

Review Summary – CH370 - Exam 1

Amino Acids and Peptides

Know all 20 common amino acids – name / 3-letter abbrev. / 1-letter abbrev.
Know approximate pKa's of titratable amino acids (2 / 4 / 6 / 8 / 10 / 12)
Charge properties of amino acids and peptides / pI
Nature of the peptide bond (phi / psi angles)

Protein Structure

Definitions of primary, secondary, tertiary and quaternary structures
Common secondary structures / Phi, Psi (ϕ / ψ) torsion angles
How to read a Ramachandran Plot
Common terms used to describe protein structure – motifs / domains - examples

Review of Nucleic Acids: Structures / Folding

Know N Bases; Primary & Secondary structure: double helix by Watson & Crick -1953
Nucleotide pairings: Watson-Crick
Conformations of nucleosides - syn / anti; Sugar pucker: endo or exo
Stabilization (destabilization) Hydrogen Bonding / Electrostatics / Stacking
Denatured DNA: Heat denaturation of DNA is called "melting," T_m / *hypochromism*.
DNA Sequencing – Maxam-Gilbert vs. Sanger (basics; how to read a sequencing gel)

Bioinformatics and Software

Major web resource sites – NCBI / EMBL / ExPASy / PDB
BLAST – principles, uses and definitions of **key terms**,
Substitution matrices
Sequence alignments / Scoring

Protein Purification

Produce / Extract / Purify

Produce: rich tissue / expression system
Extract: cell lysis – grinding / sonication / French Press / detergent
Purify: Take advantages of differences in: **Solubility / Charge / Size / Specificity**
- various forms of chromatography

Analysis: Follow purification using an **assay** for “activity” and SDS gels

Spectroscopy

Interaction of Light with Matter (induce oscillating dipoles in matter)

a) Scattered – ($\sim 10^{-16}$ sec) b) Absorption - ($\sim 10^{-15}$ sec)

Absorption Spectrum – “fingerprint”

Beer-Lambert Law: Absorbance (A); Intensity (I, I_0); Transmittance ($T = I / I_0$)

$$A = \log (I_0 / I) = \log (1/T)$$

Extinction Coefficient – E (1%), ϵ_M = Molar extinction coeff.

$$A = \text{O.D.} = \epsilon \cdot c \cdot l \quad \text{also} \quad [[E^{1\%}] \cdot \text{MW} = 10 \cdot [\epsilon_M]]$$

Fluorescence / Phosphorescence

Fluorescence ($\sim 10^{-4}$ sec to 10^{-9} sec) / Phosphorescence ($> 10^{-3}$ sec)

FRET (Fluor. Res. Energy Transfer) Eff. = $1/[1 + (R/R_0)^6]$ – needs “spectral overlap”