Study Guide Chapters 4, 5, 6, 11

**Write a response to each item in** **your own words**.

**Chapter 4**

Define energy, forms of energy. Where does energy (for us) originate?

Describe the 3 laws of Thermodynamics. Define bioenergetics. Define the 3 thermodynamic factors that affect reactions.

Define open system and close system. Why are living organisms considered open systems?

Define state functions. Which of the previous thermodynamic factors are state functions?

Define enthalpy. What are indications of reaction spontaneity if change in enthalpy is positive, negative, zero? Same for entropy and free energy. What is the equation that relates these 3 functions?

What are Standard Sate Conditions for non-biological reactions? What are they for biological reactions?

Define spontaneous reaction, non-spontaneous reaction, exergonic reaction, endergonic reaction.

What is the equation that relates change in free energy (standard state) to equilibrium constant.

Discuss the relationship between positive DG0’ values and reaction coupling in living organisms.

What is the importance of ATP in living cells? How is ATP formed. How is the energy of ATP released?

**Chapter 5**

List the variety of functions that proteins play. Describe the 3 general classes of proteins and their function specifically.

Describe amino acids, both standard and non-standard. General structure, why called zwitterions, stereoisomers, chiral, carbon designations.

Know the 3-letter code designation for 20 standard amino acids. Describe the amino acid groups, which amino acids are in a group and why.

What is the importance of a functional group to amino acids and proteins?

What amino acids or their derivatives act as chemical messengers? Define neurotransmitters, hormone.

Discuss ionizable groups in amino acids, resulting titration curve, pKa. isoelectric point.

What is a peptide bond, how is it formed, bond characteristics?

List and describe 8 functions of proteins.

Define prosthetic group, conjugated protein, apoprotein, holoprotein.

Describe in detail Protein levels o f structure; primary, secondary, tertiary, quaternary.

What is an allosteric protein? Importance of a ligand, allosteric transitions, effectors and modulators. What is positive cooperativity; know an example.

Discuss denaturation, what causes it, how it causes it, can it be reversed.

**Chapter 6**

What is an enzyme and importance to living systems?

How do catalysts effect reaction rate, quantify? Discuss effect in terms of free energy, activation energy, specificity.

Describe how enzyme catalysts work, substrate, active site, noncovalent interactions. Discuss the 2 models developed to describe this process.

Describe the 6 Classification of Enzymes, include representative enzyme.

Discuss enzyme kinetics in terms of velocity, initial velocity, max velocity, half-life, 1st order, 2nd order, zero order.

What is Michaelis-Menten Kinetics model? What is Michaelis constant, equation? What is Michaelis-Menten equation? Define turnover number, specificity constant.

What is a Lineweaver-Burke plot and why is it useful in enzyme kinetics. What is the Y intercept, X intercept and slope?

Discuss various ways enzymes can be inhibited, can inhibition be overcome. What can Lineweaver-Burk plots tell us about enzyme inhibition?

What are the roles of amino acids in enzymes catalysis? Describe catalysis of chymotrypsin.

Why is regulation of biochemical pathways important? Describe 4 methods of control.

**Chapter 11**

Describe lipids in general.

Describe each of the subdivisions of lipids: Fatty acids, eicosaniods, prostaglandins, thromboxanes, leukotrienes, triglycerols, wax esters, phospholipids (spingomyelins, phosphoglycerides), phospholipases, sphingolipids, glycolipids, isoprenoids, steroids

What’s all the fuss about cholesterol?

What are lipoproteins, apoproteins, classification of lipoproteins.

Discuss in detail the Fluid Mosaic model of biological membranes. Include discussion of membrane proteins both peripheral and integral.

List the 3 functions that take place in or on membranes.

Discuss in detail passive and active transport, know an example of each.