<table>
<thead>
<tr>
<th>COMMENTS/ SUGGESTIONS</th>
<th>Name: Anh Tran</th>
<th>Name: Jessica Mo</th>
<th>Name: Joshua Torosyan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What worked best?</strong></td>
<td>Strongly Agree</td>
<td>Disagree</td>
<td>Neither Agree or Disagree</td>
</tr>
<tr>
<td>This review was interactive and engaging.</td>
<td>●</td>
<td>●</td>
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<td>Comments</td>
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<tr>
<td>The presentation volume was acceptable.</td>
<td>●</td>
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<td>Comments</td>
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<td>The presentation was visually clear and logically organized.</td>
<td>●</td>
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<td>Comments</td>
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<td>The review improved/reinforced your understanding of the material.</td>
<td>●</td>
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<tr>
<td>The quality of the review packet was excellent.</td>
<td>●</td>
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<td>Comments</td>
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</tbody>
</table>
Please fill out this evaluation, even if you plan to leave early. Thank you very much.

This page is intentionally left blank on purpose. You can use this page as scratch work if you want.
Midterm 1 Review

1. Determine the conformation of the following alkenes as E, Z, or neither.

![Chemical structures](image)

2. If the following compounds were to react with cyclohexyl bromide, determine which mechanism(s) (S_N1, S_N2, E1, E2) will proceed.

KOtBu  NaOH  CH_3OH  CH_3ONa  NaCN  DBU/DBN

3. Recall the strength of nucleophilicity in polar aprotic and polar protic solvents. If the solvent contains a hydroxyl group, which is the correct order of increasing nucleophilicity?

   a. I^- > Br^- > Cl^- > F^-  
   b. I^- < Br^- < Cl^- < F^- 

4. Fill in the following boxes with the missing reagent or product(s), and classify the reaction as S_N1, S_N2, E1, and/or E2.

   a. 
   ![Chemical structure](image)  
   NaOMe  ![Chemical structure](image)
b.

\[
\begin{array}{c}
\text{Br} \\
\text{CH}_3
\end{array} 
\quad \xrightarrow{} 
\begin{array}{c}
\text{CH}_3 \\
\text{OH}
\end{array} 
\quad \text{Elimination product}
\]

c.

\[
\begin{array}{c}
\text{H}_3\text{C} \\
\text{Br} \\
\text{CH}_3 \\
\text{CH}_3
\end{array} 
\quad \xrightarrow{} 
\begin{array}{c}
\text{H}_3\text{C} \\
\text{OH} \\
\text{CH}_3 \\
\text{CH}_3
\end{array} 
\text{Elimination product}
\]

d.

\[
\begin{array}{c}
\text{Br} \\
\text{CH}_3 \\
\text{CH}_3
\end{array} 
\quad \xrightarrow{\text{DBU}} 
\begin{array}{c}
\text{DBU}
\end{array} 
\quad \begin{array}{c}
\text{DBU}
\end{array}
\]

\[
\begin{array}{c}
\text{Br} \\
\text{CH}_3 \\
\text{CH}_3
\end{array} 
\quad \xrightarrow{\text{DBN}} 
\begin{array}{c}
\text{DBN}
\end{array} 
\quad \begin{array}{c}
\text{DBN}
\end{array}
\]
5. Provide the mechanism(s) for 4(c). Show all steps and do not combine any steps.
6. Fill in the missing reagents and major products.

a)

b)

c) OH Br H\text{NaH} \rightarrow \text{NaOCH}_2\text{CH}_3 1) \text{2) H}_2\text{O workup}

d)

HCl

\text{Cl}

e) OH

1,2 halide shift

intermediate carbocation
f)
7. a) Fill in the missing products.

\[
\begin{array}{ccc}
\text{O} & \text{H} & \text{TsCl, pyridine} \\
\text{C} & \text{C} & \text{C} \\
\end{array}
\xrightarrow{\text{NaCN}}
\begin{array}{c}
\text{C} \\
\text{C} \\
\end{array}
\]

b) Provide an arrow pushing mechanism for the above reaction.
8. A bronchodilator is a drug used to treat lung diseases such as asthma and chronic obstructive pulmonary disease. Its effects can quickly relieve shortness of breath, coughing, wheezing, and chest tightness. An interesting application of nucleophilic epoxide ring opening can be used to synthesize a bronchodilator. Provide an arrow pushing mechanism for the following reaction:
9.

10. Provide an arrow pushing mechanism for the following substitution reaction.