Name _____ Test 2 (4/1)
CHEM 0313 (Biochem) Spring 2025

1. a. (2 pts.) When a protein is denatured does it still function; for example, would a denatured enzyme still act as a catalyst? 1. _____

b. (2 pts.) Does the denatured protein maintain its primary structure? 2. _____

c. (2 pts.) Does the denatured protein maintain its tertiary or quaternary structure? 3. _____

d. (2 pts.) In a denatured protein are peptide bonds disrupted? 4. _____

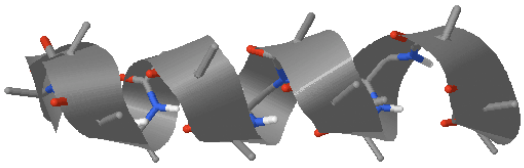
e. (2 pts.) In a denatured protein are non-covalent interactions disrupted? 5. _____

6. _____

2. a. (4 pts.) Drawn below are examples of the primary structure, secondary structure, tertiary structure, or quaternary structure of a protein? 7. _____

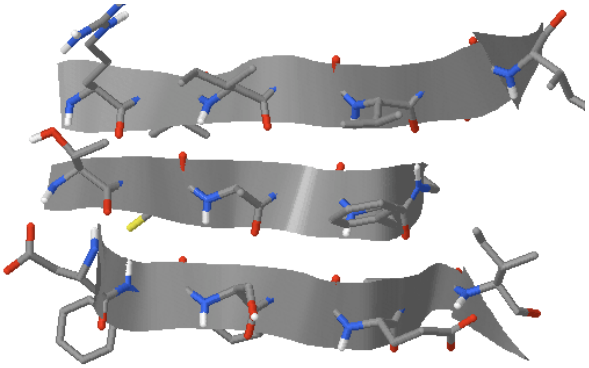
b. (8 pts.) Provide the names of the structures drawn below. 8. _____

