Study Guide Chapters 1, 2, 3

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

**Chapter 1**

Describe the study of biochemistry. Describe the 5 characteristics of life.

What are the main chemical elements of all organisms? What is the most important inorganic molecule and why.

Describe biomolecules, what are they made of, describe functional groups and their importance.

Describe the 4 major classes of biomolecules, make-up, function.

Discuss basics of amino acids, general formula, how many standard amino acids, 4 classes of amino acids and what determines class; unique functions of certain amino acids.

Describe sugars (carbohydrates), abundance in nature, structure, important sugars as energy sources and biomolecule components.

Describe fatty acids, make-up including C to C bonding characteristics, solubility characteristics; how do they occur in organisms.

Describe nucleotides, structural components, what are the key function of DNA and RNA.

Why is the cell referred to as living chemical factories? List the primary functions of cellular metabolism.

Discuss the 5 classes of biochemical reactions.

Define energy, how is it generated in organisms. What is the ultimate source of energy used by life forms?

Define metabolism. Discuss the 2 types of metabolic pathways and their importance in metabolism.

**Chapter 2**

What is a cell, importance in living systems. Compare the characteristics of the 2 classifications of cells. Discuss importance of organelles.

Discuss the importance of water in living processes. Water’s capacity to interact with substances; behavior of molecules interactions with water, hydrophilic and hydrophobic.

Describe biological membranes, include types of proteins associated and functions they are involved in.

Define integral proteins, peripheral proteins, channel (carrier) proteins, receptor proteins, and motor proteins.

What is meant by macromolecular crowding; excluded volume?

In biochemical processes define signal transduction, transduction, response, and termination.

Describe prokaryotes, types, structural characteristics, common features; importance of cell wall. What is meant by Gram stain procedure; what does it tell you about the cell wall? What are key compartments?

Describe eukaryotic cells, structure, functions, key organelles and their functions. How are organelles separated?

Discuss role of plasma membrane, composition. Define glycocalyx.

Describe the endoplasmic reticulum, make-up and function in terms of RER, SER. What is the importance of ribosomes, where are the located?

Define golgi apparatus, exocitosis, endocytosis, lyosomes.

Describe the nucleus, structure, include discussion of nuclear envelope, nucleolus, nuclear matrix, nuclear pores.

Describe the mitochondria. Why is it critically important to life processes?

Define peroxisomes, cytoskeleton, cilia and flagella

**Chapter 3**

List the unique properties of water. What contributes to these unique properties? Structure, geometry, components electronegativity

Discuss hydrogen bonding, what is it, what needs to be present for formation? What types of molecules will form hydrogen bonds, which will not, why? How many hydrogen bonds can water form? What is the importance of hydrogen bonding and water’s interactions with other molecules?

List and define Van der Waals Forces (3). List in order of relative strength starting with hydrogen bonding.

How does hydrogen bonding contribute to the unique thermal properties of water? What are these unique properties?

Discuss the solvent properties of water and why it is an ideal biological solvent. Define solvation spheres, role they play in dissolving ionic and polar substances.

Define hydrophobic, hydrophilic, amphipathic, micelles.

Define osmosis, osmotic pressure, isotonic solution, hypotonic solution, hypertonic solutions, effects on cells.

Discuss the ionization of water in terms of ionization product Kw.

Define an acid, base. What is the dissociation in water of a strong acid versus a weak acid? What is Ka? How does this relate to pH?

What is a buffer,how do they work, what makes a good buffer? What is the importance of maintaining blood pH in terms of acidosis and alkalosis?

What is the importance of the Henderson-Hasselbalch equation for choosing a buffer? Discuss relationship between pKa and pH.

Describe 3 physiological buffers, bicarbonate, phosphate, and protein.