

1154 CHAPTER 12 Nucleophilic Addition Reactions of Aldehydes and Ketones

12.22 Hemiacetals are intermediates formed in the conversion of aldehydes to acetals. In addition, hemiacetals also serve as intermediates in a number of useful carbon-carbon bond forming reactions. For example, the reaction between compound A with benzaldehyde, in the presence of a strong acid such as $\text{F}_3\text{CSO}_3\text{H}$, leads to the formation of the tricyclic compound B by way of an intermediate hemiacetal (*J Org Chem*, **2015**, 80, 12580).

Provide a complete, stepwise, curved arrow mechanism for the conversion of hemiacetal to **compound B**. You may use H-B as a generic Brønsted acid and B^\ominus as its conjugate base, as needed. The reaction is an acid-catalyzed mechanism.

Along with the necessary protonations and/or deprotonations, the major steps in the mechanism are:

- formation of a resonance-stabilized carbocation;
- reaction between the resonance-stabilized carbocation and the alkene to generate a 3° carbocation; and
- intramolecular reaction of the tertiary carbocation with the alcohol.

