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.

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.

```
\[
\begin{align*}
H_3C & \quad \text{cat. Pd(PPh}_3\text{)}_4 \\
Br & \quad \text{NaOH} \\
\end{align*}
\]
```

B.

```
\[
\begin{align*}
H_3C & \quad \text{H}_3\text{CCH}_2\text{S}^- \quad \text{K}^+ \\
\end{align*}
\]
```

C.

```
\[
\begin{align*}
\text{product IB} & \quad 1 \text{ mol H}_2\text{O}_2 \\
\end{align*}
\]
```

D.

```
\[
\begin{align*}
\text{anhydrous HBr} & \quad -80 \text{ }^\circ\text{C} \\
\end{align*}
\]
```

E.

```
\[
\begin{align*}
\text{a.) excess Li NH}_3 & \quad \text{\_\text{-BuOH} \\
\text{b.) dil. aq. HCl} & \quad \text{\_\text{-BuOH} \\
\end{align*}
\]
```
2. (25 points)

Circle the number that corresponds to the correct answer for each of the following five (5) questions.

A. Which reactions in Question 1 are stereospecific?
   1. A and B
   2. C and D
   3. B

B. How many π electrons exist in an allylic carbocation?
   1. one
   2. two
   3. three

C. The reaction of (S)-1,2-epoxydecane with ethylamine (H₃CCH₂NH₂) occurs at
   1. C-1 of the epoxide
   2. C-2 of the epoxide
   3. both positions

D. The reaction of 2-methylhex-2-ene with mercury(II) acetate and ethanol, followed by sodium borohydride affords
   1. 2-ethoxy-2-methylhexane
   2. 3-ethoxy-2-methylhexane
   3. both regioisomeric ethers

E. What is the systematic (IUPAC) name of the following conjugated diene?

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

   1. (Z)-3-methylhepta-1,3-diene
   2. (E)-3-methylhepta-1,3-diene
   3. (E)-5-methylhepta-4,6-diene
3. (30 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. Draw all important resonance contributors for intermediates (but do not draw all resonance contributors for the hydrogen sulfate anion or the nitro group).

\[
\begin{align*}
&\text{ArCH}_3 \xrightarrow{\text{HO}^- \text{N}^- \text{O}^-} \text{ArCH}_3 \quad + \quad \text{H}_2\text{O}^+ \text{HOSO}_3^- \\
\end{align*}
\]
4. (20 points)

Draw the specific reagent(s) necessary to effect the following two (2) transformations. If more than one reaction is involved in an answer, be certain to distinguish the individual steps clearly.

A.

\[ \text{Br} \quad \xrightarrow{\text{reaction}} \quad \text{racemic} \]

B.

\[ \text{Br} \quad \xrightarrow{\text{reaction}} \quad \text{CH}_3 \]

Congratulations!

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