Chemistry 1120 Exam 3 Study Guide

Chapter 9

9.1 and 9.2 Know there are 20 common amino acids that can polymerize into proteins. Know why amino acids are called alpha amino acids. Identify the charges of a zwitterion.

- Master Tutor Section 9.1, 9.2
- Review Sections 9.1, 9.2 in the Concept Summary
- For practice, do Exercises 9.2, 9.9, 9.12, 9.14

9.3 Identify the N- and C- terminal ends of a small peptide. Identify the peptide linkage in a dipeptide and know that it is an amide linkage. Know that the amino (amine) group of one amino acid reacts with the carboxyl (acid) group of another to form this amide linkage.

- Master Tutor Section 9.3
- Review Section 9.3 in the Concept Summary
- Review Learning Check 9.2
- For practice, do Exercise 9.18

9.4 Recognize that -SH side chains can react to form disulfide bridges. Identify the functions of oxytocin, ADH (vasopressin), and ACTH.

- Master Tutor Section 9.4
- Review Section 9.4 in the Concept Summary
- For practice, do Exercise 9.23

9.5 a) Know the functions of proteins in the body. From this list, identify the function of enzymes, keratin, insulin, antibodies, and ferritin.

b) Differentiate between globular (ie. Enzymes) and fibrous (is. Collagen, actin and myosin) proteins. Differentiate between simple and conjugated proteins. Know what prosthetic groups are.

- Master Tutor Section 9.5
- Review Section 9.5 in the Concept Summary
- For practice, do Exercises 9.29, 9.30

9.6 Know the primary structure of a protein is its string of amino acids connected by peptide bonds.

- Master Tutor Section 9.6
- Review Section 9.6 in the Concept Summary
- For practice, do Exercise 9.34

9.7 Know hydrogen bonds between C=O and N-H groups within a polypeptide chain gives rise to a protein's secondary structure. Differentiate between α-helix and β-pleated sheet structures.

- Master Tutor Section 9.7
- Review Section 9.7 in the Concept Summary
- For practice, do Exercises 9.37, 9.38

9.8 a) Know salt bridges, disulfide bonds, hydrogen bonds and hydrophobic interactions determine a protein's tertiary structure. Identify salt bridge structures, disulfide bridge formations, and polar side chains that can hydrogen bond.
b) Recognize that nonpolar hydrophobic side chains will be found on the interior of a protein. Identify side chains that are nonpolar and cannot hydrogen bond.

- Master Tutor Section 9.8
- Review Section 9.8 in the Concept Summary
- Review Learning Check 9.3
- For practice, do Exercises 9.40, 9.42

9.9 Recognize that two or more polypeptide subunits can be held together to give a protein its quaternary structure. Hemoglobin is an example of a protein with quaternary structure.

- Master Tutor Section 9.9
- Review Section 9.9 in the Concept Summary
- For practice, do Exercise 9.45

9.10 Recognize that such things as cooking, heavy metal ions, and U.V. light can cause proteins to lose their tertiary and secondary structure, thus denaturing them. In the hydrolysis of a protein the primary structure is lost, yielding amino acid residues.

- Master Tutor Section 9.10
- Review Section 9.10 in the Concept Summary
- For practice, do Exercise 9.49

Chapter 10

10.1 Recognize that enzyme catalyze reactions by lowering activation energies. Know the definition of a catalyst. Differentiate between absolute, relative and stereochemical specificity of enzymes. Know enzymes are regulated.

- Master Tutor Section 10.1
- Review Section 10.1 in the Concept Summary
- For practice, do Exercises 10.3, 10.5, 10.6

10.2 Identify examples when an enzyme functions as a transferase, hydrolase, or dehydrogenase. From the name of an enzyme, determine the substrate is acts on, indicating its absolute specificity.

- Master Tutor Section 10.2
- Review Section 10.2 in the Concept Summary
- Review Learning Check 10.1
- For practice, do Exercise 10.10

10.3 Know apoenzymes are inactivated enzymes that are activated with the addition of a coenzyme or cofactor. Differentiate between coenzymes (ie. organic vitamins) and cofactors (ie. metal ions).

- Master Tutor Section 10.3
- Review Section 10.3 in the Concept Summary
- For practice, do Exercises 10.13, 10.14, 10.15, 10.17

10.4 Differentiate between the lock-and-key and induced-fit theories of enzyme operation. Both account for an enzyme's specificity. Know what an active site is.

- Master Tutor Section 10.4
- Review Section 10.4 in the Concept Summary
- For practice, do Exercises 10.18, 10.20, 10.21

10.5 Know enzyme assays are done to determine an enzymes activity (efficiency). Results of the assay are given as turnover numbers (number of substrate molecules acted on by one enzyme molecule per

minute) or international units (the quantity of enzyme needed to convert 1 μ mole of substrate in 1 minute).

- Master Tutor Section 10.5
- Review Section 10.5 in the Concept Summary
- Review Learning Check 10.2
- For practice, do Exercise 10.25

10.6 a) Predict how changing enzyme or substrate concentrations in an enzyme catalyzed reaction will affect reaction rate. Recognize when Vmax will occur and why it occurs.
b) Predict the effect of changing pH or temperature on the rate of an enzyme catalyzed reaction. Know the optimum pH is usually around 7, and the optimum temperature is usually 25-40^{o}C. Understand how enzyme activity is changed (ie. decreased turnover number, denaturation).

- Master Tutor Section 10.6
- Review Section 10.6 in the Concept Summary
- Review Learning Check 10.3
- For practice, do Exercise 10.27

10.7 a) Know the definitions of competitive (ie. sulfa drugs), noncompetitive, and irreversible (ie. heavy metals) inhibitors and differentiate between them. Know cyanide is an irreversible inhibitor that covalently binds with iron atoms in cytochrome oxidase.
b) Based on experimental results, determine if an inhibitor is competitive, noncompetitive, or irreversible.

