Quiz #1

1. Draw the major organic product that is formed from the following reaction. The $^1$H NMR spectrum of the product is shown below. The labels next to each of the resonances signify the integrals and multiplicities observed in the spectrum ($s =$ singlet, $d =$ doublet, sept = septet). Use this spectroscopic evidence to determine the identity of the compound. Make clear assignments of all resonances to explain your reasoning. (A $^1$H NMR correlation table is included on page 4.)
<table>
<thead>
<tr>
<th>Chemical Shift (ppm)</th>
<th>Assignment</th>
<th>Explanation of Multiplicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.75</td>
<td></td>
<td></td>
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<tr>
<td>6.88</td>
<td></td>
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<tr>
<td>4.04</td>
<td></td>
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<tr>
<td>2.55</td>
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<tr>
<td>1.38</td>
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</tbody>
</table>
2. Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Denote all intermediates, lone pairs, nonzero formal charges, countercharges, and reversibility or nonreversibility. Finally, explain the mechanistic basis for the regiochemical and stereochemical control that is observed in this reaction.

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

\[\text{a.) } \text{H}_3\text{C} - \text{S}^- \text{Na}^+ \quad \text{b.) dil. aq. HCl}^- \]

\[
\begin{array}{c}
\text{HO} \quad \text{H}_3\text{C} \quad \text{CH}_3 \\
\text{H}_3\text{C} \quad \text{CH}_3 \\
\end{array}
\] 

\[+ \text{H-OH} + \text{Na}^+ \text{Cl}^-\]