**PART I - Monomers to Polymers Reading List**

The following sections and sub-sections of each chapter are important to your understanding of chemistry in biological systems and are relevant to the questions you will be asked in the homework and on the exams.

Chapter 2 – Water

2.1 Weak Interactions in Aqueous Systems

The following sub-sections are important:

* The Introduction
* Hydrogen Bonding Gives Water its Unusual Properties
* Water Forms Hydrogen Bonds with Polar Solutes
* Water Interacts Electrostatically with Charged Solutes
* Nonpolar Gases are Poorly Soluble in Water
* Nonpolar Compounds Force Energetically Unfavorable Changes in the Structure of Water
* Van der Waals Interactions are Weak Interatomic Attractions
* Weak Interactions are Crucial to Macromolecular Structure and Function
* Solute Affects the Colligative Properties of Aqueous Solutions

2.2 Ionization of Water, Weak Acids, and Weak Bases

The following sub-sections are important:

* The Introduction
* Pure Water is Slightly Ionized
* The Ionization of Water is Expressed by an Equilibrium Constant
* Weak Acids and Bases Have Characteristic Acid Dissociation Constants
* Titration Curves Reveal the pKa of Weak Acids

2.3 Buffering against pH changes in Biological Systems

The following sub-sections are important:

* Buffers are Mixtures of Weak Acids and Their Conjugate Bases
* Weak Acids or Bases Buffer Cells and Tissue against pH Changes

Chapter 3 – Amino Acids, Peptides and Proteins

3.1 Amino Acids

The following sub-sections are important:

* The Introduction
* Amino Acids Share Common Structural Features
* The Amino Acid Residues in Proteins are L-Stereoisomers
* Amino Acids Can be Classifies by R-Group
* Amino Acids Can Act as Acids and Bases
* Amino Acids Have Characteristic Titration Curves
* Titration Curves Predict the Electric Charge of Amino Acids
* Amino Acids Differ in Their Acid-Case Properties

3.2 Peptides and Proteins

The following sub-sections are important:

* Peptides are Chains of Amino Acids
* Peptides Can be Distinguished by Their Ionization Behavior

3.4 The Structure of Proteins: Primary Structure

* The Introduction
* The Function of a Protein Depends on its Amino Acid Sequence

Chapter 4 – The Three Dimensional Structure of Proteins

4.1 Overview of Protein Structure

The following sub-sections are important:

* The Introduction
* A Protein’s Conformation is Stabilized Largely by Weak Interactions
* The Peptide Bond is Rigid and Planar

4.2 Protein Secondary Structure

The following sub-sections are important:

* The Introduction
* The α-Helix Is a Common Protein Secondary Structure
* Amino Acid Sequence Affects Stability of the α-Helix
* The β Conformation Organizes Polypeptide Chains into Sheets
* β Turns Are Common in Proteins

4.3 Protein Tertiary and Quaternary Structure

The following sub-sections are important:

* The Introduction
* Fibrous Proteins Are Adapted for a Structural Function
* Structural Diversity Reflects Functional Diversity in Globular Proteins
* Myoglobin Provides Early Clues about the Complexity of Globular Proteins Structure
* Globular Proteins Have a Variety of Tertiary Structures
* Some Proteins or Protein Segments Are Intrinsically Disordered

4.4 Protein Denaturation and Folding

The following sub-sections are important:

* The Introduction
* Loss of Protein Structure Results in Loss of Function, the information in Figures 4-25 & 4-26 are really important
* Some Proteins Undergo Assisted Folding

Chapter 5 – Protein Function

5.1 Reversible Binding of a Protein to a Ligand: Oxygen-Binding Proteins

The following sub-sections are important:

* The Introduction
* Oxygen Can Bind to a Heme Prosthetic Group
* Globins Are a Family of Oxygen-Binding Proteins
* Protein-Ligand Interactions Can be Described Quantitatively
* Protein Structure Affects How Ligands Bind
* Hemoglobin Transports Oxygen in Blood
* Hemoglobin Subunits are Structurally Similar to Myoglobin
* Hemoglobin Undergoes a Structural Change on Binding Oxygen
* Hemoglobin Binds Oxygen Cooperatively
* Cooperative Ligand Binding Can be Describes Quantitatively
* Two Models Suggest Mechanisms for Cooperative Binding
* Hemoglobin Also Transports H+ and CO2
* Sickle Cell Anemia is a Molecular Disease of Hemoglobin

5.2 Complementary Interactions between Proteins and Ligands: The Immune System and Immunoglobins

The following sub-sections are important:

* The Introduction
* The Immune Response Includes a Specialized Array of Cells and Proteins
* Antibodies Have Two Identical Antigen-Binding Sites
* Antibodies Bind Tightly and Specifically to Antigen
* The Antibody-Antigen Interaction is the Basis for a Variety of Important Analytical Procedures

