CBMS621

Biochemistry and Cell Biology

S1 Day 2019

Dept of Molecular Sciences

Contents

General Information

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

Credit points
4

Prerequisites
Admission to MLabQAMgt or MRadiopharmSc or MSc or MBiotech or MBioBus or MScInnovation

Corequisites

Co-badged status
CBMS201

Unit description
This unit introduces students to biochemistry and cell biology, providing an understanding of cellular processes which 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, 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 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:

Overall biochemical and cell biology knowledge: after successful completion of this unit,

students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.

Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.

Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.

Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.

Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.

Tracking enzyme reactions: students will measure rates of enzyme reactions and calculate basic kinetic parameters from the data generated using theoretical principles.

Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Assessment Tasks

Name	Weighting	Hurdle	Due
Continual assessment	5%	No	Ongoing
Assignment	10%	No	Monday 8 April
In-Semester Test	10%	No	Wed 1 May; Thu 2 May
Practicals	20%	Yes	Ongoing
Tutorials	5%	No	Ongoing

Name	Weighting	Hurdle	Due
Mid-year Examination	50%	No	June - exact date TBC

Continual assessment

Due: **Ongoing**
Weighting: **5%**

This is a **continual assessment task** held during the lectures.

You will be given a number of **multiple choice questions** relevant to the current lecture, to be completed during the lecture session, to assess your understanding of concepts.

You will use the ***Kahoot!* platform** on a mobile device on the internet (see iLearn for instructions). A paper form of the assessment will be available upon request. The quizzes will be conducted and assessed randomly, starting from Lecture 2. Please try to participate in all lecture sessions for the best possible outcome.

On successful completion you will be able to:

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different

types of biomolecules.

- Tracking enzyme reactions: students will measure rates of enzyme reactions and calculate basic kinetic parameters from the data generated using theoretical principles.

Assignment

Due: **Monday 8 April**
Weighting: **10%**

The **assignment** will provide early feedback on the link between protein structure and function (Lectures 1-6), provide you an opportunity to explore and analyse the structure-function paradigm of proteins, as well as **give you an idea of the types of questions that will be asked in the mid-year examination.**

You will complete the assignment quiz on iLearn.

On successful completion you will be able to:

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.

In-Semester Test

Due: **Wed 1 May; Thu 2 May**
Weighting: **10%**

The **in-semester test** (multiple-choice format) will cover lecture materials (**Lectures 1-8**) and **give you an idea of the types of questions that will be asked in the mid-year examination.**

The test will be held in the **labs** instead of your scheduled practicals and tutorials on **Wed 1 May and Thu 2 May**, based on your Practical Class enrollment, with ***multiple sessions*** for you to

choose from (details will be posted on iLearn).

This is a closed book test.

On successful completion you will be able to:

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and calculate basic kinetic parameters from the data generated using theoretical principles.

Practicals

Due: **Ongoing**
Weighting: **20%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

The practical exercises will provide you the opportunity to apply experimental techniques, collate relevant experimental results and analyse them. **Practicals (supervised by demonstrators) are scheduled on alternate weeks.**

The pre-lab quizzes are designed to prepare you for the practicals and **should be answered online on iLearn, BEFORE attending each scheduled laboratory practical session.**

Completed practical files are **normally** due on iLearn at the end of the practical class (submission deadline will be the day of your next scheduled tutorial - please check details on iLearn).

Questions in the pre-lab quizzes and the practical quizzes will give you an idea of the types of questions that will be asked in the in-semester test and mid-year examination.

Lab schedules including **Practical Quiz** completion dates will be posted on iLearn for each practical/tutorial class.

On successful completion you will be able to:

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and calculate basic kinetic parameters from the data generated using theoretical principles.
- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Tutorials

Due: **Ongoing**
Weighting: **5%**

Tutorials provide an opportunity to work through problems and questions complementing lectures and practicals. **Tutorials (presented by tutors) are scheduled on alternate weeks.**

Tutorials will be based on **peer learning** for knowledge acquisition through collaboration, problem solving and teamwork. You should revise lecture and tutorial materials listed on iLearn prior to the scheduled tutorial session. Tutors will moderate tutorial sessions.

Questions in the tutorials and tutorial quizzes will give you an idea of the types of questions that will be asked in the in-semester test and the mid-year examination.

A paper-based tutorial quiz will be held at the end of each scheduled tutorial.

On successful completion you will be able to:

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and

calculate basic kinetic parameters from the data generated using theoretical principles.

- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Mid-year Examination

Due: **June - exact date TBC**
Weighting: **50%**

The **mid-year examination** will comprise a combination of multiple-choice questions and short answer questions, to assess your overall understanding of the subject.

The format of the exam along with example questions will be posted on iLearn.

This is a **closed book exam**.

On successful completion you will be able to:

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and

calculate basic kinetic parameters from the data generated using theoretical principles.

