Study Guide for Exam #4 (Ch. 8-14)

Chem21, Introduction to Organic and Biochemistry

MEMORIZE

- Saponification and acidic hydrolysis conditions
- 1- and 3-letter abbreviations and full names of "intuitive" amino acids
- Secondary structures of proteins (α-helix, β-sheet)
- Induced Fit and Lock-and-Key Model for enzyme specificity
- Start codon (AUG)
- Structures of AcetylCoA, AMP, ADP, ATP

Chapter 8: Lipids

I. Fatty Acids (8.2-3): Be able to identify a fatty acid from its structure and determine whether it is (1) saturated or unsaturated, (2) a fat or an oil, (3) cis or trans (if applicable), and its relative solubility or melting point compared to another structure. Be able to identify its polar/hydrophilic and nonpolar/hydrophobic portions. Be able to draw the products from esterification with glycerol into a triglyceride.
Examples, Ch. 8: 5, 9-10, 14

II. Triglycerides (8.4): Be able to draw the structures of the products from (1) saponification, (2) acidic hydrolysis, and (3) partial or complete hydrogenation of a triglyceride.
Examples, Ch. 8: 19, 21-22

III. Other Lipids (8.5-): Be able to match the structure of a lipid to its classification: (1) wax, (2) phosphoglyceride, (3) sphingolipid, (4) steroid, or (5) prostaglandin. Be able to identify the core structure in a steroid.
Examples, Ch. 8: 24, 27, 35, 44, 55

Chapter 9: Proteins

I. Structures of Amino Acids (9.1-2): Be able to identify the amine, carboxylic acid, and side chain portions of individual amino acids. Be able to draw their zwitterionic, acidic conditions, and basic conditions forms. Be able to interpret the "intuitive" 1- and 3-letter abbreviations and full names for the "intuitive" amino acids.
Examples, Ch. 9: 3, 12-13

II. Formation of Peptides (9.3-4): Be able to determine the structure of the peptide formed from individual amino acids. Be able to identify the linking amide group and peptide bonds in a protein.
Examples, Ch. 9: 15-21

III. Structures of Proteins (9.6-9): Be able to identify an α-helix and a β-sheet (parallel or antiparallel) and the intermolecular forces (hydrogen bonding in the backbone) that holds it together. Given the structures of the amino acids' side chains, be able to determine which tertiary structure interaction (disulfide bridges, salt bridges, hydrogen bonds, or hydrophobic interactions).
Examples, Ch. 9: 35, 37-38, 40-43

Chapter 10: Enzymes

I. Enzyme Activity (10.4): Know how to describe the Lock and Key Model and Induced Fit Model for enzyme specificity, being able to list their similarities and differences.
Examples, Ch. 10: 20-21

II. Factors Affecting Enzyme Activity (10.6-7): When given graphs, be able to interpret them to find the point of saturation and optimal temperatures and pH's for an enzyme. Be able to describe the effect of changing concentration of enzyme and of substrate on enzyme activity. Be able to describe the effects of both a competitive and a noncompetitive inhibitor, and which enzyme model explains each.
Examples, Ch. 10: 27-29, 34

Chapter 11: Nucleic Acids and Protein Synthesis

I. Structure of DNA (11.1-2): When given the structures, be able to identify each of the four nucleic acids. Be able to label the phosphate ester, the deoxyribose, and the nucleic acid in a strand of DNA, as well as the 3' and 5' ends.
Examples, Ch. 11: 8, 10-15

II. DNA Replication (11.3): When given the primary structure of a strand of DNA, be able to label the lagging and leading strands and determine the primary structure of the new strand of DNA created by copying the leading strand.
Examples, Ch. 11: 22, 24

III. RNA Transcription (11.4-6): When given the primary structure of a strand of DNA, be able to label the lagging and leading strands and determine the primary structure of the new strand of RNA created by copying the leading strand. When given the structures of the four bases, be able to identify adenine, cytosine, guanine, and uracil.
Examples, Ch. 11: 26-27, 34

IV. Translation (11.7): Be able to use the Genetic Code to determine the primary structure of the protein synthesized from a strand of RNA.
Examples, Ch. 11: 37-38, 45, 47

Chapter 12: Nutrition

I. Nutrients (12.2-3): Be able to determine whether a compound is a macro- or micronutrient.
Examples, Ch. 12: 4, 7, 15

II. Energy molecules (12.6-7): Know how to draw the structure of acetylCoA, and identify AMP, ADP, and ATP when given the structures.
Examples, Ch. 12: 33, 35, 37

III. NAD+ and FAD (12.8): Know how to recognize the oxidized and reduced forms of NAD+ and FAD and use them to determine whether the reaction is an oxidation or reduction.
Examples, Ch. 12: 49-51, 54

Chapter 13: Carbohydrate Metabolism

I. Glycolysis (13.3): Given individual steps in glycolysis, be able to identify what changed and classify the type of reaction occurring, if applicable.

II. The Citric Acid Cycle (13.5): Given individual steps in the Citric Acid Cycle, be able to identify what changed and classify the type of reaction occurring, if applicable.

Chapter 14: Lipid and Amino Acid Metabolism

I. β-oxidation of Fatty Acids (14.4): Given the individual steps in the β-oxidation cycle, be able to identify what changed and classify the type of reaction occurring, if applicable. Given the formula of a fatty acid, be able to determine the number of times it can participate in β-oxidation and the amount of ATP it will produce.

II. The Urea Cycle (14.9): Given the individual steps in the Urea Cycle, be able to identify what changed and classify the type of reaction occurring.