Be certain that your examination has five (5) 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. (25 points)

Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Show all intermediates and denote all unshared electrons, formal charges and countercharges where appropriate. Clearly denote reversibility or irreversibility for each primary mechanistic step.
2. (25 points)

For each of the following five (5) questions draw the structure of the expected major organic product. If relevant, explicitly specify absolute and/or relative stereochemistry.

A.

\[
\begin{align*}
\text{H}_3\text{C} & & \text{O} \\
\text{H}_3\text{C} & & \text{Ph}_3\text{P} \\
\text{O} & & \text{CH}_3 \\
\end{align*}
\]

B.

\[
\begin{align*}
\text{O} & & \text{NH} \\
\text{weak acid} & & \text{pentane-5-carboxylic acid} \\
\end{align*}
\]

C.

\[
\begin{align*}
\text{S} & & \text{S} \\
\text{a.} & & \text{n-BuLi} \\
\text{b.} & & \text{H}_3\text{C} - \text{I} \\
\end{align*}
\]

D.

\[
\begin{align*}
\text{H}_3\text{C} & & \text{O} \\
\text{CH}_3 & & \text{H}_3\text{CCH}_2\text{OH} \\
\text{CH}_3 & & \text{H}_2\text{SO}_4 \\
\end{align*}
\]

E.

\[
\begin{align*}
\text{H}_3\text{C} & & \text{O} \\
\text{CH}_3 & & \text{H}_3\text{CCH}_2\text{OH} \\
\text{CH}_3 & & \text{H}_2\text{O} \\
\end{align*}
\]

\[
\begin{align*}
\text{a.} & & \text{LiAlH}_4 \\
\text{b.} & & \text{H}_2\text{O} \\
\end{align*}
\]
3. (20 points)

Use a retrosynthetic analysis to design a synthesis of a racemic mixture of the tertiary alcohol 1 from the primary alcohol 2. Use any inorganic and organic reagents that are necessary. Show all reagents and stable synthetic intermediate compounds. (N.B. Do not draw mechanisms for each synthetic transformation!)

![Chemical structures](attachment:image.png)

4. (10 points)

Use IUPAC nomenclature to write the systematic name of the following acid chloride.

![Chemical structure](attachment:image.png)
5. (20 points)

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

A. Why is it impossible to convert a primary amide (RCONH₂) to the corresponding acid chloride (RCOCl) in one step? How would one accomplish this transformation in two steps?

B. Why is a carboxylic acid (RCO₂H) significantly more acidic than the corresponding primary alcohol (RCH₂OH)? Draw appropriate structures to illustrate your answer.