

**BIBC 102 Metabolic Biochemistry
Spring 2020 (B00)**

Instructor: Goran Bozinovic
Lectures: Tu, Th 6:30-7:50 PM
Location: *via Zoom:* <https://ucsd.zoom.us/j/728547200>
Course website: <http://canvas.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, photosynthesis, and fatty acid oxidation; 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 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. We will examine the kinetics of enzyme-catalyzed reactions, the chemical mechanisms through which enzymes produce catalysis, and the regulation of catalytic activity. The remainder of the quarter will focus on metabolism, the various pathways by which biological molecules are broken down to provide energy for the cell, and by which new biological molecules are synthesized. In our study of metabolism, we will try to understand 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 look at how these pathways are regulated so that metabolism occurs in coordinated fashion.

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: by appointment *via* Zoom

When emailing, please put BIBC102 or Metabolic Biochem in the subject line, or your email may not be read promptly.

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.
- **Sections and Instructional Assistants (IAs):** You must be enrolled and attend / participate in a section, since 26% of your grade is determined by section

participation (see grading below). If not, you will not receive credit for problem sets (see problem set section below), nor will you be able to take the quizzes, which will be administered during the section at the IA's discretion.

Sec	Day / Time	Zoom Link	IA	email
B02	M 4-4:50 pm	https://ucsd.zoom.us/j/8311654867	Shuhe Wang	shw279@ucsd.edu
B03	M 5-5:50 pm	https://zoom.us/j/428652938	Sophia McDaniel	smmcdani@ucsd.edu
B04	W 5-5:50 pm	https://ucsd.zoom.us/j/495875060	Shiv Patel	shp093@ucsd.edu
B05	W 6-6:50 pm	https://ucsd.zoom.us/j/447848200	Erin Harryman	eharryma@ucsd.edu
B06	W 7-7:50 pm	https://ucsd.zoom.us/j/951509350	Erin Harryman	eharryma@ucsd.edu
B08	F 9-9:50pm	https://ucsd.zoom.us/j/365848579	Ethan Zhu	yszhu@ucsd.edu
B09	Th 8-8:50 pm	https://ucsd.zoom.us/j/544254039	Julien Stroumza	jstroumz@ucsd.edu
B10	Tu 5-5:50 pm	https://ucsd.zoom.us/j/113113431	Mokhtarian, Sophia	smokhtar@ucsd.edu

Section zoom meetings start on Monday, April 6th.

IA's virtual office hours will be posted on Canvas in the IA section syllabus on April 8th.

Lectures: Attend lectures *via* Zoom. Use the following link to attend lectures on Tue & Thu 6:30-7:50PM

Link: <https://ucsd.zoom.us/j/728547200>

Meeting ID: 728547200

Lectures will be held live *via* Zoom beginning Tuesday, March 31. You can access the Zoom lecture log-in on Canvas or by using the link above. Lectures will be held during the time listed in the schedule of classes, and recordings of each Zoom lecture and .pdf lecture slides will be available throughout the quarter on Canvas. You are highly encouraged to attend "live" lectures as they will be interactive, and you will be able to ask questions.

Discussion Sections will begin during week 2r. These will also be held *via* Zoom, and during the sections you will work on exercises that will help you master the course material. You need to attend the discussion section in which you are enrolled; you cannot attend other discussion sections. Discussion section links are listed in the IA information table above and in the discussion section syllabi.

Online Classroom Zoom Etiquette: Keep your line muted during classes unless the Instructor / IA calls on you to ask a question. If you have a question, please use the "raise hand" function under the "participants" tab. Enabling your video is optional during lectures. Zoom etiquette for section discussions/labs are up to the discretion of your IA.

- Make sure your line is muted unless you are prompted to ask a question.
- Asking questions: Please ask questions! Student discussion during lectures is vital to course effectiveness. Use the "Raise Hand" option on zoom to notify me that you have a question. Lectures will be "paused" periodically to allow for your questions and/or clarification
- We may not have an opportunity for traditional class discussions on an online platform. If you have a comment or question, please be considerate of class time. To make sure all the questions are addressed, the last 10-15' of each lecture will be reserved for review and discussion.

GRADING POLICY**EXAMS**

There are THREE exams in this course, each worth 100 pts. The final exam will focus on the material presented after the Exam 2, but will include important fundamental concepts from the prior portion of the course.

The use of electronic Aids during Exams:

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.

PROBLEM SETS:

15% of your grade will be based on problem sets. There will be 2 problem sets throughout the course, posted in the TritonEd. They are due in your discussion section the following week. Late assignments will not be accepted!

