1. Propose a mechanism for the following transformation.
   a. Identify named reactions from step 2 and step 3.

\[
\begin{align*}
1. & \text{ LDA, TESCl} \\
2. & \text{ m-CPBA} \\
3. & \text{ EtMgBr, then HCl} \\
\text{ (79\%, 3 steps)}
\end{align*}
\]

---


2. Draw the key intermediate and propose a mechanism for the following one-pot transformation.

\[
\begin{align*}
\text{Et}_2\text{O, } & -78 \degree \text{C} \\
n-\text{BuLi} & \rightarrow \\
\text{HMPA, Et}_2\text{O, } & -78 \text{ to } -30 \degree \text{C} \\
\text{then, NH}_4\text{Cl} & \rightarrow \\
\text{68\%}
\end{align*}
\]

---

3. Draw the product, and propose a mechanism for the following transformation.

\[
\text{R}^1 (2 \text{ equiv.}), \text{DBN (10 equiv.)} \quad \text{THF, rt, 52\%} \quad \text{C}_{9}H_{13}I_{0}
\]

---


4. Propose a mechanism for the following transformation.

- a. Identify the active catalyst. (Hint: What catalyst is turned over in a closed catalytic cycle?)
- b. Explain the product ratio with respect to reaction time.

\[\text{Pd} \quad \text{Me}^+ \quad \text{Cl} \quad 2.5\% \quad \text{cat. } \text{NaBA}_{4}^+ \quad \text{DCE, rt, 3 h} \]

<table>
<thead>
<tr>
<th>reaction time</th>
<th>A</th>
<th>Yield (%)</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 h</td>
<td>83</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>24 h</td>
<td>63</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

---

5. Propose a mechanism for the following transformation.

\[
\text{AcO} \quad \text{SiMe}_3
\]

\[
\text{O} \quad \text{O}
\]

\[
\text{AcO} \quad \text{SiMe}_3
\]

\[
\text{(i-PrO)₃P} \quad \text{Pd(OAc)}₂
\]

\[
\text{Toluene, 100 °C, 12 h}
\]

93%, 98:2 dr

---


6. Upon treatment with a phosphinothiourea catalyst, compound A was found to isomerize to a propargyl ester. Compound A is the active isomer in the amination reaction that follows. Draw a mechanism for both the isomerization of A, and its transformation to the unsaturated ester.

\[
\begin{align*}
\text{Me₂N} & \quad \text{S} \\
\text{Ph} & \quad \text{N} \\
\text{NH} & \quad \text{N} \\
\text{PPh₂} & \quad \text{Ph}
\end{align*}
\]

\[
\text{CO₂Et}
\]

\[
\text{Et₂O, 0 °C}
\]

\[
\begin{align*}
\text{MeO} & \quad \text{N} \\
\text{O} & \quad \text{OMe} \\
\text{Bn} & \quad \text{CO₂Et}
\end{align*}
\]

92% yield, 92% ee

---