

SAN DIEGO STATE UNIVERSITY
CHEMISTRY 563 -- Nucleic Acid Function and Protein Synthesis
Fall 2014

PLEASE SEE THE BLACKBOARD WEB SITE FOR FUTURE ANNOUNCEMENTS
AND TO DOWNLOAD POWERPOINT SLIDES

Lectures: TTh 11:00-11:50 in GMCS-305

Textbook: Voet, Voet, and Pratt: “**Fundamentals of Biochemistry**”, 4th Edition, Wiley, 2012.
(Most of you have used this same text and edition for Chem 560.)

Instructor: Professor William Stumph, Ph.D.
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Phone: (619) 594-5575
Office hours: T,Th, 12:00-13:00 or **just about anytime by appointment.**

Prerequisite: Chemistry 560 or the equivalent (one semester of upper-level biochemistry).

Expected Student Learning Outcomes:

- 1) To understand the molecular mechanisms by which living cells synthesize DNA, RNA, and proteins.
- 2) To understand and be able to recognize how macromolecules such as DNA, RNA, and proteins interact with each other, and to be able to predict the outcomes of such interactions.
- 3) To understand and recognize how the structure of macromolecules relates to their function, and to be able to understand macromolecule biochemical function based upon structure.
- 4) To understand how the expression of genetic information is regulated.
- 5) To understand the theory behind important technologies utilized in the biochemistry/biotechnology research laboratory.

Expectations: Regarding Powerpoints and your lecture notes: The Powerpoint slides will be available for download from the SDSU Blackboard web site. Essentially all of the slides will be available as PDF files. **It is recommended to the strongest degree that you print out those pages before class and that you write your lecture notes directly on the pages with the Powerpoint images.** If possible, you should print the Powerpoint images in color.

Examinations: There will be three mid-term exams of 100 points each and a comprehensive final exam worth 150 points. There are thus a total of 450 points possible for the course. The final examination will have approximately 50-60 points on material covered after the third mid-term, and 90-100 points on material previously tested upon in the first three mid-terms.

Grading scale:	405-450 points (90-100%):	A
	360-404 points (80-90%):	B
	315-359 points (70-80%):	C
	270-314 points (60-70%):	D
	<270 points (<60%)	F

Exams will contain primarily multiple choice, but also some short answer, questions. You are not responsible for knowing everything in the textbook. **Unless noted otherwise, you are responsible for everything presented in the Powerpoint slides and for everything written on the physical blackboard during lecture, as well as the oral lecture. There will definitely be material presented in lecture and written on the board that is not in the Powerpoints. Thus, attendance at lecture is important!**

No calculators or electronic devices of any kind are allowed at the exams.

The multiple choice questions on the exams will be answered on SCANTRON forms.

On Tuesday, September 16, bring four completely blank SCANTRON forms No. 882-E to class and give them to me. Do not put your names or any marks on them. Be sure that I check off your name so that there is a record that I have received them from you. I will distribute blank Scantrons back to you for your use on the days of the exams.

Examples of past exam questions from previous years will be provided on the Blackboard Web Site.

The lecture schedule on the next page is approximate and subject to change.

However, the dates for the three mid-terms and the final exam are fixed and will not change.

SYLLABUS STATEMENT for Students with Disabilities

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at [\(619\) 594-6473](tel:6195946473). To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Disability Services. Your cooperation is appreciated.

Chem 563: Nucleic Acid Function and Protein Synthesis -- Fall 2014

(Tentative Lecture Schedule; Exam Dates Are Firm)

DATE	TOPIC	Reading
1 August 26	Nucleotides, Nucleic Acid structure	Chapter 3 pp 40-49
2 August 28	Chemical properties of DNA and RNA; RNA enzymes and the RNA World; the size of DNA molecules.	Chapter 24 pp 838-846
3 September 2	The Central Dogma; DNA/Genome sequencing, Molecular Evolution and derivation of phylogenies from molecular sequence data; Prokaryotic DNA replication.	Chpt.3 pp 49-51, pp 58-62; Chapter 25 pp 867-884
4 September 4	Prokaryotic DNA replication.	Chapter 25, pp 867-884;
5 September 9	Restriction Enzymes; Gel Electrophoresis of nucleic acids; Recombinant DNA and PCR; practical applications	Chpt. 3, pp 52-54; pp 847-851 Chapter 3 pp 62-65, 67-72
6 September 11	Nucleic acid purification, fractionation, geometry of DNA	Chapter 24 p 846; 848-855
7 September 16	DNA Supercoiling and Topoisomerases	Chapter 24 pp 830-838
8 September 18	DNA Supercoiling, Topoisomerases; Transcription, Bacterial RNA polymerase, Promoters	Chapter 24 pp 830-838 Chapter 26 pp 919-930
9 September 23	FIRST MID-TERM EXAMINATION	
10 September 25	Transcription: Bacterial RNA polymerase; Promoters, Initiation; Elongation and termination;	Chapter 26 pp 919-930
11 September 30	Eukaryotic RNA polymerases and eukaryotic promoters	Chapter 26 pp 929-937
12 October 2	Eukaryotic General Trxn Factors and Preinitiation Complex Assembly	Chapter 26 pp 937-942
13 October 7	Post-transcriptional RNA processing: eukaryotic mRNA capping, polyadenylation, and splicing; Group II and Group I self-splicing introns	Chapter 26 pp 942-959
14 October 9	Alternative Splicing; RNA editing; rRNA and tRNA processing;	Chapter 26 pp 942-959
15 October 14	Translation: the genetic code; tRNAs and aminoacylation	Chapter 27 pp 962-974
16 October 16	Translation: Codon-anticodon interactions; Wobble; Ribosomes	Chapter 27 pp 974-984
17 October 21	SECOND MID-TERM EXAMINATION	
18 October 23	Polypeptide chain initiation, elongation, and termination.	Chapter 27 pp 984-1004
19 October 28	Protein synthesis inhibitors (antibiotics); posttranslational processing	Chapter 27 pp 1000-1009
20 October 30	Regulation of prokaryotic gene expression; the lac operon and its repression and activation; helix-turn-helix DNA-binding motif ; Riboswitches	Chapter 28 pp 1023-1028 Chapter 24 pp 851-852; 1030-1032
21 November 4	Regulation of Eukaryotic Gene Expression: Activators and Repressors of Transcription; DNA binding domains in eukaryotic transcription factors	Chapter 28 pp 1043-1049 Chapter 24 pp 854-857
22 November 6	Eukaryotic chromosomes and chromatin structure; histones; nucleosomes	Chapter 24 pp 858-863
23 November 11	Veteran's Day Holiday	
24 November 13	Role of Chromatin in eukaryotic gene regulation; RNA interference; Genomics	Chapter 28 pp 1032-1043 1049-1055; 1013-1023
25 November 18	Cell Cycle, Cancer and Apoptosis (programmed cell death)	Chapter 28 pp 1059-1068
26 November 20	Eukaryotic DNA Replication	Chapter 25 pp 884-891
27 November 25	THIRD MID-TERM EXAMINATION	
28 November 27	Happy Thanksgiving!	
29 December 2	Retroviruses; Reverse Transcriptase; Telomerase; Aging	Chapter 25 pp 884-891
30 December 4	DNA damage and repair; DNA recombination	Chapter 25 pp 891-904
31 December 9	Antibodies and DNA rearrangements for antibody production.	Chapter 7, pp 208-213 Chapter 28 pp 1056-1059
32 December 16	FINAL EXAMINATION – Tuesday, Dec. 16, 10:30-12:30, GMCS305	Comprehensive Exam