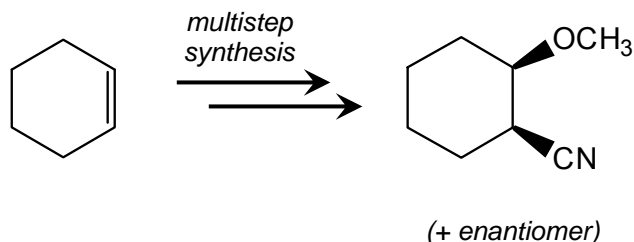
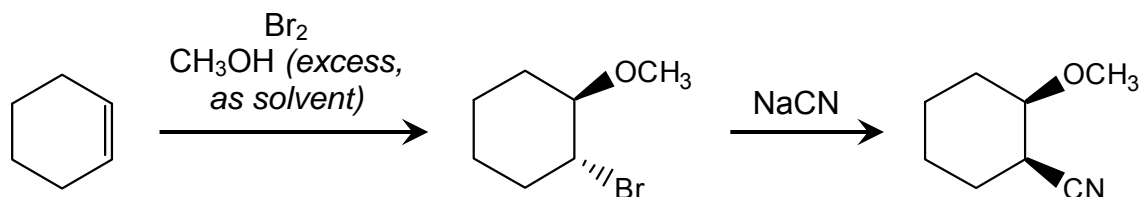


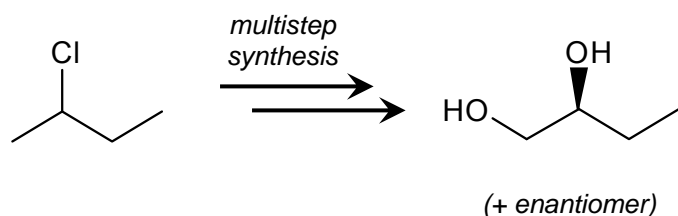
Workshop 17 Solutions
More Multistep Organic Synthesis



A challenge in both of these problems is to use the few reactions you know to make what you want. (You might imagine this issue could be resolved for professional chemists by knowing lots of reactions, but in the end, even they get stuck—there are never enough reactions to make everything.) You have learned that S_N2 reactions on either bromonium ions or epoxides can generate products with two different functional groups attached to adjacent carbon atoms, and that's what our product has. Using bromination:

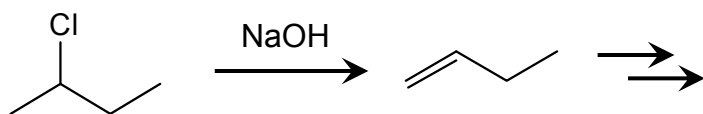


Here I've incorporated the $-OCH_3$ group first, followed by $-CN$. If I had done it the other way, the $NaOCH_3$ in the second step would have led to a lot of $E2$ elimination. You could also have done this via an epoxide, but I think it would be more complicated (but still possibly correct, depending on how you managed the stereochemistry).



In this problem, we need to put two $-OH$ groups on adjacent carbons; this will probably be most easily done from an epoxide, which will require a double bond between carbons 1 and 2 of the four-carbon backbone. We know how to make alkenes from alkyl

halide starting materials—via elimination—but here we have to be a bit careful. We could, for example, propose a very simple start to our synthesis:



This is one of the most common errors I see in synthesis problems: proposing a reaction that would succeed, but would yield a different product. This elimination would yield the most stable (Zaitsev) alkene. But, we could make it yield the less stable alkene in the presence of a sterically hindered base:

