BIOCHEMISTRY
CHMB62 2021
Course Outline

This document contains important information and should be kept in a safe place where you can refer to it throughout the semester.

Welcome to CHMB62H3: Biochemistry. This course is an introduction to the molecular structures of living systems. Topics will include the physical and chemical properties of amino acids, proteins, enzymes, fatty acids, lipids, carbohydrates, metabolism, and biosynthetic pathways.

LEC30: MON 2:00-3:00 pm, THURS 5:00-7:00 pm, online synchronous using BB collaborate.

TUT3001: THURS 7:00-8:00 pm, online synchronous using BB collaborate.

Lecturer and Tutorial Coordinator: Natashya Falcone
Contact: natashya.falcone@mail.utoronto.ca
(416) 919-6046

Office hours: Mon. 11:00-1:00 pm and Thu. 3-4 pm; feel free to also email me anytime!

Required Textbook:
J. Tymoczko, J. Berg, L. Stryer. Biochemistry: A Short Course. 4th. ed., W.H. Freeman and Company.

Method of Evaluation:
Tutorial: 18% (9% quizzes, 9% tutorial discussion booklets)
Online homework (Sapling Learning): 7%
Literature Assignment: 10% (2 marks will be assigned for peer review). It will be given to you during the second week of classes.
Midterm Test: 25%
Final Exam: 40% (April exam period)

Online homework:
We are going to be using the Sapling Learning program for this course. Please find the instructions for this program below.

STUDENT INSTRUCTIONS

1. Go to www.saplinglearning.ca/login to create an account. If you already have a Macmillan Learning account you can log in with your existing credentials and skip to step 3.
    1. Create your password and set all three security questions.
    2. Start typing in your institution to select from the options that appears in the Primary Institution or School name field. If you institution does not appear you can add it by typing in the full name.
    3. Accept the terms of use and click "Sign Up".
    4. Check your email for the confirmation link to complete your registration and return to the login page.
2. Set your institution by searching using your institution's full name and selecting the appropriate option from the menu that appears.
3. Under Enroll in a new course, you should see Courses at [Your College]. Click to expand this list and see courses arranged by subject. Click on a subject to see the terms that courses are available.
4. Click on the term to expand the menu further (note that Semester 1 refers to the first course in a sequence and not necessarily the first term of the school year).
5. Once the menus are fully expanded, you'll see a link to a specific course. If this is indeed the course you'd like to register for, click the link.
6. *If applicable,* to access your ebook click on the image of the cover on the right sidebar of your course site. Create an account or log in with an existing Macmillan Learning eBook account.
7. **Need Help?** Our technical support team can be reached by phone, chat, or by email via the Student Support Community. To contact support please open a service request by filling out the webform: https://macmillan.force.com/macmillanlearning/s/

The following link includes more detailed instructions on how to register for your course: https://macmillan.force.com/macmillanlearning/s/article/Sapling-Learning-Registering-for-courses

Please also check the External links section on the course Quercus page.

Learning Outcomes for Course:

By the end of this course, students will be able to:

- Describe the key classes of biomolecules including amino acids, carbohydrates, lipids, and nucleic acids.
- Understand the chemical principles connected to living systems.
- Understand the role of enzymes and their kinetics and their role in metabolism.
- Describe how dietary proteins, carbohydrates, and lipids are digested.
- Describe the genetic code and identify the steps in protein synthesis.

- Understand the main processes of cellular respiration
- Students who successfully complete this course will demonstrate a broad knowledge of biochemical concepts, paradigms, and vocabulary as well as be able to critically review experimental evidence in the scientific literature.

Lecture Schedule: This is a rough guide and may change throughout the term.

