BMOL2201

Biochemistry and Cell Biology

Session 1, Weekday attendance, North Ryde 2020

Department of Molecular Sciences

Contents

General Information

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

Credit points
10

Prerequisites
CHEM1001 or CBMS107 or CBMS103

Corequisites

Co-badged status
BMOL6201

Unit description
This unit introduces students to biochemistry and cell biology, providing a biochemical understanding of processes that allow cells to synthesise and breakdown nutrients for growth and to communicate with other cells. This unit provides students with the basic knowledge of cellular structure, biochemical signalling 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 emphasises 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.

Assessment Tasks

Coronavirus (COVID-19) Update

Assessment details are no longer provided here as a result of changes due to the Coronavirus (COVID-19) pandemic.

Students should consult iLearn for revised unit information.

Find out more about the Coronavirus (COVID-19) and potential impacts on staff and students

General Assessment Information

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, Tutorial 2). Students may receive an extension; the average mark from the 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 submission will receive a **10% per day penalty** and will not be marked if more than 1 week late.

Delivery and Resources

Coronavirus (COVID-19) Update

Any references to on-campus delivery below may no longer be relevant due to COVID-19.

Please check here for updated delivery information: https://ask.mq.edu.au/account/pub/display/unit_status

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.

- **Students are expected to attend all lectures (physically or online) as there will be interactive questions in the spot tests to provide them instant feedback on their comprehension.**
- **Students are expected to attend all practical and tutorial classes.**

Lectures

- Lectures will be delivered as scheduled with eCHO recordings available through iLearn**. 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 from 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 with tutorials and each group of max. 16 students. Lab/tutorial schedules of each group will be posted on iLearn. **Practicals (supervised by demonstrators) and tutorials (supervised by tutors) are scheduled on alternate weeks and provide a group learning environment.**
- **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*** will be provided in the lab.
- **Before commencing an experiment**, you are **required to complete the prelab quiz** on iLearn. The pre-lab quiz will be available for 15 mins. at the start the your lab session. You should read each experiment carefully before coming to the lab. Poor preparation

may delay starting the experimental work and may affect your results.

- 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 notes 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 normally due on iLearn** on the day of the practical. Submissions will be accepted up to the next week or scheduled tutorial session and may incur a reduced "on-time submission" mark - please check iLearn for a detailed submission schedule for your practical class. Your lab report comprises **answers to all questions as well as your completed data file**, submitted via an **iLearn quiz**. Attending the Practical session but not 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.
- ***Peer learning* techniques will be adopted** - so please come prepared to form small groups and discuss solutions to questions in a collaborative manner, with materials provided on iLearn.
- **Tutorial quizzes** need to be completed **during 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 and tutorial sessions** in the Timetable **may not be available,** in order to **optimise** lab/tutorial room 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 purchase the recommended textbook and performance in this unit.***

- **Fundamentals of Biochemistry: Life at the Molecular Level,** 5th Edition by Donald Voet, Judith G. Voet, Charlotte W. Pratt, Wiley

Electronic access:

- **eBook ($65):** from *https://www.wileydirect.com.au/buy/fundamentals-of-biochemistry-5th-edition/* - including case studies and exercises.

Hardcopy versions of the textbook (available from campus Co-Op Bookshop):

- **Hardcopy**
- **Binder-ready-version (loose leaf)**

A few copies of the prescribed text are available in the library in the main and reserve sections.

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 are not permitted during the test or the mid-year examination. Calculators on smart phones and watches are also not allowed.

Unit Schedule

Coronavirus (COVID-19) Update

The unit schedule/topics and any references to on-campus delivery below may no longer be relevant due to COVID-19. Please consult iLearn for latest details, and check here for updated delivery information: https://ask.mq.edu.au/account/pub/display/unit_status

The unit will cover four modules in biochemistry and cell biology: the exact lecture schedule is on iLearn.

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 Biochemical Signalling

- Enzyme function, including catalytic site and enzyme mechanisms, enzyme classification, enzyme inhibition and review of thermodynamics and chemical equilibria.
- Membrane structure.
- Biochemical signalling.
- Types of metabolic strategies that organisms utilize: chemolithotroph, photoautotroph, photoheterotroph and heterotroph
- The link between catabolism and biosynthesis: reducing equivalents, coupling reactions for thermodynamic favourability, carbon and nitrogen sources and other nutrients.

- Compartmentalization of enzymes and pathways and clustering of enzyme activities
- Regulation of metabolic pathways by cellular signals.

Module 3: Sugar 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 and Lipid Metabolism.

- Amino acid synthesis and breakdown
- Fatty acid synthesis and degradation
- The role of vitamins and coenzymes in cell function and diseases caused by deficiencies in these essential molecules.
- Integration of mammalian fuel metabolism.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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 *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

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

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/p

olicy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/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.

Changes since First Published

Date	Description
18/ 02/ 2020	I have removed Kahoot on CMS and this has now been approved and is reflected in the assessment tasks for inclusion in the unit outline.
09/ 02/ 2020	I have updated the Kahoot section to read: "Kahoot!: for interactive student engagement during lectures. Your understanding of concepts will be gauged via online quizzes.You can directly use the kahoot.it website, using a mobile device or laptop, or the Kahoot! app. You will be allocated a random nickname on iLearn, which you will use to enter each quiz. Marks for this nickname will be traced back you and uploaded to iLearn."