CHE 232  Section 001  Organic Chemistry
Exam 3  April 13, 2005

Name_________________________  Student ID No._____________________

You are allowed to have scratch paper and a simple model set. You do not need a calculator.

Read each question carefully so that you answer properly.

Please have your ID visible on the adjacent seat.

Make sure answers are clear to receive maximum credit.

In cases where you are asked to answer only part of the problems, answering more will not count as extra credit. However, answer as many as you can, because your best answers will be counted.

Do not second-guess yourself.
1. (10 points) For each compound, circle the most acidic proton.

2. (10 points) For each compound, circle the most electrophilic atom (excluding protons).

3. (10 points) Explain briefly why the proton-decoupled $^13$C NMR spectrum of the following compound shows 6 signals instead of the expected 3 (there are more than 3 types of carbons?!??!). Drawing a structure will help.

In $^13$C NMR, you see signals from both tautomers. Form A is favored due to conjugation and H-bonded 6-membered ring.
4. (20 points) Please provide mechanisms for 2 of the 3 following conversions.

\[
\begin{array}{c}
\text{H}_2\text{N} & \text{NH} \\
\text{Et}_2\text{C} & \text{N} \\
\text{OEt} & \text{O} \\
\end{array}
\xrightarrow{\text{H}_3\text{O}^+} \\
\text{H}_2\text{O}
\]

This is a masked carbonyl (acetal) which means that it can be converted to another masked carbonyl (enamine).

See problem 16.47

The abbreviation "Ph" can be used to draw faster.

\[
\begin{array}{c}
\text{Ph} & \text{Ph} \\
1 & 2 \\
\end{array}
\xrightarrow{\text{KOH}}
\begin{array}{c}
\text{Ph} & \text{Ph} \\
3 & 4 \\
\text{Ph} & \text{Ph} \\
\end{array}
\]

Double Knoevenagel, see problem 17.49

This is really like a double aldol condensation. Elimination occurs by E1cb and is favored due to extensive conjugation (product is purple).

\[
\begin{array}{c}
\text{CH}_3\text{C} & \text{O} \\
\text{O} & \text{Ag} \\
\end{array}
\xrightarrow{\text{Br}_2}
\begin{array}{c}
\text{CH}_3 \text{Br} \\
\end{array}
\]

See page 1008, Chapter 18
5. (20 points) Provide a reasonable synthesis for 2 of the following 3 compounds from the indicated starting materials and any other reagents.

\[
\text{CHOH} \xrightarrow{S_OCl_2} \text{COCl} \xrightarrow{AICl}_3 \xrightarrow{\text{LDA}} \text{HCl}
\]

Michael addition

\[
\text{NH}_2 \xrightarrow{\text{LDA}} \text{H}_2\text{C}
\]

Not isolated. Converts to ketone during workup.
6. (30 points) Draw the expected product. Assume workup to get neutral products. Do 6 of the following 10.

- [Chemical Reaction Diagram]
- [Chemical Reaction Diagram]
- [Chemical Reaction Diagram]
- [Chemical Reaction Diagram]
- [Chemical Reaction Diagram]
- [Chemical Reaction Diagram]