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 / Ramachandran Plot
Common terms used to describe protein structure – motifs / domains - examples

Protein Folding

Non-covalent Interactions
Protein Folding – chaperones / models
- thermo and approaches to predicting protein folds
- use of energy potentials and simulations

Denaturation / Renaturation – thermo and practice

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 / Hydrophobicity
- various forms of chromatography (GF / IEC / HIC / AC (IMAC))

Analysis: Follow purification using an **assay** for "activity" / understand table

N Bases / Nucleosides / Nucleotides and Nucleic Acids

Know N Bases; Primary & Secondary structure: double helix Watson & Crick -1953
Nucleotide pairings: Watson-Crick / etc.
Conformations of nucleosides - syn / anti; Sugar pucker: endo or exo
Stabilization (destabilization) Hydrogen Bonding / Electrostatics / Stacking
Denatuted DNA: Heat denaturation of DNA is called "melting," **Tm / hypochromism**.
DNA Sequencing – Maxam-Gilbert vs. Sanger - basics; how to read a sequencing gel
Key features of NexGen Sequencing (NGS):
Clonal Amplification: *(illumina- bridge amplification vs. pyro 454- emulsion PCR)*
DNA microarrays – general principles of gene-expression profiling (red / green / yellow)

Protein Expression

Cloning: review steps involved / roles of restriction enzymes / PCR / primer design
Advantages/Disadvantages of expression vectors

Spectroscopy

Beer-Lambert Law: $A = \log (Io / I) = \log (1/T) = \varepsilon \bullet c \bullet l$ also [$E1\% \bullet MW = 10 \bullet eM$]
Fluorescence: shifts (folding) / FRET (distances) Eff. = $1/(1 + (r^6/r_o^6))$