

COURSE TITLE and NUMBER: BIOCHEMISTRY (BMB) 514, Medical Biochemistry

TERM COURSE OFFERED: Fall Semester, 2005

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Course Objectives: This course is intended to present a survey of the major biochemical events that occur in normal cells and tissues. It should provide students with a vocabulary of terms they will encounter in other basic science and clinical courses and with an understanding of the principal biochemical mechanisms that contribute to homeostasis. Where possible, examples will relate directly to human biology. The normal state will be described; abnormal conditions are considered insofar as they serve to illuminate the normal condition.

Prerequisites: One year of college level organic chemistry.

Course Credit by Waiver Examination: As announced in a memo dated April 25, 2005 (from the Biochemistry Department to all CHM/COM students beginning in 2005), this waiver examination will be offered on August 25, 2005, 6:00-8:00 p.m., in Room 101, Biochemistry Building.

Textbooks: a) "*Lippincott's Illustrated Review: Biochemistry*," P.C. Champe, R.A. Harvey, and D.R. Ferrier, Lippincott Williams & Wilkins, 3rd edition, 2005.
b) Biochemistry 514 course packet.
c) "*Medical Physiology*," R.A. Rhoades and G.A. Tanner, eds., Lippincott Williams & Wilkins, 2nd edition, 2003. (This is a PSL 534 text.)

Other Instructional Material: In addition to the texts, homework assignments may also be derived from computer-aided instructional (CAI) material. These are available in the CHM Echt Computer Laboratory (A137 Clinical Center) and the COM Kobiljak Computer Center (E-102 Fee Hall).

Office Hours: During the weeks that a particular instructor is teaching the course, he/she will hold office hours on Mondays, Noon-1:00 pm. In addition, students are encouraged: (a) to use our "virtual office hours" on the Internet (<http://angel.msu.edu>); (b) to address questions and suggestions to instructors via the E-mail system; (c) to seek individual consultation with any instructor by appointment throughout the semester; and (d) to attend help sessions (see below).

Help Sessions:

<u>Date</u>	<u>Time</u>	<u>Instructor</u>	<u>Location</u>
Friday, September 2	Noon - 1:00 pm	Wang/Wilkins	A-133 Life Sciences
Friday, September 16	Noon - 1:00 pm	LaPres	A-133 Life Sciences
Sat., September 17	3:00 pm - ?	Wang	E-105 East Fee
Friday, September 23	Noon -1:00 pm	Wilkins/LaPres	A-133 Life Sciences
Thursday, October 6	5:00 – 6:00 pm	Wilkins	E-105 East Fee
Friday, October 7	Noon – 1:00 pm	Wilkins	A-133 Life Sciences
Saturday, October 8	3:00 - 4:00 pm	LaPres	E-105 East Fee
	4:00 - 5:00 pm	Ferguson-Miller	E-105 East Fee
Saturday, October 22	3:00 - 4:00 pm	Ferguson-Miller	E-105 East Fee
	4:00 - 5:00 pm	Wang	E-105 East Fee

Evaluation of Student Performance: The achievement of course objectives will be evaluated on the basis of: (a) two in-class quizzes (Q#1 and #2); (b) two “In-Semester” exams (E#I and #II); and (c) one comprehensive final examination. Questions will deal with material presented in lectures, in the list of specific instructional objectives (see course packet), and in the homework assignments.

Exam/Quiz	Date	Sessions	# of Sessions	# of Points	% of Grade
Q #1	9/6	1-6	6	6	4.2
E #I	9/19	1-15	15	32	22.9
Q #2	9/28	16-23	8	6	4.2
E #II	10/10	16-31	16	32	22.9
Final	10/24	32-45	14	64 (38 new/26 review)	45.8

- (a) Each Quiz will contain 6 questions, to be completed in 10 minutes during the first hour of class on the date stated, in the lecture venue..
- (b) "In-Semester" Exams: Exams I-II will be held 8 - 9 a.m. on: (I) Monday, 9/19; (II) Monday, 10/10. Please note **THESE ARE NOT AT THE USUAL CLASS HOUR!**
- (c) Final Exam: The final exam will be held 7:30 – 9:30 am on Monday, 10/24. There will be 38 questions specifically covering the last 14 sessions (#32-45) of the course. The remaining 26 questions of the final exam will be comprehensive, reviewing the major points of the course.

