



BMOL6201

Biochemistry and Cell Biology

Session 1, In person-scheduled-weekday, North Ryde 2023

School of Natural Sciences

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General Information

Unit convenor and teaching staff

Palmisano

Giuseppe Palmisano

giuseppe.palmisano@mq.edu.au

Contact via via email

confirmed by email

Co-Convenor

Abidali Mohamedali

abidali.mohamedali@mq.edu.au

Contact via Email

4WW 119

Confirmed by email

Abidali Mohamedali

abidali.mohamedali@mq.edu.au

Credit points

10

Prerequisites

Admission to GradDipBiotech or GradCertLabAQMgt or GradDipLabAQMgt or MBiotech or MBioBus or MLabAQMgt or MRadiopharmSc or MSc or MScInnovChemBioSc

Corequisites

Co-badged status

BMOL6201

Unit description

This unit introduces students to biochemistry and cell biology, providing an understanding of cellular processes which allow cells to synthesize and breakdown nutrients for growth and to communicate with other cells. This unit provides students with the basic knowledge of cellular structure, cell communications and the biochemical reactions which drive growth and development of cells in a variety of contexts. The unit will introduce key biochemical concepts such as enzyme catalysis, compartmentation, metabolic regulation and the flow of energy within cells in the context of intermediary metabolism. The laboratory component of the unit emphasizes the interpretation of quantitative data and the experimental basis for our current ideas and developments in cell biology and biochemistry. Laboratory practical sessions will alternate with tutorials covering lecture and practical topics.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Define the structural and metabolic differences between eukaryotic and prokaryotic cells with emphasis on biochemical energy metabolism, involving the synthesis and breakdown of important biomolecules.

ULO2: Define chemical and biochemical principles and apply these to identify the interactions between different metabolic pathways and the biochemical signals involved.

ULO3: Connect protein structure with function by defining the protein structure-function paradigm and evaluate the relationship between structure and function of proteins.

ULO4: Identify, quantify and separate biomolecules using appropriate experimental methods to characterise, quantify and separate different types of biomolecules.

ULO5: Track and measure rates of enzyme reactions and calculate kinetic parameters from the data generated.

ULO6: Collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

General Assessment Information

Requirements to Pass this Unit

To pass this unit you must:

- Attempt all assessments, and
- Achieve a total mark equal to or greater than 50%, and
- Participate in, and undertake all hurdle activities, a minimum of 4 practicals out of 5 and 4 SGTAs out of 5.
- Achieve at least 50% in the practical report (hurdle requirement).

- **Hurdle assessments**

Practical report: Practice and report-based task (20%) Development of knowledge and skills requires continual practice at authentic problems in a laboratory-based setting. This unit has

weekly laboratory classes and you must demonstrate your progress in developing and communicating knowledge and skills in a minimum of 50%. This is a hurdle assessment meaning that failure to meet this requirement may result in a **fail** grade for the unit. Students are permitted up to one absence in the laboratory practical: **additional absences will require a Special Consideration to be applied for (see below) via ask.mq.edu.au.**

Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is **11:55 pm**. A 1-hour grace period will be provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for [Special Consideration](#).

Assessments where Late Submissions will be accepted

Practical reports, Tutorials quiz, Test 1 - YES, Standard Late Penalty applies

Test 2, Final Exam - NO, unless special consideration is granted

Spot tests - NO, **only the top 10 attempts** will be counted

Special Consideration

The [Special Consideration Policy](#) aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable, and significantly disruptive, and which may affect their performance in assessment.

Written Assessments: If you experience circumstances or events that affect your ability to complete the written assessments in this unit on time, please inform the convenor and submit a **Special Consideration request through ask.mq.edu.au.**

Fortnightly practicals: To pass the unit you need to demonstrate ongoing development of skills and application of knowledge in at least 4 out of 5 practicals. If you miss a fortnightly practical class due to serious, unavoidable, and significant disruption, contact your convenor ASAP as you may be able to attend another class that week.

If it is not possible to attend another class, you should still contact your convenor for access to class material to review in your own time.

