Name: _____________________

Midterm #4
Chemistry 1315 - Survey of Organic Chemistry

Date: 04-13-04
Time: 9:35 am - 10:55 am
Place: Boggs B6

You MUST answer question #1 and can choose five out of the next six questions (questions 2 - 7). Mark the question you DO NOT want to have graded. If you do not mark a question, the grader will pick one at random and will not grade it!

You must sign the Honor Code Agreement (If you do not sign it, your exam will not be graded):
Having read the Georgia Institute of Technology Academic Honor Code, I understand and accept my responsibility as a member of the Georgia Tech Community to uphold the Honor Code at all times. In addition, I understand my options for reporting honor violations as detailed in the code.

_________________
Signature

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<tr>
<th>Question</th>
<th>Points possible</th>
<th>Your Score</th>
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Total: 150

Summary of the counted exams: /450
You must answer this question!

Question 1 (25 points)  See Notes and book

Explain the following concepts in the space provided below. Use two sentences or less, and/or a formula, and/or a graph:

(a) Haworth projection (give an example)

See Notes and book

(b) Mutarotation (give an example)

See Notes and book

(c) Saponification (give an example)

See Notes and book
(d) Mannose

See Notes and book

(e) Esterification (give an example)

See Notes and book
Question 2 (25 points)

Give the products of these reactions (give reactant for (c))

(a)

\[
\text{H}_3\text{C}(\text{H}_2\text{C})_{14}\text{O} \rightarrow \text{HO} \xrightarrow{\text{NaOH}} \text{HO} \]

(b)

\[
\text{KMnO}_4 \xrightarrow{\text{COOH}} \text{COOH} \]

(c)

\[
\text{SOCl}_2 \xrightarrow{1.\text{LiAlH}_4} \text{Cl} \xrightarrow{2.\text{H}_3\text{O}^+} \]

\[
\text{H}_2\text{N-} \]

\[
\text{LiAlH}_4 \]

\[
\text{H}_2\text{O}^+ \]
Question 3 (25 points)

Draw the following compounds:

a) $4$-O-($\alpha$-D-glucopyranosyl)-$\beta$-glucopyranose

\[ \text{Diagram of compound a)} \]

b) N-cyclohexylethanamide

\[ \text{Diagram of compound b)} \]

c) Cyclodecanecarboxylic acid

\[ \text{Diagram of compound c)} \]
d) Purine

\[
\begin{array}{c}
\text{N} \\
\text{N} \\
\text{N} \\
\text{N} \\
\text{N} \\
\end{array}
\]

e) Imidazole

\[
\begin{array}{c}
\text{HN} \\
\text{N} \\
\text{HN} \\
\end{array}
\]
Question 4 (25 points)

Classify each of the functional group.
Question 5 (25 points)

Estimate the $K_b$ of each of the following compounds. Give a reason for your answers and the order of $K_b$.

1. **Alkyl substituted amine**
   - $10^{-4}$
   - Delocalization of the electron pair

2. **Trialkyl substituted amine**
   - $10^{-3}$

3. **Alkyl substituted amine**
   - $10^{-4}$

4. **Delocalization of the electron pair + alkyl group**
   - $10^{-10}$

5. **N locked into position with really low reactivity**
   - $10^{-12}$
Question 6 (25 points)

Indicate if the following reactions will occur and write the mechanism for the ones that will work. If you assign one reaction as “not occurring” give a brief reason for your choice.

a)

\[
\text{CH}_3\text{OH} \rightarrow \text{CH}_3\text{COCl} + \text{HCl} \rightarrow \text{CH}_3\text{COCl} + \text{HCl} \rightarrow \text{CH}_3\text{COCl} + \text{HCl}
\]

b)

\[
\text{CH}_3\text{OH} \rightarrow \text{CH}_3\text{COOH} + \text{NH}_3
\]

No reaction
Question 7 (25 points)

Draw the structures of the D-2-Ketoses in the Fisher projection (from ketotriose to ketohexoses) and name them.

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