

**COURSE TITLE and NUMBER: MEDICAL BIOCHEMISTRY
BMB 514 (Fall semester, 2009)**

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Section Codes for the Course: For quiz/examination scantron (bubble) sheets, please code
001 for CHM-EL;
002 for COM-EL;
003 **NOT** used in this course;
004 for COM-DMC;
005 for COM-MUC

Lines of Communication:

- (a) Administrative aspects of the Course: contact course coordinator, John L. Wang
- (b) Scientific content pertaining to a specific lecture or topic: contact the instructor teaching that specific portion of the course.
- (c) Missed exams: CHM students --- Dr. Wanda Lipscomb (517-353-7140);
COM-EL students --- Dr. William Falls (517-353-7741)
COM-DMC students --- Dr. Gary Willyerd (313-578-9600)
COM-MUC students --- Dr. Kari Hortos (586-263-6731)

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

You should pay attention to three MAIN sections at this website:

- (1) Announcements – Course-related communication to the class will be made here. You should check for announcements on a daily basis.
- (2) Syllabus - information in this course protocol (textbooks, exam dates, grading system, rules and regulations, etc.) and information on the instructional team (phone, e-mail of faculty) will be provided.
- (3) Course Content – Lecture recordings, tutorials (TT), self-study module (SSM), and all other scientific material will be deposited.

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 Lessons section twice (on specific dates). Although the instructors of the course will have access to such information, we do not intend to use it.

Office Hours: Students are encouraged: (a) to address questions and suggestions to instructors via the E-mail system; (b) to seek individual consultation with the lecturer or the on-site instructor by appointment throughout the semester; and (c) to attend help sessions.

Help Sessions (**no** new material will be presented; attendance optional; neither broadcast nor recording will be made of these question-and-answer sessions)

(a) In EL, Help Sessions are scheduled for the following dates, times, and venues.

<u>Date</u>	<u>Time</u>	<u>Instructor</u>	<u>Location</u>
Friday, September 4	Noon - 1:00 pm	Wang	102 Conrad
Wed., September 16	7:30 - 9 pm	Wang	102 Conrad
Thurs., September 17	11 am - noon	LaPres	102 Conrad
Friday, September 25	Noon - 1:00 pm	LaPres	102 Conrad
Friday, October 9	10 am - noon	LaPres/Wilkins	102 Conrad
Friday, October 23	12 - 1 pm	Wilkins/Wang	102 Conrad

(b) Help Sessions corresponding to the above dates and times will be arranged and announced by Dr. Harriott at DMC and by Dr. Osenkowski at MUC.

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 May 26, 2009 (from the Biochemistry Department to all CHM/COM students beginning in 2009), this waiver examination will be offered on August 27, 2009, 6-8 pm.

Textbooks: a) "*Lippincott's Illustrated Review: Biochemistry*," P.C. Champe, R.A. Harvey, and D.R. Ferrier, Lippincott Williams & Wilkins, 4th edition, 2008.
b) Biochemistry 514 course packet.
c) "*Medical Physiology: Principles for Clinical Medicine*," R.A. Rhoades and D.R. Bell, eds., Lippincott Williams & Wilkins, 3rd edition, 2009.
(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) in EL and in the corresponding resource centers at DMC and MUC.

There are four tutorials (TT) that consist of Camtasia recordings posted on the Course website on Angel. An interactive self-study module (SSM), as well as exercises associated with each TT, all provide opportunities to confirm mastery of the material.

There are four clinical cases (CC) that provide excellent examples of the inter-connectedness of several metabolic pathways. Each CC will present data from a real patient, background material to the metabolic problems, and several exercises that will require students to integrate the information learned in lecture sessions. Each CC represents an excellent opportunity to review for the examination shortly following the assignment of the case.

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 as JW-1, JLL-2, CW-3 etc.). These are at appropriate places within the course packet (see Lecture schedule, reading assignments, and other homework on pages 8 and 9). Answers to the homework problems are also provided. Homework will not be collected.

All the exams for this course from 2000-2008 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 these old exams to gauge the level of the questions to be expected 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.

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 pack), in the homework assignments, in the tutorials (TT), self-study module (SSM), and in the clinical case (CC) discussions.

Exam/Quiz	Date	Sessions	# of Lectures	# of Points	% of Grade
Q #1	9/9	1-6 + TT #1	6 + 1 TT	6	4.3
E #I	9/18	1-13 + TT # 1-4 CC-A	13 + 4 TT	32	22.8
Q #2	9/29	14-20 SSM #1	7 + 1 SSM	6	4.3
E #II	10/12	14-30 + 1 SSM + CC-B	15 +1 CC + 1 SSM	32	22.8
Final	10/26	31-42 + CC-C, D	10 + 1 CC	64 (28 new/36 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 7:30 – 8:40 a.m. on: (I) Friday, 9/18; (II) Monday, 10/12. Please note **THESE ARE NOT AT THE USUAL CLASS HOUR!**
 (1) CHM-EL: (i) students whose LAST names **A– Bensch**, report to 102 Conrad Hall;
 (ii) students whose LAST names **Bishop–Z**, report to A-133 Life Sciences.
 (2) COM-EL students report to 102 Conrad Hall.
 (3) COM-DMC students report to your regular classroom, G030, DMC.
 (4) COM-MUC students report to your regular classroom, 208 UC-3, MUC.
- (c) **Final Exam:** The final exam will be held 7:30 – 9:30 am on Monday, 10/26. There will be 28 questions specifically covering the last 12 sessions (#31-42) of the course and Clinical Cases C and D. The remaining 36 questions of the final exam will be comprehensive, reviewing the major points of the course.
 Exam venues: as you reported for “In-Semester” exams.

