Be certain that your examination has eight (8) 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.

Molecular models are allowed for this examination. All electronic devices, including calculators, are unnecessary and are not allowed.
1. (25 points)

Draw the structure of the expected major organic product for each of the following five (5) questions. Specify stereochemistry clearly, if relevant.

A.

\[
\begin{array}{c}
\text{O} \\
\text{H} \\
\text{3} \\
\text{C} \\
\text{Cl} \\
\text{AlCl}_3 \\
b.) \ H_2O
\end{array}
\]

B.

\[
\begin{array}{c}
\text{CH}_3 \\
\text{CH}_3 \\
\text{NBS} \\
\text{hv}
\end{array}
\]

C.

\[
\begin{array}{c}
\text{H}_3\text{C} \\
\text{CH}_3 \\
\text{EtLi} \\
\text{H}_2\text{O}
\end{array}
\]

D.

\[
\begin{array}{c}
\text{H}_2\text{N} \\
\text{Cl}_2\text{Cl}
\end{array}
\]

E.

\[
\begin{array}{c}
a.) \ \text{PhLi} \\
b.) \ \text{dil. aq. HCl}
\end{array}
\]
2. (40 points)

Draw the specific reagent(s) necessary to effect the transformation shown for each of the following four (4) questions. If more than one step is required, be certain to specify each step separately.

A.

\[
\text{H}_3\text{C}-\text{CH}_2-\text{CHO} \rightarrow \text{H}_3\text{C}-\text{CH}_2-\text{CH}_2\text{C}_3\text{H}_5
\]

B.

\[
\text{Br} \rightarrow \text{C}_6\text{H}_6\text{O}_2\text{O}
\]

C.

\[
\text{H}_3\text{CO}-\text{C}_9\text{H}_{15} \rightarrow \text{C}_9\text{H}_{15}\text{O}_2\text{O} \quad \text{(racemic)}
\]

D.

\[
\text{C}_5\text{H}_5\text{O} \rightarrow \text{C}_22\text{H}_{35}\text{O}_2\text{H} \quad \text{(racemic)}
\]
3. (50 points)

These questions are unavailable due to copyright considerations.
4. (25 points)

Draw a specific example of each of the following twelve (12) categories.

A. any electrophile:

B. any allylic sulfide:

C. any aprotic base:

D. any glycerophospholipid:

E. any steroid:

F. any naturally-occurring wax:

G. any aldonic acid:

H. any addition homopolymer:

I. any stereospecific reaction:

J. any iminium ion:

K. any essential $\alpha$-amino acid:

L. any prostaglandin:
5. (20 points)

Answer the following two (2) questions precisely, succinctly, and with correct grammar.

A. Why is an alkyl β-D-glucopyranoside a “nonreducing sugar”?

B. Why are carbobenzoxy carbamates used in peptide synthesis? What specifically makes them so useful?

6. (15 points)

The terpene, 7-epizingiberene, is a naturally-occurring insect repellent found in wild tomatoes. Circle the "isoprene" units in this terpene. Label the head (h) and tail (t) of each "isoprene" unit. Finally, state 7-epizingiberene’s terpene classification.

![7-epizingiberene terpene structure]

7-epizingiberene

terpene classification:
7. (25 points)

Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Show all intermediates, unshared electrons, formal charges and countercharges. Specify reversibility or irreversibility for each primary mechanistic step.

\[
\begin{align*}
\text{MeO} & \quad \text{O} \quad \text{MeO} \\
\text{MeO} & \quad \text{O} \quad \text{OMe} \\
\text{Na}^+ & \quad \text{OMe} \\
\text{H}_3\text{O}^+ & \quad \text{Cl}^- \\
\text{a.} & \\
\text{b.} & \\
\text{+ 2 MeOH} & + \text{Na}^+ \cdot \text{Cl}^- + \text{H}_2\text{O}
\end{align*}
\]

Congratulations!

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