BMOL6201

Biochemistry and Cell Biology

Session 1, Weekday attendance, North Ryde 2021

Archive (Pre-2022) - Department of Molecular Sciences

Contents

Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff
Unit Coordinator
Shoba Ranganathan
shoba.ranganathan@mq.edu.au
Contact via via email
4WW (Building F7B), Room 121
confirmed by email

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

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

On campus attendance:

1. Students unable to attend classes due to 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, **giving details of exact assessment task missed** (e.g. Prac 1). Students may receive an extension; the average mark from similar sessions that they did attend; may be given alternate assessment tasks or simply be marked absent. For any unapproved absences, students will receive a zero mark. ***Spot tests*** do not require a formal ***ask*** request ***as only the top 10 attempts*** will be counted.
2. Late submissions will receive a **10% per day penalty** and will not be marked if more than 1 week late.

Special circumstance and approved online only attendance:

1. Students to contact unit coordinator by email for all submission difficulties and requests for due date extensions.
2. For any unattempted assessments, students will receive a zero mark. ***Spot tests*** do not require a formal ***ask*** request ***as only the top 10 attempts*** will be counted.

Assessment Tasks

Name	Weighting	Hurdle	Due
Spot Tests	5%	No	on iLearn
Practical Assessment	20%	Yes	on iLearn

Name	Weighting	Hurdle	Due
Test 2	15%	No	Week 13
Test 1	15%	No	Week 6
Tutorial Quizzes	5%	No	on iLearn
Final Examination	40%	No	as per S1 exam timetable

Spot Tests

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 5 hours
Due: **on iLearn**
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.

Practical Assessment

Assessment Type [1]: Lab report
Indicative Time on Task [2]: 15 hours
Due: **on iLearn**
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. Practicals 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 2

Assessment Type [1]: Case study/analysis
Indicative Time on Task [2]: 10 hours
Due: **Week 13**
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.

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.

Tutorial Quizzes

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 5 hours
Due: **on iLearn**
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.
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- Collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Final Examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 40 hours
Due: **as per S1 exam timetable**
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.

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[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 6 and in 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 as scheduled via Zoom, 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 provide 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. Lab/tutorial 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 6 and in 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.
- **Before commencing an 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 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 a zero mark for the assessment. **Penalties for late submission** are provided in a separate section.

Tutorials

- **Tutorial sessions** are scheduled in the timetable and are held alternately with practicals, in a tutorial room. There will be no Tutorial classes in Week 6 and in 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 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 Tutorial class 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. 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 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.

TEXTBOOK USED

Prescribed text: ***A strong 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 text 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.
- **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 the mid-year 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.
- Tricarboxyic 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://policie

s.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
- Grade Appeal Policy
- Complaint Management 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). 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) 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

Student Support

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

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- 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

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

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.