

Topics for exam 2

1. (15 pts.) Draw the structures of (don't worry about stereochemistry) and provide the three letter abbreviations for the following amino acids.

a. proline

b. asparagine

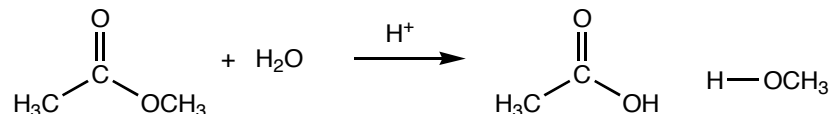
c. threonine

2. (8 pts.) Draw a Fischer projection for D-fructose.

3. (8 pts.) Draw a Haworth projection of β -D-glucopyranose

4. (8 pts.) One of the oxidized forms of D-galactose is D-galactoaldonic acid. Draw a Fischer projection of D-galactoaldonic acid.

5. (8 pts.) Draw the mechanism for the general acid catalyzed hydrolysis of an ester. In other words, draw the mechanism for the following reaction.



6. What does it mean to say that an enzyme-catalyzed reaction has reached saturation kinetics? (4 pts.) That is, when a reaction has reached this point, what happens to the rate of the reaction if the concentration of the substrate is increased?

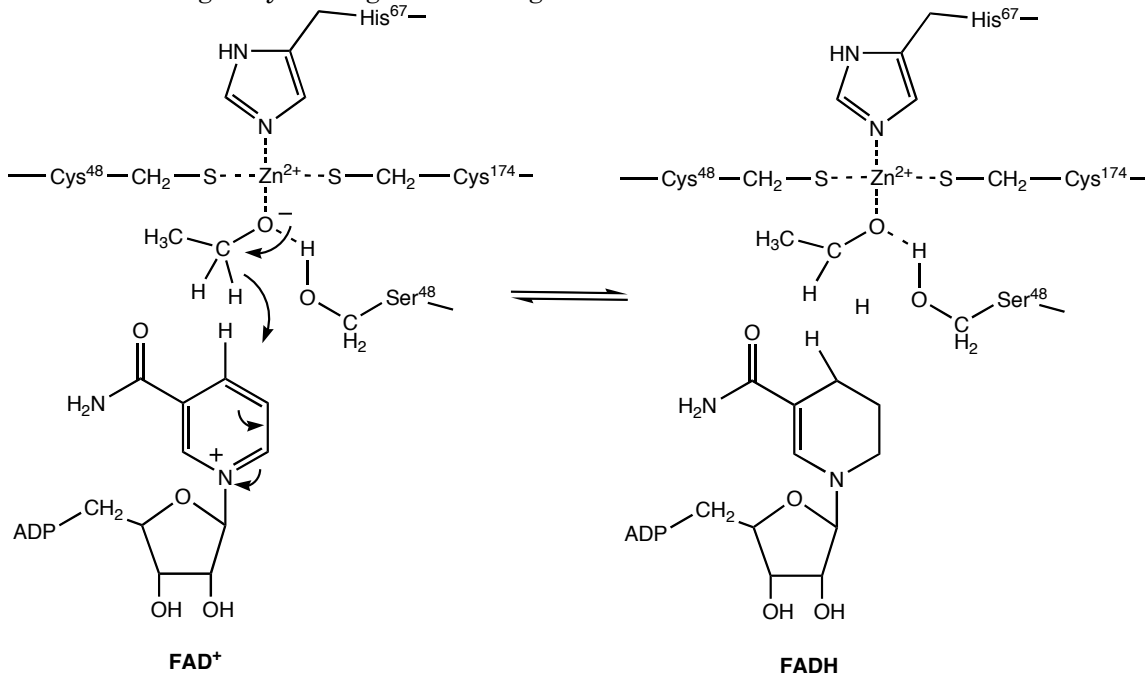
7. The Michaelis-Menten equation is written below.

$$\text{rate} = V_{\text{max}} \frac{[\text{S}]}{K_{\text{m}} + [\text{S}]}$$

- a. (6 pts.) Explain how the equation accounts for the observation that at low substrate concentrations, the reaction is first order with respect to the substrate concentration. When responding, consider the size of K_{m} .
- b. (6 pts.) Explain how the equation accounts for the observation that at high substrate concentrations, the rate of the reaction doesn't depend on substrate concentration. When responding, consider the size of K_{m} .

