Chemistry 334

Third Hour Examination

November 21, 1994

Name: ________________________________

Be certain that your examination has four (4) pages including this one.

Put your name on each page of this examination booklet.

By putting your name on this examination booklet you agree to abide by California State University, Northridge policies of academic honesty and integrity.
1. (30 points)

For each of the following six (6) questions draw the expected major organic product. If relevant, clearly specify the relative and/or absolute stereochemistry of the product.

A. 
\[
\text{cat. TiCl}_3 / \text{Et}_3\text{Al} \quad H_2C=CH_2
\]

B. 
\[
\text{H}_3\text{C} \quad \text{CH}_3 \\
\text{H}_3\text{C} \quad \text{CH}_3 \\
\text{NaBH}_4 \quad \text{CH}_3\text{CO}_2\text{H}
\]

C. 
\[
\text{Ph} \quad \text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2 \quad \text{NaOH} / \text{Br}_2
\]

D. 
\[
\text{Cl} \quad \text{CH}_2\text{Cl} \quad \text{Cl} \quad \text{NaOH} \quad \text{H}_2\text{N} \quad \text{CH}_2\text{NH}_2
\]

E. 
\[
\text{Br} \quad \text{NH}_2 \quad \text{NaN}_3 \quad \text{H}_2\text{SO}_4 \quad \text{H}_2\text{O} \quad \Delta
\]

F. 
\[
\text{H}_3\text{C} \quad \text{OCH}_3 \quad \text{a)} \text{NaOCH}_3 \quad \text{b)} \text{H}_3\text{O}^+ \text{Cl}^- \quad \text{workup}
\]
2. (25 points)

Design a synthesis of the bicyclic α,β-unsaturated ketone 1 from acrolein (2) and cyclohexanone (3). Use any inorganic and organic reagents that you deem necessary. Draw clearly all reagents and isolable synthetic intermediate compounds. (N.B. Do not draw mechanisms for each synthetic transformation!)

![Chemical structures](image)

3. (25 points)

Draw the mechanism of the following equilibrium for the monosaccharide, D-(+)-altrose, using the curved-arrow notation to indicate the reorganization of electron density. Show all intermediates and denote all lone pairs, formal charges and countercharges. Draw all important resonance structures where appropriate.

![Chemical structures](image)
4. (10 points)

Why is the substituted phenol 7 ("butylated hydroxytoluene"; BHT) an excellent inhibitor of free-radical chain reactions? Draw resonance structures to illustrate your answer.

\[
\begin{align*}
\text{H}_3C & \quad \text{C}_2H_5 \\
\text{CH}_3 & \quad \text{C}_\text{H}_3
\end{align*}
\]

5. (10 points)

Draw the most stable conformation of the glycoside 8. Clearly denote all 1,3-diaxial interactions.

\[
\begin{align*}
\text{OH} & \quad \text{OCH}_3 \\
\text{OH} & \quad \text{COCH}_3
\end{align*}
\]

Congratulations!

\[
\begin{align*}
1 & \quad /30 \\
2 & \quad /25 \\
3 & \quad /25 \\
4 & \quad /10 \\
5 & \quad /10 \\
\text{Total:} & \quad /100
\end{align*}
\]