Exam 1

Name (PRINT) ____________________________
I have neither given nor received aid on this exam (SIGN) ____________________________________________

Recitation (circle one): Tues, 8:30 Tues, 5:30 pm Thurs, 8:30 am Circle one: Undergrad Grad

There are 4 pages and 150 pts on this exam. Please read each question carefully before answering.

1. (6 pts) Rank the following compounds (from 1 to 3) in order of increasing acidity (1 = least acidic):

   \[
   \begin{align*}
   & \text{H}_3\text{C} \quad \text{H}_3\text{C} \quad \text{H}_3\text{C} \\
   & \text{O} \quad \text{O} \quad \text{O}
   \end{align*}
   \]

2. (6 pts) Rank the following compounds (from 1 to 3) in order of increasing acidity (1 = least acidic):

   \[
   \begin{align*}
   & \text{O} \quad \text{O} \quad \text{O} \\
   & \text{O} \quad \text{O} \quad \text{O}
   \end{align*}
   \]

3. (10 pts) Which compound is more acidic between A and B? Explain.

   \[
   \begin{align*}
   & \text{A} \\
   & \text{B}
   \end{align*}
   \]
4. (28 pts) Provide the products of the following reactions. If there is more than one product, predict which will be major.

(a) 

(b) 

1) LDA, −78°C
2) CH₃I

(c) 

(d) 

1) NaOCH₃
2) Br

(e) 

(f) 

1) NaOH
2) 
3) H₃O⁺

(g) 

(h) 

1) LDA, −78°C
2) CH₃CH₂I
5. (45 pts) Provide syntheses for these compounds and provide complete reagents and conditions.

(a) Start with \( \text{CH}_3\text{O} \quad \text{CH}_3\text{O} \quad \text{OCH}_3 \) and prepare \( \text{CH}_3\text{O} \quad \text{CH}_3\text{O} \quad \text{OCH}_3 \)

(b) Start with \( \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \) and prepare \( \text{CH}_3\text{O} \quad \text{CH}_3\text{O} \quad \text{OCH}_3 \)

(c) Start with \( \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \quad \text{O} \) and prepare \( \text{CH}_3\text{O} \quad \text{CH}_3\text{O} \quad \text{OCH}_3 \)
6. (25 pts) Provide all reagents for the following reactions. In some cases, more than one step may be required.

\[
\begin{align*}
\text{H}_2\text{N} & \quad \text{O} \\
\text{O} & \quad \text{H}_2\text{N} \\
\text{Br} & \quad \text{O} \\
\text{O} & \quad \text{H}_2\text{N}
\end{align*}
\]

7. (15 pts) Provide a mechanism for the following transformation.

\[
\begin{align*}
\text{CH}_3\text{CO}_2\text{H} & \quad \text{HOAc} \\
\text{Br}_2 & \quad \text{Br}
\end{align*}
\]

8. (15 pts) Ethyl acetate (CH\textsubscript{3}CO\textsubscript{2}CH\textsubscript{2}CH\textsubscript{3}) readily undergoes a Claisen condensation in the presence of one equivalent of sodium ethoxide (NaOCH\textsubscript{2}CH\textsubscript{3}), but phenyl acetate (CH\textsubscript{3}CO\textsubscript{2}C\textsubscript{6}H\textsubscript{5}) does not undergo a Claisen condensation in the presence of one equivalent of sodium phenoxide (NaOCC\textsubscript{6}H\textsubscript{5}). Explain.