Fundamentals of Biochemistry

Zoom Meeting ID: 968-620-02871

Dr. Gail K. Grabner

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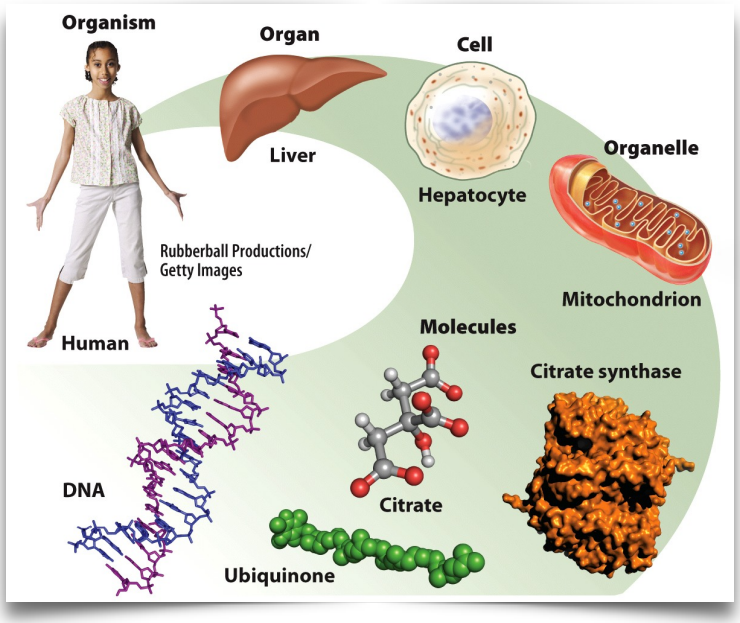

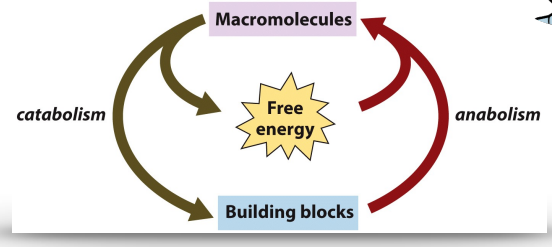

Chemistry of Life

Biochemistry is a branch of science involved in elucidating the structure, organization and function of living systems in molecular terms. We will see the themes of rhythm, balance, and order in multiple applications. One of the main tenets of biochemistry is the close relationship between structure and function – and this we will see repeated numerous times. Much of what we discuss will relate to energy use and generation. For example, how does that hummingbird get the energy it needs for flight? I look forward to sharing this science with you as we investigate together the molecular wonders of life!

Prerequisites: Chemistry 310M, 318M, 320M, or 328M with a minimum grade of C-

When: M, Tu, W, Th

Where: Online course

Time: 10:00 - 11:15 am

Textbook: Campbell, Farrell, McDougal, 9th ed. with OWLv2[1]

Also required: Squarecap

Dr. G's Office Hours[2]: MWF 1:00-2:00 pm

Zoom meeting ID: 983-147-26036

[1] Purchasing options will be discussed on the first class day.

[2]Office hours use a group format. Contact Dr. G for a private meeting.

TA's/email:

Tyler Smith (graduate TA): tylersmith128@utexas.edu
Zaid Almubaid: zaidalmubaid1@gmail.com
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Chandershekhar Shori: cshori@icloud.com

Course Goals

- Learn the language of biochemistry
- Be thoroughly familiar with the dynamic nature of living systems
- Understand and be able to apply principles of thermodynamics to biological systems
- Know the basic compartments within a living cell and how they relate to biochemical systems
- Understand and be able to apply the principles that govern the use of various techniques in the study of biochemical systems
- Understand the basic principles that govern the interaction of various biological molecules.
- Understand the importance of balance in biological systems and the consequences of imbalance in terms of disease
- Be able to apply knowledge to real world challenges
- Develop and practice problem solving skills
- Learn to work productively and collaboratively with others

Component*	Due	% of Grade	Drops
Module Quizzes	½ hour before class	10%	2
Squarecap	During class	15%	2
OWL Homework	Sundays @ 11 pm	15%	1
Exam Quizzes	Sundays @ 11 pm	40%	1
Final Exam	July 30-August 1 (3 h)	20%	–
Extra Credit	Based on HW	Added to EQs	
	***Other than OWL HW, all assignments are completed on Canvas**		

Grade	Scale	Grade	Scale
A	94.5*-100%	C	71.5-75.4%
A-	89.5-94.4%	C-	68.5-71.4%
B+	85.5-89.4%	D+	65.5-68.4%
B	81.5-85.4%	D	62.5-65.4%
B-	78.5-81.4%	D-	59.5-62.4%
C+	75.5-78.4%	F	<59.5%

*The decimals are simply to let you know that I round up using standard mathematical principles.

