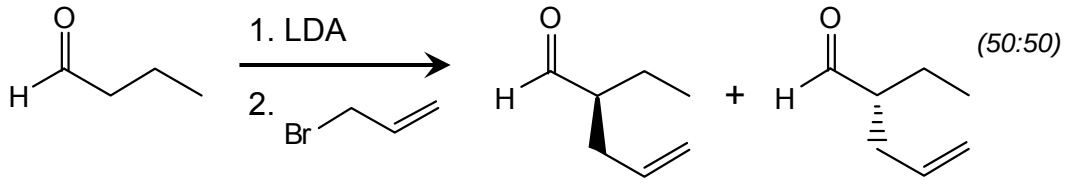
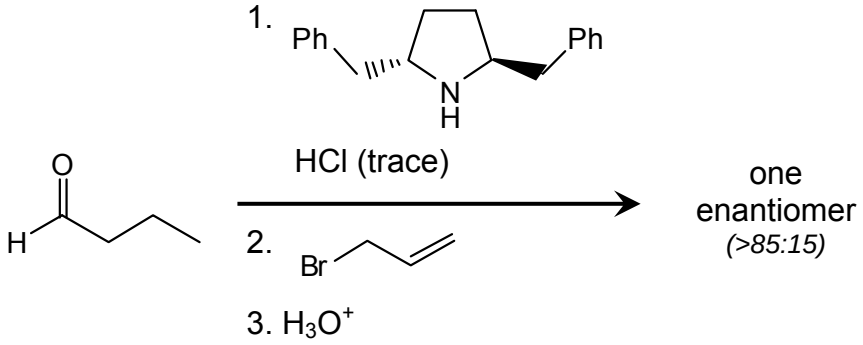
Chemistry 2302

Workshop 15
Asymmetric Induction via Chiral Enamines

Ordinarily, the α-allylation of butyraldehyde enolate gives a racemic mixture of enantiomeric products:



However, in the presence of the chiral amine shown in step 1 below, the same reaction can be biased to produce one enantiomer selectively over the other:



In this Workshop, you will try to determine which enantiomer is preferred under the conditions above.

1. In step 1 of the three-step reaction sequence above, what iminium ion, and then what enamine, is produced? (Make sure the molecules you propose are the most stable choices for each.)

2. In step 2, the chiral enamine is selectively allylated on one face. Which face? What iminium product is generated by this reaction?

3. Based on your answers above, which enantiomeric aldehyde product would be preferred in this reaction?

4. How would you selectively make the other enantiomer?

5. If the reaction is carried out with the chiral secondary amine shown on the right, not only is the reaction not as selective for one enantiomer, but it also favors the opposite enantiomer relative to the reaction shown on the first page. Why?