i. 9. _____



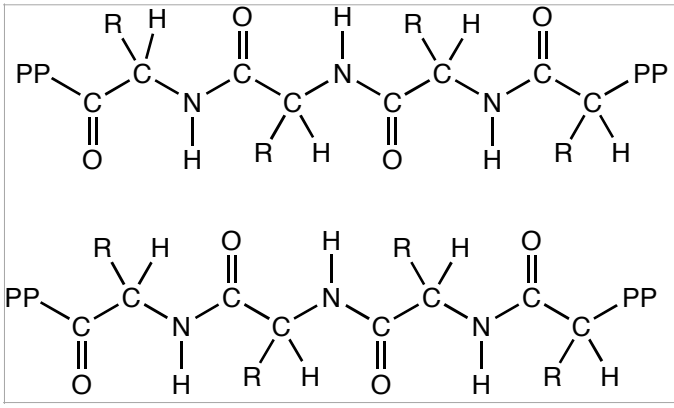
_____

ii. 10. _____



_____

3. Drawn below is a representation of part of the structure depicted in 3. ii.

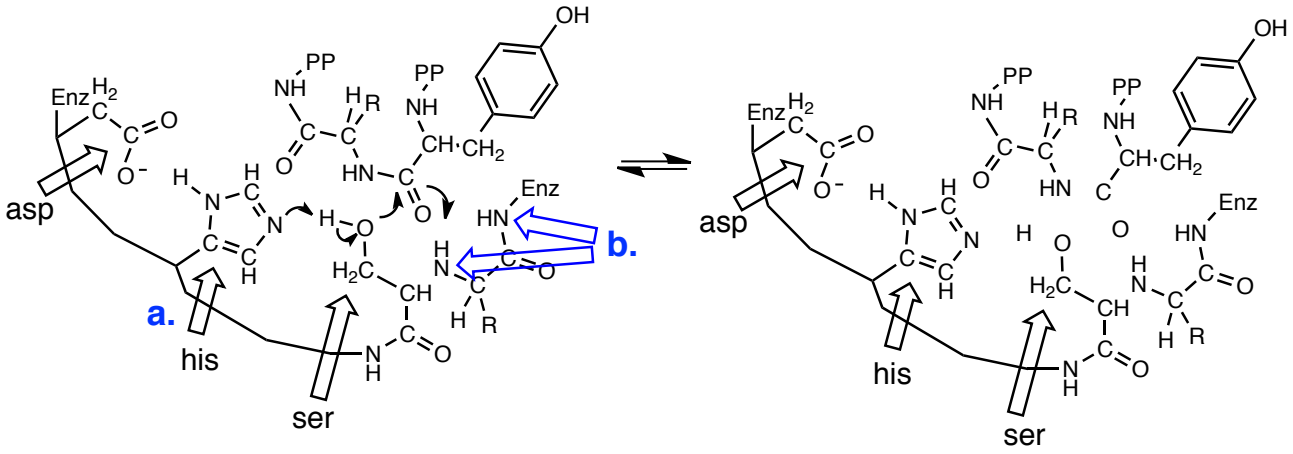


a. (6 pts.) What non-covalent interaction is primarily responsible for keeping this structure together.

b. (6 pts.) On the drawing to the left, indicate where the interactions will form.

PP = more polypeptide, R = sidechain

4. Below, the first step of the chymotrypsin catalyzed hydrolysis of a polypeptide is drawn.



a. (6 pts.)Describe the role of the histidine residue in this reaction.

b. (6 pts.) Describe the role of the indicated amide NH groups.

c. (6 pts.) Add bonds and charges as needed to show the results of the "arrow pushing" in the first step.

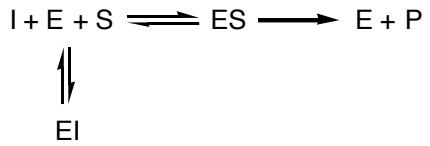
5. The Michaelis-Menten equation is written below.

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

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.

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

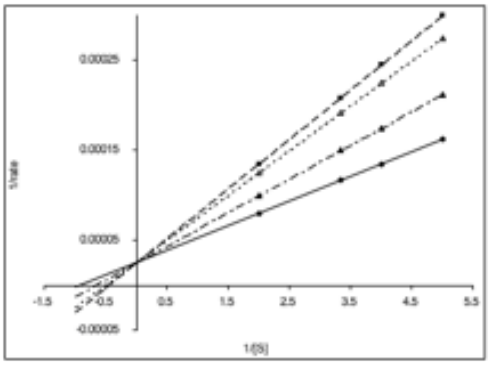


a. (4 pts) Why is this model of enzyme inhibition referred to as competitive inhibition?

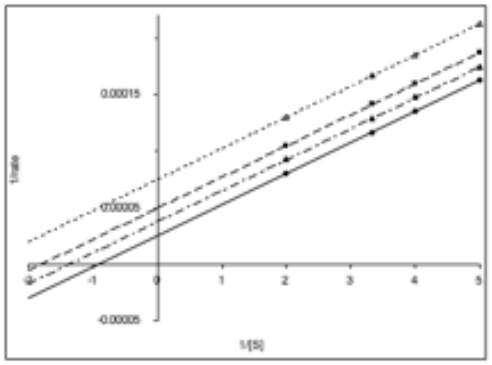
b. (4 pts.) With competitive inhibition, V_{max} can still be attained. Explain how V_{max} can be reached even though inhibitor is present.

7. a. (5 pts.) What does it mean to say that a reaction is first order with respect to substrate concentration?

8. The graphs below show the rate of an enzyme catalyzed reaction under increasing inhibitor concentration.



$$\frac{1}{\text{rate}} = \frac{K_m}{V_{max}[S]} + \frac{1}{V_{max}}$$



a. (2 pts.) For both graphs, which line represents the uninhibited reaction (label the line)?

b. (2 pts.) For both graphs, which line represents the experiment with the highest concentration of inhibitor (label the line)?

c. (4 pts.) The graph on the right is consistent with uncompetitive inhibition. What can we learn about V_{max} from the graph on the left?