

General Course Information

BCHM 222 BIOCHEMISTRY B Metabolism; the reactions of molecules in cells

Second Semester 2023
0.125 EFTS 15 Points

PREREQUISITES:

- i) BIOL 111
- ii) CHEM 112 (or CHEM115)

DESCRIPTION:

This course aims to communicate the fundamental principles governing the energy generating pathways within the cell. The major emphasis will be on carbohydrate metabolism and mitochondrial electron transport chain. This course will focus on biochemical systems and the functioning of their individual components.

BCHM222 is a prerequisite for several courses in Biochemistry, Chemistry and Biology, particularly BCHM305, 306. Students wishing to major in biochemistry must pass BCHM202, BCHM212, BCHM222, BCHM281 and at least one of BCHM206 and BCHM253. Those who wish to learn more – including material at the frontiers of Biochemical Research – can continue in BCHM305, BCHM306, BCHM338, BCHM339.

BCHM222 runs in semester two. It counts 15 points towards a Bachelor of Science degree and is required to major in biochemistry and preferably it is taken in conjunction with other 200-level biochemistry, biology and chemistry courses.

COURSE CO-ORDINATOR:

Prof. Renwick Dobson renwick.dobson@canterbury.ac.nz

SCHEDULE:

Lectures: Mondays and Thursdays 12-1pm
Tutorial times: Wednesdays 4-5pm

LECTURERS:

Term 3	Prof. Ren Dobson (5 lectures)	Rm 424, Biological Sciences, Email: renwick.dobson@canterbury.ac.nz
	Dr Amy Yewdall (4 lectures)	Rm 417, Biological Sciences, Email: amy.yewdall@canterbury.ac.nz

Term three Ren will begin with an introduction to enzymes and the general concepts of enzyme-driven catabolic and anabolic metabolism in mammalian cells. We will also discuss the role of molecular interactions in cells. This will be followed by Amy who will consider how we manipulate metabolic networks within cells for synthetic purposes.

Term 3/4	A/Prof. Steven Gieseg (9 lectures)	Rm 437, Biological Sciences, Email: Steven.Gieseg@canterbury.ac.nz
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We will examine the process of electron transport in the mitochondria and how this is coupled to the generation of ATP. We will look in detail at each of the major electron transport complexes and the ATP generating nano-machine within the mitochondria. A consequence of electron transport is free radical generation within the cell. We will examine how these radicals are generated and how the cell neutralises these toxic compounds. The mitochondrial is a key part of the controlled cell death mechanism known as apoptosis. We will examine how the mitochondria is involved in cell death.

Term 4	Dr Claudia Meisrimler (6 lectures)	Rm 633, Biological Sciences, Email: claudia.meisrimler@canterbury.ac.nz
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In term four, we will gain an overview of the plant primary metabolisms and the electron transport chain associated with photosynthesis in plant chloroplasts; this will include different strategies for carbon fixation by C₃, C₄ and CAM plants in context with the bigger picture. Ultimately, we will discuss the role of photosynthesis and photorespiration in plants.

INTENDED LEARNING OUTCOMES AND ASSOCIATED ASSESSMENT:

As a student in this course, I will develop the ability to:

- Apply concepts of enzymology to evaluate how the metabolism is coordinated (*assessment task: final exam*).
- Evaluate the importance of allosteric regulation for controlling metabolic flux (*assessment task: final exam*).
- Compare and contrast the different levels of metabolic regulation in a cell and between different types of cells (*assessment task: final exam*).
- Understand the molecular basis of metabolic diseases (*assessment tasks: proposal assignment & final exam*).
- Understand the molecular details of energy generation pathways and how they are integrated within metabolism (*assessment task final exam*).
- Synthesise primary scientific literature to provide necessary background and context for understanding and interpreting experimental data (*assessment task: proposal assignment*).