Excused Absences and Make-Up Exams/Quizzes: Make-up exams/quizzes will be given only to students with excused absences, obtained from the respective Associate Deans listed on page 1 under **Lines of Communication**. 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: Saturday, January 9, 2010, 3-5 pm; 60 questions, comprehensive for the course; passing is 75%. Venues to be arranged and announced at a later date.
- (2) Remediation examination: sometime in the week of August 23, 2010, prior to the start of Fall Semester, 2010 (date, time, venue to be arranged); 60 questions, comprehensive for the course; passing is 75%.

CHM students earning a CP or N **MUST** take the remediation examination offered in January, unless: a) they have more than one 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 **MUST** take the remediation exam offered in January unless they have two or more remediation exams to take. In that case, they must consult with Dr. William Falls, who will advise them regarding the appropriate course of action. COM students attempting a remediation examination should complete an "Application for Remediation" and 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. The "Application for Remediation" can be obtained from the Office of Student Services: (a) Robin Hastings (C-110 E. Fee) in EL; (b) Cathleen Watson at DMC; and (c) Jennifer Lanuzza at MUC.

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.

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 electronic 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.
- (e) Late arrivals will not be admitted to the examination more than 20 minutes after the exam has started. Students who have completed the exam will be allowed to leave the exam room only after 20 minutes have elapsed.

This course will make use of the audience response system (clickers) in certain class discussions.

As is the case with all issues regarding academic integrity and professional behavior, we will follow the policy stipulated by your college (see CHM/COM student clicker policy): (a) you should register your clicker and bring it to class; (b) you should not loan your clicker to another student; (c) you should not be in possession of a clicker other than your own; and (d) you should not answer questions or check in for attendance on behalf of another student.

ACKNOWLEDGMENT

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Lippincott's Illustrated Reviews: Biochemistry, by P.C. Champe, R.A. Harvey, and D.R. Ferrier, 4th edition, Lippincott Williams & Wilkins, 2008

for use in the Biochemistry 514 course, Michigan State University, Fall semester, 2009

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Lippincott's Illustrated Reviews: Biochemistry Fourth Edition

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Acquisitions Editor: Nancy Anastasi Duffy
Managing Editor: Kathleen Scogna
Marketing Manager: Jennifer Kuklinski
Production Editor: Kevin Johnson
Designer: Holly Reid McLaughlin
Printer: R.R. Donnelley & Son's—Willard, Ohio

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Printed in the United States of America

First edition, 1987
Second edition, 1994
Third edition, 2005

Library of Congress Cataloging-in-Publication Data has been applied for (ISBN-13: 978-0-7817-6960-0)

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Library of Congress Cataloging-in-Publication Data

Champe, Pamela C.
Biochemistry / Pamela C. Champe, Richard A. Harvey, Denise R. Ferrier. -- 4th ed.
p. ; cm. -- (Lippincott's illustrated reviews)

Includes index.
ISBN-13: 978-0-7817-6960-0
ISBN-10: 0-7817-6960-4

1. Biochemistry--Outlines, syllabi, etc. 2. Biochemistry--Examinations, questions, etc. 3. Clinical biochemistry--Outlines, syllabi, etc. 4. Clinical biochemistry--Examinations, questions, etc. I. Harvey, Richard A., Ph.D. II. Ferrier, Denise R. III. Title. IV. Series.

[DNLM: 1. Biochemistry--Examination Questions. 2. Biochemistry--Outlines. QU 18.2 C451L 2008]
QP514.2.C48 2008
612.3'9--dc22