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Spot Tests</u>	5%	No	Weekly
<u>Tutorial Quizzes</u>	5%	No	Fortnightly
<u>Practical Assessment</u>	20%	Yes	Fortnightly
<u>Test 1</u>	15%	No	Week 6
<u>Test 2</u>	15%	No	Week 12
<u>Final Examination</u>	40%	No	Exam Week

Spot Tests

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 5 hours

Due: **Weekly**

Weighting: **5%**

This is a continual assessment task held during the lectures, starting from Lecture 2, to assess your understanding of concepts. Please try to participate in all lecture sessions for the best possible outcome.

On successful completion you will be able to:

- Define the structural and metabolic differences between eukaryotic and prokaryotic cells with emphasis on biochemical energy metabolism, involving the synthesis and breakdown of important biomolecules.
- Define chemical and biochemical principles and apply these to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Connect protein structure with function by defining the protein structure-function paradigm and evaluate the relationship between structure and function of proteins.

Tutorial Quizzes

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 5 hours

Due: **Fortnightly**

Weighting: **5%**

Tutorials are scheduled on alternate weeks, to work through problems and questions complementing lectures and practicals. These are based on peer learning through collaboration, problem solving and teamwork.

On successful completion you will be able to:

- Define the structural and metabolic differences between eukaryotic and prokaryotic cells with emphasis on biochemical energy metabolism, involving the synthesis and breakdown of important biomolecules.
- Define chemical and biochemical principles and apply these to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Connect protein structure with function by defining the protein structure-function paradigm and evaluate the relationship between structure and function of proteins.
- Identify, quantify and separate biomolecules using appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Track and measure rates of enzyme reactions and calculate kinetic parameters from the data generated.
- Collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Practical Assessment

Assessment Type ¹: Lab report

Indicative Time on Task ²: 15 hours

Due: **Fortnightly**

Weighting: **20%**

This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)

The practical exercises apply experimental techniques, collate relevant experimental results and analyse them. Practical sessions are scheduled on alternate weeks.

On successful completion you will be able to:

- Identify, quantify and separate biomolecules using appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Track and measure rates of enzyme reactions and calculate kinetic parameters from the

data generated.

- Collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Test 1

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 9 hours

Due: **Week 6**

Weighting: **15%**

The test will cover lecture materials (Lectures 1-8) and test your understanding of protein structure and function and enzyme catalysis.

On successful completion you will be able to:

- Define the structural and metabolic differences between eukaryotic and prokaryotic cells with emphasis on biochemical energy metabolism, involving the synthesis and breakdown of important biomolecules.
- Define chemical and biochemical principles and apply these to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Connect protein structure with function by defining the protein structure-function paradigm and evaluate the relationship between structure and function of proteins.

Test 2

Assessment Type ¹: Case study/analysis

Indicative Time on Task ²: 10 hours

Due: **Week 12**

Weighting: **15%**

The test will present case studies based on lecture materials (Lectures 1-17) and will test your comprehension of how cellular structure, biochemical signalling and the biochemical reactions in energy metabolism can address problems in biochemistry.

On successful completion you will be able to:

- Define the structural and metabolic differences between eukaryotic and prokaryotic cells with emphasis on biochemical energy metabolism, involving the synthesis and

breakdown of important biomolecules.

- Define chemical and biochemical principles and apply these to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Connect protein structure with function by defining the protein structure-function paradigm and evaluate the relationship between structure and function of proteins.

Final Examination

Assessment Type ¹: Examination

Indicative Time on Task ²: 40 hours

Due: **Exam Week**

Weighting: **40%**

The final examination will comprise of multiple-choice and short answer questions, to assess your overall understanding of the subject.

On successful completion you will be able to:

- Define the structural and metabolic differences between eukaryotic and prokaryotic cells with emphasis on biochemical energy metabolism, involving the synthesis and breakdown of important biomolecules.
- Define chemical and biochemical principles and apply these to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Connect protein structure with function by defining the protein structure-function paradigm and evaluate the relationship between structure and function of proteins.
- Identify, quantify and separate biomolecules using appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Track and measure rates of enzyme reactions and calculate kinetic parameters from the data generated.
- Collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

LEARNING AND TEACHING STRATEGY

This unit will comprise **2 lectures** (or equivalent) per week. **Five sets of Practical sessions (3 hours) and tutorials (2 hours)** are **scheduled on alternate weeks**, starting in Week 2. There will be no Practical/Tutorial classes in Week 12 and Week 13.

- **We are providing eText access and other textbook resources to all enrolled students via iLearn.**
- **The textbook resources provided will include adaptive learning strategies, using the Mastering Chemistry approach.**
- **Several assessment tasks will be directly on the textbook's site.**

Lectures

- Lectures will be delivered FACE TO FACE, with video recordings available through [iLearn](#) shortly after the lecture. **Due to the interactive lecture format being followed, we strongly recommend that you attend the lectures.**
- Additional learning materials (notes, animations, movies) and revision materials provided by the textbook publisher are also available through [iLearn](#). **Interactive learning will be adopted - so please bring your mobile phones, tablets or laptops to answer the spot quizzes!**

Laboratory Work

- **Labs are scheduled to alternate with tutorials (SGTAs).** Lab/tutorial (SGTA) schedules with exact dates for each class will be posted on [iLearn](#). **Practicals (supervised by demonstrators) and tutorials are scheduled on alternate weeks and provide a group learning environment.** There will be no Practical classes in Week 12 and Week 13.
- **Laboratory sessions** are scheduled in the timetable. You will undertake experiments at the bench (wet-labs) in **14 Eastern Road (Building E8A) 130/150 - you must bring your own lab coat and wear covered shoes.** **Safety glasses** and other personal protective equipment (if required) will be provided in the lab.
- **Mandatory Lab Safety presentation and lab induction will be scheduled in Week 1** - details will be on iLearn
- **Before commencing each experiment, you are required to complete the prelab quiz on [iLearn](#).** You should read

each experiment carefully before coming to the lab. Short videos are available to demonstrate practical techniques and the correct use of equipment. Poor preparation may delay starting the experimental work and may affect your results.

- Practical demonstrators will explain procedures and assist you to get things working properly - they will not provide you answers.
- Students unable to attend laboratory classes due to serious illness or misadventure (as defined in the Handbook of Undergraduate Studies) should complete a “Disruption to studies” request on ask.mq.edu.au, as soon as possible, with details of the exact Practical class missed. Students will receive the average mark from the sessions that they did attend for the first approved absence. Additional approved absences will require completion of tasks provided by the Unit Coordinator. Unapproved absences will lead to a zero mark and may be liable for compulsory withdrawal from the unit. If the absence can be anticipated, e.g. religious observance days and pre-scheduled events, it is your responsibility to email the unit coordinator **in advance** of the absence, to rearrange your schedule if possible, as each laboratory session is offered over two weeks, in multiple sessions.
- Some practical work may be undertaken before the corresponding theory material has been covered in lectures. The prac materials have been written with this in mind and you should read the relevant lectures PDFs and the textbook to prepare for the lab.
- **Lab Report Submission Dates: Reports are due on iLearn** on the day of the practical. Once the report is submitted, you will have access to the **iLearn practical quiz**. Attending the Practical session but not submitting the prac report and completing the Practical Quiz will only count towards participation but result in zero marks for the assessment. **Penalties for late submission** are provided in a separate section.

Tutorials

- **Tutorials are scheduled to alternate with practicals.** Lab/tutorial schedules with exact dates for each class will be posted on iLearn. Tutorial sessions are held in the allocated tutorial rooms. There will be no Tutorial classes in Week 12 and Week 13.
- ***There may be some simple mathematical questions to solve biochemical problems.***
- **Tutorial quizzes** need to be completed **after your scheduled tutorial**.
- Students unable to attend tutorial classes due to serious illness or misadventure (as defined in the Handbook of Undergraduate Studies) alone should complete a “Disruption to studies” request on ask.mq.edu.au, as soon as possible, with details of the exact Tutorial class (e.g. SGTA 1) missed. Students will receive the average mark from the

sessions that they did attend, for a maximum of two missed sessions. Unapproved absences will lead to a zero mark. Please email your tutor. If the absence can be anticipated, e.g. religious observance days and pre-scheduled events, you may rearrange your schedule if possible, as each Tutorial session is offered over two weeks, in multiple sessions, provided the Tutor of the session you are attending permits.

