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BIBC 102 Metabolic Biochemistry
Spring 2024 (A_00)

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Instructor:	Goran Bozinovic
Lectures:	Mon, Wed 5 - 6:20 PM
Location:	*Peterson Hall 110*
Course website:	http://canvas.ucsd.edu
Podcast Link:	https://podcast.ucsd.edu/
Textbook*:	**Optional**: D.L. Nelson and M.M. Cox, Lehninger-Principles of Biochemistry, *6th or 7th* Edition (Freeman) – see the end of the tentative schedule table for further explanation
Text website:	https://store.macmillanlearning.com/us/product/Lehninger-Principles-of-Biochemistry/p/1464126119

Course Description: Energy-producing pathways – glycolysis, the TCA cycle, oxidative phosphorylation, and biosynthetic pathways – gluconeogenesis, glycogen synthesis, and fatty acid biosynthesis. Nitrogen metabolism, urea cycle, amino acid metabolism, nucleotide metabolism, and metabolism of macromolecules.

Goals: This in-person course will examine the concepts of energy and metabolism, and how they are harnessed and regulated at the cellular and molecular level. We will start by looking in detail at the action of enzymes, examine the kinetics of enzyme-catalyzed reactions, the chemical mechanisms through which enzymes produce catalysis, and the regulation of catalytic activity. Then we will focus on metabolism, the pathways by which biological molecules are broken down to provide energy for the cell, and pathways by which new biological molecules are synthesized. We will discuss how energy flows in the cell, such as in the oxidation of glucose to produce ATP, and how this energy and energy-containing intermediates are utilized to construct new molecules, as in the synthesis of fatty acids from acetyl-CoA. The various biochemical pathways that accomplish this will be examined in detail. We will also discuss how pathways are regulated so that metabolism occurs in coordinated manner.

Prerequisites: Chem 40A or Chem 140A or BENG 120 and Chem 40B or Chem 140B or BENG 120.

Contact Information
Email: gbozinovic@ucsd.edu
Office hours: Thu 6:00 PM-7:00 PM via Zoom
https://ucsd.zoom.us/j/94945440978
meeting ID: 949 4544 0978

- *Virtual office hours will start on Thu, April 9th*
- The course is podcasted, and the course content is available for the duration of the quarter;

Communication: *When emailing, use gbozinovic@ucsd.edu contact and put "BIBC102" or "Metabolic Biochem" in the subject line, or your email may not be read promptly. Emails will not be answered in the evening or on weekends. If you have not received an answer to your email for several business days, it is likely that your inquiry should be resolved by a simple internet search or discussing the matter with your IAs and/or classmate(s).*

Course Website – CANVAS:
- For class-related materials, please access CANVAS at http://canvas.ucsd.edu using your username and password.
- Make sure to log in often and check for announcements.
- Post all class-related questions on the discussion board. It will be sectioned based on the Textbook chapter numbers (1, 2, etc..), so that the IAs can answer your questions effectively.
- Each IA section will have its own folder, so that section-specific materials can be posted and retrieved accordingly.
- **Discussion Section and Instructional Assistants (IAs):** You must be enrolled and virtually attend / participate in a section, since 26% of your grade is determined by section participation (see grading below). Note that quizzes will be administered by your IAs during the discussion section.

Sec	Day / Time	Location	IA	email
B01	M 4-4:50 P	RCLAS (zoom)	Donivian, Al Dikka	doaldikka@ucsd.edu
			Gregory Cook	gmcook@ucsd.edu
			Haley Schultz	hcschultz@ucsd.edu
			Ziyao Shen	zis003@ucsd.edu
			Rita Fisher (grader)	rifische@ucsd.edu
			Katie Sohn (grader)	ksohn@ucsd.edu

Zoom Discussion Section meetings start on Monday, April 8ʰ.
Discussion Section zoom link: TBD
IAs' syllabus, and office hours will be posted on Canvas by Friday, April 5th.
Lectures: *Attend lectures in-person.*

Lecture materials and course content: .pdf lecture slides and other relevant course materials will be available throughout the quarter on Canvas (weekly "Modules" folder). Although the lectures podcast will be available during the quarter, you are highly encouraged to attend lectures as they will be interactive, and you will be able to ask questions and participate in a discussion.

Zoom Discussion Section and Quizzes: Discussion section will begin during week 2 (Wed, Oct 11th). Attendance is mandatory; during the sections you will review concepts and work on exercises that will help you master the course material. Note that the mandatory, time-restricted quizzed (3) will be administered during the discussion sections (see the schedule on the last page); there is no make-up for a missed quiz.