Course Format

We will be following a blended learning model including assignments before, during and after class. Most lecture material is included in pre-recorded videos, though there will be some lecturing in class. **This model has proven especially helpful in learning this subject** and is intended to help you divide the material into more bite-sized pieces.

Modules and Module Quizzes (10%)

Students will complete a Module prior to each class period, composed of several pre-recorded short videos (2-5 min/each) related to the topic for the day. Each module also contains a Module Quiz comprised of 5 multiple-choice questions that must be completed ½ hour before the lecture period. The modules and quizzes are intended to foster familiarity with the subjects so that we can devote most of our time in lecture to problem solving. You do NOT need to be content experts before class – you just need to be somewhat familiar with the topics. Students will get 2 attempts for each quiz (24 quizzes, total) and your 2 lowest scores will be dropped. The final page of each module contains videos of material that students are responsible for – but these do not need to be reviewed prior to class ("post-lecture" videos).

Squarecap and Lecture (15%)

We will be using the Squarecap system for in-class questions and problems. Students are encouraged to work through the problems in a collaborative way – engaging with other students as well as with TA's. After we work through a set of problems, we will review the concepts behind the solutions and take time to clarify any points or address questions that might arise. Some of the more challenging topics will be addressed as live mini lectures in class – serving also to reduce the number of videos required before lecture. Lectures will be conducted using Zoom and will be recorded. Recordings will be posted on the day following lecture. ***Attendance is required for the lectures scheduled on Monday thru Wednesday.*** Lecture time on Thursday will be an optional review of the material prior to the weekend assignments (HW and EQ).

Each Squarecap question is scored as 1 point for completion and 1 point for accuracy. Since the number of questions will vary with each lecture, grades are uploaded as percentages. A grade of 80% or higher in Squarecap will equate to a 100% score in Canvas – in other words only 80% accuracy is required for 100% credit. There will be a total of 24 Squarecap grades and your lowest two scores will be dropped.

OWL Homework (15%)

Students will have an OWL HW assignment due each weekend on topics covered in lecture. Coupled with our work in class, these will help students achieve a deeper understanding of the topics. These assignments are due Sundays by 11 pm (see schedule below) and will include 3 chapters of material – 10 questions each. There are a total of 8 HW assignments and your lowest score will be dropped. ***Students are encouraged to complete the HW assignment first, in preparation for taking the Exam Quiz.*** As soon as the assignment is completed, OWL gives you the option to practice – a good idea if you struggled with particular questions or concepts.

Exam Quizzes (40%)

There will be an Exam Quiz due each weekend – on Sundays at 11 pm. It will cover the same material as that of the OWL HW assignment due at the same time (see schedule below). These quizzes will be composed of 6 questions worth 1 point each, 14 questions worth 2 points each, and 2 questions worth 3 points each – a total of 40 points for each EQ. Students will get only one attempt – and responses and scores will not be released until after the due date has passed. The EQ will be available from 8 am on Saturdays to 11 pm on Sundays. These are timed and students will have one hour from the time they begin – but students that start late on Sunday will NOT get any time past 11 pm. There will be a total of 7 EQ's and your lowest score will be dropped. Practice exam quizzes will be provided in advance. *Note: these are open-note exams – but if you take the time to search in your book or notes for all the answers – you will NOT have time to finish.*

Extra Credit

Students will have multiple opportunities to earn extra credit. There will be a couple of short surveys you can complete for extra credit, but these points will primarily be based on your performance on the OWL HW. Students that score 95% or higher on a HW assignment, will earn 1 extra credit point. All of the extra credit will be summed into an Extra Credit Total grade column (I do this manually), which is included in the EQ grade category. By adding this total to a grade category rather than an individual exam – you get the value of the extra credit, even if the EQ is dropped. There is a maximum of 8 extra credit points.