TRANSFERABLE SKILLS REGISTER:

As a student in this course, I will develop the following skills:

- Writing a research report. This will be important for any career in research or in an NGO, where you will need to write convincing applications for increasingly-limited funding. *We will have tutorials to provide instruction on the elements of successful reports and help you identify these elements with clear marking rubrics. (Employable, innovative and enterprising)*
- Synthesising information. In everyday life and in many job situations you will be required to read information from different sources, construct your own understanding and shape your own viewpoint. *In lectures and tutorials, we will discuss recent research papers in a group environment and this will develop your abilities to identify the essential elements of research outputs - you will then use in proposal and report writing. (Employable, innovative and enterprising, Critically competent)*
- Analysing data. Important for research, as well as in a number of private-sector organizations. *This skill will be further developed when we assist you to analyse data we provide. (Employable, innovative and enterprising, Critically competent)*

WEB-BASED RESOURCES

Various learning resources (lecture material, reference links, quizzes, discussion forums etc.) for this course are available via the University of Canterbury's Learn web site -- <http://learn.canterbury.ac.nz/>. This site will also be used regularly as a means of communication and information distribution for all of your Canterbury courses. You should familiarise yourself with Learn as soon as possible.

TUTORIALS:

These are workshops where the assignments work will be discussed and set. It will also be an opportunity to further discuss issues from the lectures and ask questions relating to the lecture material. Timing and location of the tutorials will be confirmed and communicated at lectures and on Learn.

ASSIGNMENTS:

This will take the form of written reports on topics set by the lecturers during the term. The topics will be on aspects of cell metabolism and designed to expand and test the student's skills in scholarship-based research. This will require reading and researching material introduced in lectures.

WORKLOAD:

Students should note that the Science Faculty recommends approximately 3.2 hours of additional study for each hour of lecture/workshop contact time at the 200-level.

ASSESSMENT:

(Note this has been changed in 2021, as discussed in class, because of the Covid situation)

Assignments:

Term 3 15% Work set by Dr Yewdall/Prof. Dobson
Term 4 15% Work set by A/Prof. Giesege
Term 4 10% Work set by Dr Meisrimler

Test: 25% (on Yewdall, Dobson, date and time TBC (1.5 or 3 hours, in person, closed book)

Final Examination: 35% (on A/Prof. Giesege and Meisrimler material, 2 or 2.5 hours; details to be advised.)

REQUIRED READING:

Lehninger Principles of Biochemistry by D L Nelson & M M Cox – 6 Edition. If you buy an earlier edition (perhaps second hand – it's cheaper), there is little difference between editions 4-6; however, when we refer to the text in lectures and tutorials we will generally refer to page numbers in the 6th edition.

OTHER USEFUL TEXTBOOKS:

Garrett & Grisham "Biochemistry" (3, 4,) 5 Edition.

The latest edition of "Biochemistry" by Lehninger is an alternative.

Nelson and Cox *Lehninger Principles of Biochemistry* (5th edition)

Voet and Voet *Biochemistry* (2nd edition)

Hames and Hooper *Instant Notes Biochemistry* (2nd edition)

Alberts *et al.*, *Molecular Biology of the Cell* (4th edition)

Buchanan *et al.*, *Biochemistry and Molecular Biology of Plants*

Horton *et al* *Principles of Biochemistry*

Zubay *Biochemistry* (4th edition)

Stryer *Biochemistry* (4th edition)

Mathews and van Holde *Biochemistry* (3rd edition)

Lodish *et al* *Molecular Cell Biology* (3rd edition)

Dobson, Gerrard and Pratt, *Foundations of Chemical Biology*, Oxford Chemistry Primer

COURSE SURVEY 2020:

Materials provided helped me to understand what was required.	3.8
The organisation of this course helped me learn	3.8
The overall workload in this course was	3.9
I found the assessments appropriate for the course.	4.1
I received helpful feedback on my progress	3.6
Overall this was a good quality course	3.8
Number of response for survey	70%

COURSE SURVEY 2017:

Materials provided helped me to understand what was required.	4.1
The organisation of this course helped me learn	3.8
The overall workload in this course was	3.8
I found the assessments appropriate for the course.	4.0
I received helpful feedback on my progress	3.6
Overall this was a good quality course	3.9
Number of response for survey	70%

COURSE SURVEY 2015:

This was a well organised course	3.8
This course helped to stimulate my interest in the subject	4.2
The overall workload in this course was	3.7
Provided effective opportunities for active student participation was	4.2
I received helpful feedback on my progress	3.5
The assessments in this course measured my learning effectively	3.7
Overall this was a good quality course	3.8
Number of response for survey	14%

RULES, REGULATIONS, AND WHAT TO DO WHEN THINGS GO WRONG

[updated March 2023]

If in doubt: ASK! The course coordinator is happy to answer questions. All staff involved in the course are available for advice on specific issues.