2007020782

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

Date	#	Subject	Instructor	Readings (Champe et al. text)	Other Assignments (course pack)
8/31	1	Chemical principles	Wang		p. 1 Course Pack
		Tutorial #1: Amino acid structures	'	Chapter 1: 1-5	
9/1	2	Amino acids: acid-base properties	'	Chapter 1: 6-11	
9/2	3	Proteins: structure and properties	'	Chapter 2: 13-14; 16-23	CAI Kinemages, p. 45
9/2	4	Globular proteins: myoglobin and hemoglobin	'	Chapter 3: 25-29	
9/3	5	Regulation of O ₂ binding	'	Chapter 3: 29-39	Problem set JW-1, p. 57
9/4	6	Blood buffers		<i>[PSL text: Rhoades and Bell</i>	Clinical Case A , p. 76
9/8	7	Acid-base balance	'	Chapter 24: 442-449; 455-461]	Item 8b, p. 75 (optional)
		Clinical Case A (mini case discussion on acidosis)	'		
9/9	8	Enzymes: distinctive properties, mechanism of catalysis	'	Chapter 5: 53-58	
9/9	9	Enzymes: kinetics, Michaelis-Menten analysis	'	Chapter 5: 58-62	Case study, p. 94
9/10	10	Enzymes: inhibition/allosteric effects	'	Chapter 5: 62-67	Problem set JW-2, p. 99
		Tutorial #2: Nucleotide structures			
		Tutorial #3: Oxidation-reduction states			
9/11	11	Vitamins	LaPres	Chapter 28: 373-381, 392-393	Folic acid questions, p. 140
9/14	12	Metabolic principles	'	Chapter 8: 91-96	
		Clinical Case A (mini case discussion on diabetes)	'		
9/15	13	Energetics	'	Chapter 6: 69-73	
		Tutorial #4: Carbohydrate structure and function	'	Chapter 7: 83-90	Problem set JIL-1, p. 162
SEPTEMBER 18, 2009 – EXAM I (covering sessions 1-13 and tutorials #1-4)					
9/18	14	Glycolysis: reactions		Chapter 8: 96-108	
9/21	15	Glycolysis: regulation	'	Chapter 12: 137-143	Case study, PK deficiency, p. 200
		Self-study Module #1: Gluconeogenesis	'	Chapter 10: 117-124	
9/21	16	Pentose phosphate pathway	'	Chapter 13: 145-156	
9/22	17	Glycogen metabolism: overview	'	Chapter 11: 125-136	Clinical Case B, p. 222
		Clinical Case B assigned	'		
9/23	18	Mitochondrial structure/function; PDH	;	Chapter 8: 105-106; Chapter 6: 73-74	Case studies, PDH deficiency, p. 239
9/24	19	TCA cycle, regulation, anaplerotic routes		Chapter 9: 109-116	mitochondrial neuromyopathy, p. 253
9/25	20	Energy transduction – electron transport		Chapter 6: 73-82	cytochrome oxidase inhibition, p. 275

Date	#	Subject	Instructor	Readings (Champe et al. text)	Other Assignments (course pack)
9/28	21	Ox. phos./regulation	LaPres		
9/29	22	Lipid metabolism: β -oxidation of fatty acids	Wilkins	Chapter 16: 181-182; 189-195	Problem set JJJ-2, p. 276
9/29	23	Ketone bodies; Fatty acid synthesis		Chapter 16: 183-188; 195-197	Case study, carnitine deficiency, p. 299
9/30	24	Fatty acid synthesis, processing, regulation		Chapter 16: 183-188; Chap. 27: 360-365	
10/1	25	Triglyceride/phospholipid synthesis; lipid storage disease		Chapter 16: 188-189; Chap 17: 201-214	Problem Set CW-1, p. 319
10/2	26	Cholesterol synthesis/regulation; derivatives; vitamins		Chapter 18: 219-224; Chap. 28: 381-391	
10/5	27	Bile salts; Lipid digestion/absorption/transport; lipoproteins	,	Chapter 15: 173-178; Chap. 18: 224-237	Metabolism Assignment, p. 343
10/6	28	Lipoproteins; endocytosis; hypercholesterolemia	,	Chapter 18: 227-237	Case study, FA oxidation in heart, p. 348
10/7	29	Clinical Case B discussion	LaPres		Problem Set CW-2, p. 350
10/7	30	(two-hour i-clicker session)	,		
10/8	31	Protein nutrition; essential amino acids, nitrogen balance	Wilkins	Chapter 27: 367-369	
10/9	32	Protein digestion; protein metabolism Clinical Case C assigned		Chapter 19: 245-250	
OCTOBER 12, 2009 -- EXAM II (covering sessions 14-30)					
10/12	33	Amino acid synthesis and degradation; the urea cycle	Wilkins	Chapter 19: 250-256; Chap. 20: 267-274	
10/13	34	Ammonia; inter-organ relationships; carbon skeletons	,	Chapter 19: 256-258; Chap. 20: 261-267	
10/13	35	Integration of metabolism ; Hormones: glucagon, insulin	,	Chapter 23: 307-318	
10/15	36	Epinephrine; Starved/fed responses;	,	Chapter 21: 285-288; Chap. 24: 321-332	
10/16	37	Clinical Case C discussion		Chapter 25: 337-346	Problem set CW-3, p. 397
10/16	38	(two-hour i-clicker session)			
10/19	39	One-carbon metabolism	Wang	Chapter 28: 373-377; 381	
10/20	40	Nucleotide structure/synthesis		Chapter 20: 264-265	
10/20	41	Nucleotide synthesis	,	Chapter 22: 291-295	
10/21	42	Nucleotide catabolism/salvage Clinical Case D (mini case discussion on gout)	,	Chapter 22: 296-304	Problem set JW-3, p. 424
OCTOBER 26, 2009 -- FINAL EXAM (covering 1-42)					