

Ngā whakamārama
Course Information: 2026

BCHM306

Biochemical pathology

0.125 EFTS 15 Points
Semester 2 2026

Course description | Whakamahuki

Biochemical pathology is the study of the biochemical processes that underlie disease. It focuses on how molecular and cellular processes become disrupted in illness and how these changes can be detected and measured in the laboratory. Biochemical pathology is important in medicine because understanding the molecular and biochemical basis of disease helps us identify its causes and develop effective treatments. In addition, many diseases are associated with characteristic biochemical changes in blood, urine, and tissues. Measuring these changes can provide valuable information for disease diagnosis, monitoring, and management.

In this course we will explore the underlying biochemistry of diseases and toxicity, and show why the changes occur and how they are used as part of the diagnostic process. We will focus on cholesterol-related disorders and Alzheimer's disease to illustrate key biochemical principles underlying disease pathology. This course is divided into three sections: biochemistry of cardiovascular disease and oxidative stress (Steven Gieseg), biochemistry of Alzheimer's disease (Vanessa Morris), and in the third section will feature an overview of other human disorders and their treatments, including cancer and muscular disorders.

This course is designed to help you to understand the biochemistry underpinning disease, how diseases are diagnosed using biochemical markers, and how molecules can be used to treat disease. The course aims to introduce you to modern biochemical ideas and research, and will include a substantial amount of reading from the biochemical literature, as well as from your recommended textbook. The course is intended to complement courses such as BCHM305, BCHM338, BCHM339, BCHM381, BIOL330, BIOL313. Our aim is to encourage and provide advice and feedback to enable you to develop skills in written and oral communication, and in the efficient and critical acquisition of scientific information.

Course coordinator | Kairuruku Akoranga

A/Prof. Vanessa Morris, Julius von Haast Room 422, vanessa.morris@canterbury.ac.nz

Lecturers | Pūkenga

A/Prof. Steven Gieseg, West Building Room 754, steven.gieseg@canterbury.ac.nz

Dr Gretel Major, Julius von Haast Room 422, gretel.major@canterbury.ac.nz

Dr Christoph Goebel, Julius von Haast Room 418, christoph.goebel@canterbury.ac.nz

Guest Lecturers

A/Prof. Jitendra Mata, Australian Nuclear Science and Technology Organisation

Erskine Fellow, jtm@ansto.gov.au

Dr Cory Sellwood, New Zealand Clinical Trials, cory.sellwood@nzcr.co.nz

Intended Learning Outcomes | Hua Akoranga and Associated Assessment | Aromatawai

This is a specialised third year course to build on prior study in biochemistry, chemistry and biology. At the end of the course, you will have developed critical analysis skills in biochemical pathology, developed advanced problem-solving skills, and be able to:

- provide examples of the use of biochemical markers in diagnosis,
- delineate the link between cholesterol and lipoprotein metabolism and the process of cardiovascular disease,
- explain the general principals of free radical biochemistry,
- explain the biochemistry and pathology of Alzheimer's disease and provide evidence for the hypotheses of the underlying cause
- explain, using detailed examples, of how understanding the molecular and biochemical basis of disease can lead to new diagnostic and treatment strategies,
- present complex biochemical ideas for both experts and non-specialists (science communication),
- communicate effectively in written English,
- effectively access and use information relevant to the subject,
- demonstrate advanced knowledge of a subject of science and an ability to apply scientific principles and concepts,
- research, analyse, evaluate, and argue from evidence,
- work independently.

All of these skills will be tested through the exam, test and tutorial assignments.

Transferable Skills Register | Pūkenga Ngaio

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

- critical analysis of the scientific literature (including understanding the limitations of scientific data). *(this skill maps to the UC attribute: Critically competent)*
- constructing your own understanding and shaping your own viewpoint based on reading scientific literature. *(this skill maps to the UC attributes: Critically competent and Globally aware)*
- Communicating science both spoken and written to both specialists and non-specialists. *(this skill maps to the UC attributes: Employable, innovative and enterprising, and Globally aware)*

UC Graduate Attributes:

	Critically competent	Employable, innovative and enterprising	Biculturally competent and confident	Engaged with the community	Globally aware
Biochemical Pathology	×	×			×

Timetable | Wātaka

There are 2 lectures per week for this course. The times and locations of these will be notified on My Timetable so please check this regularly. Tutorials will be held once per fortnight. Weeks when we hold tutorials will be indicated by the lecturers.

Students should note that in the Science Faculty the average student is responsible for approximately 4.5 hours of additional study for each hour of lecture at the 300-level.

SCHEDULE

CHOLESTEROL: LIPOPROTEINS TO FREE RADICALS

(12 lectures, term 3)

Lecturer: A/Prof. Steven Gieseg

Lipoprotein Metabolism, Heart Disease, and Free Radicals. We will begin by examining the pathway of cholesterol synthesis and rapidly move into an exploration the mechanisms of atherosclerosis (heart disease). This will involve a detailed look at the control of cholesterol synthesis and transport around the body. The oxidative mechanism of heart disease will be examined with emphasis on the possible role of antioxidants in inhibiting this process. In addition to providing a basic understanding of free radical biochemistry and the mechanisms of heart disease, this lecture series will demonstrate how an understanding of both biology and chemistry are important in understanding a disease process.

ALZHEIMER'S DISEASE

(5 lectures, term 4)

Lecturer: A/Prof. Vanessa Morris

Neurodegenerative diseases, such as Alzheimer's disease, involve progressive dysfunction and death of neurons in the central nervous system. Nerve cell death is preceded by myriad biochemical changes throughout the nervous system, including protein misfolding and aggregation and chronic inflammation. Which changes are causative, and which are consequences is highly debated. We will discuss the underlying pathological changes in Alzheimer's disease, as well as current and future diagnostic and therapeutic strategies.

OTHER DISEASE AND TREATMENTS

(7 lectures, term 4)

Lecturer: Dr Cory Sellwood, A/Prof. Jitendra Mata, Dr Gretel Major, Dr Christoph Goebel

The last section of the course will include snapshots of other human diseases as well as a discussion of their treatments. This will include a guest lecture covering clinical trials, including exploring how they work and how new drugs move from preclinical development through the various trial phases and eventually to approval including some example studies (Cory Sellwood). A visiting fellow from ANSTO Australia will discuss scattering techniques including small-angle X-ray scattering (SAXS) and small-angle neutron scattering and how they can be applied to developing drug formulations and biomaterials (Jitendra Mata). Finally, the course will cover muscular disorders such as muscular dystrophy (Gretel Major) and cancer (Christoph Goebel), including their underlying biochemistry, diagnosis and treatments.

Assessment | Aromatawai

In-term assignments (40%)

Test (30%) The test will examine the material from the first six weeks of lectures (term 3) and will be held within the first two weeks of term 4

Exam (30%) The exam will examine the material from the last six weeks of lectures (term 4)

Textbook and Resources

Recommended text for the biochemistry underpinning this course – Lehninger Biochemistry by D L Nelson & M M Cox. Additional reading in the form of scientific literature will be recommended throughout the lectures.

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.

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

[updated January 2025]

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 text/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.

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.

Generative AI tools cannot be used for writing assessments

In the assessments for this course, you are strictly prohibited from using generative artificial intelligence (AI) to generate any content related to the assessment. Although you may use AI to help search for and generate references, the use of AI-generated content in the text of an assessment is not permitted and may be considered a breach of academic integrity. Please ensure that all work submitted is the result of your own knowledge, skills, and efforts.

It is a School policy 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