

B RTP 821 – Macromolecular Structure and Function

August 10, 2012

Fall 2012 - 4 Credit Hours

Lectures: DRC I 1004 from 3-4 p.m. MWF – check schedule for room assignment exceptions

Recitations: See below for further information

Exams: See below for room assignments, dates and times

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. 20	M	Introduction	MacDonald/Ciborowski	
			Thermodynamics I	Marky	1
	Aug. 22	W	Thermodynamics II	Marky	2
	Aug. 24	F	Energetics and Chemical Equilibria I	Marky	3
2	Aug. 27	M	Energetics and Chemical Equilibria II	Marky	4
	Aug. 29	W	Noncovalent Interactions in Water	MacDonald	5
	Aug. 31	F	Proteins: Building Blocks	MacDonald	6
3	Sept. 3	M	Labor Day – NO CLASS		
	Sept. 5	W	Proteins: Primary Structure	MacDonald	7
	Sept. 7	F	Proteins: Higher Levels of Organization I	MacDonald	8
4	Sept. 10	M	Proteins: Higher Levels of Organization II	MacDonald	9
	Sept. 12	W	Proteins: Folding I and II	Ciborowski	10
	Sept. 14	F	Proteins: Folding II	Ciborowski	11
5	Sept. 17	M	Proteins: Principles of Protein-Protein Interactions	Ciborowski	12
	Sept. 19	W	Proteins: Principles of Protein-Small Molecule Interactions	Natarajan	13
	Sept. 21	F	EXAMINATION 1 (Lectures 1-13, DRC I 1002, 3-6 pm)		
6	Sept. 24	M	Proteins: Characterization and Analysis I (WHM 3034)	Sorgen	14
	Sept. 26	W	Proteins: Characterization and Analysis II/ Purification Strategies I	Sorgen	15
	Sept. 26 [#]	W	Proteins: Purification Strategies II (Lectures 15-16 will be held in DRC I 1002 from 3-5 p.m.)	Sorgen	16
7	Oct. 1	M	Proteins: Detection of Protein-Protein Interactions	Sorgen	17
	Oct. 3	W	Introduction to Enzyme Project Enzyme Kinetics and Catalysis I	Ramaley Lin	18
	Oct. 5	F	Enzyme Kinetics and Catalysis II	Lin	19

Week	Date	Day	Lecture Topic	Lecturer	No.
8	Oct. 8	M	Enzyme Mechanisms I	Lin	20
	Oct. 10	W	Enzyme Mechanisms II	Li	21
	Oct. 12	F	Enzyme Mechanisms III	Li	22
9	Oct. 15	M	Nucleic Acids: Primary and Secondary Structures of DNA	Klinkebiel	23
	Oct. 17	W	Nucleic Acids: Tertiary Structure of DNA	Klinkebiel	24
	Oct. 19	F	Nucleic Acids: Structure of rRNA and tRNA	Klinkebiel	25
10	Oct. 22	M	Fall Break – NO CLASS		
	Oct. 24	W	Chromatin Structure	Klinkebiel	26
	Oct. 26	F	EXAMINATION 2 (Lectures 14-26*, DRC I 1002, 3-6 pm)		
11	Oct. 29	M	DNA Replication: Mechanisms	Shcherbakova	27
			DNA Replication: Enzymes	Shcherbakova	28
	Oct. 31	W	DNA Replication: Reconstitution of Replication Machinery	Shcherbakova	29
	Nov. 2	F	DNA Repair: Types of DNA Damage	Pavlov	30
12	Nov. 5	M	DNA Repair: Mechanisms of Repair	Pavlov	31
	Nov. 7	W	DNA Recombination	Pavlov	32
	Nov. 9	F	Restriction and Modification of DNA	Klinkebiel	33
13	Nov. 12	M	Mobile DNA	Klinkebiel	34
	Nov. 14	W	Recombinant DNA Technology I	Klinkebiel	35
	Nov. 16	F	Recombinant DNA Technology II	Klinkebiel	36
14	Nov. 19	M	Recombinant DNA Technology III	Klinkebiel	37
	Nov. 21	W	Gene Databases	Klinkebiel	38
	Nov. 23	F	Thanksgiving Break – NO CLASS		
15	Nov. 26	M	Protein Databases	Ciborowski	39
	Nov. 28	W	Cellular Energetics I	Batra	40
	Nov. 30	F	Cellular Energetics II	Batra	41
16	Dec. 3	M	Cellular Energetics III	Batra	42
	Dec. 5	W	Cellular Energetics IV	Batra	43
	Dec. 7	F	NO CLASS		
17	Dec. 13	Th	EXAMINATION 3 (Lectures 27-43***, DRC I 1002, 2-5 pm)		

