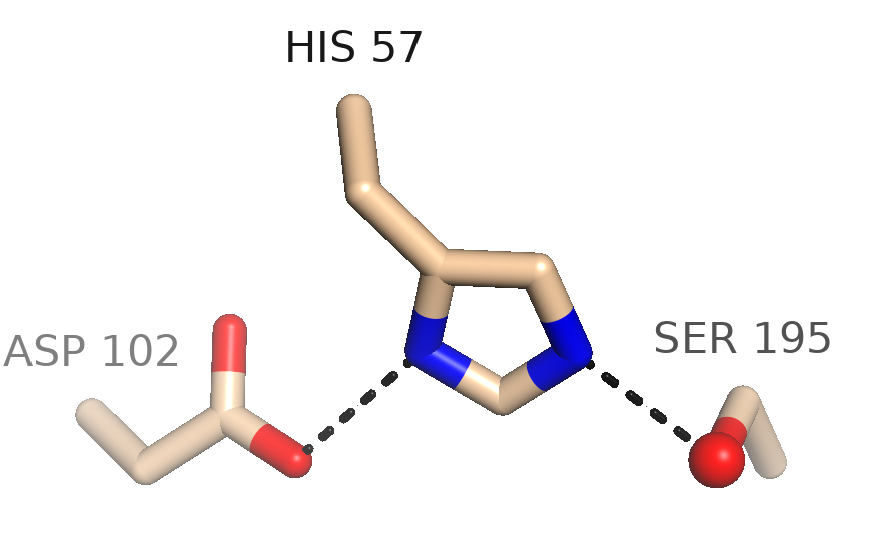
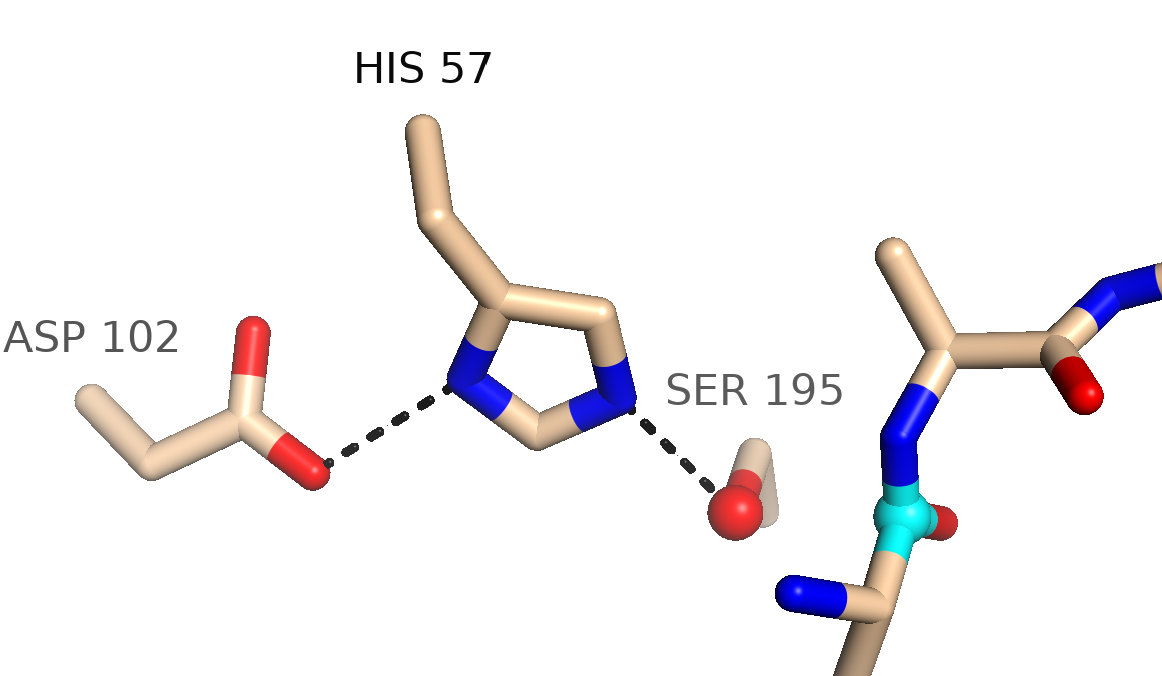
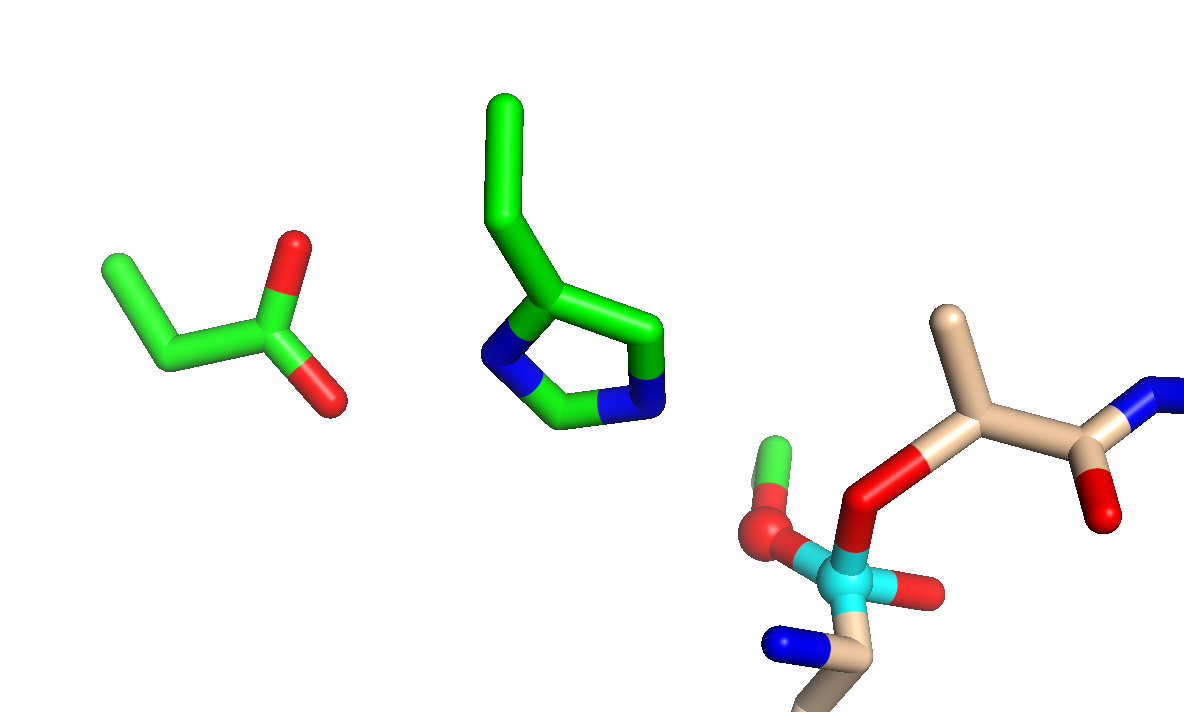
1. The catalytic triad of trypsin (Asp 102, His 57, Seri 195) is shown below. Add the missing hydrogen atoms. Indicate the charge on HIS 57. 
2. The catalytic triad in the Michaelis complex of trypsin is shown below. Add the missing hydrogen atoms, and use arrows to indicate electron flow during nucleophilic attack. Indicate the charge on HIS 57. 
3. A tetrahedral intermediate in the serine protease mechanism is shown below. Label the catalytic triad. Add all the missing hydrogen atoms, hydrogen bonds, and the oxyanion hole. Indicate the charge on HIS 57. Label the oxyanion.



1. Draw the mechanism of peptide hydrolysis by trypsin (7 steps). Then make your best guess at a reaction coordinate (free energy versus extent of reaction) for this reaction. Indicate the substrate+enzyme, all 6 intermediates, and product + enzyme on the coordinate. On the same graph, sketch a reaction coordinate for non-catalyzed hydrolysis on a peptide. (A reaction coordinate is a graph with free energy on the vertical axis and extent of reaction on the horizontal axis.)