

## Biochemistry I    Important Topics for the First Exam. Fall Term, 2003

### Water Structure

- hydrogen bonds
- solubility
- dielectric constant

Functional group properties: identity and their size, shape, & polarity

### Acids and Bases

- Titration curves
- Buffer calculations

### Amino Acids

- Names & 3-letter abbreviations
- Structures
- Properties of sidechains
  1. hydrogen bonding groups (e.g. Thr)
  2. ionizable groups & their  $pK_a$ 's (e.g. Lys)
  3. nonpolar groups (e.g. Phe)
  4. UV absorbing groups

### Peptides

- Peptide bond formation and stability
- Phi ( $\Phi$ ) and Psi ( $\Psi$ ) angles
- cis/trans forms of the peptide bond

### Proteins

- 1° structure - sequence determination, types of cleavage
- 2° structure - properties of  $\alpha$ -helix,  $\beta$ -sheet, and turns
- Super 2° structure (e.g.  $\beta$ -hairpin,  $\beta\alpha\beta$ ,  $\alpha\alpha$ , and others) & forces that 'hold it together'
- 3° structure:

Know the size and source of dominate forces in protein folding. How do these forces result in the final folded form of the protein?

  - i) Electrostatics
  - ii) Hydrogen bonding
  - iii) Van der Waals (induced dipole)
  - iv) "Hydrophobic effect"
- 4° structure - assembly of subunits into the native structure (e.g. hemoglobin)
- Dimensions - Typical length ( $\text{\AA}$ ) and mass ( $M_r$ ) scales for proteins.

<b>Theory</b>	<b>Applications</b>
Hydrogen bond	Identify donor and acceptor
Solubility	Behavior of amino acids, protein folding
$\text{pH} = \text{pK}_a + \log[\text{A}^-]/[\text{HA}]$	Buffer calculations & titration curves
Amino acid structures	Identify functional groups, protein folding
Peptide bond & key characteristics	Conformational Properties
1° structure	Sequence determination
2° structure	Protein backbone structures
3° structure	Protein folding & stability

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