Organic Chemistry CH 352-01 (Wilson)

Exam #2

March 23, 1999

Question 1 _______ (8)
Question 2 _______ (18)
Question 3 _______ (25)
Question 4 _______ (16)
Question 5 _______ (10)
Question 6 _______ (14)
Question 7 _______ (9)
BONUS _______ (5)

TOTAL _______ (100)

“…I was taught that the way of progress is neither swift nor easy…”  
Marie Curie, 1923
1. Trifluoroacetic acid (CF$_3$CO$_2$H) is a very strong acid. The pKa of this acid is comparable to HCl or H$_2$SO$_4$. Suggest a very good reason that this might be so.

2. Given the following two "roadmaps," supply the structures for A, B, and C. There is only one correct answer for each compound, which will match the molecular formula given. Partial credit may be awarded for incorrect answers carried through the sequence.

A =  
B =  
C =
Supply the missing products for **five** of the following six equations. Give answers for **only** five, and indicate which problems you would like graded.

3.  

\[ \text{A=} \quad \text{B=} \]

\[ \text{C=} \]

(25)
b. 

\[
\text{Cyclic compound} \xrightarrow{1) \text{amine, TsOH}} \xrightarrow{2) \text{NMe}_2} \xrightarrow{3) \text{H}_3\text{O}^+} \]


c. 

\[
\text{Ph} \text{CH}_2\text{CO} + \text{X} \xrightarrow{\text{KOH, H}_2\text{O, heat}} \]

(CROSSED)


d. 

\[
\text{Cyclic compound} \xrightarrow{\text{KOH, EtO}} \]


e. 

\[
\text{Acid} \xrightarrow{1) \text{MeOH, TsOH}} \xrightarrow{2) \text{PhMgBr (excess), THF}} \xrightarrow{3) \text{H}_3\text{O}^+} \]

f. 

\[
\text{Halide} \xrightarrow{1) \text{NaCN, THF}} \xrightarrow{2) \text{H}_3\text{O}^+, \text{H}_2\text{O, heat}} \]
4. Propose synthesis routes for two out of the following three compounds. Legal starting materials include monoalcohols of four carbons or less, bromobenzene, toluene, bases for elimination, and any inorganic reagent or solvent required to carry out the transformation. Keep in mind there are many correct synthesis routes for each compound.

\[
\begin{align*}
&\text{O} \quad \text{O} \\
&\text{O} \quad \text{O} \\
&\text{Ph} \quad \text{HO} \\
&\text{NH}_2
\end{align*}
\]
5. Propose a synthesis route for one out of the following two compounds. Legal starting materials for this part include all those for problem 4, monofunctional compounds of five carbons or less (carboxylic acid derivatives are **NOT** monofunctional, but carboxylic acids are for this exercise), pyrrolidine and morpholine, and bases for elimination (like LDA, KH, etc.). Keep in mind there are many correct synthesis routes for each compound.

- ![Chemical structure](image)
- ![Chemical structure](image)
6. Give the complete, arrow pushing mechanism for one of the following three transformations. Choose ONLY one. Be sure to include all resonance structures.

A. 

B. 

C.
7. If you are in the process of a synthesis, any synthesis, and you want to determine whether or not you have the desired product or starting materials, what are two methods that you might use to do this? (Think about what we used in lab! Give details and be specific!)

BONUS: In the past couple of chapters, we have studied several reactions which were named after people. Give the name of one of these “named” reactions (2 pts), and give an example of that same reaction which you have just named.