Delivery and Resources

LEARNING AND TEACHING STRATEGY

CBMS621 will comprise **2 lectures** (or equivalent) per week. **Practical sessions (3 hours)** and **tutorials (2 hours)** are scheduled on alternate weeks.

- **Students are expected to attend all lectures as there will be interactive questions that will contribute to the continual assessment task and 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 recording 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 on-the-spot quizzes!**

Laboratory Work

- Labs are scheduled with tutorials and each group of max. 16 students will be allocated a tutor. Lab/tutorial schedules of each group will be posted on iLearn. **Practicals (supervised by demonstrators) and tutorials (supervised by tutors) are scheduled alternately in a group 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 **lab coat** and **wear covered shoes**. ***Safety glasses*** will be provided in the lab.
- **Before commencing a practical**, you are **required to complete the prelab quiz** on iLearn. The pre-lab quiz will close 10 mins. before the your lab session. You should attempt the pre-lab quizzes well in advance of each practical class, and 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. Students will receive the average mark

from the sessions that they did attend for the first approved absence. For any unapproved absences, students will receive 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.

- Some practical work may be undertaken before the corresponding material has been covered in lectures. The notes have been written with this in mind and you should read the textbook to prepare for the lab.
- **Lab Report Submission Dates**: **Reports are normally due on iLearn** from the day of the practical, with submissions accepted up to the next tutorial - please check iLearn for a detailed 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**. **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**.

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.

TEXTBOOK USED

Please see the **Textbook** section for details. To do well in this unit, we strongly recommend that you purchase the recommended textbook.

TECHNOLOGY USED

- ***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. Use your student ID as the nickname when entering each quiz to obtain your marks.

- **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

The unit will cover four modules in biochemistry and cell biology: the exact lecture schedule is on iLearn (login with your student ID and password).

Weeks 1-3: 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.

Weeks 4-6: Enzymes and Cell Biology

- 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.

Weeks 7-9: 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

Weeks 10-13: Lipid and Protein Metabolism.

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

Learning and Teaching Activities

Lectures

The lectures provide an overview of each topic/concept. Students will be given questions during the lectures to test their understanding of key concepts. The student is encouraged to follow up with textbook reading as well as additional reading materials. Wherever possible, animations and movies are also provided along with revision quizzes from the textbook, accessible via a personal eBook license.

Practicals

Laboratory exercises are designed to provide a concrete hands-on example of the lecture topics covered in the course work, and to give you the opportunity to discover the principles and applications for yourself. Laboratory exercises also offer the opportunity to explore the uncertainty inherent in scientific investigations and the limitations of models and theories by allowing comparison with real systems. Questions covered in the practical quizzes will prepare students for the in-semester test and the mid-year exam.

Tutorials

Tutorials provide an opportunity to work out problems and questions complementing lecture and practical materials. Tutorials will enable students to learn from their peers, discuss possible solutions and collaboratively work out answers. Tutorial questions and tutorial quizzes will prepare students for the in-semester test and the mid-year exam.

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.)*

Undergraduate 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/policy-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

If you have missed an assessment task (assignment, in-semester test, practical, tutorial or exam), please check if you are eligible for Special Consideration from: **http://ask.mq.edu.au**

If yes, please complete the online form and submit required documentation (medical certificate, etc.) to the Science Centre, **within 5 working days of the absence.** You must provide the exact details of the task(s) missed (e.g. Prac 1 or Tut 2) so special consideration can be provided.

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 improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell

structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.

- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and calculate basic kinetic parameters from the data generated using theoretical principles.
- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Assessment tasks

- Practicals
- Tutorials

Learning and teaching activities

- Tutorials provide an opportunity to work out problems and questions complementing lecture and practical materials. Tutorials will enable students to learn from their peers, discuss possible solutions and collaboratively work out answers. Tutorial questions and tutorial quizzes will prepare students for the in-semester test and the mid-year exam.

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell

structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.

- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and calculate basic kinetic parameters from the data generated using theoretical principles.
- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Assessment tasks

- Continual assessment
- Assignment
- In-Semester Test
- Practicals
- Tutorials
- Mid-year Examination

Learning and teaching activities

- The lectures provide an overview of each topic/concept. Students will be given questions during the lectures to test their understanding of key concepts. The student is

encouraged to follow up with textbook reading as well as additional reading materials. Wherever possible, animations and movies are also provided along with revision quizzes from the textbook, accessible via a personal eBook license.