Lec. #	Week of	Subject	Book Chapter
1	Jan.11	**Introduction to Biochemistry and the Unit of Life. Biochemical Interactions and pH.**	1,2
2	Jan.18	**Amino Acids and Protein Structure.**	3,4
3	Jan. 25	**Enzymes and Coenzymes. Kinetics and Regulation.**	6,7
4	Feb. 1	**Mechanisms and Inhibitors. Hemoglobin.**	8,9
5	Feb. 8	**Carbohydrates and Lipids.**	10,11
Reading week – week of February 15th (no classes)			
Midterm – date and location TBA			
6	Feb. 22	**Membrane Structure and Function. Signal-Transduction Pathways.**	12, 13
7	Mar. 1	**Nucleic Acid Structure and DNA Replication**	33,34
8	Mar. 8	**RNA Synthesis and Regulations. The Genetic Code.**	36,39
9	Mar. 15	**Glycolysis and Glucogensis.**	16,17
10	Mar. 22	**The Citric Acid Cycle.**	18,19
11	Mar. 29	**Oxidative Phosphorylation (Electron transport chain and ATP synthase)**	20,21
12	Apr. 5	**Fatty Acid and Lipid Metabolism.**	27,29
	Apr. 12	**Review Session**	
Winter Term Exams	April exam period	**Three-hour final exam (TBA).**	

Assigned Sapling problems will be posted with every lecture.

Expectations from CHMB62H3 Students:

I understand that this is a hard time for all, but I expect everyone to be online during class and tutorial times and to engage in lecture material. I will do my best to provide a positive, approachable, and effective learning environment but I expect you to exhibit an autonomous, self-regulated learning behaviour. I would like you all to push yourselves to think critically and understand the concepts and their applications beyond the classroom, and how biochemistry impacts your health, environment, and the biological world as a whole. Your success as a student depends on your ability to think creatively and critically while being able to work efficiently individually and as a group. Lastly, I expect you to reach out to myself or the TAs if you are struggling with any concepts, we are here to help you and clarify important but difficult topics.

Expectations from the Course Instructor:

The instructor's role is to facilitate learning (by lecturing, answering questions, etc.) and to evaluate learning (by tutorials, exams, etc.). Remember that you are doing this work for yourself (to prepare for future endeavors), not for the instructor. What can you expect from me? You can expect me to be prepared for class with both knowledge and enthusiasm. You can expect that I

will utilize all reasonable resources to help you succeed in this class. Again, don't be afraid to seek help when needed. I am here to help you learn the material covered in this course and to provide an impartial evaluation of your performance.

Literature assignment

The literature assignment is a great way to facilitate your understanding of a biochemistry topic by developing skills on how to look up scientific articles and to study and dive deeper into the real-life research pertaining to this topic. The assignment will be given to you during the second tutorial and a detailed explanation of my expectations for a good literature assignment will be posted on our Quercus course page. We will also be having a library help session to help you with finding literature and citations. You will submit your literature assignment through a Turnitin program imbedded into our Quercus course page. This is a U of T statement about this program:

"Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site".

I will post a detailed explanation of how to submit your assignment later on a course page.

Your assignment will NOT BE GRADED if you refuse to submit it through the Turnintin program.

Class notes:

Sets of *incomplete notes*, including figures discussed in class, will be available on the class Quercus page prior to the corresponding lecture. You are responsible for printing these notes and bringing them with you to class. **You will be responsible for all material covered in lecture, even if it is not included in the online notes**; you must attend lecture in order to get additional information.

Steps toward Success in Biochemistry:

1. **Look through the chapter before lecture.** It is not necessary to read the whole chapter before class, but look at headings and schemes, specifically trying to find similarities to topics that will be covered on the slides.
2. **Go to class.** Go to class every time and pay attention during class.
3. **Do practice problems!** This is the most important and most productive way to study and is ESSENTIAL for you to succeed in the course.
4. **Ask questions!** Attend office hours and tutorial sessions and email.
5. **In order to make sense of the material** in this course, you should be asking at least some of the following questions:

- HOW is this built or HOW does this work (structure/order)?
- WHY is it built or WHY does it work this way (function)?
- WHAT IF it worked a different way (order)?
- HOW does this allow it to perform its role in the cell (context)?
- HOW does this interact with other molecules or processes (cross---talk)?
- HOW is this molecule or process activated or inhibited (regulation)?

- HOW well does this work (redundancy)?
- HOW can I know if this is happening (detection)?
- HOW can I measure this (quantitative/qualitative analysis)?