Special day/time

* Includes points earned on the Enzyme Project

*** Does not include Lectures 38 and 39

Lecturers

Dr. Surinder K. Batra, BMB, DRC I 7052, 9-5455, Zip 5870
 Dr. Pawel S. Ciborowski, BMB, DRC I 3048, 9-3733, Zip 5800
 Dr. David L. Klinkebiel, BMB, DRC II 1032, 9-3842, Zip 5870
 Dr. David Li, BMB, DRC I 4014, 9-5073, Zip 5870
 Dr. Ming-Fong Lin, BMB, DRC I 7046, 9-6658, Zip 5870
 Dr. Richard G. MacDonald, BMB, DRC I 7009, 9-7824, Zip 5870
 Dr. Luis A. Marky, PHARM SCI, COP 3040, 9-4628, Zip 6025
 Dr. Amarnath Natarajan, Eppley Institute (EI), ESH 8008, Zip 6805
 Dr. Youri I. Pavlov, EI/BMB, ESH 7009, 9-7717, Zip 6805
 Dr. Robert F. Ramaley, BMB, DRC I 7008, 9-6662, Zip 5870
 Dr. Polina V. Shcherbakova, EI, ESH 7008, 9-7694, Zip 6805
 Dr. Paul L. Sorgen, BMB, DRC I 7011, 9-7557, Zip 5870

Textbook and Resources

The prescribed textbook for this course is **Biochemistry** by Garrett and Grisham, 4th or 5th 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.**

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.

Section A meets on Thursdays 9-10:30 a.m. in DRC I Room 7004; Section B meets on Thursdays 10:30-noon in DRC I Room 7006. Section C meets Fridays 9-10:30 a.m. in DRC I Room 7004; Section D meets on Fridays 10:30-noon in DRC I Room 7006.

Week	Date	Day(s)	Sections	Lecture Material Covered
1	Aug. 23/24	Th/F	1A,B,C,D	Marky lectures 1-2
2	Aug. 30/31	Th/F	2A,B,C,D	Marky 3-4
3	Sept. 6/7	Th/F	3A,B,C,D	MacDonald 5-7
4	Sept. 13/14	Th/F	4A,B,C,D	MacDonald 7-9
5	Sept. 20/21	Th/F	5A,B,C,D	Ciborowski 10-12, Natarajan 13 Exam 1 prep
6	Sept. 27/28	Th/F	6A,B,C,D	Sorgen 14-15
7	Oct. 4/5	Th/F	7A,B,C,D	Sorgen 16-17
8	Oct. 11*/12	Th/F	8A,B,C,D	Lin 18-20
			*Date of BRTP 822 Midterm Exam	
9	Oct. 18/19	Th/F	9A,B,C,D	Li 21-22
10	Oct. 25/26	Th/F	10A,B,C,D	Klinkebiel 23-26, Exam 2 prep
11	Nov. 1/2	Th/F	11A,B,C,D	Shcherbakova 27-29
12	Nov. 8/9	Th/F	12A,B,C,D	Pavlov 30-32
13	Nov. 15/16	Th/F	14A,B,C,D	Klinkebiel 33-34
14	Nov. 22-23	Th/F	Thanksgiving Break—NO CLASS	
15	Nov. 29/30	Th/F	15A,B,C,D	Klinkebiel 35-37
16	Dec. 6/7	Th/F	16A,B,C,D	Batra 40-43, Exam 3 prep

Detailed scheduling information for your recitation section can be found in the tables under Course Information on Blackboard.

Teaching Assistants

The teaching assistants for this course will be:

Eric Kumar (ekumar@unmc.edu) will supervise recitation sections A and B.
Neeley Remmers (nremmers@unmc.edu) will supervise recitation sections C and D.

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 nucleotide and protein sequence analysis resources as described in Lectures 38/39.** Students will be expected to complete the exams and the Lectures 38/39 project in the allotted time. There will be no make-up exams for unexcused absences.

<u>Exam/Activity</u>	<u>Lectures Included</u>	<u>Percent of Total Grade</u>
Exam 1	13	30
Exam 2	13*	30
Exam 3	15	35
Lectures 38/39 Project	2	5
Total	43	100

***Includes points earned on the Enzyme Project**

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 scores will not count directly toward calculation of the final grade in this course. However, for each quiz, students may earn up to 3 "quiz points" by exceeding expectations:

<u>Quiz Score</u>	<u>Quiz Points</u>
71-80	1
81-90	2
>91	3

With 15 quizzes during the entire semester, a total of 45 quiz points would be available. Quiz points convert to final grade points by a 1:10 ratio, meaning that students could increase their overall final point tally by a maximum of 4.5 points. These points would be added to each student's final percentage calculations for determination of letter grades by the faculty. Thus, being well prepared for the recitations and scoring well in quizzes could 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+.

Grading Appeals: Students may discuss exam questions with course faculty at any time after the exams have been returned. Student requests for faculty to re-evaluate grading of a specific answer will be restricted to a period of 2 weeks after the exams have been returned to the class. Students should note that course faculty reserves the right to increase OR decrease a given score if asked to re-examine an exam.

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.

Accommodation of Students with Disabilities

Students with disabilities are encouraged to contact the coordinator of this course for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University to provide flexible and individualized accommodation to students with documented disabilities. Faculty will not be required to provide accommodation without prior approval. To be eligible to receive reasonable accommodation, students must be registered with the Services for Students with Disabilities (SSD) office. Once the request has been approved, an individualized accommodation plan will be formulated and an official 'Letter of Disability Accommodation' will be issued to the student. Please contact Ronda Stevens at 402-559-5553 or rstevens@unmc.edu to register.