

**Biology as a chemical phenomenon (Chapter 1)**

**Understand the properties of living systems**

**Know the major classes of molecules of biochemistry and understand their nature as polymers**

**Be able to quickly and accurately draw and identify key functional groups commonly found in biomolecules and biological processes**

**Know how the properties of biomolecules make them appropriate for living systems**

**Know the overall biochemical organization of prokaryotic and eukaryotic cells**

**Know the structural features of the cell**

**Be able to compare and contrast cellular organelles of prokaryotes and eukaryotes**

**Water the Medium of Life (Chapter 2)**

**Know the properties of water that make it an important biological compound**

**Be able to identify and predict noncovalent interactions responsible for macromolecular interactions**

**Be able to explain how water functions as a solvent for various solutes**

**Understand how noncovalent interactions are important to 3-D structures of macromolecules**

**Understand how ionization of water affects the actions of biomolecules**

**Understand the pH scale and how pK<sub>a</sub> values are related to pH**

**Be able to use the Henderson Hasselbach equation to make buffered solutions**

**Be able to clearly and accurately explain the chemistry surrounding the activity of buffers**

**Understand the biological importance of buffers and predict buffer capacity from pK values or from titration curves**

**Be able to sketch appropriate titration curves**

**The Role of Thermodynamics in Biochemical Models (Chapter 3)**

**Understand the first and second laws of thermodynamics and their roles in living systems**

**Understand the relationship between free energy, enthalpy, and entropy**

**Understand the meaning of spontaneity for a biological process**

**Understand the relationship between equilibrium constants and free energy changes**

**Know the standard state conventions defined by biochemists**

**Be able to describe the significance of the van't Hoff plot**

**Be able to justify the persistent occurrence of energetically unfavorable reactions in living systems**

**Be able to use your knowledge of chemistry to rationalize the high energy yields of phosphoanhydrides, acylphosphates, and enol phosphates**

**Understand the significant effects that slight changes in concentrations have on direction of biochemical reactions**

**Nucleic Acid Structure (Chapters 10/11)**

**Have a strong understanding of the roles of DNA and RNA in the molecular processes of storage, retrieval, and transfer of genetic information**

**Understand the structure of nucleic acids**

**Understand how nucleotides are covalently organized into components**

**Be able to quickly and accurately draw structures of all bases, nucleosides, and nucleotides**

**Understand the tautomeric shifts that occur in purines and pyrimidines**

**Understand the base pairing patterns of nucleic acids and how the acid base properties contribute to this base pairing**

**Know the naturally occurring conformations of DNA**

**DNA and understand the role of various proteins in maintaining these structures**

**Understand how DNA is denatured and how base composition governs these processes**

**Know the principle kinds of RNA and understand their structural properties**

**\*Be able to integrate principles from Chapters 1, 2, 3, 10, and 11 (understand their relationships)**