1. (10 points) Deduce the structures of A and B, and name A and B.

\[
\text{A} \quad \text{C}_6\text{H}_{12}\text{O} \quad \text{B} \quad \text{C}_6\text{H}_{10}
\]

\[^{13}\text{C NMR: } 69.5, \text{ d} \quad ^{13}\text{C NMR: } 127.3, \text{ d (2)}\]

2. (10 points) Using any starting materials that contribute three or fewer carbons to the final product, outline a synthetic route to C. Absolute configuration is not important, but relative configuration is.

3. (10 points) Deduce the structure of E, and draw an arrow-pushing mechanism for its formation.

\[\text{E} \quad \text{C}_{10}\text{H}_{10}\text{O} \]

\[^{1}\text{H NMR: }\]
\begin{align*}
4.56, \text{ d, } J = 7.1\text{Hz, } 2\text{H} \\
4.84, \text{ d, } J = 6.9\text{Hz, } 2\text{H} \\
5.38, \text{ m, } 1\text{H} \\
6.89-6.97, \text{ m, } 3\text{H} \\
7.24-7.30 \text{ m, } 2\text{H}
\end{align*}

\[^{13}\text{C NMR: }\]
\begin{align*}
65.6, \text{ t} \\
76.4, \text{ t} \\
87.0, \text{ d} \\
114.7, \text{ d (2)} \\
120.8, \text{ d} \\
129.3, \text{ d (2)} \\
158.2, \text{ s} \\
209.3, \text{ s}
\end{align*}

For other examples of this functional group, an allene, go to http://www.chem.wisc.edu/areas/reich/Handouts/nmr-c13/cdata.htm, and click on allene.