

Chemistry 4055 (Spring 2013)
Exam 3 Study Guide

Chapter 7

Monosaccharides

- Aldoses
- Ketoses
- Enantiomers
- Diastereomers
- Epimers
- Anomers
- Know how to determine the number of stereoisomers that a sugar will have. You can memorize the rules that I taught you.
- Be able to distinguish between D and L isomers of sugars.
- Hemiacetal/hemiketal
- Acetal/Ketal
- Differentiate between furanose and pyranose structures.
- Be familiar with different common types of sugar derivatives (Figure 7.9).
- Be able to recognize a reducing sugar and know under what conditions a sugar acts as a reducing agent.
- Aldose-ketose isomerization
- Glucose oxidase

Disaccharides

- O-glycosidic bond
- Dihedral angles ϕ (phi) and Ψ (psi)
- Reducing versus nonreducing
- The abbreviated naming system

Oligosaccharides/Polysaccharides (or glycans)

- Homopolysaccharides
- Heteropolysaccharides
- Linear structures
- Branch structures
- Defining polysaccharide molecular weight
- Storage polysaccharides
 - Structure
 - Efficiency of sugar storage
 - Osmolarity
 - Metabolism
 - Glycogen

- Starch
- Structural polysaccharides
 - Structure
 - Metabolism
 - Cellulose
 - Chitin
 - Glycosaminoglycans
- Information Carriers
 - Glycoproteins
 - O-linked
 - N-linked
 - Physiological location
 - Glycolipids
 - Structure
 - Sugar linkage
 - Physiological location
 - Proteoglycans
 - Sugar linkages
 - Syndecans
 - Glypicans
 - Aggregates and function
 - Physiological location
- Oligosaccharides
 - Lectins
 - Sugar Code

I do not require that you memorize the sugars listed on page 241 but familiarity with them will greatly help you. Know how to draw monosaccharides in linear form, cyclic form, and where applicable in the chair conformation. Also know how to draw disaccharides. PRACTICE, PRACTICE, PRACTICE.

Chapter 8

Nucleotides

- Function
- Composition and structure
- Nucleobases (Memorize them)
 - Pyrimidines
 - Purines
 - Charge
 - Atom number system
 - Connection to sugar component
 - Tautomers
 - General understanding of unusual nucleobases and why they may be important
 - Absorbance
 - Hyperchromic effect
 - Hypochromic effect
- Pentose (D-ribose)
 - Form in RNA
 - Form in DNA
 - Endo vs exo conformation
- Phosphate group
 - Sugar attachment
- Nucleosides
- Abbreviations for nucleotides

Nucleic Acids

- Function
- Primary Structure
 - Phosphodiester linkage
 - Hydrophilic backbone and nucleobases as sidegroups
 - 5'-3' directionality
- Secondary Structure
 - Contributions by scientists to DNA structure
 - Friedrich Miescher
 - Erwin Chargaff
 - Rosalind Franklin
 - James D. Watson
 - Francis Crick
 - Maurice Wilkins
 - DNA
 - Watson-Crick Model (B form) and DNA Replication
 - Hydrophilic backbone
 - Hydrophobic interior
 - Base Stacking
 - Base pairing (Watson Pairing and Hoogsteen Pairing)

G-C

A-T

- Antiparallel and parallel strand pairing
- A form
- Z form
- Triplex form
- G-tetraplex form
- Anti and syn conformation of nucleobases
- Palindrome
- Hairpin loops
- Cruciform
- Mirror Repeats
- Circular and linear form
- RNA
 - Single-stranded structure
 - Double-stranded structure
 - Base-pairing
 - Physiologically relevant A form
 - Bulges
 - Internal loops
- Tertiary Structure
 - DNA supercoiling
- Agarose Gels
 - Size based on #BP
 - Movement through gels based on DNA conformation
- DNA and RNA stability
 - DNase
 - Base-catalyzed RNA hydrolysis
 - RNase
 - RNase P
 - Dicer
 - Thermal Denaturation
 - Two-step process
 - Used to perform PCR
 - Melting temperature (T_m)
 - Factors that affect T_m
 - DNA Hybridization and evolutionary relatedness
 - Nonenzymatic Transformations
 - Spontaneous Mutagenesis
 - Radiation-induced Mutagenesis

Chapter 9

Transcription

Translation

The Genetic Code

Workflow for DNA Cloning and Protein Expression

- DNA cloning
 - Important enzymes
 - Restriction enzymes (Sticky vs blunt ends)
 - DNA ligase
 - Cloning Vectors and understanding the components of plasmids
 - Plasmid
 - BAC
 - YAC
 - Advantages of each
 - Recombinant DNA
 - Host Cell
 - Transformation and methods
 - Agar plates
 - Determining whether host cell contains recombinant DNA
 - Agarose Gel
 - Sanger Method
- Polymerase chain reaction (PCR)
 - Creating forward and reverse primers for designing modified genes of interest
 - Polymerase
 - Methodology
- Protein Expression
 - Expression vectors
 - Components of expression vectors
 - Bacterial recognition sequence (Shine-Dalgarno)
 - Eukaryotic recognition sequence (Kozak sequence)
- Gene Mutations
 - Site-directed mutagenesis
 - Oligonucleotide-directed mutagenesis
 - Mutations to append a tag for protein purification
 - Common protein tags
 - Methodology for purifying tagged proteins