

# Biochemistry Study Guide Exam #1

## Chemical Bonds

### Covalent bond

- Single, double and resonance structures

- Polar and non-polar covalent bonds

### Electrostatic interactions (Ionic bond, Hydrogen bond, van der Waals interaction)

- Be able to describe/diagram the differences between the above

- Donor/acceptor groups in hydrogen bonds

### Hydrophobic interaction

- Be able to explain how this occurs using concept of entropy

Have a general idea of the bond dissociation energies for chemical bonds

Relative electronegativity of H, C, O, and N atoms

## Acid/Base Chemistry

### Bronstead-Lowery acid (acid/conjugate base)

Definition of pH

Acid ionization constant ( $K_a$ )

Definition of  $pK_a$

Derivation of  $[HA]$  equals  $[A^-]$ , when  $pH = pK_a$

How buffers work

Ampholytic molecules and pI

How to calculate pI from the  $pK_a$  of ionizable groups

## Protein structure

Amino acid structure (amine, carboxylic acid groups,  $\alpha$ -carbon)

Equilibria between different ionic forms

How to tell difference between D- and L-amino acids

Which type is found in proteins

Amino acid side chains

- Be able to diagram an example of the following types of side chains:

  - Uncharged, non-polar

  - Uncharged, polar

  - Charged, acidic

  - Charged, basic

Reactions of side chains with hydroxyl group, sulphydryl group

Primary structure

- Definition of

- Amino/carboxy termini

- Peptide bond formation reaction

- Concept of homology (paralogues/orthologues)

Secondary structure

- Definitions of  $\alpha$ -helix,  $\beta$ -strand, reverse turn

Tertiary structure

Experiment showing that tertiary structure formation is an intrinsic property of a protein.

Quaternary structure

Definition of

Types

How common are quaternary structures?

Domain

Definition of

### Proteomics

Two-dimensional gels

Isoelectric focusing

SDS-Polyacrylamide gel electrophoresis

Don't worry about sequencing and two-hybrid techniques

### Hemoglobin structure and function

Everything we covered in class!

Important Note: the power point file posted on the web contains only figures not in your textbook. The figures from your textbook that I showed in class still must be studied carefully.