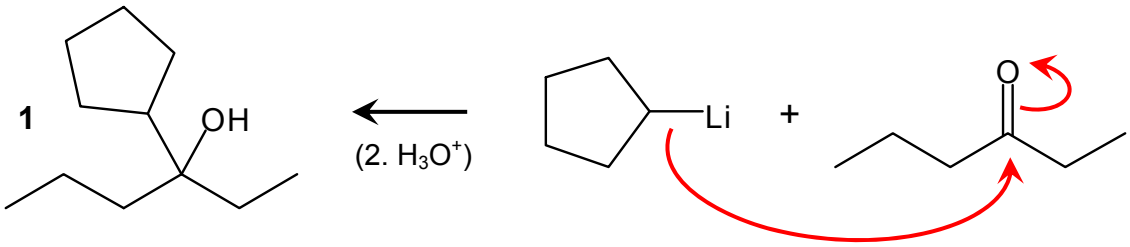
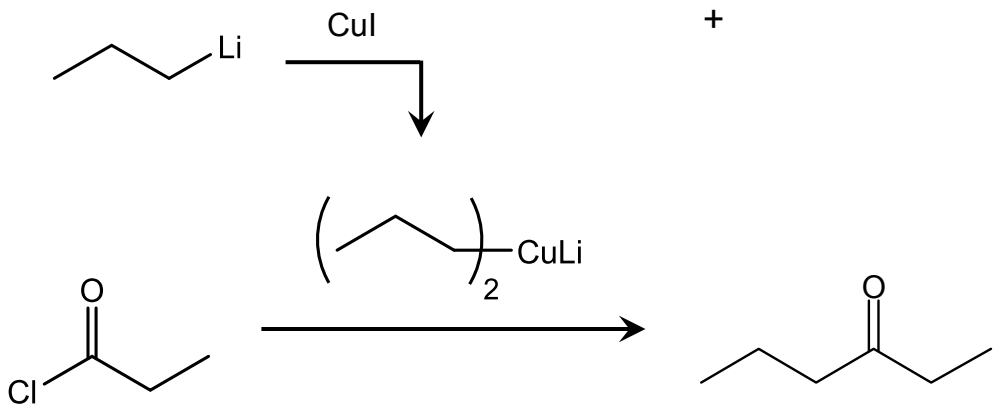
Chemistry 2302 Tuesday, July 1

In-Class Exercise Solutions:
Multistep Synthesis with Organometallic Additions to Carbonyls

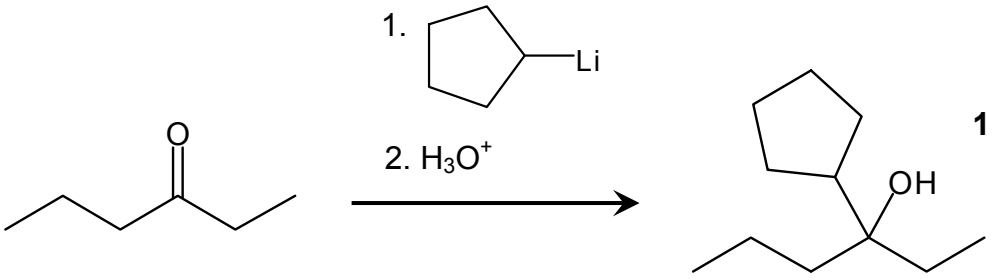
1. Molecule **1** has 11 carbons in it. Right off the bat, we know that if it has to be constructed from pieces that contain five carbons or less, there will need to be at least three of those pieces. Just as important, the three "R" groups that are attached to the alcohol carbon are different, meaning that each R will have to be supplied by a unique reagent. I think the easiest way to think about this problem is backwards; from what materials would we make molecule **1**? We know from Chapter 10 that an alcohol can be synthesized from a carbonyl containing compound and an alkyl metal. So, for example,



This is great, but of the starting materials on the right, only the alkyllithium has five carbons or less; the ketone will have to be constructed from smaller starting materials. One easy way to do this is to use the unique reaction of alkyllithium lithium dialkylcuprates with acyl chlorides:



Followed by:



2. The main difference between molecule **2** and molecule **1** is that, of the three "R's" attached to the alcohol carbon in **2**, two of them are the same. That means that they don't have to be added separately, but rather by double addition to an ester or acyl halide. This synthesis, as a result, would be just one step: