



## COURSE OUTLINE

### 1. **Course:** BCEM 341, Biochemistry of Life Processes - Winter 2022

#### **Coordinator(s)**

<b>Name</b>	<b>Email</b>	<b>Phone</b>	<b>Office</b>	<b>Hours</b>
Dr. Marie Fraser	frasm@ucalgary.ca	403 220-6145	BI 413	Zoom meetings by appointment. I answer questions after my lectures.

#### **Section(s)**

Lecture 01 : MWF 13:00 - 13:50 in CHC 105

<b>Instructor</b>	<b>Email</b>	<b>Phone</b>	<b>Office</b>	<b>Hours</b>
Amy Du	adu@ucalgary.ca	TBA	TBA	Zoom meetings by appointment.
Dr. Brienne Burkinshaw	brienne.burkinsha1@ucalgary.ca	403 220-5350	BI 443	Zoom by appointment; in-person office hours TBA
Dr. Marie Fraser	frasm@ucalgary.ca	403 220-6145	BI 413	Zoom meetings by appointment. I answer questions after my lectures.

To account for any necessary transition to remote learning in the winter 2022 semester, courses with in-person lectures, labs, or tutorials may be shifted to remote delivery for a certain period of time. In addition, adjustments may be made to the modality and format of assessments and deadlines, as well as to other course components and/or requirements, so that all coursework tasks are in line with the necessary and evolving health precautions for all involved (students and staff).

#### **In Person Delivery Details:**

Lectures, lab sessions, quizzes, and the final exam will be in person whenever permitted.

#### **Re-Entry Protocol for Labs and Classrooms:**

To limit the spread of COVID-19 on campus, the University of Calgary has implemented safety measures to ensure the campus is a safe and welcoming space for students, faculty and staff. The most current safety information for campus can be found [here](#).

#### **Course Site:**

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D2L: BCEM 341 L01- (Winter 2021) - Biochemistry of Life Processes

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**Note:** Students must use their U of C account for all course correspondence.

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Please identify the course as **BCEM 341** in the subject line of any e-mail messages.

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#### **Equity Diversity & Inclusion:**

The University of Calgary is committed to creating an equitable, diverse and inclusive campus, and condemns harm and discrimination of any form. We value all persons regardless of their race, gender, ethnicity, age, LGBTQIA2S+ identity and expression, disability, religion, spirituality, and socioeconomic status. The Faculty of Science strives to extend these values in every aspect of our courses, research, and teachings to better promote academic excellence and foster belonging for all.

The Biological Sciences Equity Committee acknowledges there are persistent barriers that prevent such accessibility and hinder our progress towards EDI. Our representatives (faculty, staff, postdocs, graduate and undergraduate students) are committed to addressing any concerns and work towards proactive solutions that enact necessary change within the department. To submit anonymous questions, comments or concerns

regarding EDI related issues, please reach out to our Chair, Constance Finney ([constance.finney@ucalgary.ca](mailto:constance.finney@ucalgary.ca)), or a committee representative of your choice at <https://science.ucalgary.ca/biological-sciences/about/equity-diversity-and-inclusion>

## 2. Requisites:

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

### Prerequisite(s):

Chemistry 351.

### Antirequisite(s):

Not open to majors in the Department of Biological Sciences or Natural Sciences concentrators in Biological Sciences. Credit for Biochemistry 341 and 393 will not be allowed.

## 3. Grading:

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar.

In determining the overall grade in the course the following weights will be used:

Course Component	Weight	Due Date (duration for exams)	Modality for exams	Location for exams
Memory quizzes during five of the lab sessions (5 x 1%) <sup>1</sup>	5%	Ongoing		
Laboratory work (6 x 4%) <sup>2</sup>	24%	Ongoing		
In-classtime quiz I <sup>3</sup>	7%	Jan 28 2022		
In-classtime quiz II	8%	Mar 02 2022		
In-classtime quiz III	8%	Mar 28 2022		
In-classtime quiz IV	8%	Apr 11 2022		
Registrar Scheduled Final Exam	40%	Will be available when the final exam schedule is released by the Registrar	in person	Will be available when the final exam schedule is released by the Registrar

<sup>1</sup> Memory quizzes are in lab sessions 1, 2, 3, 5, and 6. When the lab is held online, the quiz will be delivered via D2L at the beginning of the lab session.

<sup>2</sup> Pre-lab assignments are due before the beginning of your assigned lab session. The first five lab reports are due seven days (168 hours, one week) after the beginning of your assigned lab session. The final lab report is due at 5 pm on the final day of classes (April 12, 2022) to accommodate the end of term. Please submit your pre-lab assignments and your lab reports as a single file in portable document format (pdf).

<sup>3</sup> This timed assessment will be available on D2L on Jan 28 at 1 pm. You will have 50 minutes to complete and submit it.

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
<b>Minimum % Required</b>	92 %	86 %	82 %	78%	74%	70 %	66 %	62%	58%	54 %	50 %

This course will have a Registrar Scheduled Final exam that will be delivered in-person and on campus. [The Final Examination Schedule](#) will be published by the Registrar's Office approximately one month after the start of the term. The final exam for this course will be designed to be completed within 2 hours.