Classroom Etiquette: Please ask questions! Student discussion during lectures is vital to course effectiveness. Lectures will be "paused" periodically to allow for your questions and/or clarification and discussion. To make sure all the questions are addressed, the last 10-15' of each lecture will be reserved for review and discussion.

Policy on recording lectures: recording lectures is **NOT** permitted; per university policy, students must get express permission from their instructor to record class sessions. Screenshots showing instructors and students are considered recordings. Even if permission is granted, student-initiated recordings must be used only for educational purposes for the students enrolled in the initiating student's class. Recordings may be used only during the period in which the student is enrolled in the class. Authorized student-initiated recordings may not be posted or shared in any fashion outside of the class, including online or through other media, without the express written consent of the course instructor or appropriate University administrator. Students who engage in the unauthorized distribution of class recordings may be held in violation of the University's Code of Conduct, and/or liable under Federal and State laws.

<u>GRADING POLICY</u>

EXAMS
There are THREE exams in this course (Midterm 1 - 100 pts, Midterm 2 – 100 pts, and Final – 125 pts). While the final exam will focus on the material presented after the Midterm, it will include important fundamental concepts from the prior portion of the course. The final exam is scheduled for Week 10. There is a take-home 25-section of the final exam to be completed during the finals' week.
<u>The use of electronic Aids during Exams</u>:
Unless you are an exceptionally skilled mathematician, you'll need a calculator during the exam. The use of any other electronic device, including your phone is prohibited.
Midterm 1 Exam (100 pts) – Mon, Apr 22nd
Midterm 2 Exam (100 pts) – Wed, May 15th
Final Exam – in-person (100 pts) – Wed, June 5th 5 – 6:20 P.M.
Final-exam take home Qs (25 pts) – Due on Friday, June 7th (online submission due by midnight)

PROBLEM SETS:
<u>15% of your grade</u> will be based on problem sets. There will be 2 problem sets throughout the course, posted on Canvas / Assignments.   Late assignments will not be accepted!
Problem Set #1 available on Canvas on Fri, Apr 12, Due on Wed, Apr 17
Problem Set #2 available on Canvas Mon, May 27, Due Fri, May 31
- *upload your assignment on Canvas by midnight of a due date; <u>late assignment will not be accepted.</u>*

Discussion Section QUIZZES:
There are three scheduled quizzes during discussion sections worth 15 points each. Section quizzes content is the responsibility of your IA. If your quiz point total is <45, your IA will have the opportunity to award up to 5 more points based on consistent attendance and participation in discussion section to raise your point total to a maximum of 45. *<u>There will be no make-up quizzes.</u>*

<u>GRADING</u>
Your final grade will be determined by what percentage of 405 points you earn (no exam or quiz scores may be dropped). Points are available as follows:

Midterm 1	100 pts
Midterm 2	100 pts
Final Exam	125 pts
Section Pop Quizzes (3) / Section attendance	45 pts
Homework Problem Sets (2)	60 pts
Total Points possible	**430**

Here are *<u>guidelines for the <mark>minimum</mark> grade</u>* you will receive based on point totals, including extra credit:

≥ 395 points _____	A	335 – 343 _____	C+
387 – 394 _____	A-	309 – 334 _____	C
378 – 386 _____	B+	301 – 308 _____	C-
352 – 377 _____	B	280 – 300 _____	D+
344 – 351 _____	B-	250 – 279 _____	D

The points / grade scale maybe adjusted based on the overall class performance.

After the grading is completed, you can view your scores by clicking on "my grades" on the Canvas course homepage. At the end of the quarter, final grades will also be posted in the UCSD e-grade system. Re-grade requests must be submitted <u>via email</u> (explaining the error you found in the grading of your exam) with your attached exam to your IA <u>**within two weeks of when graded exams were first made available;**</u> no requests will be considered after this date, except for correction of point addition errors.

Taking the Exam:
- Exams will be administered <u>in-person</u> in the lecture hall. *Taking the exam remotely / online is NOT an option in this course*.
- Once you submit an exam, you will not be able to drop the score or negotiate a reduction in its impact on your grade for any reason (e.g. you decide afterwards you weren't well enough).
- Requests to reconsider any grading must be submitted via email along with your exam to the IA who graded the question within TWO weeks after graded exam are made available.

<u>Extraordinary Circumstances</u>:
- If you have an illness, injury, or personal crisis that you believe will prevent you from performing adequately on an exam, contact the instructor about this problem before the exam to discuss your options. Your **excuse must include official documentation** (doctor's note).
- If you cannot do this and miss an exam for one of these reasons, you <u>must</u> contact the instructor within 24 hours of the exam to discuss your options.
<u>If a discussion section quiz is missed</u> due to a similar sort of problem, <u>contact your IA</u> no later than 24 hours after the missed quiz. The decision for re-taking the quiz will be at your IA's discretion but will adhere to the same policies stated above.

