

BRTP 821 – Macromolecular Structure and Function

August 12, 2009

Fall 2009 4 Credit Hours

Lectures: DRC I 1004 from 3-4 p.m. MWF

Recitations: DRC I rooms as assigned 9-10:30 a.m. and 10:30 a.m.-12 noon, Thursdays (see schedule attached)

Exams: 3-6:00 p.m. (see below for room assignments and dates)

Course Description and Syllabus

Co-Coordinators: Richard G. MacDonald, Ph.D., 9-7824, DRC I 7009, Zip 5870
Dept. of Biochemistry and Molecular Biology

Pawel S. Ciborowski, Ph.D., 9-3733, DRC I 3048, Zip 5800
Dept. of Pharmacology and Experimental Neuroscience

Description: This course provides an introduction to fundamental concepts in the biochemistry of macromolecules, including the structure, characterization, purification and functional analysis of proteins and nucleic acids. Basic material related to thermodynamics, acid-base, intermolecular interactions, chemical equilibria, and enzymology lead to discussion of synthesis, folding, and degradation of proteins. Basic information on the structure of DNA and RNA leads to discussion of the mechanisms of replication, repair, recombination, restriction and the tools of molecular biology. In addition to 3 lecture hours per week, recitation sessions consist of weekly small-group meetings overseen by teaching assistants. Recitation activities include administration of quiz questions to assess knowledge gained and to guide discussion of material covered in the past week of the course, question-and-answer sessions to review major concepts, and partnered problem solving exercises.

Lecture Schedule

Week	Date	Day	Lecture Topic	Lecturer	No.
1	Aug. 24*	M	Noncovalent Interactions in Water	MacDonald	1
	Aug. 24*	M	Proteins: Building Blocks	MacDonald	2
2	Aug. 31*	M	Proteins: Primary Structure	MacDonald	3
	Aug. 31*	M	Proteins: Higher Levels of Organization I	MacDonald	4
	Sept. 2	W	Proteins: Higher Levels of Organization II	MacDonald	5
	Sept. 4	F	Thermodynamics I	Marky	6
3	Sept. 7	M	Labor Day – NO CLASS		
	Sept. 9	W	Thermodynamics II	Marky	7
	Sept. 11	F	Energetics and Chemical Equilibria I	Marky	8
4	Sept. 14	M	Energetics and Chemical Equilibria II	Marky	9
	Sept. 16	W	Nucleic Acids: Primary Structure of DNA & RNA I	Lockridge	10
	Sept. 18	F	Nucleic Acids: Primary Structure of DNA & RNA II	Lockridge	11
5	Sept. 21	M	Proteins: Folding I	Ciborowski	12
	Sept. 23	W	Proteins: Folding II	Ciborowski	13
	Sept. 25	F	EXAMINATION 1 (Lectures 1-13, DRC 1002)		
6	Sept. 28	M	Nucleic Acids: Secondary Structure of DNA	Haorah	14
	Sept. 30	W	Nucleic Acids: Tertiary Structure of DNA	Haorah	15
	Oct. 2	F	Nucleic Acids: Structure of rRNA and tRNA	Haorah	16
7	Oct. 5	M	Chromatin Structure	Haorah	17
	Oct. 7	W	DNA Replication: Mechanisms	Shcherbakova	18
	Oct. 9	F	DNA Replication: Enzymes	Shcherbakova	19

*Note double-lecture days on August 24 and 31.