Venues for Exams I and II, as well as the Final Exam:

- (a) CHM students report to A-133 Life Sciences Building;
- (b) COM students report to 102 Conrad Hall.

Academic Honesty: Michigan State University has established policies on the integrity of scholarship and grades (All University Policy on Integrity of Scholarship and Grades). The Colleges of Human and Osteopathic Medicine follow these policies and additional policies and procedures as prescribed in the respective documents on Medical Students' Rights and Responsibilities. The faculty, in turn, has the responsibility to insure the integrity of scholarship and grades. In order to facilitate the performance of this responsibility, several specific announcements at the outset may be useful:

- (a) Examination proctors may require students to present pictured identification when exam papers are collected. Please obtain a pictured identification prior to the first exam and please bring such identification for each exam.
- (b) For each exam, the examination papers will already be distributed (at the seats) prior to students entering the room. Once you enter the exam room, no books, notebooks, etc., can be used for studying before beginning the exam (all backpacks, books, etc., should be stowed as directed by proctors).
- (c) Simple, arithmetic calculators will be provided for your use during exam sessions where you are required to solve numerical problems. No other calculators, computers, cell phones, or other communication devices will be allowed at exams and quizzes.
- (d) An exam proctor may assign specific seating to students. Students must refrain from distracting (*e.g.*, toe or pencil tapping, finger drumming, thinking out-loud, *etc.*) or suspicious behaviors. Exam proctors have the responsibility to address these behaviors during examinations (*e.g.*, by asking students to change seats). In order to avoid unnecessary anxiety/embarrassment for any individual student, a whole row or column of students may be asked to exchange seats with another row/column.

Excused Absences and Make-Up Exams/Quizzes: Make-up exams/quizzes will be given only to students with excused absences, obtained from either the CHM Office of Student Affairs (353-7140) or from the COM Office of Student Services (353-7741). Otherwise, there will be no make-up exams offered during the semester. Make-up exams/quizzes (based on excused absences) should be arranged with the instructor or course director.

Grading: A total of 140 points can be derived from the two quizzes, two in-semester exams, and final exam. Course grades will be assigned on the basis of the overall examination scores, delineated below.

<u>CHM</u>	<u>COM</u>
P ≥ 105 points (75%)	P ≥ 98 points (70%)
CP 98-104 (70-74%)	
N < 98 points (70%)	N < 98 points (70%)

Students failing to earn 70% overall will receive an **N** grade that remains on their college record. They will be required to remediate in accordance with the policy detailed below.

CHM students that receive the **CP** grade will also need to remediate by examination in order to change the **CP** to a **CP/P** grade.

Remediation: See "CHM/COM Block I Joint Course Administration Remediation Policy." Consistent with the above policy, the remediation opportunities for BMB 514 are as follows:

- (1) Remediation examination: Friday, January 13, 2006, 3-5 p.m., Room 502 Biochemistry Building; 60 questions, comprehensive for the course; passing is 70%.
- (2) Remediation examination: sometime in August, 2006, prior to the start of Fall Semester, 2006 (date, time, venue to be arranged); 60 questions, comprehensive for the course; passing is 70%.

CHM students earning a CP or N MUST take the remediation examination offered in January, unless: a) they have more than 2 remediation exams to take; OR b) they intend to remediate an N grade by retaking the course. In either case, they must consult with the Block I director.

COM students who receive an N grade may elect to take either one (but NOT BOTH) of the remediation opportunities. COM students attempting a remediation examination must enroll for 3 credits of OST 590. A P or an N grade will be recorded for OST 590, based on performance on the remediation examination.

Students failing either remediation exam must retake BMB 514. However, they are NOT eligible for the waiver exam for BMB 514 when they re-enroll in the course.

