

**LAND ACKNOWLEDGEMENT**

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

**COURSE INFORMATION**

Course Title	Course Code Number	Credit Value
Introductory Medical Biochemistry	BIOC 202.001	3

**PREREQUISITES**

One of CHEM 203, CHEM 223, CHEM 233.

**COURSE LOCATION AND TIME**

Time (Day(s), Hour)	Room
Lecture Mon, Wed & Fri, 8-8:50AM	Friedman Building, Room 153

**COURSE CHAIR**

Course Instructor(s)	Contact Details	Office Location	Office Hours
Dr. Warren Williams (Pronouns: he/him/his)	<a href="mailto:wwarren@ubc.ca">wwarren@ubc.ca</a>	Biological Sciences Building Rm 3047	M/W/F 2-3 In-person or <b>ZOOM</b>

**COURSE INSTRUCTOR(S)**

Course Instructor(s)	Contact Details	Office Location	Office Hours
Dr. Lindsay Rogers (Pronouns: she/her/hers)	<a href="mailto:lindsay.rogers@ubc.ca">lindsay.rogers@ubc.ca</a>	Biological Sciences Building Rm 3117	Mon 10:00-11:00 Wed 11:30-12:30 Fri 9:30-10:30 In-person or <b>ZOOM</b>



## COURSE OUTLINE

BIOC202 will introduce students to chemical processes and biomolecules present within the human body and how they work together to create a living organism. Students will review basic chemical principles, learn about the 20 amino acids and how these amino acids can be arranged to create and fold into complex three-dimensional structures. Students will also learn how protein structure can be related to protein function both in transport (example: hemoglobin) and catalysis (example: chymotrypsin). Students will also be introduced to enzyme thermodynamics and kinetics to understand how enzymes can be characterized and how they can facilitate reactions within a cell by greatly increasing reaction rate. With a good understanding of enzyme function, students will then be introduced to metabolic pathways and the role of ATP in cells. Following a review of carbohydrate chemistry, students will then use their knowledge of metabolism to study how glucose can be broken down into  $\text{CO}_2$  and  $\text{H}_2\text{O}$  with the subsequent production of ATP within a cell (carbohydrate catabolism). Specifically, students will study glycolysis, the Krebs cycle, oxidative phosphorylation (both the electron transport chain and ATP synthase) and regulation of these pathways at the local level. Following the completion of carbohydrate catabolism, students will then study gluconeogenesis and glycogen metabolism. Finally, students will cover glucose homeostasis in the human body. Students will learn about the major hormones involved in glucose homeostasis (insulin, glucagon, and epinephrine) and how they lead to altered metabolism in various cell types at the molecular level. A brief introduction to ketone bodies will also be covered.

## COURSE SCHEDULE (tentative)

Date	Lecture	Topic
Dr. Rogers' Section		
Sept 7 <sup>th</sup>	1	Chemical Review: Biomolecules, Atoms & Bonding
Sept 9 <sup>th</sup>	2	Chemical Review: Water & Thermodynamics
Sept 12 <sup>th</sup>	3	Chemical Review: pH & Buffers
Sept 14 <sup>th</sup>	4	Protein Structure: Amino Acid Structure
Sept 16 <sup>th</sup>	5	Protein Structure: Amino Acid Classification
Sept 19 <sup>th</sup>	6	Protein Structure: Primary Structure & Peptide Bonds
Sept 21 <sup>st</sup>	7	Protein Structure: Secondary Structure ( $\alpha$ helices & $\beta$ sheets)
Sept 23 <sup>rd</sup>	8	Protein Structure: Tertiary & Quaternary Structure
Sept 26 <sup>th</sup>	9	Protein Structure: Protein Folding & Posttranslational Modifications
Sept 28 <sup>th</sup>	10	Enzyme Kinetics: Characteristics of Enzymes