What do I do if I have to miss a test/exam or if my performance was impaired?

In Biological Sciences, we require a satisfactory level of achievement in both the theoretical aspects of the discipline and in practical activities. **This means you must attend all class activities (labs, tutorials, fieldtrips)** and submit all items of assessment unless you have a very good reason not to (e.g. medical reasons) and if this has been approved by your course coordinator.

If you feel that **illness, injury, bereavement or other extenuating circumstances beyond your control** prevented you from completing a **test/exam** worth 10% or more of the total course assessment, or if these circumstances affected your performance in such assessments, you should apply for Special Consideration. Applications for Special Consideration should be submitted via the Special Consideration website <http://www.canterbury.ac.nz/study/special-consideration/> *within five working days* of the assessment or its due date. You should also notify the course coordinator. If you apply for Special Consideration because of medical reasons, you should visit a doctor within a reasonable timeframe (application form available on the website above or from the Student Health Centre).

The Special Consideration provisions are intended to assist students who have covered the work of a course but have been prevented by illness or other critical circumstances from demonstrating their mastery of the material or skills at the time of a test/exam – **they do not excuse you from doing the test/exam** within a reasonable time agreed with the course coordinator.

What do I do if I have to miss a quiz or assignment or if I need an extension?

You cannot apply for Special Consideration if you miss an assessment that is not a test/exam, such as a quiz, lab report, essay, literature review or other assignment, or if the test/exam is worth less than 10% or more of the total course assessment. If this happens or if you need an extension because of **illness, injury, bereavement or other extenuating circumstances beyond your control**, please contact the course coordinator and arrange an alternate activity and/or submission date. You should also do this if you have to miss a laboratory, tutorial or field trip.

What are other valid reasons to miss an assessment or mandatory course activity?

The Special Considerations policy (<https://www.canterbury.ac.nz/about/governance/ucpolicy/student/special-consideration-procedures-and-guidelines/>) outlines only a few kinds of activities that UC considers valid reasons for missing an assessment or mandatory course activity other than those outlined above. These include **involvement in international or national representative sport or cultural groups**. Holiday trips, birthday parties, weddings, work-related commitments etc. are not given special status in this University policy. Please contact your course coordinator to ask for an alternate activity and/or submission date if you are eligible.

Special Consideration for late discontinuation of a course

Students prevented by **extenuating circumstances** from completing the course after the final date for withdrawing, may apply for Special Consideration for late discontinuation of the course. Applications must be submitted via <http://www.canterbury.ac.nz/study/special-consideration/> no later than five working days after the examination period has finished.

Academic Integrity

It is the responsibility of each student to be familiar with the definitions, policies and procedures concerning academic misconduct/dishonest behaviour. Instances of academic misconduct will be dealt with in a serious and appropriate manner. Students should refer to: <https://www.canterbury.ac.nz/about/ako/academic-quality/academic-integrity/>

Plagiarism

It is essential that you are aware that plagiarism is considered a very serious offence by the academic community, the University and the School of Biological Sciences. Plagiarism is defined as taking content from another work or author and presenting it, without attribution, as if it is your own work. Content here includes text (sentences or major parts of sentences), display items (graphs and tables), and overall structure (the detailed sequence of ideas). Plagiarism includes:

- re-use of previous assignments (even if each individual sentence has been rephrased to say the same thing in different words, if the overall structure is re-used).
- copying of another student's work (with or without their consent).
- the unreferenced use of published material or material from the internet, e.g. cutting and pasting of paragraphs or pages into an essay.
- the generation of text using artificial intelligence technology without disclosure and when it is not intended to be part of an assignment.

For most pieces of in-term assessment you will be given information concerning the use of direct and indirect quotes from previously published work. If you have any doubt about the appropriate use of published material, please speak with an academic staff member. If you are unsure what plagiarism is, seek advice.

It is a School policy that courses will likely that you submit work electronically for subsequent analysis of originality using *Turnitin*. Students agree that by taking courses in BIOL, assessments may be submitted to Turnitin.com for textual similarity review. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Terms and Conditions of Use as posted on the Turnitin.com site.