Student Feedback on Instruction/Course: The faculty of BMB 514 will be monitoring the effectiveness of the instruction throughout the semester and will be responsive to constructive student feedback. Four main mechanisms are available to assess the attainment of instructional objectives: (a) direct student contact with the instructors; (b) the use of short-term (lecture-by-lecture) questionnaires addressing specific scientific content (see *The Spartan Quickie* below); (c) the use of “focus groups” and class liaisons; and (d) the use of instructor/course evaluations.

The purpose of *The Spartan Quickie*, a questionnaire given to a few students selected at random (for each lecture), is to gain some information on the effectiveness of the lecture in delivering scientific content. Students completing this questionnaire are urged to write down specifically what they learned from a particular session (rather than their impressions of style, environment, etc.). Past experience with such questionnaires indicates that the instructors can gauge whether important conceptual points were achieved (or missed). Appropriate adjustments and reinforcements can be made in the following sessions.

Over the long-term, student feedback via “focus groups” and instructor/course evaluations provides the instructors with invaluable information regarding student perspectives on the performance of the faculty and the quality of the course. The information gained from these evaluations will be used to develop future offerings of biochemistry.

Course Web Site: The URL for the Course Web site is <http://angel.msu.edu>.

There are five main sections:

- (2) Announcements - all course announcements.
- (3) Syllabus - information in this course protocol (textbooks, exam dates, grading system, rules and regulations, etc.) will be provided.
- (4) Class - information on the instructors (office address, phone numbers, e-mail addresses, etc.) will be provided.
- (5) Lessons - special handouts (lecture notes, slides, etc.) will be provided.
- (6) In Touch - tools for e-mail communication and discussion group will be provided.

Please note that each visit to any section of *Angel* by an individual student is “tracked” by the computer. For example, *Angel* will know that student X has visited the Course Information section seven times (on specific dates) and has visited the Communication Discussion Board twice (on specific dates). Although the instructors of the course will have access to such information, we do not intend to use it.

Opportunities to confirm your understanding: You are strongly encouraged to confirm your mastery of the material by working on practice questions in homework problem sets (designated JW-1, SFM-1, etc.). These are at appropriate places within the course packet (see Lecture schedule, reading assignments, and other homework pages H and I). Answers to the homework problems are also provided. Homework will not be collected.

A set of sample exams, derived from the last offering of BMB 514, is also provided at the end of this course packet. In addition, all the exams for this course from 2000-2004 can be found at the website, <http://www.bch.msu.edu/courses/514/bch514XM.htm> (Note: This is distinct from the *Angel* course website but can be found as a link from the *Angel* course website.) You can use the exams to gauge the level of the questions to be expected in the course.

BMB 514 (BIOCHEMISTRY) Lecture schedule, reading assignments, and other homework

Date	#	Subject	Instructor	Readings (Champe et al. text)	Other Assignments (course pack)
8/29	1	Chemical principles	Wang		p. 1-18 Course Pack
8/30	2	Amino acids: structures	'	Chapter 1: 1-5	Item 3, p. 26-27
8/31	3	Amino acids: acid-base properties	'	Chapter 1: 5-11	
8/31	4	Proteins: structure and properties	'	Chapter 2: 13-14; 16-23	CAI Kinemages, p. 40-41
9/1	5	Globular proteins: myoglobin and hemoglobin	'	Chapter 3: 25-29	
9/2	6	Regulation of O ₂ binding	'	Chapter 3: 29-34; 40-41	Problem set JW-1, p. 52-56
9/6	7	Blood buffers	'	Chapter 25: 426-432; 439-441 in	Case study, p. 62-63
9/6	8	Acid-base balance	'	Rhoades and Tanner (PSL text)	Item 8b, p. 72 (optional)
9/7	9	Enzymes: distinctive properties, mechanism of catalysis	'	Chapter 5: 53-58	
9/8	10	Enzymes: kinetics, Michaelis-Menten analysis	'	Chapter 5: 58-62	Case study, p. 88-92
9/9	11	Enzymes: inhibition/allosteric effects	'	Chapter 5: 62-67	Problem set JW-2, p. 93-97
9/12	12	Vitamins	LaPres	Chapter 28: 371-379	Folic acid questions, p. 119
9/13	13	Metabolic principles	'	Chapter 8: 89-94	
9/13	14	Energetics	'	Chapter 6: 69-73	Problem set JJJ-1, p. 141-143
9/14	15	Carbohydrate structure and digestion	'	Chapter 7: 83-88	
9/15	16	Glycolysis: reactions	Wilkins	Chapter 8: 94-105	
9/16	17	Glycolysis: regulation	'	Chapter 12: 135-142	Case study, PK deficiency, p. 179-180
SEPTEMBER 19, 2005 -- EXAM I (covering sessions 1-15)					
9/19	18	Gluconeogenesis	'	Chapter 10: 115-121	
9/20	19	Mitochondrial structure/function; pyruvate dase	LaPres	Chapter 8: 103-104; Chapter 6: 73-74	
9/21	20	Pyruvate dase: regulation; TCA cycle	'	Chapter 9: 107-114	
9/21	21	TCA cycle, regulation, anaplerotic routes	'	Chapter 9: 107-114	Case study, PDH deficiency, p. 197
9/22	22	Energy transduction - electron transport	'	Chapter 6: 73-81	Case study, mitochondrial neuromyopathy, p. 218
9/23	23	Ox. phos./regulation	'	Chapter 6: 73-81	Case study, cytochrome oxidase inhibition, p. 240