==*How to do well in this course:*==
- *Read lecture material BEFORE the lecture*
- *Attend lectures!* Most of the exam-relevant material will be" highlighted" during lectures
- Turn assignments in on time
- Take your own notes – active note taking is the key to effective learning
- Actively participate in discussion sections
- Ask questions; attend virtual office hours; utilize IAs expertise and assistance
- **Don't procrastinate**
- Work through the problem sets: metabolic biochemistry is a *problem-solving science. It is, therefore, essential to spend time solving problems and applying concepts introduced during lectures. A significant portion of your exams, homework sets, and quizzes will consist of such problems. Learn how to solve problems not just by looking up the answers in the solutions manual.
- When attempting the end-of-chapter exercise and problem sets, you may use the Study Guide and Solution Manual or any other aids on the text website BEFORE seeking clarification during the discussion sessions. This way you will have a good idea of topics that need further explanation and could seek the help of your IA to understand the material.

==*ACADEMIC DISHONESTY*==
Please carefully review the "**Policy on Integrity of Scholarship**" at:
http://senate.ucsd.edu/manual/appendices/app2.htm
Academic dishonesty (aka cheating) will not be tolerated in this class. According to UCSD policy, academic dishonesty includes:
- taking an exam for another student; allowing another student to take an exam for you
- copying another student's work on an exam or quiz; allowing a student to copy your work
- altering graded assignments and submitting them for a re-grade

Lecture schedule: <mark>TENTATIVE</mark>, subject to change

Date	Topic	*Reference Textbook Reading
M 4.1	Course Introduction, Review Metabolism Overview	Slides, **L1**: Discussion Ch 1 (21-29)
W 4.3	Amino Acids, Peptides, Protein Structure, 3D, Folding	**L2**: 3 (75-81, 85-88); 4(115-117) 13 (495-501); 6 (187-213; 225-231)
M 4.8	Thermodynamics and enzyme catalysis;	**L3**: 6(187-215; 225-231)
W 4.10	Michaelis-Menten enzyme kinetics;	**L3**: 6(187-215; 225-231)
M 4.15	<mark>Quiz 1 Discussion Section</mark> Chymotrypsin mechanism	**L3**: 6 (225-231)
<mark>W,</mark> 4.17	Regulation of enzyme activity Enzyme Inhibition Homework #1 due	**L4**: ppt slides
M 4.22	<mark>EXAM 1</mark>	
W 4.24	Metabolism: Coupling of endergonic and exergonic Rxns; Electron carrier cofactors	**L5**: 13 (491-494; 507-524)
<mark>M 4.29</mark>	Metabolism Bioenergetics; Pathway Regulation	**L5: ppt** slides
W 5.1	Glycolysis;	**L6**: 14 (533-545)
M 5.6	<mark>Quiz 2 Discussion Section</mark> Gluconeogenesis; Glycogen Synthesis and Degradation	**L6**: 14 (558-570); 15 (601-608)
W 5.8	Alternate fates of pyruvate: Cori Cycle - the pyruvate dehydrogenase complex* TCA Cycle (1)	**L6**: 14 (553-557) **L7**: 16
M 5.13	TCA cycle (2)	**L6**: 14 (553-557); 16; **L7**: 16
W 5.15	<mark>EXAM 2</mark>	
<mark>M</mark> 5.20	The mitochondrial electron transport chain; the Q cycle*	**L8**: 19 (711-743)
W 5.22	Oxidative phosphorylation and ATP synthase The malate-aspartate shuttle*	**L8**: 19 (711-743)
M 5.27	No Class	
<mark>W 5.29</mark>	Insulin, Glucagon, Leptin, Diabetes Homework #2 Due on Friday, May 31	**L9**: Lecture notes
M 6.3	<mark>Quiz 3 – Discussion Section</mark> Synthesis of fatty acids; Cholesterol synthesis **FYI**: Amino acid metabolism and the urea cycle Final Exam Review	**L10**: 21 (811-819) **L11**: 18 (675-691)
W 6.5	<mark>In -person FINAL EXAM</mark> Final Exam on-line answers Due by midnight on Friday, June 7	

- <mark>The Textbook for this course is NOT required.</mark> The textbook reference is a suggested reading, and ANY relatively recent (published within last 3-4 years) peer-reviewed biochemistry textbook will be a good resource for this course.