BC351 – Principles of Biochemistry
Study Guide for Exam 2

Lecture 04

1. What is a ligand? How does the K_d relate to the affinity of a protein for its ligand? Does the number of sites occupied by a ligand increase linearly with the [L]? When I say that the K_d is 20uM what does this mean in terms of [L] and occupied binding sites? If you have a 1000 binding sites and a 1000 ligands are all the binding sites filled? How does all this relate to the fraction bound?
2. The P_{50} of heme for oxygen and carbon monoxide changes depending on if it is free heme or myoglobin/hemoglobin bound heme, why? For each diatomic molecule which P_{50} is higher, that recorded for free heme or for myoglobin/hemoglobin bound heme? The P_{50} for carbon monoxide and myoglobin/hemoglobin bound heme is actually a lower value as compared to the P_{50} of oxygen. Why does this seem counter-intuitive? At the same time why is this not a concern physiologically?
3. What is the primary difference b/w hemoglobin and myoglobin? Why is it surprising that their primary structures are so different?
4. How does the structure of myoglobin and hemoglobin affect their oxygen binding curves? Which has a lower affinity for oxygen and why? How is this (the affinity and shape of their curves) important in terms of physiology?
5. What is the T and R-state? Which has a higher affinity for oxygen? Describe the events that lead to a conformational change in hemoglobin.
6. What is an allosteric protein? What is a modulator? What is homotropic modulation and heterotropic modulation? What are O_2/BPG an examples of? How so? How does fetal hemoglobin out compete adult hemoglobin at the placental interface?
7. How is BPG related to an individual's acclimation to changes in altitude?
8. **Problems from the Textbook:** pg. 180 #1, #6; pg. 181 #8

Lecture 05

1. How does the stability of a molecule relate to the rate of how it will breakdown to a product? How does this relate to the free energy of the reactant vs. that of the product? How does it relate to the transition state?
2. How does the transition state relate to catalysis? What do catalyst do to increase the rate of the reaction? Can a catalyst change the free energy of a product or a reactant? What does this mean in terms of the catalyst ability to change the equilibrium constant and the change in free energy?
3. How does the activation energy relate to the rate of the reaction?
4. How does an enzyme lower the activation energy?
    a. What are specific catalytic mechanisms? What 3 types did we discuss?
    b. What is transition state stabilization?
5. What does lysozyme demonstrate at each of it's reaction steps?
6. What does enolase demonstrate at each of it's reaction steps?
7. **Problems from the Textbook:** pg. 230 #7; pg 232 #21

Lecture 06

1. Why would you want to know anything about enzyme kinetics?
2. What is the rate constant?
3. What is V_{max}?
4. How does the $[E_T]$ affect the rate of an enzymatic reaction? What will it change on the hyperbolic curve?
5. How does the [S] affect the rate of an enzymatic reaction? Why don't enzyme catalyzed rates increase linearly with [S]?
6. What is k_{cat}? How will it affect the rate of an enzymatic reaction? What will it change on the hyperbolic curve? When should you use this as a means to compare two different enzymes? Would you want to use this value alone?
7. What is the K_m? How will it affect the rate of an enzymatic reaction? What will it change on the hyperbolic curve?
8. Why is the k_{cat}/K_m ratio a superior way to compare one enzyme to another as compared to either of the two constants alone?
9. What is human sulfite deficiency? At a molecular level, what has happened to these individuals genomes? What does this do to the efficiency of the enzyme?
10. **Problems from the Textbook:** pg. 230 #8 (c), #9 (a), #11