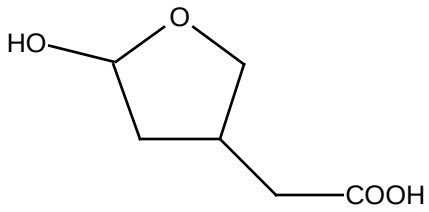
GTQ on Lactones. (30 points, reaction chem., mechanistic and recognition elements)

A lactone is a cyclic ester. Cyclic ester can be made in several ways and the simplest synthesis consists in the intramolecular esterification. Let's look at that and then we will also examine one other synthetic route to lactones.

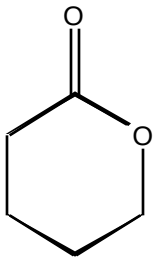
(a) The compound shown contains two functional groups. There is a carboxy group and the other functional group corresponds to a _____ (hydrate, hemiacetal, acetal). Under acid catalysis, the molecule shown will form an ester. Show the structure of the product ester. Provide a detailed mechanism for the formation of the ester showing intermediates and reagents for every step.



Product Ester (3 points):

Mechanism (7 points):

(b) The lactone shown can be made in two ways: Via intramolecular cyclization of a hydroxycarboxylic acid or by Baeyer-Villiger reaction. For each of these syntheses, provide the starting materials and the reagents for the key step. Furthermore, suggest a synthesis of the precursors (the appropriate hydroxy carboxylic acid and ketone, respectively) employed in these two reactions.



Intramolecular Cyclization (10 points):
Baeyer-Villiger reaction (10 points):