- Master Tutor Section 10.7
- Review Section 10.7 in the Concept Summary
- Review Learning Check 10.4
- For practice, do Exercises 10.33, 10.34, 10.35

10.8 a) Know allosteric enzymes have a location other than the active site where modulators can bind to influence the enzyme's activity. Modulators can have a negative (ie. noncompetitive inhibitor, feedback inhibition) or positive influence.
b) Identify what zymogens are and instances of enzyme induction.

- Master Tutor Section 10.8
- Review Section 10.8 in the Concept Summary
- Review Learning Check 10.5
- For practice, do Exercises 10.38, 10.41, 10.42, 10.44

10.9 Know what isoenzymes are. Know blood serum analysis of isoenzymes can detect cell damage or imply the site of tissue damage. Common isoenzymes include lactate dehydrogenase, creatine kinase and lipase.

- Master Tutor Section 10.9
- Review Section 10.9 in the Concept Summary
- For practice, do Exercise 10.46

Chapter 11

11.1 Differentiate between RNA and DNA based on location in the cell, sugar groups and nucleotide bases. Know nucleic acids are polymers of nucleotides.

- Master Tutor Section 11.1
- Review Section 11.1 in the Concept Summary
- Review Learning Check 11.1
- For practice, do Exercises 11.2, 11.4

11.2 Recognize DNA is a helix of 2 antiparallel strands of nucleic acids held together with hydrogen bonds between purine and pyrimidine base pairs. The backbone of each DNA strand consists of alternating phosphates and sugars. Identify bases as pyrimidines or purines, and which base hydrogen bonds with another. Given a DNA strand in the 5'→3' direction, predict the antiparallel strand in the 5'→3' direction.

- Master Tutor Section 11.2
- Review Section 11.2 in the Concept Summary
- Review Example 11.1 and Learning Check 11.2
- For practice, do Exercises 11.8, 11.12, 11.14

11.3 Know the function of histones, DNA polymerase, Okazaki fragments, and DNA ligase. Know the definition of semi-conservative replication and that a human cell contains 46 chromosomes which contain genes that code for specific proteins.

- Master Tutor Section 11.3
- Review Section 11.3 in the Concept Summary
- For practice, do Exercises 11.16-11.22

11.4 a) Know t-(transfer) RNA is the smallest RNA molecule and transports amino acids to the site of protein synthesis the 3' end of the t-RNA molecule attaches to the amino acid and the anticodon portion binds to m-RNA.
b) Know that m-(messenger) RNAs carries the information for protein synthesis from the nucleus to the cytoplasm. The majority of a cell's RNA is r-(ribosomal) RNA, which is the site of protein synthesis where amino acids link together. All forms of RNA are found in the cytoplasm.

- Master Tutor Section 11.4

- Review Section 11.4 in the Concept Summary
- For practice, do Exercises 11.26, 11.28

11.5 Recognize the flow of genetic information as DNA → transcription in nucleus → mRNA → translation in cytoplasm → protein polypeptide.

- Master Tutor Section 11.5
- Review Section 11.5 in the Concept Summary
- For practice, do Exercises 11.31, 11.32

11.6 Recognize hnRNA is synthesized by RNA polymerase from a DNA template. hnRNA contains both exon (codes for proteins) and intron (useless?) information. The introns are "snipped out" to form mRNA. Know which DNA base pairs with which RNA base. Given a DNA strand in the 5'→3' direction, predict the mRNA strand transcribed in the 5'→3' direction.

- Master Tutor Section 11.6
- Review Section 11.6 in the Concept Summary
- Review Example 11.2 and Learning Check 11.3
- For practice, do Exercise 11.36

11.7 Recognize the genetic code is mostly universal codons (3 nucleotides) on an m-RNA molecule code for an individual amino acid. Most of the genetic code is degenerate in that more than one codon codes for an individual amino acid. There are 3 codons that code for chain termination and 1 that codes for the start of the chain (methionine).

- Master Tutor Section 11.7
- Review Section 11.7 in the Concept Summary

- For practice, do Exercises 11.38, 11.40

11.8 a) Know and apply that 3 nucleotides (1 codon) on mRNA are needed to code for 1 amino acid in a polypeptide. Translocation is the movement of a ribosome on mRNA. Polysomes are several ribosomes on a single mRNA.
b) Know protein synthesis consists of initiation, elongation, and termination. The initiation complex includes the mRNA strand, large and small ribosomal subunits, and f-Met tRNA. tRNA molecules bring in amino acids to the A site of the ribosome, which then translocates to the P site as elongation occurs.

- Master Tutor Section 11.8
- Review Section 11.8 in the Concept Summary
- Review Learning Check 11.4
- For practice, do Exercises 11.41, 11.42, 11.44, 11.45, 11.46

11.9 Know that changes in the DNA code (mutations) can be caused by chemicals (mutagens), ionizing radiation (gamma and X-rays and U.V. light) and occur naturally during replication (incorrect base pairing). Know which bases pair together.

- Master Tutor Section 11.9
- Review Section 11.9 in the Concept Summary
- For practice, do Exercise 11.48

11.10 Recognize that recombinant DNA in genetic engineering is formed by combining the DNA of two different organisms. Identify the functions of restriction enzymes, vectors, plasmids, and ligases in making recombinant DNA.

- Master Tutor Section 11.10
- Review Section 11.10 in the Concept Summary
- For practice, do Exercises 11.51-11.53