- Laboratory exercises are designed to provide a concrete hands-on example of the lecture topics covered in the course work, and to give you the opportunity to discover the principles and applications for yourself. Laboratory exercises also offer the opportunity to explore the uncertainty inherent in scientific investigations and the limitations of models and theories by allowing comparison with real systems. Questions covered in the practical quizzes will prepare students for the in-semester test and the mid-year exam.
- Tutorials provide an opportunity to work out problems and questions complementing lecture and practical materials. Tutorials will enable students to learn from their peers, discuss possible solutions and collaboratively work out answers. Tutorial questions and tutorial quizzes will prepare students for the in-semester test and the mid-year exam.

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Assessment tasks

- Continual assessment
- Assignment
- Tutorials

Learning and teaching activities

- The lectures provide an overview of each topic/concept. Students will be given questions during the lectures to test their understanding of key concepts. The student is encouraged to follow up with textbook reading as well as additional reading materials. Wherever possible, animations and movies are also provided along with revision quizzes from the textbook, accessible via a personal eBook license.
- Tutorials provide an opportunity to work out problems and questions complementing lecture and practical materials. Tutorials will enable students to learn from their peers, discuss possible solutions and collaboratively work out answers. Tutorial questions and tutorial quizzes will prepare students for the in-semester test and the mid-year exam.

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.

- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and calculate basic kinetic parameters from the data generated using theoretical principles.
- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Assessment tasks

- Continual assessment
- Assignment
- In-Semester Test
- Practicals
- Tutorials
- Mid-year Examination

Learning and teaching activities

- The lectures provide an overview of each topic/concept. Students will be given questions during the lectures to test their understanding of key concepts. The student is encouraged to follow up with textbook reading as well as additional reading materials. Wherever possible, animations and movies are also provided along with revision quizzes from the textbook, accessible via a personal eBook license.
- Laboratory exercises are designed to provide a concrete hands-on example of the lecture topics covered in the course work, and to give you the opportunity to discover the principles and applications for yourself. Laboratory exercises also offer the opportunity to explore the uncertainty inherent in scientific investigations and the limitations of models and theories by allowing comparison with real systems. Questions covered in the

practical quizzes will prepare students for the in-semester test and the mid-year exam.

- Tutorials provide an opportunity to work out problems and questions complementing lecture and practical materials. Tutorials will enable students to learn from their peers, discuss possible solutions and collaboratively work out answers. Tutorial questions and tutorial quizzes will prepare students for the in-semester test and the mid-year exam.

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and

calculate basic kinetic parameters from the data generated using theoretical principles.

- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Assessment tasks

- Assignment
- In-Semester Test
- Practicals
- Tutorials
- Mid-year Examination

Learning and teaching activities

- The lectures provide an overview of each topic/concept. Students will be given questions during the lectures to test their understanding of key concepts. The student is encouraged to follow up with textbook reading as well as additional reading materials. Wherever possible, animations and movies are also provided along with revision quizzes from the textbook, accessible via a personal eBook license.
- Laboratory exercises are designed to provide a concrete hands-on example of the lecture topics covered in the course work, and to give you the opportunity to discover the principles and applications for yourself. Laboratory exercises also offer the opportunity to explore the uncertainty inherent in scientific investigations and the limitations of models and theories by allowing comparison with real systems. Questions covered in the practical quizzes will prepare students for the in-semester test and the mid-year exam.
- Tutorials provide an opportunity to work out problems and questions complementing lecture and practical materials. Tutorials will enable students to learn from their peers, discuss possible solutions and collaboratively work out answers. Tutorial questions and tutorial quizzes will prepare students for the in-semester test and the mid-year exam.

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Capacity to define key concepts: students of this unit will acquire sufficient knowledge to define and relate the key concepts of compartmentation of biochemical processes; the thermodynamic principles of enzyme catalysis; the major biological systems involved in metabolism and energy production pathways in the living cell; and the concept of cell-cell communication as related to metabolic control.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and calculate basic kinetic parameters from the data generated using theoretical principles.
- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Assessment tasks

- Assignment
- In-Semester Test
- Practicals

Learning and teaching activities

- Laboratory exercises are designed to provide a concrete hands-on example of the lecture topics covered in the course work, and to give you the opportunity to discover the

principles and applications for yourself. Laboratory exercises also offer the opportunity to explore the uncertainty inherent in scientific investigations and the limitations of models and theories by allowing comparison with real systems. Questions covered in the practical quizzes will prepare students for the in-semester test and the mid-year exam.

- Tutorials provide an opportunity to work out problems and questions complementing lecture and practical materials. Tutorials will enable students to learn from their peers, discuss possible solutions and collaboratively work out answers. Tutorial questions and tutorial quizzes will prepare students for the in-semester test and the mid-year exam.