Sept 30 <sup>th</sup> No Class: National day for Truth and Reconciliation.		
Oct 3 <sup>rd</sup>	11	Enzyme Kinetics: Enzyme Thermodynamics & Kinetics
Oct 5 <sup>th</sup>	12	Enzyme Kinetics: Michaelis-Menten Kinetics
Dr. Williams' Section		
Oct 7 <sup>th</sup>	13	Enzyme Kinetics: Enzyme Inhibition
Oct 10 <sup>th</sup> No Class: Thanksgiving		
Oct 12 <sup>th</sup>	14	Protein Function: Chymotrypsin
Oct 14 <sup>th</sup>	15	Protein Function: Chymotrypsin/Hemoglobin
Oct 17 <sup>th</sup>	16	Protein Function: Hemoglobin
Oct 19 <sup>th</sup>	17	Thermodynamics & Biochemical Pathways
Oct 21 <sup>st</sup>	18	Thermodynamics & ATP/Carbohydrates
Oct 24 <sup>th</sup>	19	Carbohydrates
Oct 26 <sup>th</sup>	20	Glycolysis: Introduction, the 10 Rxns: Stage 1
Oct 28 <sup>th</sup>	21	Glycolysis: The 10 Rxns: Stage 2
Oct 31 <sup>st</sup>	22	Glycolysis: Redox & Carrier Molecules, Fermentation & Regulation
Nov 2 <sup>nd</sup>	23	Pyruvate Dehydrogenase Complex: Cofactors & Enzymes
Nov 4 <sup>th</sup>	24	Pyruvate Dehydrogenase Complex: Mechanism & Regulation
Nov 7 <sup>th</sup>	25	Krebs Cycle: The 8 Rxns, Regulation
Nov 9 <sup>th</sup> & 11 <sup>th</sup> No Class: Reading Break		
Nov 14 <sup>th</sup>	26	Oxidative Phosphorylation: Intro, e- transfer & Thermodynamics
Nov 16 <sup>th</sup>	27	Oxidative Phosphorylation: The Electron Transport Chain (ETC)
Nov 18 <sup>th</sup>	28	Oxidative Phosphorylation: ATP Synthase: Overview & F <sub>1</sub>
Nov 21 <sup>st</sup>	29	Oxidative Phosphorylation: ATP synthase: F <sub>0</sub>



Nov 23 <sup>rd</sup>	30	Oxidative Phosphorylation: Regulation, Uncouplers, Transporters
Nov 25 <sup>th</sup>	31	Oxidative Phosphorylation: Transport & ATP Yield of Glucose
Nov 28 <sup>th</sup>	32	Oxidative Phosphorylation: Transport & ATP Yield of Glucose
Nov 30 <sup>th</sup>	33	Glycogen: Role, Structure & Synthesis
Dec 2 <sup>nd</sup>	34	Glycogen: Breakdown Gluconeogenesis: Role & Substrates
Dec 5 <sup>th</sup>	35	Gluconeogenesis: Rxns, Stoichiometry & Regulation
Dec 7 <sup>th</sup>	36	Blood Glucose Homeostasis

### COURSE MATERIALS

*Lehninger, Principles of Biochemistry (8<sup>th</sup> edition)*. Nelson, D. L., Cox, M. M., Freeman and Company 2021. Readings and problem sets will be highlighted in Canvas

### GRADING SCHEME

Assignment	Grade Weight	Date
Midterm I (Dr. Rogers' section)	33.3 %	Oct 13 <sup>th</sup> 6:45-8:15PM in HEBB 100
Midterm II (Dr. Williams' section)	33.3%	Nov 17 <sup>th</sup> 6:15-7:45PM in WOOD 2
Final (Dr. Williams' section)	33.3%	TBA

### GRADING AND COURSE POLICY

The midterm will be scheduled at night, to enable a longer available writing period for this assessment. Check your schedule to ensure that you are able to write at this time. Students who have a scheduling conflict should contact the course chair to make arrangements to write in the make-up session. Students who miss the midterm due to illness or scheduling conflict must submit a request for an academic concession within 48 hours of the missed midterm. Those eligible will write the makeup midterm (to be scheduled just after the midterm to ensure all eligible students are available to write at this alternate date/time).

All learners are welcomed in this course. Students with disabilities and ongoing medical conditions have the option to request an [accommodation](#) for the course assessments after registering with the [Centre for Accessibility](#). If you are eligible for exam accommodations, you will need to write your exams with the Centre for Accessibility. To book an exam, notify the course chair or instructor by email and register with the Centre for Accessibility at least one week in advance of the midterm date, or at least 7 days before the start of the examination period for a final exam in April or December.