Week	Date	Day	Lecture Topic	Lecturer	No.
8	Oct. 12	M	DNA Replication: Reconstitution of Replication Machinery	Shcherbakova	20
	Oct. 14	W	DNA Repair: Types of DNA Damage	Pavlov	21
	Oct. 16	F	DNA Repair: Mechanisms of Repair	Pavlov	22
9	Oct. 19	M	Fall Break---No Class		
	Oct. 21	W	DNA Recombination**	Pavlov	23
	Oct. 23	F	Restriction and Modification of DNA	Klinkebiel	24
10	Oct. 26	M	Mobile DNA	Klinkebiel	25
	Oct. 28	W	Recombinant DNA Technology I	Klinkebiel	26
	Oct. 30	F	Recombinant DNA Technology II	Klinkebiel	27
11	Nov. 2	M	Recombinant DNA Technology III	Klinkebiel	28
	Nov. 4	W	Genetic Sequence Analysis	Klinkebiel	29
	Nov. 6	F	Protein Database Applications	Ciborowski	30
12	Nov. 9	M	EXAMINATION 2 (Lectures 14-28*, ESH 3010)		
	Nov. 11	W	Proteins: Characterization and Analysis I	Sorgen	31
	Nov. 13	F	Proteins: Characterization and Analysis II/ Purification Strategies I	Sorgen	32
13	Nov. 16	M	Proteins: Purification Strategies II	Sorgen	33
	Nov. 18	W	Detection of Protein-Protein Interactions	Sorgen	34
	Nov. 20	F	Protein Translation I	Caplan	
14	Nov. 23	M	Protein Translation II	Caplan	35
	Nov. 25	W	Protein Degradation**	Caplan	36
	Nov. 27	F	Thanksgiving Break – NO CLASS		
15	Nov. 30	M	Enzymes: Kinetics, Selected Models	Ramaley	38
	Dec. 2	W	Enzymes: Catalytic Mechanism for Chymotrypsin	Ramaley	39
	Dec. 4	F	Enzymes: Thermodynamics, Kinetics and Reaction Pathways	Ramaley	40
16	Dec. 7	M	Enzymes: Mechanisms and the Role of Coenzymes	Ramaley	41
	Dec. 9	W	Enzymes: Regulation and Metabolic Control	Ramaley	42
	Dec. 11	F	Enzymes: Molecular Biology of Mechanisms	Ramaley	43
17	Dec. 17	Th	EXAMINATION 3 (Lectures 31-43, DRC 1002)		

Lecturers

Dr. Steven H. Caplan, BMB, DRC I 7013, 9-7556, Zip 5870, SCAPLAN
Dr. Pawel S. Ciborowski, BMB, DRC I 3048, 9-3733, Zip 5800, PCIBOROWSKI
Dr. James Haorah, PEN, SWH 4069, 9-5406, Zip 5215, JHAORAH
Dr. David L. Klinkebiel, BMB, DRC I 7012, 9-3842, DKLINKEBIEL
Dr. Oksana Lockridge, EI/BMB, ECI 6017A, 9-6032, Zip 6805, OLOCKRID
Dr. Richard G. MacDonald, BMB, DRC I 7009, 9-7824, Zip 5870, RGMACDON
Dr. Luis A. Marky, PHARM SCI, COP 3040, 9-4628, Zip 6025, LMARKY
Dr. Youri I. Pavlov, EI/BMB, ESH 7009, 9-7717, Zip 6805, YPAVLOV
Dr. Robert F. Ramaley, BMB, DRC I 7008, 9-6662, Zip 5870, RRAMALEY
Dr. Polina V. Shcherbakova, EI, ESH 7008 9-7694, Zip 6805, PSCHERB
Dr. Paul L. Sorgen, BMB, DRC I 7011, 9-7557, Zip 5870, PSORGEN

Recitation Schedule

Small-group recitation activities will include short quizzes designed for self-assessment and do not count toward the final grade as well as problem-solving exercises. These sessions will be overseen by teaching assistants. Assignment of students to recitation sections A through D will be made by the course coordinators during the first week of classes. If students have any questions regarding their section assignments, they should address them to the course coordinators at that time. Attendance at the recitation sections is strongly recommended, but not mandatory.

Sections A and B meet Thursdays at 9-10:30 a.m. in DRC I rooms 7004 (A) and 7006 (B); Sections C and D meet Thursdays at 10:30-noon in DRC I rooms 7004 (C) and 7006 (D).