Chapter 6 – Enzymes

6.1 An Introduction to Enzymes

The following sub-sections are important:

* The Introduction
* Most Enzymes are Proteins
* Enzymes of Classified by the Reactions They Catalyzed

6.2 How Enzymes Work

The following sub-sections are important:

* The Introduction
* Enzymes Affect Reaction Rates, Not Equilibria
* Reaction Rates and Equilibria Have Precise Thermodynamic Definitions
* A Few Principles Explain the Catalytic Power and Specificity of Enzymes
* Weak Interactions Between Enzyme and Substrate Are Optimized in the Transition State
* Binding Energy Contributes to Reaction Specificity and Catalysis

6.3 Enzyme Kinetics as an Approach to Understanding Mechanism

The following sub-sections are important:

* The Introduction
* Substrate Concentrations Affect the Rate of Enzyme-Catalyzed Reactions
* The Relationship Between Substrate Concentration and Reaction Rate can be Expressed Quantitatively
* Kinetic Parameters are Used to Compare Enzyme Activities
* Many Enzymes Catalyze Reactions with Two or More Substrates
* Enzyme Activity Depends on pH
* Pre-Steady State Kinetics Can Provide Evidence for Specific Reaction Steps
* Enzyme are Subject to Reversible or Irreversible Inhibition

6.4 Examples of Enzymatic Reactions

* This section has way more detail than you are expected to know. All you need to know are the 6

classes of enzymes that are in the slides and the types of reactions they catalyze.

6.5 Regulatory Enzymes

The following sub-sections are important:

* The Introduction
* Allosteric Enzymes Undergo Conformational Changes in Response to Modulator Binding
* The Kinetic Properties of Allosteric Enzymes Diverge from Michaelis-Menten Behavior
* Some Enzymes Are Regulated by Reversible Covalent Modifications
* Phosphoryl Groups Affect the Structure and Catalytic Activity of Enzymes
* Multiple Phosphorylation Allow Exquisite Regulatory Control

Chapter 7 – Carbohydrates and Glycobiology

7.1 Monosaccharides and Disaccharides

The following sub-sections are important:

* The Introduction
* The Two Families of Monosaccharides are Aldoses and Ketoses
* Monosaccharides have Asymmetric Centers
* The Common Monosaccharides Have Cyclic Structures
* Monosaccharides are Reducing Agents
* Disaccharides Contain Glycosidic Bonds

7.2 Polysaccharides

The following sub-sections are important:

* The Introduction
* Some homopolysaccharides Are Fuel Storage Forms of Fuel
* Some Homopolysaccharides Serve Structural Roles

7.3 Glycoconjugates: Proteoglycans, Glycoproteins, and Glycosphingolipids

The following sub-sections are important:

* The Introduction
* Glycoproteins Have Covalently Attached Oligosaccharides

Chapter 8 – Nucleotides and Nucleic Acids

8.1 Some Basics

The following sub-sections are important:

* The Introduction
* Nucleotides and Nucleic Acids Have Characteristic Bases and Pentoses
* Phosphodiester Bonds Link Successive Nucleotides and Nucleic Acids
* The Properties of Nucleic Bases Affect the Three-Dimensional Structure of Nucleic Acids

8.2 Nucleic Acid Structure

The following sub-sections are important:

* The Introduction
* DNA is a Double Helix that Stores Genetic Information
* Certain DNA Sequence Adopt Unusual Structures

8.3 Nucleic Acids Chemistry

The following sub-sections are important:

* The Introduction
* Double-Helical DNA & RNA Can be Denatured
* Nucleotides & Nucleic Acids Undergo Nonenzymatic Transformations
* Some Bases of DNA Are Methylated

Chapter 10 – Lipids

10.1 Storage Lipid

The following sub-sections are important:

* The Introduction
* Fatty Acid are Hydrocarbon Derivatives
* Triacylglycerols are Fatty Acid Esters of Glycerol
* Triacylglycerols Provide Stored Energy and Insulation
* Partial Hydrogenation of Cooking Oils Improves Their Stability but Creates Fatty Acids with Harmful Health Effects
* Waxes Serve as Energy Stores and Water Repellents

10.2 Structural Lipids in Membranes

The following sub-sections are important:

* The Introduction
* Glycerophospholipids Are Derivatives of Phosphatidic Acid
* Sterols Have Four Fused Carbon Rings

10.3 Lipids as Signals, Cofactors and Pigments

The following sub-sections are important:

* The Introduction
* Eicosanoids Carry Messages to Nearby Cells
* Steroid Hormones Carry Messages Between Tissues
* Vitamins A and D Are Hormone Precursors
* Vitamins E and K and the Lipid Quinones Are Oxidation Cofactors