**If you are ill, please do not attend class. If you do miss class/assessments because of illness:** Lectures will be made available as a video recording. If you are ill, please plan to attend class from your study space.

**If you do miss a final exam because of illness:** Students who miss a final exam due to illness or extreme personal distress and would like to [apply for a deferred exam](#) must submit a request for an academic concession within 48 hours of the missed exam to faculty of Science Advising. All appropriate documentation must be submitted within 14 calendar days of the missed exam. In addition, the course chair and instructor should also be notified by email within 48 hours to coordinate the deferred exam.

**If the instructor is sick:** We will all do our best to stay well, but if one of the instructors falls ill then they will not come to class. If that happens, all efforts will be made to communicate that to students in a timely manner prior to class time, usually via an announcement in Canvas. Depending on the situation a substitute lecturer will take over, the lecture may take place over Zoom, or the class may be cancelled.

## ACADEMIC MISCONDUCT

UBC and the Department of Biochemistry and Molecular Biology take the issue of academic misconduct very seriously; the honest assessment of student learning is key to both the success of the university and success for individual students. Cheating, in any form, undermines the value of a degree and can have serious consequences for your continued academic success. As such it is important to know what your responsibilities are, what constitutes misconduct and how you can avoid it. With some effort and forethought no student should ever have to find themselves facing discipline for academic misconduct; inform yourself as to the expectations placed on you and what your responsibilities are. UBC definition of academic misconduct can be found in the [UBC Calendar](#) and additional information is available in this [UBC resource link](#).

### What consequences can arise from academic misconduct?

The severity of the discipline can range from a letter of reprimand or a zero on the assignment in question all the way to expulsion from the University. Perhaps the most common outcome in these cases are grades of zero in the course in which the misconduct occurred.

## EQUITY DIVERSITY AND INCLUSION (EDI) POLICIES

It is our goal that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and diversity that the students bring to this class be viewed as a resource, strength and benefit. We make a commitment to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic



status, ethnicity, race, nationality, religion, and culture. We will foster a climate within the classroom where students of diverse backgrounds and identities feel comfortable sharing their opinions and experience with varied topics throughout the class. We (like many people) are learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable or if you observe a situation where someone else is made to feel uncomfortable, please talk to us about it. This includes concerns about any class-related interactions that lead to feelings of exclusion or marginalization. We welcome and encourage your feedback on how we can better cultivate a sense of inclusion in our course. This can be done through meetings, email or anonymous feedback through canvas. We aim to do our best to address each situation as it arises and effect meaningful changes moving forward. For more information visit our [departmental EDI website](#).

## STUDENT RESOURCES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the [UBC Senate website](#).

### Mental Health Resources

In case you are struggling with mental health, or are feeling stressed or anxious, [UBC Counselling Services](#) provides information about a number of resources for students to use. Additionally, UBC students receive [mental health coverage](#) of up to \$1500 under the AMS Health & Dental Plan.

[Here2Talk](#) is available for BC post-secondary students to talk with trained counsellors 24/7 (via voice call or text messages). If you are a student living in UBC residence, [Counsellor in Residence](#) can also be a valuable resource to provide mental health support. If you have a UBC email address, [Therapy Assistance Online \(TAO\)](#) is a free online resource that provides tools to manage stress, relationship problems, substance use, etc.

## COVID RELATED POLICIES

For UBC's latest response to COVID-19, please visit [covid19.ubc.ca](https://covid19.ubc.ca). For our in-person meetings in this class, it is important that all of us feel as comfortable as possible engaging in class activities while sharing an indoor space. Non-medical masks that cover our noses and mouths are a primary tool to make it harder for COVID-19 to find a new host. The higher the rate of vaccination is in our community overall, the lower the chance of spreading this virus. You are an important part of the UBC community. Please arrange to get vaccinated if you have not already done so. **If you're sick, it's important that you stay home – no matter what you think you may be sick with (e.g., cold, flu, other).**



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