

## B RTP 821 – Macromolecular Structure and Function

August 13, 2004

Fall 2004, 3 Credit Hours, DRC 1006, 3-4:00 p.m.

Exams: 2-5:00 p.m. (check syllabus for locations)

### Course Description and Syllabus

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

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.

### Lecture Schedule

Week	Date	Day	Lecture Topic	Lecturer	No.
1	Aug. 23	M	Nucleic Acids: Primary Structure of DNA and RNA I	Lockridge	1
	Aug. 25	W	Nucleic Acids: Primary Structure of DNA and RNA II	Lockridge	2
	Aug. 27	F	Nucleic Acids: Secondary Structure of DNA	Ghorpade	3
2	Aug. 30	M	<b>Labor Day -- NO CLASS</b>		
	Sept. 1	W	Nucleic Acids: Tertiary Structure of DNA	Ghorpade	4
	Sept. 3	F	Nucleic Acids: Structure of rRNA and tRNA	Ghorpade	5
3	Sept. 6	M	Chromatin Structure	Ghorpade	6
	Sept. 8	W	DNA Replication: Mechanisms	Shcherbakova	7
	Sept. 10	F	DNA Replication: Enzymes	Shcherbakova	8
4	Sept. 13	M	DNA Replication: Reconstitution of Replication Machinery	Shcherbakova	9
	Sept. 15	W	DNA Repair: Types of DNA Damage	Pavlov	10
	Sept. 17	F	DNA Repair: Mechanisms of Repair	Pavlov	11
5	Sept. 20	M	DNA Recombination	Pavlov	12
	Sept. 22	W	Introduction to Genetic Sequence Analysis I	Chaney	13
	Sept. 24	F	Introduction to Genetic Sequence Analysis II	Chaney	14
6	<b>Sept. 27</b>	<b>M</b>	<b>EXAMINATION 1 (Lectures 1-12) UH 4208 Amp</b>		
	Sept. 29	W	Restriction and Modification of DNA	Christman	15
	Oct. 1	F	Mobile DNA	Christman	16
7	Oct. 4	M	Recombinant DNA Technology I	Christman	17
	Oct. 6	W	Recombinant DNA Technology II	Christman	18
	Oct. 8	F	Recombinant DNA Technology III	Christman	19
8	Oct. 11	M	Thermodynamics	Marky	20
	Oct. 13	W	Thermodynamics	Marky	21
	Oct. 15	F	Energetics and Chemical Equilibria	Marky	22
9	Oct. 18	M	<b>Fall Break---No Class</b>		
	Oct. 20	W	Energetics and Chemical Equilibria	Marky	23
	Oct. 22	F	Noncovalent Interactions in Water	MacDonald	24
10	Oct. 25	M	Proteins: Building Blocks	MacDonald	25
	Oct. 27	W	Proteins: Primary Structure	MacDonald	26
	Oct. 29	F	Proteins: Higher Levels of Organization I	MacDonald	27

11	Nov. 1	M	Proteins: Higher Levels of Organization II	MacDonald	28
	Nov. 3	W	Proteins: Folding I	MacDonald	29
	<b>Nov. 5</b>	<b>F</b>	<b>EXAMINATION 2 (Lectures 15-28) DRC 1002 Amp</b>		
12	Nov. 8	M	Proteins: Folding II	MacDonald	30
	Nov. 10	W	Proteins: Characterization and Analysis I	MacDonald	31
	Nov. 12	F	Proteins: Characterization and Analysis II	MacDonald	32
13	Nov. 15	M	Proteins: Purification Strategies	MacDonald	33
	Nov. 17	W	Solving Problems in Quantitative Biochemistry	MacDonald	34
	Nov. 19	F	Protein Translation I	MacDonald	35
14	Nov. 22	M	Protein Translation II	MacDonald	36
	Nov. 24	W	Protein Degradation	MacDonald	37
	<b>Nov. 26</b>	<b>F</b>	<b>Thanksgiving Break --NO CLASS</b>		
15	Nov. 29	M	Enzymes: Kinetics, Selected Models	Ramaley	38
	Dec. 1	W	Enzymes: Catalytic Mechanism for Chymotrypsin	Ramaley	39
	Dec. 3	F	Enzymes: Thermodynamics, Kinetics and Reaction Pathways	Ramaley	40
16	Dec. 6	M	Enzymes: Mechanisms and the Role of Coenzymes	Ramaley	41
	Dec. 8	W	Enzymes: Regulation and Metabolic Control	Ramaley	42
	Dec. 10	F	Enzymes: Molecular Biology of Mechanisms	Ramaley	43
17	<b>Dec. 16</b>	<b>Th</b>	<b>EXAMINATION 3 (Lectures 29-43) DRC 1002 Amp</b>		

### Lecturers

Dr. William G. Chaney, BMB, BH 3017, 9-6657, Zip 5870, WCHANAY  
 Dr. Judith K. Christman, BMB, DRC 7005E, 9-6660, Zip 5870, JCHRISTM  
 Dr. Anuja Ghorpade, PAMM/CNND, SWH 2030, 9-5275, Zip 5215, AGHORPAD  
 Dr. Eric Haas, PAMM/GSAF, DRC 1048, 9-9527, Zip 5812, EHAAS  
 Dr. Oksana Lockridge, EI/BMB, ECI 6017A, 9-6032, Zip 6805, OLOCKRID  
 Dr. Richard G. MacDonald, BMB, DRC 7009, 97824, Zip 5870, RGMACDON  
 Dr. Luis A. Marky, Pharmaceutical Science, COP 3040, 9-4628, Zip 6025, LMARKY  
 Dr. Youri Pavlov, EI/BMB, ECI 6003B, 9-7717, Zip 6805, YPAVLOV  
 Dr. Robert F. Ramaley, BMB, DRC 7008, 9-6662, Zip 5870, RRAMALEY  
 Dr. Polina Shcherbakova, EI, ECI 6010B 9-7694, Zip 6805, PSHCHERB

### 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.

### 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 GSAF

sequence analysis facilities as described in Lectures 13 and 14. Students will be expected to complete the exams and GSA project in the allotted time. There will be no make-up exams for unexcused absences.

<b>Exam/Activity</b>	<b>Lectures Included</b>	<b>Percent of Total Grade</b>
<b>Exam 1</b>	<b>12</b>	<b>28</b>
<b>Exam 2</b>	<b>14</b>	<b>32</b>
<b>Exam 3</b>	<b>15</b>	<b>35</b>
<b>GSA Project</b>	<b>2</b>	<b>5</b>
<b>Total</b>	<b>43</b>	<b>100</b>

### **Grading Policy**

A final letter grade will be issued for each student at the end of the course according to the following grading system as per University of Nebraska guidelines:

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.

### **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 coordinator.