

## Chem 331 Biochemistry

Chapter 1

Learning Objectives, Study Guides



## Learning Objectives

- Understand the application of enthalpy to biochemical systems
- Relate the entropy and enthalpy contributions to protein folding
- In both descriptive and mathematical approaches, determine if a reaction is favorable at standard state and non-standard state conditions. Be able to calculate Keq and Gibbs free energy
- Predict if a process is favorable for coupled reactions
- Understand and explain the two means reactions can be coupled to make an enzyme catalyzed reaction(s) thermodynamically favorable
- Mathematically and chemically define what makes PEP a high energy molecule
- Be able to analyze a biochemical to determine if there is a high energy bond within the structure
- Explain why ATP is the energy currency of the cell and relate how the standard state Gibbs free energy for hydrolysis of ATP is only half that of three other biomolecules
- Recognize ATP and be able to chemically demonstrate the features that provide a negative Gibbs free energy of hydrolysis.
- Interpret, relate and utilize the weak forces involved in biochemistry
- Recognize hydrogen bonding donors and acceptors
- Relate the specific forces which drive hydrophobic interaction and apply its uses in biochemistry
- Calculate pH of a buffered solution and re-calculate the pH after acid or base has been added to the system
- Know what a buffer is and the practice aspects of making a buffer
- Know, write and understand the complete reaction(s) of water with carbon dioxide
- Explain how the blood pH can become acidic or basic.
- Understand the difference between metabolic and respiratory acidosis and alkalosis
- Predict which compensation method is used based on specific input
- Relate the blood pH to equilibrium in an open system
- Describe why the pKa is considered off but appropriate to for the bicarbonate system to be effective in the human body

Chapter 1 questions: 3, 4, 17, 22, 25, 26, 27, 28, 29, 34, 35.

**Study Notes from Dr P:** This chapter covers a lot of ground that cover important basic principles of biochemistry. Don't be descriptive in your understanding. Think about what causes the phenomenon your reading and learning about. For instance, just knowing that lipids aggregate into membranes is descriptive; the mechanism for this is the force that drives the aggregation. Use this approach for the rest of the semester and things will go well.

I will not cover the functional groups, solubility and reaction mechanisms of sections 1.2 but you will need to read and learn them. This section is review for you and will have one or two simple questions on the exam on each section. We will cover thermodynamics in depth. Understanding the logic or principle concepts and being able to do the calculations are important. Don't focus on just the problems without understanding what the equations mean for us in biochemistry. Understand the contributions of enthalpy and entropy to predict biochemical functions. You will have questions that you have to explain thermodynamic principles AND calculate Gibbs free energy. Also focus on biochemical molecules and their role in energy transfer. Know what (in both descriptive and molecular terms) what makes a high-energy bond. Pay attention to what and how the book describes group transfer potential.