

## Biochemistry Exam I Topics to Know

- Chapter 1: Introduction
  - Very basic cell biology
  - Bonding geometry
  - Functional groups
  - Stereoisomers
  - Free energy
  - Enthalpy
  - Entropy
  - Definitions of Metabolism
- Chapter 2: Water
  - Hydrogen bonding
  - Hydrophobic/hydrophilic
  - Hydrophobic Effect
    - Amphipathic
  - Colligative Properties
    - Osmolarity/osmosis
  - pKa
  - Henderson-Hasselbalch equation
  - Buffering
  - Hydrolysis Reactions
- Chapter 3: Amino Acids
  - Chiral centers
  - DL configuration
  - Twenty Amino Acids
    - Structure
    - Name
    - Abbreviations
    - Functional Groups
    - Ionizable?
  - Approximate pKas of Amine, Carboxylic Acid
    - Zwitterions
  - Charge as a Function of pH
    - Isoelectric Point
  - Peptide Bond
  - Oligo/Polypeptide
    - N- and C-termini
  - Primary/Secondary/Tertiary/Quaternary Structure
  - Fractionation of Peptides
    - Chromatography
      - Ion Exchange
      - Size-Exclusion
      - Affinity
  - SDS-PAGE
  - Isoelectric Focusing

- 2-D Gel Electrophoresis
- Methods of Protein Sequencing (Qualitative)
- Chemical Synthesis of Peptides (General)
- Sequence Math
- Chapter 4: Three-Dimensional Structure of Proteins
  - Conformation
    - Peptide Bond Planarity
    - Ramachandran Plots
  - Secondary Structure
    - $\alpha$ -helices
      - Hydrogen Bonding
      - Arrangement of Side Chains
      - Helical Dipole
    - $\beta$ -sheet
      - Hydrogen Bonding
      - Arrangement of Side Chains
      - Parallel and Antiparallel
  - Tertiary Structure
    - Hydrophobic Effect
    - Arrangement of Side Chains in Secondary Structure
    - X-ray crystallography
    - NMR Spectroscopy