Problem Set #1 available on Canvas Thursday, April 16, Due on Tuesday, April 21

Problem Set #2 available on Canvas Thursday, May 28, Due Thursday, June 04

- *To make the allotted assignment time fair to all sections, please email your assignment to your IA by midnight of a due date; late assignment will not be accepted*

Discussion Section QUIZ:

There will be three quizzes given in discussion sections worth 15 points each. 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. *Credit will only be given for quizzes taken in the section you are enrolled in as shown at the online section enrollment site (<http://sections.ucsd.edu>).*

Exceptions to this policy will not be made. It is your responsibility to know what section you are enrolled in!

GRADING

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, 2	200 pts (100 pts each)
Final Exam	100 pts
Section Pop Quizzes (3) / Section attendance	45 pts
<u>Homework Problem Sets (2)</u>	<u>60 pts</u>
Total Points possible	405

Here are guidelines for the minimum grade you will receive based on point totals, including extra credit:

≥ 372 points	A	315 – 323	C+
364 – 371	A-	291 – 314	C
356 – 363	B+	283 – 290	C-
332 – 355	B	275 – 282	D+
324 – 331	B-	240 – 274	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 via email (explaining the error you found in the grading of your exam) with your attached exam to your IA within two weeks of when graded exams were first made available; no requests will be considered after this date, except for correction of point addition errors.

Taking the Exam:

- Exams will be posted on Canvas at a specific time (start of lecture). To minimize the effect of a time constraint, you will have 2.5 hrs to complete the exam and email it to your IA. Late submission will not be accepted.
- 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 particular question within TWO weeks after graded exam are made available.

Extraordinary Circumstances:

- 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 must contact the instructor within 24 hours of the exam to discuss your options. Once you have submitted 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).

If a section quiz is missed due to a similar sort of problem, contact your IA 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 (see extraordinary circumstances).

How to do well in this course:

- Read lecture material BEFORE the lecture
- Attend live zoom lectures! Most of the exam-relevant material will be "highlighted" during lectures via screen share
- 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. The 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 another student to copy your work
- altering graded assignments and submitting them for a re-grade

Lecture schedule: **TENTATIVE**, subject to change

Date	Topic	*Reference Textbook Reading
Tu 3.31	Course Introduction	L1: Discussion Ch 1 (21-29)
Th 4.2	Amino Acids and Peptides	L2: Ch 3 (75-81;85-88)
Tu 4.7	Protein Structure, 3D, Folding	L2: 3 (85-88); 4(115-117) 13 (495-501); 6 (187-213; 225-231)
Th 4.9	Thermodynamics and enzyme catalysis; Michaelis-Menten enzyme kinetics;	L3: 6(187-215; 225-231)
Tu 4.14	Chymotrypsin mechanism	L3: 6 (225-231)
Th 4.16	Regulation of enzyme activity Enzyme Inhibition	L4: ppt slides
Tu 4.21	Metabolism: Coupling of endergonic and exergonic Rxns; Electron carrier cofactors; Homework #1 due	L5: 13 (491-494; 507-524)
Th 4.23	Metabolism Bioenergetics; Pathway Regulation	L5: ppt slides
Tu 4.28	Glycolysis;	L6: 14 (533-545)
Th 4.30	Gluconeogenesis; Glycogen Synthesis and Degradation	L6: 14 (558-570); 15 (601-608)
Tu 5.5	Exam 1 – on canvas	
Th 5.7	Fermentation; alternate fates of pyruvate: Cori Cycle - the pyruvate dehydrogenase complex*	L6: 14 (553-557) L7: 16
Tu 5.12	Alcohol metabolism in animals; TCA cycle (1)	L6: 14 (553-557); 16
Th 5.14	TCA: The citric acid cycle (2)	L7: 16
Tu 5.19	The mitochondrial electron transport chain; the Q cycle*	L8: 19 (711-743)
Th 5.21	Oxidative phosphorylation and ATP synthase The malate-aspartate shuttle*	L8: 19 (711-743)
Tu 5.26	Exam 2 – on canvas	
Th 5.28	Inulin, Glucagon, Leptin, Diabetes	L9: Lecture notes
Tu 6.2	Synthesis of fatty acids; Cholesterol synthesis	L10: 21 (811-819)
Th 6.4	Amino acid metabolism and the urea cycle Final Exam Review Homework #2 due	L11: 18 (675-691)
Tu 6.9	FINAL EXAM (cumulative, focus on the material after Exam 2)	

- **The Textbook for this course is NOT required.** 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.