Week	Date	Day	Sections	Lecture Material Covered
1	Aug. 27	Th	1A,B,C,D	MacDonald lectures 1-2
2	Sept. 3	Th	2A,B,C,D	MacDonald 3-5
3	Sept. 10	Th	3A,B,C,D	Marky 6-7
4	Sept. 17	Th	4A,B,C,D	Marky 8-9
5	Sept. 24	Th	5A,B,C,D	Lockridge 10-11, Ciborowski 12-13, Exam 1 prep
6	Oct. 1	Th	6A,B,C,D	Haorah 14-15
7	Oct. 8	Th	7A,B,C,D	Haorah 16-17
8	Oct. 15	Th	Recitations Cancelled for BRTP 822 Exam	
9	Oct. 22	Th	9A,B,C,D	Shcherbakova 18-20
10	Oct. 29	Th	10A,B,C,D	Pavlov 21-23
11	Nov. 5	Th	11A,B,C,D	Klinkebiel 24-28, Exam 2 prep.
12	Nov. 12	Th	Recitations Cancelled—Post-Exam	
13	Nov. 19	Th	14A,B,C,D	Sorgen 31-34
14	Nov. 27-28	Th/F	Thanksgiving Break—NO CLASS	
15	Dec. 3	Th	15A,B,C,D	Caplan 35-37
16	Dec. 10	Th	16A,B,C,D	Ramaley 38-41, Exam 3 prep.

Textbook and Resources

The prescribed textbook for this course is **Biochemistry** by Mathews, van Holde and Ahern, 3rd edition. Students are encouraged to become familiar with and utilize the resources of the UNMC Leon S. McGoogan Library of Medicine, especially the current literature holdings, as well as online biomedical literature. Many electronic journals are also available through the library website. Individual faculty may make library assignments and/or provide relevant study problems and questions which will require use of the library or its electronic resources. Further, students are encouraged to seek individual assistance as needed from the participating faculty. **Many course documents and related information may be located on Blackboard.**

Lectures/Problem Solving/Review

Lectures will be given according to the attached schedule. On occasion, and at the mutual consent and convenience of both the students and faculty, problem solving and/or review sessions outside of the normal class schedule may be arranged.

Evaluation

There will be three examinations during the semester, each accounting for a portion of the final grade (see new grading formula, next page). The examinations will consist predominantly of subjective, discussion-type questions in which students will be expected to apply their knowledge, often to research-oriented problems. Mastery and use of the material presented in the lectures, the textbook and other reading assignments will be expected. ***There will also be a project based on use of the sequence and protein analysis resources as described in Lectures 29/30.** Students will be expected to complete the exams and the Lectures 29/30 project in the allotted time. There will be no make-up exams for unexcused absences.

Exam/Activity	Lectures Included	Percent of Total Grade
Exam 1	13	30
Exam 2	15	35
Exam 3	13	30
Lectures 29/30 Project	2	5
Total	43	100

Grading Policy

The University of Nebraska guidelines for assigning final letter grades are detailed in the table below. For BRTP 821, these guidelines represent the minimum letter grade associated with a particular percentage score (e.g., a score of 80% will yield a letter grade of **at least B-**; however, the scale may be adjusted such that 80% might result in a higher letter grade).

A+ 97-100%	A 93-96%	A- 90-92%
B+ 87-89	B 83-86	B- 80-82
C+ 77-79	C 73-76	C- 70-72
D+ 67-69	D 63-66	D- 60-62
F 59 & below		

Students enrolled in this course are expected to adhere scrupulously to the Standards of Academic Integrity outlined in the UNMC Student handbook under Standards of Student Academic performance. Cheating, academic misconduct, fabrication and plagiarism are viewed as serious matters. Any student found to be cheating on an examination will receive a "0" for that examination and be referred to the Dean for Graduate Studies and Research for appropriate disciplinary action as described in the UNMC Student Handbook under Procedural Rules Relating to Student Discipline.

Quizzes will be collected by the teaching assistants after administration in the recitations, graded by the course coordinators, and returned to students in the next week's recitation. Quiz points will not count directly toward calculation of the final grade in this course; however, each student's quiz scores will be recorded to gather information on consistency and quality of performance over the semester. As final letter grades are assigned, students' overall performance on quizzes will be taken into consideration, which may result in an overall grade increase in cases where the final score is close to the next higher letter grade level, e.g., from B to B+.

Attendance

Students must attend all lectures. If a student is unable to attend a particular lecture he/she should provide an acceptable excuse in a timely manner to the course coordinators.