

**BIOS 452/CHEM 452
TOPICAL SUMMARY
FINAL EXAM**

NUCLEIC ACIDS

DNA and RNA

Nucleotide and nucleotide structures and nomenclature

Nucleotide base tautomerization

Purine and pyrimidine acid/base equilibria

Covalent bonding between nucleotides in DNA and RNA

Acid/base ionization of the phosphodiester group

Secondary structure of DNA

Complementarity and base pairing

Structural features of B form

Handedness

Rotation per base pair

Base pairs per turn

Rise per base pair

Pitch

Conformation of glycosidic bond

Sugar Pucker

Stability and helix-coil transition

Tertiary structure of DNA

Supercoiling of circular DNA

Flow of genetic information

Transcription

Translation/genetic code

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PROTEINS

Peptide bond

Amino Acids

Structure

Abbreviations

Stereochemistry

Acid dissociation equilibria

pK_a values

Hydrophobic interactions

Hydrogen bonding

Salt bonding

Metal ligand bonding

pI

Primary structure

Secondary structure

Peptide backbone bond angles/distances

cis and *trans* configurations

Φ and Ψ angles

Ramachandran plot

Stabilization by peptide H-bonding

Helices

β-sheets

Turns

Relation to composition and sequence

Tertiary structure

Stabilization by side-chain interactions

Hydrophobic effect/Micelle model

Hydrogen bonding

Salt bonds

Metal ligand interactions

Disulfide bonds

Quaternary structure

Structure and Function

Reversible O₂ binding to Mb, Hb

Hyperbolic and sigmoidal binding curves

Allosteric effects

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CARBOHYDRATES

Monosaccharides

- Aldoses/ketoses
- D, L configuration
- Open chain and hemiacetal/hemiketal forms
- Furanose and pyranose forms
- Haworth representation
- α , β anomers
 - Structure
 - Stability

Disaccharides

- Acetal/ketal formation
- α/β configuration
- Haworth representation

Polysaccharides

- Amylose and cellulose

LIPIDS

Classification

Fatty Acids

- Saturated
- Unsaturated/configuration
- Chain length
- Nomenclature
- Melting Point

Triacylglycerols (Triglycerides)

- Structure
- Components
- Properties
- Function

Polar lipids

- Glycerophospholipids
 - Components
- Sphingolipids
 - Components

Properties

Function

Lipid bilayer structure

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ENZYME KINETICS

Velocity vs. reactant (substrate) plot
Uncatalyzed 1st order reaction
Enzyme catalyzed reaction

Dependence of V_{max} on enzyme concentration
Kinetic scheme for enzyme catalyzed reaction
Derivation of Michaelis-Menten equation
Steady-state approximation
 K_M
 V_{max}

Relation of K_M to K_S and substrate affinity
Determination of K_M , V_{max} from Lineweaver-Burke plot

Competitive inhibition
V vs. [S] plot
Kinetic scheme
Equation for V
Determination of K_i
Relation of K_i values to structure and substrate binding site

Noncompetitive inhibition
V vs. [S] plot
Kinetic scheme
Equation for V
Determination of K_i
Site on enzyme associated with non-competitive inhibition

Enzyme catalysis
Catalytic triad in chymotrypsin
Role of His, Ser, Asp
Thiol proteases
Role of cys mercapto group

Enzyme regulation
Allosteric control by small molecules
Sigmoidal dependence of v on substrate
Changes in quaternary structure
Control by proteins
Covalent Modification
Proteolytic activation