Final Exam (20%)

There will be a cumulative final exam scheduled during the period of July 30-August 1. It will be completed on Canvas and will be similar in format to that of the Exam Quizzes. One portion of the exam will be identical in form to that of the other EQ's (same number of questions; 40 points) and will relate to the material in Chapters 22 thru 24. The other portion of the final will relate to the material in Chapters 1 thru 21. This portion will include 2 questions from each chapter, worth 2 points each (84 points). An abbreviated form of the Learning Objectives for this section of the final will be provided. Students will have 3 hours to complete the final once they begin. It is considered an open-note exam, as well.

Makeup Policy

According to UT policy, make-up exams may be given only if there is proper documentation of a UT-sanctioned reason (serious illness, death in the family, but **not** planned vacations, weddings, over-slept, etc). You will need to register your excuse with Student Emergency Services, who can document your absence. Please email Dr. G to discuss.

How do I succeed in this course?

- Use the Learning Objectives as your foundation for understanding the concepts.
- Make use of class time!
- Work as many problems as you can – from Squarecap, OWL HW, and the textbook Review Exercises.
- Digest as you go! Study a little each day.

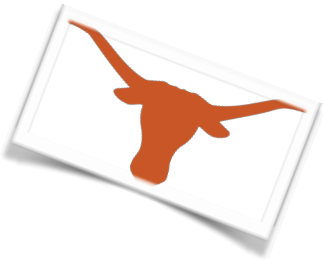
University Policies and Non-academic Resources

More information about each of the following subjects is available on the associated UT website.

Academic Integrity: Ethical conduct is expected at all times. Unethical conduct (cheating on exams, quizzes, etc) may result in an automatic failing grade in the course and/or academic probation. If you have a question about whether a particular activity is considered unethical, ASK FIRST. See the UT Academic Policy.

Administrative Deadlines: It is your responsibility to keep track of the deadlines for dropping the course, changing to Pass/Fail, etc.

Behavior Concerns Advice Line (BCAL), Counseling, and the Mental Health Center Crisis (MHCC) line: College can be pretty stressful and sometimes we need a little help. Luckily, we have a wealth of resources and dedicated people ready to assist you.



- If you are experiencing a **mental health** crisis (depression, anxiety, e.g.) call the MHCC line at **512-471-CALL (2255)**. Call even if you aren't sure you're in a full-blown crisis, but sincerely need help. Staff are there to help you.
  - Alternatively, you can talk to **Amy Trinh**, our LPC (licensed professional counselor) right here in CNS, by walking over to her office **WC Hogg 2.214,** or calling her at **512-471-7162**. She usually has daily office hours for drop-ins.
- If you have a **behavioral concern about about someone else** and need some advice on what to do, you may call BCAL at **512-232-5050** to talk with someone about it. The call is confidential, and you decide how much information you'd like to share.
- Of course, if you feel the behavior requires **immediate attention**, (e.g. person is of harm to self or you feel threatened), call **911** directly.

General UT information: Recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767, http://www.utexas.edu/safety/ . Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building. Link to information regarding emergency evacuation routes and emergency procedures can be found at: www.utexas.edu/emergency.

Personal or Family Emergencies: If you experience a personal or family emergency (death in the family, protracted sickness, serious mental health issues) that prevents you from attending an exam or forces you to miss multiple days of class, you should contact Student Emergency Services in the Office of the Dean of Students http://deanofstudents.utexas.edu/emergency/index.php . They will work with you to communicate with your professors and let them know of your situation.

Religious Observances: By UT Austin policy, you must notify me of your pending absence at least fourteen (14) days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

Students with Disabilities: All procedures outlined at http://www.utexas.edu/diversity/ddce/ssd/index.php will be followed in this course. Please provide proper documentation from the SSD Office at the beginning of the semester.

