Organic Chemistry CH 352-01 (Wilson)

Exam #4

April 17, 2001

Question 1 _______ (9)
Question 2 _______ (10)
Question 3 _______ (25)
Question 4 _______ (25)
Question 5 _______ (26)
Question 6 _______ (5)
BONUS _______ (5)

TOTAL _______ (100)

"The most beautiful thing we can experience is the mysterious. It is the source of all true art and science."

- Albert Einstein
1. Assistant Beaker has forgotten that catalytic acid can do a whole bunch of reactions, and he added acid and warmed up the following reagents. He took the following $^1$H NMR and IR spectra for one of the products he isolated. What did Beaker make? What else did Beaker make?

\[ \text{Products} \]

$^1$H NMR

IR
(10) 2. Consider the following three compounds. Protons α to carbonyls are acidic. Predict which would be the strongest acid (number it 1) and the weakest acid (number it 3). Support your predictions with good reasons (an explanation, a drawing, whatever works for you).

\[
\text{H-CH}_2\text{C-Br} \quad \text{H-CH}_2\text{CH}_2\text{Br} \quad \text{H-CH}_2\text{C-N(CH}_3\text{)}_2
\]
3. Supply the missing products for five of the following six equations. Give answers for only five, and indicate which problems you would like graded.

a. 
\[
\begin{align*}
\text{products} & \rightarrow 1) \text{NaOEt, EtOH} \\
& \rightarrow 2) \text{H}_3\text{O}^+ 
\end{align*}
\]

b. 
\[
\begin{align*}
\text{products} & \rightarrow 1) \text{Mg}^+, \text{Et}_2\text{O} \\
& \rightarrow 2) \text{CO}_2 \\
& \rightarrow 3) \text{H}_3\text{O}^+ \\
& \rightarrow 4) \text{Br}_2, \text{PBr}_3 \text{ (cat)}
\end{align*}
\]

c. 
\[
\begin{align*}
\text{products} & \rightarrow 1) \text{LDA, -78°C, THF} \\
& \rightarrow 2) \text{Et-Br, THF}
\end{align*}
\]

d. 
\[
\begin{align*}
\text{products} & \rightarrow 1) \text{Na}_2\text{Cr}_2\text{O}_7, \text{H}_2\text{SO}_4 \\
& \rightarrow 2) \text{2-butanol, TsOH} \\
& \rightarrow 3) \text{NaH, 0°C, THF} \\
& \rightarrow 4) \text{Me-I, THF}
\end{align*}
\]

e. 
\[
\begin{align*}
\text{products} & \rightarrow 1) \text{ } \\
& \rightarrow 2) \text{H}_3\text{O}^+
\end{align*}
\]

f. 
\[
\begin{align*}
\text{products} & \rightarrow 1) \text{Br}_2, \text{TsOH} \\
& \rightarrow 2) \text{KOTBu, EtOH} \\
& \rightarrow 3) \text{O}_3 \\
& \rightarrow 4) \text{H}_2\text{O}_2, \text{KOH}
\end{align*}
\]
4. Propose synthesis routes for **TWO** out of the following three compounds. Legal starting materials include **mono**-functional compounds with a sum total of four carbons or less, benzene, unsubstituted dithiane, bases for elimination and/or deprotonation (LDA and alkoxides are okay), ethylene glycol (for protection only!), MVK, and any inorganic reagent or solvent required to carry out the transformation (CN, PPh₃, NBS, etc. are all inorganic). Keep in mind there are many correct synthesis routes for each compound.

![3,5-dimethyl-4-heptanol](image)
5. Give complete arrow pushing mechanisms for two of the next three equations. Be sure to include all relevant resonance structures and account for all products. You may use the back of this page if you wish. (13 pts each)
6. Describe one of the talks you went to for Undergraduate Research Conference. Please attempt to use verifyable information (a name, time, subject, etc.).

BONUS: On Monday April 2, we engaged (observed?) in an unusual activity in class. What did we do? Name at least two key players (characters?) in this activity.