A mark of 50% is the minimal passing grade for the laboratory work in this course. Attendance at labs is mandatory. Please bear in mind that a failing grade (F) will result if you do not pass the laboratory work.

The University of Calgary offers a [flexible grade option](#), Credit Granted (CG) to support student's breadth of learning and student wellness. Faculty units may have additional requirements or restrictions for the use of the

CG grade at the faculty, degree or program level. To see the full list of Faculty of Science courses where CG is not eligible, please visit the following website: <https://science.ucalgary.ca/current-students/undergraduate/program-advising/flexible-grading-option-cg-grade>

#### 4. **Missed Components Of Term Work:**

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, one possible arrangement is that the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course. This option is at the discretion of the coordinator and may not be a viable option based on the design of this course.

#### 5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

#### 6. **Course Materials:**

Required Textbook(s):

Tymoczko, Berg, Stryer, *Biochemistry A Short Course 4th edition*: MacMillan Education.

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The laboratory manual will be available from the D2L course site for download. Before your lab session, please read the corresponding chapter and submit your answers to the pre-lab assignment to the D2L dropbox for that lab.

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In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC [ELearning](#) online website.

#### 7. **Examination Policy:**

No aids are allowed for in-person quizzes or the final exam. Non-programmable calculators will be permitted.

Any in-classtime quiz held online is open-book. You are permitted to use the textbook, course notes, and your personal notes. You are not permitted to search the internet, and all work must be individual.

For any in-classtime quiz held online, accommodations for students with issues (e.g., caregiving responsibilities, different time zones) will be done on a case-by-case basis. Please contact Dr. Fraser at least 14 calendar days prior to the quiz to discuss the matter.

**IMPORTANT:** It is the student's responsibility to ensure that they have adequate computer and internet access to write any online quiz. If a student encounters any technical issues in starting a quiz, they **MUST** document the issue by taking a photo, screenshot, or video, and they must contact the course coordinator immediately so that either additional time can be provided to access the quiz or alternative arrangements made. Students claiming such difficulties who do not contact the course coordinator providing evidence of technical difficulties within 15 minutes of the scheduled start of the quiz will not be allowed to write the quiz and will receive a grade of zero (0) on the quiz. If a student's quiz is suspended during the quiz (lost internet connection, internet browser crashes etc.), they **MUST** provide evidence as outlined above and contact the course coordinator immediately. Students will then be granted re-entry to suspended quizzes if they began the quiz on time, provided evidence of the suspension, and still have time remaining to complete their quiz.

Students should also read the Calendar, [Section G](#), on Examinations.

## 8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

## 9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

## 10. **Human & Living Organism Studies Statements:**

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

**STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS.** Students taking laboratory and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

Students are expected to be familiar with [Section SC.4.1](#) of the University Calendar.

## 11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar
- b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

## 12. **Other Important Information For Students:**

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Services:** For more information, see [www.ucalgary.ca/wellnesscentre](http://www.ucalgary.ca/wellnesscentre) or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email ([syva@ucalgary.ca](mailto:syva@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208). The complete University of Calgary policy on sexual violence can be viewed at (<https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Sexual-and-Gender-Based-Violence-Policy.pdf>)
- d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act

with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional [Code of Conduct](#) and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

[Student Handbook on Academic Integrity](#)  
Student Academic Misconduct [Policy](#) and [Procedure](#)  
[Research Integrity Policy](#)

Additional information is available on the [Student Success Centre Academic Integrity page](#)

**e. Academic Accommodation Policy:**

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf>

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf>.

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, by filling out the [Request for Academic Accommodation Form](#) and sending it to Lisa Gieg by email [lmgieg@ucalgary.ca](mailto:lmgieg@ucalgary.ca) preferably 10 business days before the due date of an assessment or scheduled absence.

**f. Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.

**g. Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). [Student Ombudsman](#), Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca).

**h. Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

**i. Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

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## Classroom Performance System

You may be asked to use the classroom performance system, Top Hat, in lecture. We will use Top Hat as a learning tool, not to calculate course grades.

## Course Policies

Material covered in the lectures, labs, and textbook readings may be examined during the quizzes and final examination. The final examination will be cumulative.

Please contact the course coordinator (Dr. Fraser) by e-mail for any administrative issues. I generally respond within 24 hours on a weekday and within 48 hours over the weekend.

Attendance at your laboratory sessions is mandatory. If one week you are unable to attend your assigned session for a valid reason, please contact the course coordinator (Dr. Fraser) as soon as possible to arrange a switch to another lab session or, if this is not possible, to shift the weight of the missed lab to your other lab sessions.

The first five lab reports are due seven days (168 hours, one week) after the **beginning** of your assigned lab session. The final lab report will be due on the final day of classes to accommodate the end of term. Failure to submit your report on time will result in a score of zero (0). Information about lab report format, rubrics, and marking policies will be provided in the "Lab Report Guidelines" posted on D2L.

### Overview of the Course

Biochemistry 341 is a course for chemistry and kinesiology majors wishing to familiarize themselves with all aspects of biochemistry in one term. There is a laboratory component that integrates with the lecture material.