Where do I hand in assignments and then collect them once marked?

All assignments should be submitted as directed by the course coordinator. Typically, this will be electronically via Learn for on-line grading and for analysis in *Turnitin*. If a hard copy is requested, assignments should be placed in the designated collection boxes in the foyer of the 2nd floor of the School of Biological Sciences (Julius von Haast building, at the top of the stairs). All assignments must be accompanied by a cover sheet signed by you stating that the submitted work is not plagiarised. Cover sheets are available on top of the collection boxes, or you can download one from the Biology website (<http://www.canterbury.ac.nz/media/documents/science-documents/assignment-coversheet.pdf>).

Marked assignments will be returned through Learn or, if in hard copy, can be collected from the School of Biological Sciences reception, unless directed otherwise by the course coordinator. Teaching staff will endeavour to return work as soon as possible, and should contact you if there are likely to be any delays that will prevent return within the maximum 4-week timeframe.

What if I can't get it finished in time?

Reports and assignments should be handed in on time. Extensions may be granted if you have a valid reason (see above).

If you require an extension, you should request one from the course coordinator (or the lecturer responsible for marking the work), with as much notice as possible. Please do this BEFORE the deadline for the assignment. **If you have been given an extension and you have been asked to submit a hard-copy of your work, you should hand the work DIRECTLY to the course coordinator** (do not put it in the drop box as it may not be cleared after the due date).

If an extension has not been granted:

- work handed in within 1 hour of the deadline: penalty of up to 5 percentage points of the mark for the assignment (e.g., a mark of 75% might be reduced to 70%).
- work handed in 1 – 24 hours after the deadline: penalty of 10 percentage points of the mark for the assignment (e.g., a mark of 75% is reduced to 65%).
- work handed in 1 – 7 days after the deadline: penalty of 15 percentage points of the mark for the assignment (e.g., a mark of 75% is reduced to 60%).
- work handed in more than 7 days after the deadline will not be marked or earn credit.

What if I have written more than the word or page limit?

If there is a word limit on an assignment, it is usually there to stop you doing too much work and to encourage you to write succinctly. You can be up to 10% over without too much worry, but if the length increases beyond that your mark may suffer due to failure to follow the requirements. If you find yourself way over the word limit talk to the lecturer concerned about how to get your assignment to an acceptable length. Unless specifically advised that there is flexibility, you must adhere to the word limit indicated.

What if I fail part of the course?

In Biological Sciences, we require a satisfactory level of achievement in both the theoretical aspects of the discipline and in practical activities. This means you must attend all class activities and submit all items of assessment unless you have a very good reason not to (e.g. medical reasons). **A student must attain an average score of at least 40% for in-course assessments (e.g. assignments, reports, quizzes) and an average score of at least 40% in the exam and/or tests, AND score at least 50% overall for the course, to be awarded a passing grade. See the course outlines for clarification of the assessment items included in each category and ask the coordinator if you are still unsure.**

What's the best way to give feedback?

We welcome constructive feedback at all times – help us to make this a valuable course for you. We endeavour to remain approachable at all times. If you would rather give feedback anonymously, please use the online course survey or talk to lab demonstrators, or your class rep (who will all report back to the staff-student liaison committee that includes a representative from each of the undergraduate classes). Class representatives will be selected from each class at the start of course.

What's the best way to complain?

If you feel you have not been fairly treated during this course, please raise the issue with the lecturer or course coordinator in the first instance. Other avenues include your class rep., who can raise issues anonymously, or the UCSA education coordinator.

Grading

A+	90% or above
A	85 – 90
A-	80 – 84
B+	75 – 79
B	70 – 74
B-	65 – 69

C+ 60 – 64
C 55 – 59
C- 50 – 54

A restricted pass (R) **may** be awarded to those who are close to a pass (i.e. an overall score of 48-49.9%) AND who have achieved at least a 40% overall score in both in-course assessment and tests/exams. If an R grade is awarded you gain credit for the course but **cannot continue into papers that require this course as a pre-requisite**. NB. The R grade is only available at 100 and 200 level - it cannot be awarded for third year papers.

Failing grades: D 40-49 E 0–39