CBMS337

Biochemistry and Cell Biology

S2 Day 2014

Chemistry and Biomolecular Sciences

Contents

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General Information

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Mon 2-5, Tues 9-5, Weds 9-5, Thurs 2-5, Fri 9-1

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Credit points
3

Prerequisites
CBMS223 and CBMS224

Corequisites

Co-badged status
Co-badged with CBMS837 and CBMS737

Unit description
Biochemistry and cell biology are central to our understanding of medicine and biotechnology. Advances in these fields are dependent on an advanced understanding of the molecular basis of diverse cellular processes. This unit links important biochemical processes to functions and properties of eukaryotic cells. We explore advanced concepts including: enzyme function, properties of membranes, signal transduction, protein trafficking and transport, and protein turnover. These are linked to whole cell behaviours such as cell division and differentiation, programmed cell death, and general responses to external stimuli. Practical work complements lecture material and provides experience with a broad range of current techniques used in research and industry. Laboratory techniques used include analysis of signalling cascades, spectrophotometry, and fluorescence and light microscopy.

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:

Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
Define the major biological systems and control points involved in a range of fundamental cell processes;
Describe qualitative and quantitative relationships between cellular structure and function;
Define the key experimental methodologies by which cell biologists understand how cell function;
Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
Be able to successfully communicate advanced molecular cell biological concepts and research verbally and in writing;
Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of molecular cell biology; and

Contribute to the generation of new data and where appropriate entries in scientific databases.

Assessment Tasks

Name	Weighting	Due
Subcellular Challenge	10%	Practical (Week 2)
Mid-Semester Exam	10%	Week 7
Practical Reports	20%	iLearn schedule/consult staff
Human Cell Atlas Assignment	10%	Week 10
Hot Topics Seminar	10%	Practicals (Week 11-12)
Final Examination	40%	University Examination Period

Subcellular Challenge

Due: **Practical (Week 2)**
Weighting: **10%**

Group oral presentation regarding a subcellular organelle run during practical

On successful completion you will be able to:

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
- Describe qualitative and quantitative relationships between cellular structure and function;
- Define the key experimental methodologies by which cell biologists understand how cell function;
- Be able to successfully communicate advanced molecular cell biological concepts and research verbally and in writing;
- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of molecular cell biology; and

Mid-Semester Exam

Due: **Week 7**
Weighting: **10%**

There will be a 60 min exam (10% total assessment) held in the practical class of Week 7 (i.e., Monday 10th September from 1.05 pm sharp). This will cover all materials and textbook reading associated with lectures 1-12. This is designed to give you specific feedback on your understanding of the topics up to this stage to assist you in your further study of the unit. There will be no make-up exam for the mid-semester exam. Medical certificates or official documents must be lodged along with a special consideration form by October 8 at the Science Centre, Level 1, E7A if you are absent for the this exam. In this case, if the circumstances are accepted as valid, your final exam mark will be used for the missed mid-term mark (i.e., final exam mark will be out of 50%).

On successful completion you will be able to:

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Describe qualitative and quantitative relationships between cellular structure and function;

Practical Reports

Due: **iLearn schedule/consult staff**
Weighting: **20%**

Prac reports are due in three instalments (P2 then P3 and then P4+5+6) during the semester - please check the practical timetable for due dates and all prac reports should be submitted to CBMS337 unit technical staff.

On successful completion you will be able to:

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;

- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Describe qualitative and quantitative relationships between cellular structure and function;
- Define the key experimental methodologies by which cell biologists understand how cell function;
- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
- Contribute to the generation of new data and where appropriate entries in scientific databases.

Human Cell Atlas Assignment

Due: **Week 10**
Weighting: **10%**

Prepare an illustrated brief one (1) page summary of the biochemistry and cell biology of one (1) of the ~230 known human cell types for entry into the CBMS337/837 Macquarie Human Cell Atlas database.

On successful completion you will be able to:

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Describe qualitative and quantitative relationships between cellular structure and function;
- Define the key experimental methodologies by which cell biologists understand how cell function;

- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of molecular cell biology; and
- Contribute to the generation of new data and where appropriate entries in scientific databases.

Hot Topics Seminar

Due: **Practicals (Week 11-12)**
Weighting: **10%**

Prepare an individual PowerPoint presentation/seminar one a hot topic in molecular cell biology/ biochemistry

On successful completion you will be able to:

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Define the key experimental methodologies by which cell biologists understand how cell function;
- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
- Be able to successfully communicate advanced molecular cell biological concepts and research verbally and in writing;
- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of molecular cell biology; and

Final Examination

Due: **University Examination Period**
Weighting: **40%**

The final exam (40% total assessment) will be 3hr in length with 10min reading time. It is designed to address specific understanding of topics presented in all of the lectures, practicals and peer-assisted leaning exercises and to show that the knowledge you have obtained can be applied to new problems.

On successful completion you will be able to:

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
- Describe qualitative and quantitative relationships between cellular structure and function;

Delivery and Resources

Classes

Timetable: Please check https://timetables.mq.edu.au/2012/default.aspx for the official timetable of the unit.

