TRU
Open Press

Synthetic Strategies

Transcript

Instructor: Jessie Key

00:00:00:00 - 00:00:20:02
Instructor: Hello, again, Doctor Jessie Key here. In this slideshow, you'll be exploring some considerations towards applying the reactions learned in Unit six towards synthetic problems. Whenever tackling synthesis problems, your approach should start by taking stock of the starting material and the final product to look for the differences between them.

00:00:20:02 - 00:00:38:08
Instructor: First, ask yourself, is there a change to the carbon skeleton? There are relatively few reactions that result in the lengthening or shortening of the carbon skeleton. So being able to recognize these changes can be very diagnostic and point you towards certain reaction options.

00:00:38:24 - 00:00:58:89
Instructor: Next, ask yourself, is there a change in functional groups? Identify which functional groups have changed, and then you can narrow down the type of reaction or reactions required to accomplish that change. In Unit six, we saw a few types of reactions that can change the carbon skeleton.

00:00:58:89 - 00:01:14:35
Instructor: Some of these reactions elicit change directly at the carbonyl carbon. I've intentionally put carbonyl in quotes here. As remember that nitriles are also carboxylic acid derivatives and undergo change at the nitrile carbon.

00:01:14:35 - 00:01:40:66
Instructor: Grignard reagents simultaneously reduce groups like acid chlorides to alcohols while installing two equivalents of the alkyl groups to extend the carbon skeleton. The Gillman reagent converts groups like acid chlorides to ketones while installing one equivalent of the alkyl group to extend the carbon skeleton. Some of the reactions we've covered are very distinctive because they add a single carbon to the skeleton.

00:01:40:66 - 00:02:00:95
Instructor: For instance, the reaction of a Grignard reagent with carbon dioxide to form a carboxylic acid adds one additional carbon to the skeleton. Similarly, SNT using sodium cyanide adds one additional carbon in the form of the nitrol group. There were many functional group interconversions discussed in this unit.

00:02:00:95 - 00:02:14:40
Instructor: I find it most helpful to organize them in a reaction web and think about it in the following way. Like, I'm trying to use a roadmap to get to my destination. The carboxylic acid group should be considered home.

00:02:14:40 - 00:02:38:02
Instructor: From almost any place in the reaction web, you can return home to the carboxylic acid, usually by an acid or base catalyzed hydrolysis. Acid chlorides can be thought of like a highway entrance near your home. They allow for the fastest and most convenient arrival at most destination functional groups because acid chlorides are the most reactive and versatile carboxylic acid derivative.

00:02:38:02 - 00:03:01:42
Instructor: Sometimes you might need to go through an intermediate neighborhood to reach your final destination. But the acid chloride highway can get you just about wherever you want to go in this unit. Example let's imagine you're trying to go from a primary alcohol located at the bottom center of the reaction web to a primary amine located toward the bottom right of the reaction web.

00:03:01:46 - 00:03:14:14
Instructor: There's no direct reaction to accomplish this that we've learned in this unit. One strategy would be to oxidize the primary alcohol to carboxylic acid. In other words, first go home.

00:03:14:22 - 00:03:41:72
Instructor: Next, convert to an acid chloride, the highway entrance, which allows access to an amide by aminolysis. The resulting amide can then be reduced to get to the final destination, the primary mean. Hopefully, this tutorial about synthetic strategies has given you some additional insight for approaching synthetic problems requiring the reactions of carboxylic acids and their derivatives.