Extra Credit Activities:

There are two extra credit activities in order to give you a chance to improve your class performance and to also allow you to learn some extra material related to the class but is outside of the lecture material. There are two options that you can perform and earn up to two extra grades on top of your final course mark. Each project is worth one extra mark.

Molecule of the Week Project:

You can do this project as a group (**not more than two students** allowed to participate in one group). Each of you will be given one extra mark. Choose one of the following molecules below or if you are interested in another biochemical molecules please obtain permission from the Course Instructor. Once a topic is chosen you will be responsible for making a short power point will information on the molecule, this will be presented after our last tutorial to the TA and anyone else who decided to do the extra credit assignment. Please let me know by the reading week if you intend to do this extra credit assignment.

In general, your presentation should have information about the discovery, the physical and chemical properties of that molecule, its practical application and interaction with biological system (human body, plant, etc.). Please do not forget to include references into your presentation. The best way to do it – list them as foot notes on each slide. Wikipedia will not be considered as a reference; you must look at the original paper and refer to it.

Here are some molecules which we would like to introduce to our class:

1. Aspirin (discovery, commercial method of preparation, practical application)
2. Cinnamaldehyde (natural sources, synthesis, practical application)
3. Vanillin (natural sources, synthesis, practical application)
4. Muscone (natural sources, synthesis, practical application)
5. Carvone (natural sources, synthesis, practical application)
6. Strawberry or raspberry ketones (natural sources, synthesis, practical application)
7. α-Damescone (natural sources, synthesis, practical application)
8. Z-Jasmone (natural sources, synthesis, practical application)
9. DIBAL-H (structure, importance in synthesis, usage in synthesis of natural compounds such as ciguatoxin, etc.)
10. NADH – natural reducing agent
11. α-Sinesal – structure, simple chemistry, appearance in nature.
12. Ninhydrin (natural sources, synthesis, practical application)
13. DNA (discovery, chemical properties, practical application)
14. Nicotine (natural sources, synthesis, practical application)
15. Coumarin (natural sources, synthesis, practical application)
16. D-Ribose (natural sources, synthesis, practical application)
17. Estradiol (natural sources, synthesis, practical application)
18. Anabolic Steroids (classification, synthesis, practical applications)
19. D-Glucose (natural sources, synthesis, practical application)

20. Caffeine (natural sources, synthesis, practical application)
21. Acetaminophen (synthesis, chemical properties, practical application)
22. Procaine (synthesis, chemical properties, practical application)

These are just a few ideas and we will be more than happy to welcome your own topic as well.

Dietary or Body Building Supplements Discovery Project:

Supplements are everywhere. Dietary supplements and bodybuilding supplements – proteins, amino acids, cofactors, hormones, fat burners, antioxidants and multivitamins. This extra credit activity will involve making a brochure or video on a chosen supplement and its information. More specifically include:

1. A picture of the supplement
2. State what the manufacturer is claiming this supplement does for you.
3. Identify the active ingredient(s) in the supplement and justify the manufacturer's claims using your biochemical knowledge of human metabolism.

Accessibility:
Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the Access*Ability* Services Office as soon as possible. I will work with you and Access*Ability* Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC Access*Ability* Services staff (located in SW302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416)287-7560 or ability@utsc.utoronto.ca.

ACADEMIC INTEGRITY STATEMENT
Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (http://www.governingcouncil. utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:
IN PAPERS AND ASSIGNMENTS: Using someone else's ideas or words without appropriate acknowledgement. Submitting your own work in more than one course without the permission of the instructor. Making up sources or facts. Obtaining or providing unauthorized assistance on any assignment.
ON TESTS AND EXAMS: Using or possessing unauthorized aids. Looking at someone else's answers during an exam or test. Misrepresenting your identity. **IN ACADEMIC WORK**: Falsifying institutional documents or grades. Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behavior on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behavior or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see http://www.utoronto.ca/academicintegrity/resourcesfor students.html).

I am very excited and looking forward to meeting all of you and working together in this Biochemistry course! ☺