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.
- Connecting protein structure with function: after successful completion of this unit, students will be able to define the protein structure-function paradigm and evaluate in qualitative and quantitative terms, the relationship between structure and function of proteins.
- Metabolic pathway mapping: students will be able to understand the flow of metabolites via metabolic pathway mapping and apply basic chemical and biochemical principles to identify the interactions between different metabolic pathways and the biochemical signals involved.
- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Tracking enzyme reactions: students will measure rates of enzyme reactions and calculate basic kinetic parameters from the data generated using theoretical principles.
- Data analysis: after successful completion of this unit students will be able to collect

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

Assessment tasks

- In-Semester Test
- Practicals
- Tutorials
- Mid-year Examination

Learning and teaching activities

- The lectures provide an overview of each topic/concept. Students will be given questions during the lectures to test their understanding of key concepts. The student is encouraged to follow up with textbook reading as well as additional reading materials. Wherever possible, animations and movies are also provided along with revision quizzes from the textbook, accessible via a personal eBook license.
- Laboratory exercises are designed to provide a concrete hands-on example of the lecture topics covered in the course work, and to give you the opportunity to discover the principles and applications for yourself. Laboratory exercises also offer the opportunity to explore the uncertainty inherent in scientific investigations and the limitations of models and theories by allowing comparison with real systems. Questions covered in the practical quizzes will prepare students for the in-semester test and the mid-year exam.
- Tutorials provide an opportunity to work out problems and questions complementing lecture and practical materials. Tutorials will enable students to learn from their peers, discuss possible solutions and collaboratively work out answers. Tutorial questions and tutorial quizzes will prepare students for the in-semester test and the mid-year exam.

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell

structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.

- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Assessment tasks

- Continual assessment
- Practicals
- Tutorials

Learning and teaching activities

- The lectures provide an overview of each topic/concept. Students will be given questions during the lectures to test their understanding of key concepts. The student is encouraged to follow up with textbook reading as well as additional reading materials. Wherever possible, animations and movies are also provided along with revision quizzes from the textbook, accessible via a personal eBook license.
- Laboratory exercises are designed to provide a concrete hands-on example of the lecture topics covered in the course work, and to give you the opportunity to discover the principles and applications for yourself. Laboratory exercises also offer the opportunity to explore the uncertainty inherent in scientific investigations and the limitations of models and theories by allowing comparison with real systems. Questions covered in the practical quizzes will prepare students for the in-semester test and the mid-year exam.

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Overall biochemical and cell biology knowledge: after successful completion of this unit, students will be able to define the differences between eukaryotic and prokaryotic cell

structure, and relate the biochemical processes required for growth and energy, including their control and the mechanisms involved in the synthesis and breakdown (i.e. metabolism) of important biomolecules.

- Identify, quantify and separate biomolecules: students completing this unit will be able to utilise appropriate experimental methods to characterise, quantify and separate different types of biomolecules.
- Data analysis: after successful completion of this unit students will be able to collect experimental data using biochemical techniques and sort, graph, analyze and present the experimental results in a biochemical context.

Assessment tasks

- Continual assessment
- Practicals

Learning and teaching activities

- The lectures provide an overview of each topic/concept. Students will be given questions during the lectures to test their understanding of key concepts. The student is encouraged to follow up with textbook reading as well as additional reading materials. Wherever possible, animations and movies are also provided along with revision quizzes from the textbook, accessible via a personal eBook license.
- Laboratory exercises are designed to provide a concrete hands-on example of the lecture topics covered in the course work, and to give you the opportunity to discover the principles and applications for yourself. Laboratory exercises also offer the opportunity to explore the uncertainty inherent in scientific investigations and the limitations of models and theories by allowing comparison with real systems. Questions covered in the practical quizzes will prepare students for the in-semester test and the mid-year exam.

Changes from Previous Offering

Tutorial quizzes will be paper-based instead of online.

The in-semester test will be online instead of paper-based.

Penalties for late submission

1. Students are to submit their **completed Assignment** on or before the due date.

- Late assignments will receive a **10% per day penalty** and will not be marked if more than 1 week late. Extensions will only be given under extenuating circumstances (see Special Considerations policy), by the unit coordinator if the request is received BEFORE the due date.

2. **Practical Quizzes along with completed practical files** are to be uploaded to iLearn via the corresponding **Practical Quiz** for grading, at the end of the Practical session, with specific last dates for submission available on iLearn.

- Late submissions will only be allowed by special permission and will not be marked if more than 1 week late. Extensions will only be given in extenuating circumstances, by the unit coordinator either by email BEFORE the due date, or by completing the Special Consideration request at ***ask.mq.edu.au*** (details in Policies and Procedures: Results).
- Prac Quizzes will only be graded if the completed data file has been uploaded.
- **No extensions are possible for the pre-lab quiz if the student has attended the scheduled practical class.**

Textbook

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 http://www.wileydirect.com.au/buy/fundamentals-of-biochemistry-5th-edition/ - *case studies and exercises are on* WileyPLUS.

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

- **Hardcopy + access to WileyPLUS**
- **Binder-ready-version (loose leaf) + access to WileyPLUS**

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