$)

an enolate
1,2-addition

1,4-addition (conjugate addition)
Acid Halides (acetyl chloride)

Acid anhydrides (acetic anhydride)

Esters (methyl acetate)

Amides (acetamide)
\[
\begin{align*}
  \text{General NAS Reaction} & : \quad R^\text{Nuc}Y + \text{Nuc-H} \rightarrow R^\text{Nuc} + HY \\
  \text{Hydrolysis} & : \quad R^\text{Nuc}Y + \text{HO-H} \rightarrow R^\text{Nuc}OH + HY \\
  \text{Alcoholysis} & : \quad R^\text{Nuc}Y + \text{R'O-H} \rightarrow R^\text{Nuc}OR' + HY \\
  \text{Aminolysis} & : \quad R^\text{Nuc}Y + \text{NH}_3 \rightarrow R^\text{Nuc}NH_2 + HY
\end{align*}
\]
Reduction

Grignard

DIBAL
Acid Catalyzed Enol Equilibrium

Base Catalyzed Enol Equilibrium
The image shows a chemical reaction. The left side of the image has a ketone and LDA (lithium diisopropyl amide) reacting to form an enolate anion (marked with a superscript negative). The reaction proceeds with 100% yield.

On the right side, there is a ketone with an substituent added. The reaction steps are:

1. Treatment with LDA
2. Reaction with CH₃I

The final product is a ketone with a methyl group attached.
\[
\text{EtO}_2\text{C} = \text{CO}_2\text{Et} \quad \text{pK}_a = 20
\]
\[
\text{EtO}_2\text{C} = \text{CO}_2\text{Et} \quad \text{pK}_a = 9
\]
\[
\text{EtO}_2\text{C} = \text{CO}_2\text{Et} \quad \text{pK}_a = 13
\]
\[
\text{Ph} \quad \text{EtOH} \quad \text{NaOEt} \quad \text{Ph} \\
\text{Ph} \quad \text{Ph} \quad \text{90%} \\
\text{Ph} \quad \text{EtOH} \quad \text{NaOEt} \quad \text{22%}
\]
The reaction shown in the diagram involves the reaction of NaOEt in EtOH with a diester to form an enolate, which then reacts with an alkene to form a diester. The reaction can be written as:

\[ \text{Diester} + \text{NaOEt, EtOH} \rightarrow \text{Enolate} \rightarrow \text{Diester} + \text{Alkene} \]
The image depicts a chemical reaction between two compounds. On the left, there is a structure labeled with 'ONHO2O'. This compound reacts with 'C=C=O' (an alkene) to form a product shown in the middle of the image. The product is a more complex molecule with a nitrogen-containing ring and an alkene side chain. This new compound then reacts with water (labeled as H2O) to form a final product shown on the bottom right, which is a ketone with a similar alkene side chain. The reaction shows a clear transformation from reactants to products, with the addition and removal of functional groups.