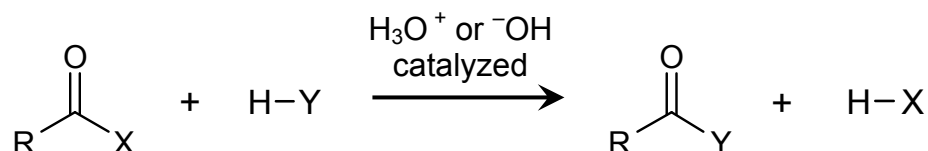


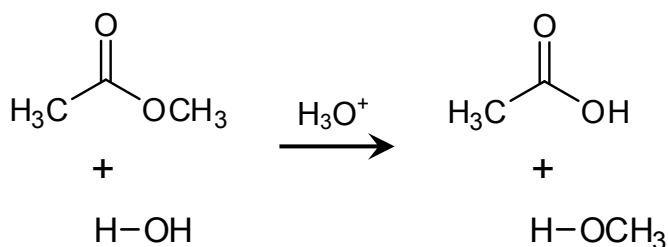
**In-Class Exercise:  
Electron Pushing in Carboxylic Acid Derivative Exchange**

In this exercise, you will be practicing drawing mechanisms for the general reaction:

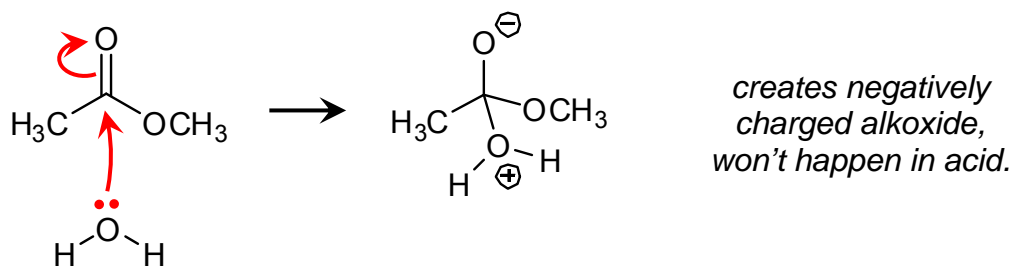


Wade shows many examples of mechanisms for this general class of reactions in Chapters 20 & 21, but I feel that it is possible to come up with all of those mechanisms on your own, as long as you follow a few simple rules.

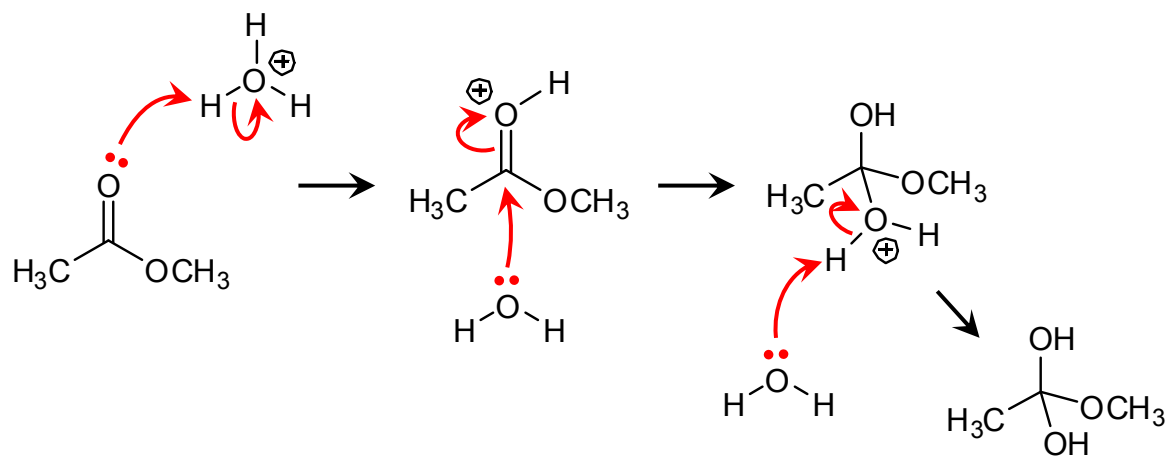
1. As we've discussed before, under acid catalysis, try not to create anionic bases in your mechanism; if you can, keep everything either neutral or positively charged. For example, in an acid-catalyzed ester hydrolysis reaction,



the -OH and -OCH<sub>3</sub> groups exchange, and we need to draw a mechanism in which the water oxygen adds and the methanol oxygen leaves. But we can't just start with water attack; instead of drawing

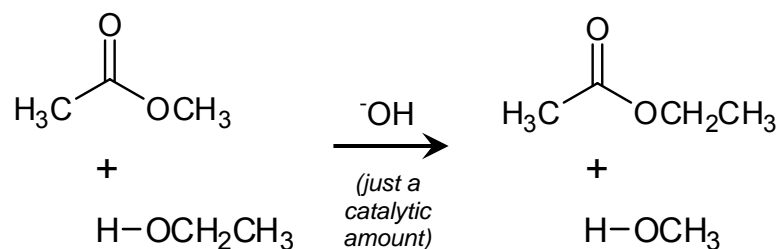


we can avoid the unstable intermediate by protonating the oxygen first:



In the space below, finish the mechanism for the acid-catalyzed hydrolysis of an ester.

2. By the same token, under base catalysis, try not to create cationic acids in your mechanism; if you can, keep everything either neutral or negatively charged. In other words, if your electron pushing creates a positively charged atom, ask yourself whether that atom could be deprotonated first before doing what you are doing. For example, the base-catalyzed transesterification reaction,



starts differently from the acid-catalyzed reaction. How? Draw the mechanism for this reaction.