Schedule of Topics

Date	Class	Chapter	Topic	Campbell Reading	Canvas Module
	Unit 1: Biochemical Molecules and Methods				
Thu June 4	1	Ch 1	Biochemistry & the Organization of Cells	Syllabus; Ch 1.1-1.6	M1
	No OWLv2 HW				
Mon June 8	2	Ch 2	Water: The Biochemical Solvent	Ch 2.1-2.5	M2
Tue June 9	3	Ch 2-4	Buffers & Amino Acids* *Case Study: Aspirin Overdose	Ch 2.5-4.1	M3
Wed June 10	4	Ch 4	Three-Dimensional Protein Structure	Ch 4.3-4.5	M4
Thu June 11			**Review of Chapters 1-3**		
	OWL Intro (extra credit); OWLv2 HW 1 and EQ 1: Ch 1-3				
Mon June 15	5	Ch 4-5	Hemoglobin; Protein Purification & Characterization* *Case Study: Sickle Cell Anemia	Ch 4.5-5.4	M5
	Unit 2: Structure and Function of Biochemical Molecules				
Tue June 16	6	Ch 6	Enzymes	Ch 6.1-6.6	M6
Wed June 17	7	Ch 6-7	Enzymes, Mechanisms & Control* *Case Study: Alcohol Dehydrogenase	Ch 6.6-7.5	M7
Thu June 18			**Review of Chapters 4-6**		
	OWLv2 HW 2 and EQ 2: Ch 4-6				
Mon June 22	8	Ch 7-8	Enzyme Mechanisms; Biological Membranes	Ch 7.6-8.4	M8
Tue June 23	9	Ch 8-9	Transport & Receptors; Nucleic Acid	Ch 8.5-9.5	M9
Wed June 24	10	Ch 9-10	DNA Replication	Ch 9.6-10.7	M10
Thu June 25			**Review of Chapters 7-9**		
	OWLv2 HW 3 and EQ 3: Ch 7-9				

Date	Class	Chapter	Topic	Campbell Reading	Canvas Module
	Unit 3: Molecular Biology and Bio Techniques; Energetics of Metabolism				
Mon June 29	11	Ch 11	Transcription	Ch 11.1-11.4	M11
Tue June 20	12	Ch 11-12	Protein Synthesis	Ch 11.6-12.4	M12
Wed July 1	13	Ch 13	Nucleic Acid Biotechnology Techniques	Ch 13.1-13.8	M13
Thu July 2			**Review of Chapters 10-12**		
	OWLv2 HW 4 and EQ 4: Ch 10-12				
Mon July 6	14	Ch 14	Viruses & Immunology	Ch 14.1-14.3	M14
Tue July 7	15	Ch 14-15	Cancer & HIV; Energy Changes in Metabolism	Ch 14.4-15.6	M15
	Unit 4: Carbohydrates and Metabolism				
Wed July 8	16	Ch 16	Carbohydrates	Ch 16.1-16.5	M16
Thu July 9			**Review of Chapters 13-15**		
	OWLv2 HW 5 and EQ 5: Ch 13-15				
Mon July 13	17	Ch 17	Glycolysis	Ch 17.1-17.5	M17
Tue July 14	18	Ch 18	Storage & Control in Carbohydrate Metabolism	Ch 18.1-18.3	M18
Wed July 15	19	Ch 18-19	Hormonal Regulation; Citric Acid Cycle	Ch 18.3-19.5	M19
Thu July 16			**Review of Chapters 16-18**		
	OWLv2 HW 6 and EQ 6: Ch 16-18				
Mon July 20	20	Ch 19-20	Electron Transport & Oxidative Phosphorylation	Ch 19.5-20.5	M20
	Unit 5: Intermediary Metabolism and its Integration				
Tue July 21	21	Ch 21	Lipid Metabolism	Ch 21.1-21.6	M21

Date	Class	Chapter	Topic	Campbell Reading	Canvas Module
Wed July 22	22	Ch 21-22	Lipid Synthesis; Photosynthesis	Ch 21.7-22.6	M22
Thu July 23			**Review of Chapters 19-21**		
	OWLv2 HW 7 and EQ 7: Ch 19-21				
Mon July 27	23	Ch 23	Nitrogen Metabolism* *Case Study: Phenylketonuria	Ch 23.1-23.9	M23
Tue July 28	24	Ch 24	Integration of Metabolism & Signaling	Ch 24.1-24.5	M24
	OWLv2 HW 8: Ch 22-24 (Due July 30 at 11 pm)				
	FINAL EXAM*: Available July 30-August 1; 3-hour time limit Part I: Ch 22-24 (40 points): Part II: Ch 1-21 (84 points)				

*More information regarding the material and content of the final exam will be provided later in the semester.