TIMETABLE

- Please check www.timetables.mq.edu.au for the official timetable of the unit. **Please note** that **some practical sessions** in the Timetable **may not be available**, in order to **optimise** lab usage and technical staff/demonstrator time.
 - Students may be moved to an equivalent set of practical and tutorial classes if sufficient places are available - pl. check eStudent for your scheduled practical/tutorial class.
 - Some practical and tutorial (SGTA) classes listed in the timetable may not be scheduled due to low enrollments, in which case students may be offered places in available sessions based on their individual timetables.
 - Lecture/SGTA rooms may be changed by University Timetabling due to different enrollments across the university. Please check iLearn/Timetables frequently for updates.

TEXTBOOK USED

Prescribed text: *A strong positive correlation has been noticed between students who consult the recommended textbook and performance in this unit.*

- **Biochemistry: Concepts and Connections, Global Edition, 2nd Edition**, by Dean Appling, Spencer Anthony-Cahill, Christopher Mathews (<https://www.pearson.com.au/products/A-C-Appling-Anthony-Cahill/A-C-Appling-Dean-et-al/Biochemistry-Concepts-and-Connections-Global-Edition/9781292267203?R=9781292267203>)

Electronic access:

- **eBook:** from *iLearn* - including case studies and exercises.

A few copies of the prescribed eBook are available in the library.

TECHNOLOGY USED

- **PDF viewer:** You will need the free Adobe Acrobat Reader to view notes on all the lecture topics, assignment, tutorial materials and past questions on [iLearn](#). Acrobat Reader can be downloaded from the [Adobe](#) website. Acrobat Reader has already been installed on the computers in the library.

- **IT and internet:** General use computers are provided by the University, but it would be advantageous to have your own computer and internet access. **MS Word** and **Excel files** will be used to complete the lab reports.
- **E-mail:** Please check your **Macquarie University student email account** regularly to get the latest information on the unit. If you do not use this account regularly, **please set up automatic forwarding to your preferred email address** on eStudent. We will communicate with you via your university email or through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or email directly the convenors.
- **Calculators:** Hand-held calculators will be occasionally used in tutorials and practicals, for tests and in the final examination. Note that text-retrieval or programmable calculators and calculators on smart phones and watches are not permitted during **Test 2** and the semester **examination**.

Unit Schedule

Module 1: Building Blocks of Biochemistry.

- Structure and properties of amino acids found in proteins.
- Definition and properties of a peptide bond.
- Definition of primary, secondary, tertiary and quaternary structure of proteins.
- Protein analysis, including protein purification, sequencing methods such as Edman degradation and MS-MS, chromatography, solubility, spectroscopic properties and gel electrophoresis.
- Protein structure determination methods and the structure-function paradigm.
- Protein stability and folding.

Module 2: Enzymes and the Chemical Logic of Metabolism

- Enzyme function, including catalytic site and enzyme mechanisms, enzyme classification, enzyme inhibition and review of thermodynamics and chemical equilibria.
- Sugars and Lipids
- Membrane structure and Transport across Membranes
- Metabolic Pathway Overview
- Metabolic Control Mechanisms
- Experimental Analysis of Metabolism

Module 3: Energy metabolism

- Glycolysis and gluconeogenesis: the key regulatory steps, enzyme mechanisms and

compartmentalization of parts of the gluconeogenesis pathway in mammals.

- Tricarboxylic acid cycle in mitochondria: catalytic and synthetic roles
- Glyoxalate cycle
- Pentose phosphate pathway
- Electron transport chain and oxidative phosphorylation

Module 4: Protein, Lipid and Nucleotide Metabolism.

- Amino acid synthesis and breakdown
- Fatty acid synthesis and degradation
- Nucleotide metabolism
- Interorgan and intracellular coordination of vertebrate energy metabolism.

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au or if you are a Global MBA

student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

COVID Information and on-campus classes

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: <https://www.mq.edu.au/about/coronavirus-faqs>. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

Unit information based on version 2023.01R of the [Handbook](#)