8. Below is a step in the mechanism for the dehydrogenation of ethanol by alcohol dehydrogenase.

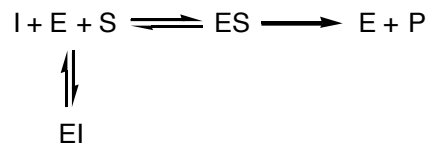
a. (6 pts.) Using the mechanism arrows on the left hand structure as a guide, complete the structure on the right by adding the missing bonds.



b. (3 pts.) Is FAD^+ acting as a reducing or oxidizing agent, how can you tell?

c. (2 pts.) When a metal cation is incorporated into an enzyme, like the enzyme above, what is the metal cation called?

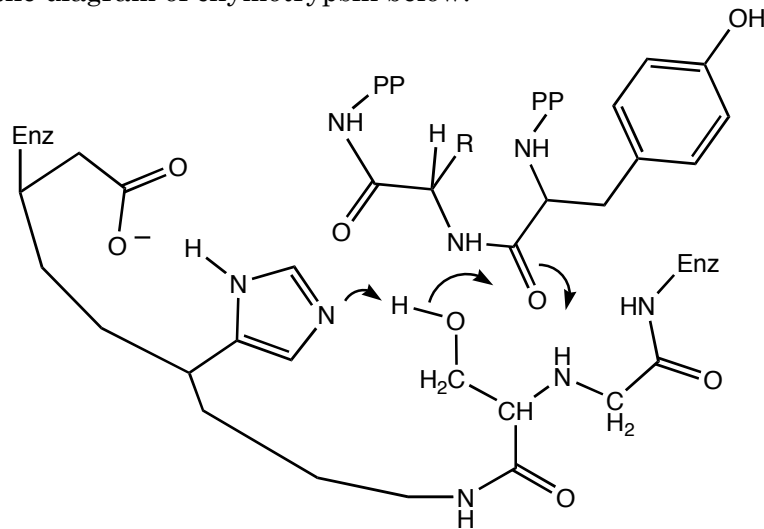
9. The mechanism by which a competitive inhibition occurs is explained by the following equation.



a. (4 pts) Why is this model of enzyme inhibition referred to as competitive inhibition?

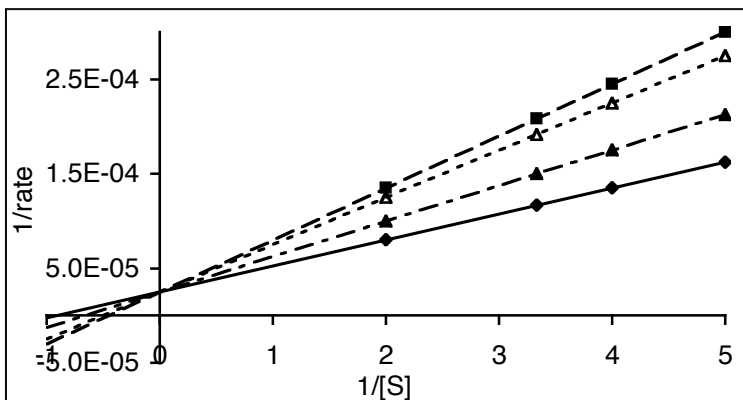
b. (4 pts.) With competitive inhibition, V_{max} can still be attained. Explain how V_{max} can be reached even though inhibitor is present.

10. The first step in the cleavage of a peptide bond by chymotrypsin is drawn below. The following questions refer to the diagram of chymotrypsin below.



- (6 pts.) Identify (circle) the side chains of the serine, histidine, and aspartate amino acid residues in the diagram.
- (4 pts.) In this step of the mechanism, what is the role of the histidine residue in the reaction above?

11. The following questions refer to the graph below.



- (2 pts.) What kind of plot is this?
 - (3 pts.) What is the significance of the y-intercept of the lines; that is, what important value can be determined from the y-intercept.
- c. (3 pts.) The data points connected by the solid trend line are derived from reaction rates that were observed at specific substrate concentrations in the absence of any inhibitors. The dashed lines are all derived from experiments where an inhibitor was introduced. What kind of inhibition is being observed in these experiments.