### Tentative Schedule

Date	Topic	Instructor	
Jan.	10	Introduction to the Course and Lipids	MF/BB1
	12	Lipids in Membranes	BB2
	14	Amino Acids - Structures and Properties	BB3
	17	Peptides and Proteins - Peptide Bond and Primary Structure	BB4
	<b>18-21</b>	<b>Lab 1: Analysis of lipids in foods (online)</b> <b>- memory quiz lipids</b>	<b>MEF</b>
	19	Peptides and Proteins - Secondary Structure	BB5
	21	Peptides and Proteins - Tertiary and Quaternary Structure	BB6
	24	Membranes, including Membrane Proteins; Transport across Membranes	BB7
	26	Carbohydrates - Monosaccharides	BB8
	28	<b>Quiz I Jan. 10 - 24 (online)</b>	<b>BB</b>
	31	Carbohydrates - Linking Monosaccharides	BB9
Feb.	<b>1-4</b>	<b>Lab 2: Analysis of proteins in milk and whey (online)</b> <b>- memory quiz amino acids</b>	<b>MEF</b>
	2	Carbohydrates Attached to Proteins and Proteins that Bind Carbohydrates	BB10
	4	Basic Concepts about Enzymes	BB11
	7	Enzyme Kinetics	BB12
	9	Enzyme Kinetics - Allosteric Enzymes	BB13
	11	Enzyme Mechanisms and Inhibitors	BB14
	14	Classes of Enzymes. Example of a Hydrolase: Chymotrypsin	BB15
	<b>15-18</b>	<b>Lab 3: A metabolically reversible reaction (online)</b> <b>- memory quiz carbohydrates</b>	<b>MEF</b>
	16	Example of an Allosteric Protein: Hemoglobin	BB16
	18	Digestion: Turning a Meal into Cellular Biochemicals	MEF1
	<b>20-26</b>	<b>Winter Break *** No Lectures***</b>	
		28	Basic Concepts of Metabolism
Mar.	2	<b>Quiz II Jan. 26 - Feb. 16, Labs 1 and 2</b>	<b>BB/MEF</b>
	4	Glycolysis	MEF3
	7	Fermentation and Regulation of Glycolysis	MEF4
	<b>8-11</b>	<b>Lab 4: Reducing sugars invertase assay</b>	<b>MEF</b>
	9	Gluconeogenesis	MEF5
	11	Preparation for Citric Acid Cycle & Citric Acid Cycle	MEF6
	14	Citric Acid Cycle (cont'd)	MEF7
	16	Ox Phos: The Electron Transport Chain	MEF8
	18	Ox Phos: ATP Synthesis	MEF9
	21	Regulation	MEF10
	<b>22-25</b>	<b>Lab 5: Enzymatic activity of beta-galactosidase</b> <b>- memory quiz metabolic molecules</b>	<b>MEF</b>
	23	Nucleic Acids: Base Pairing, the Double Helix and DNA packaging	AD1
	25	DNA Replication	AD2
28	<b>Quiz III Feb. 18 - Mar. 21, Labs 3 and 4</b>	<b>MEF</b>	
30	DNA Repair and Recombination	AD3	
Apr.	1	Transcription of DNA = Synthesis of RNA	AD4
	<b>5-8</b>	<b>Lab 6: Restriction enzyme digest and electrophoresis</b> <b>- memory quiz nucleic acids</b>	<b>MEF</b>
	4	Gene Expression and RNA Processing in Eukaryotes	AD5
	6	The Genetic Code and tRNA	AD6
	8	Translation of RNA	AD7
	11	<b>Quiz IV Mar. 23 - Apr. 8, Lab 5</b>	<b>AD/MEF</b>

### Course Outcomes:

- By the end of this course, successful students will be able to:
- 1. Compare the structures of the major classes of biological molecules, i.e. lipids, carbohydrates, proteins and nucleic acids, and relate these to their cellular roles;
- 2. Describe and experimentally examine how enzymes catalyze reactions, and describe how pH, temperature, inhibitors and allosteric regulators can affect the functions of enzymes using the principles of protein structure, Michaelis-Menten kinetics, and allostery;
- 3. Distinguish between aerobic and anaerobic carbohydrate metabolism, and describe for each reaction the flow of energy and matter, the purpose(s), the mechanism of catalysis and regulations, and the conditions under which the reaction occurs;
- 4. Explain the process of DNA replication, RNA transcription and translation of RNA into proteins that can be post-translationally modified, and how errors in DNA can give rise to mutations that are either lethal or non-lethal;
- 5. Demonstrate skills frequently used in biochemistry laboratories: dispense small volumes accurately using mechanical pipettors; perform serial dilutions; measure absorbance by visible spectroscopy; use standard curves for quantification; use chromatography and electrophoresis to separate biochemical molecules; distinguish qualitative from quantitative experiments; work as a team; communicate biochemical experiments in written reports.

Electronically Approved - Jan 25 2022 10:34

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**Department Approval**

Electronically Approved - Jan 25 2022 14:02

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**Associate Dean's Approval**