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Name ________________________________

ORGANIC CHEMISTRY CH 351-01 (Wilson)
Final Exam
December 13, 1999

Question 1 _________  (8)
Question 2 _________  (8)
Question 3 _________  (8)
Question 4 _________  (28)
Question 5 _________  (30)
Question 6 _________  (46)
Question 7 _________  (8)
Question 8 _________  (18)
Question 9 _________  (30)
Question 10 _________  (10)
Question 11 _________  (6)
E. C. ___________  (8)

TOTAL ___________  (100)

“Birds sing after a storm; why shouldn’t people feel as free to delight in whatever remains to them?”  Rose Fitzgerald Kennedy
1. Looking at the following molecule, capsaicin, name two non alkane functional groups present in this molecule.

2. Given the following drawing of Calichemicin, an anti-cancer agent, indicate the hybridization of the indicated carbon, nitrogen, and oxygen atoms.

3. For the following compound, fructose (a sugar), how many stereocenters are present in this drawing? (3 pts) Using your answer, how many stereoisomers are possible? (5 pts)
4. For all the parts of the following question consider the following reaction:

\[
\text{ethylcyclohexane} \xrightarrow{\text{Cl}_2, \text{light}}
\]

a. Give any two monohalogenation products. (4 pts)

b. Choose a monohalogenation product of a secondary carbon, and draw it in the most stable chair conformation. (6 pts)

c. Draw your answer from part b in a NEWMAN projection. (5 pts)
d. Looking at your drawing for part b, how many chiral centers are there? (2 pts) Give their R/S configuration (you may re-draw your compound if you wish). (3 pts).

e. Draw the enantiomer of your compound using any kind of drawing you like. Label the chiral centers as R or S. (4 pts)

f. Draw a diastereomer of your compound using any kind of drawing you like. Label the chiral centers as R or S. (4 pts)

(30) 5. Synthesize the two of following three molecules using reasonable synthetic steps. Your legal starting materials include: mono-alkyl halides of five carbons or less, bromobenzene, acetylene (HCCH), bases for elimination, inorganic reagents, and solvents as needed. Keep in mind that if a carbon containing group is added to a molecule, you must synthesize the appropriate starting material. Use good, high yielding steps. There may be many correct answers to these questions. Use hints and clues scattered through the rest of the exam!
[This space left blank for your answer for problem 5]
6. Give the starting materials for **ALL** the reactions below in the space provided. (18 pts) Then give the answers to **seven** out of the nine questions. (28 pts) Indicate clearly which questions you would like graded.

a. (2R) hex-3-yne-2-ol

\[
\begin{align*}
1) & \text{PBr}_3 \\
2) & \text{NaCN, CH}_3\text{CN}
\end{align*}
\]

b. bicyclo[2.2.2] oct-2-ene

\[
\begin{align*}
1) & \text{mCPBA, CH}_2\text{Cl}_2 \\
2) & \text{H}_3\text{O}^+ \\
3) & \text{NaIO}_4
\end{align*}
\]

c. (3S, 4R) 3-bromo-4-isobutyl heptane

\[
\begin{align*}
1) & \text{KoBu, EtOH} \\
2) & \text{NBS, hv}
\end{align*}
\]

d. 3-hydroxy-1-pentanethiol

\[
\begin{align*}
1) & \text{MsCl, py} \\
2) & \text{BuOH, heat}
\end{align*}
\]
e. (Z)-5-secbutyl-5-decene
   1) Br₂, H₂O
   2) Na°, DMF
   3) Me-I, DMSO

f. Non-5-ene-2-ol
   1) KMnO₄, KOH, H₂O
   2) H₃O⁺

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g. 1-bromo-2-cyclobutyl pentane
   1) KOTBu, EtOH
   2) Br₂, CCl₄
   3) KOTBu, DMSO, Δ

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h. 3,3-dimethyl-1-butyne
   1) HB(Sia)₂
   2) H₂O₂, KOH

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i. (3S)-3-bromo-1-hexane thiol
   1) I₂
   2) NaOCH₃, DMF
7. Given A below, compare it to the following compounds. Determine whether A is the same, a completely different compound, structural isomer, the enantiomer, or a diastereomer of these drawings.

![Compounds](image)

8. Given the following two roadmaps, give reasonable structures for A, B, and C. There is only one correct answer for each one, so look carefully at the molecular formulas!

![Roadmaps](image)
(30) 9. Given the following three reactions, choose two and give reasonable mechanisms. Be sure to show each step, the flow of electrons from one step to the next, ALL resonance structures (if any), and form the products indicated. There may be other products formed which are not shown.

i. 

ii. 

iii.
[This space left blank for your answer for problem 9]
10. Assistant Beaker is about to take off to Hollywood to film the next Muppet Movie. Before Bunsen Honeydew will let him go, he must perform one last reaction. Beaker is not sure if the reaction has gone to completion. Tell Beaker two ways that he might check to see if the reaction is done, what are the advantages and disadvantages of each method. Tell Beaker two ways he might have to isolate his product (keep into account that Beaker’s product may be a liquid or a solid).
(6) 11. Name two things that you learned in laboratory that you **could not** have learned in lecture. These can be practical or scientific.

(5) BONUS: The Friday before Thanksgiving, we watched a movie in class. Name one character (any one, it can be a “group”) from the movie. (3 pts) Who was the author/illustrator of this story/movie? (2 pts)

(3) BONUS BONUS: This semester, we have spent a great deal of time learning about reactions and reagents named after **people**. Give one “named” reaction or reagent. (2 pts) The gender of the majority of these “named” people was what (hee hee)? (1 pt)