9/26	24	Pentose phosphate pathway	LaPres	Chapter 13: 143-153	Problem set JJL-2, p. 263-265 Case study, carnitine deficiency, p. 276
9/27	25	Glycogen synthesis/breakdown	'	Chapter 11: 123-133	
9/28	26	Regulation of glycogen metabolism; storage disease	'	Chapter 11: 127-133	
9/28	27	Lipid metabolism: β -oxidation of fatty acids	Wilkins	Chapter 16: 179-180; 187-193	
9/29	28	Ketone bodies; Fatty acid synthesis		Chapter 16: 180-183; 193-197;	
10/3	29	Fatty acid synthesis, processing, regulation	'	Chapter 16: 183-185; Chap. 27: 358-362	Case study, FA oxidation in Heart, p. 312
10/4	30	Triglyceride/phospholipid synthesis; lipid storage diseases	Ferguson-	Chapter 17: 199-210	
10/5	31	Cholesterol synthesis/regulation; derivatives: vitamins	Miller	Chapter 18: 217-222; Chap. 28: 379-391	
10/5	32	Bile salts; Lipid digestion/absorption/transport; lipoproteins	'	Chapter 15: 171-178; Chap. 18: 222-235	
10/6	33	Lipoproteins; endocytosis; hypercholesterolemia	'	Chapter 18: 225-235	
10/7	34	Integration of metabolism (I)	'	Chapter 24	
OCTOBER 10, 2005 -- EXAM II (covering sessions 16-31)					
10/10	35	Protein/nitrogen metabolism; nitrogen balance	'	Chapter 19: 243-245	Problem set SFM, p. 333-335
10/11	36	Amino group removal/fixation; Urea cycle	'	Chapter 19: 247-254	
10/11	37	Ammonia; inter-organ relationships; carbon skeleton	'	Chapter 19: 254-257; Chap. 20: 259-264	
10/12	38	Essential amino acids; nutrition; protein digestion	'	Chapter 19: 245-247; Chap. 27: 365-367	
10/13	39	Integration of metabolism (II); Hormones: glucagon, insulin	'	Chapter 23: 305-317	
10/14	40	Epinephrine; Starved/fed responses	'	Chapter 21: 283-284; Chap. 24: 319-333	
10/17	41	Diabetes	'	Chapter 25: 335-345	Case study, p. 381-382 Problem set JW-3, p. 383-384
10/18	42	One-carbon metabolism	Wang	Chapter 28: 371-375; 379; Chppter 20: 264-265	
10/19	43	Nucleotide structure/synthesis	'	Chapter 22: 289-294	
10/20	44	Nucleotide synthesis	'	Chapter 22: 295-303	
10/20	45	Nucleotide catabolism/salvage	'		
OCTOBER 24, 2005 -- FINAL EXAM (covering 1-45)					

Link to exams from previous years. <http://www.bch.msu.edu/courses/514/bch514XM.htm>