Required and Recommended Texts and/or Materials

Prescribed Texts:

B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts, P. Walter (2008) "Molecular Biology of the Cell" (5th Edition), ISBN 978-0-8153-4106-2. Your lectures will cover the generic parts of each chapter and you are strongly advised to read and understand the reminder of each Alberts *et al.,* chapter as referred to in the lecture outline.

CBMS337 lecture notes can be obtained from the CBMS337 unit web site.

Further reading material is also available in the library:

R. Garrett & C. Grisham (2008) "Biochemistry" (4th or earlier editions)

Technology Used and Required

You are expected to access the unit iLearn web site on a frequent basis and to download all necessary pdf files. To access the unit web site, if you have off-campus Internet access, simply start your web browser and proceed as above for logging in. On-campus wireless access is also available. If you do not have your own computer you may wish to access the CBMS337 web resources on campus using the computers in the Library.

To view the lecture notes and other pdf files on the website, you will require Adobe Acrobat Reader Version 9 or later to be installed on your computer. Acrobat Reader can be downloaded from the Adobe website http://get.adobe.com/uk/reader/. If you are using the computers in the library, then Acrobat has already been installed.

Please note information may also be sent by email to your student email account so please

look at your student email account on a frequent basis.

Unit Web Page

The web page for this unit is at Macquarie's new learning management system website: *http://ilearn.mq.edu.au*

Login and follow prompts to CBMS337 Biochemistry and Cell Biology.

You are expected to access the unit web site frequently (i.e., almost daily). This site contains important information including lecture notes that you must typically download before the appropriate lecture class, mid-semester exam and/or assignment.

Logging In: Type in the URL http://ilearn.mq.edu.au **and find CBMS3376/837/737.** Your username is your Macquarie Student ID Number (MQID), which is an 8 digit number found on your student card. The password is your myMQ Student Portal password. This will be the original MQID password (2 random characters followed by your date of birth in ddmmyy format) that was sent to you on enrolment, unless you have already changed your password in the myMQ Student Portal. If you experience difficulties in getting your reprint or your password, please contact the StudentIT Desk (ph: 9850 6500).

Teaching and Learning Strategy

CBMS337 is a 3-credit point half-year unit and will require an average of 9 hours of work per week (contact hours plus self-study time). For students with "weaker" biochemistry backgrounds, more time than the 9 hours per week will probably be necessary to perform satisfactorily in this unit.

CBMS337 consists of 2 hours of lectures and a 4 hour laboratory class every week. The unit is designed to allow you to develop an understanding of biochemistry and cell biology and the practical skills to undertake experiments in this field in an efficient and safe manner. The lecture material and laboratories complement each other and have been developed to increase your understanding of the topics so you can achieve the learning outcomes.

The unit coordinator's expectation is that you will:

· Attend **all** lectures. If you cannot attend a lecture, you are expected to listen to the iLecture as soon as possible after it is made available.

· Demonstrate reasonable competence in all laboratory preparation exercises and attend each laboratory class/tutorial.

· Perform satisfactorily in the final exam.

· Spend an average of no less than 3 hours per week of private study in addition to direct contact.

If you prepare and attend all components of the unit and work consistently/continuously throughout the semester, you should be able to develop a strong understanding of biochemistry and how it operates in the context of molecular cell biology.

Students who "memorise" just before final exams typically do poorly in this unit.

You are expected to download lecture materials and bring these to lectures so you can spend most of the time listening rather than transcribing. Do not assume notes or iLectures are in any way a suitable substitute for attending lectures – lecturers put an effort into making the lectures up to date and relevant, whilst textbooks cannot not cover all examples or the latest research. Students historically fall behind and perform poorly if they do not attend lectures.

Learning is an active process, and as such you must engage with the material. This means downloading and reading lecture notes and relevant sections of the textbook (and beyond) before and after lectures are strongly recommended.

· The mid-semester exam will be run in a practical class.

· Laboratory prac classes are designed to develop basic laboratory skills, general safety practices and critical and analytical thought. In-lab and post-lab work are designed to allow you to appropriately record experimental observations and calculations in a detailed and accurate manner and assess your understanding of the theory behind experiments.

Changes to the Unit Since Last Offering

CBMS337 Biochemistry & Cell Biology in 2013 has undergone some important changes based on student assessment received in 2010 to 2012. As well the unit now has a new coordinator (Prof. Baker). He has heard student feedback and has simplified the unit by condensing lectures into 2 instead of the 3 lectures per week, with his strong encouragement that students consult heavily with their prescribed Alberts et al., textbook for examples and additional explanatory materials. Other changes include that practical reports are now worth 25% instead of 20%, with the final exam worth 40% instead of 50%. More emphasis is now placed upon peer learning experiences, like the *Subcellular Challenge* in week 1 practical class (5%) and *Hot Topics in Cell Biology* in the final two practical classes (5%). CBMS337/837 was offered first in 2010 and resulted from a merger between CBMS309 Advanced Biochemistry and CBMS375 Cell & Developmental Biology. CBMS337/837 contains the most critical lecture materials and the best laboratory classes from both units.

In addition to streamlining the unit, aspects previously duplicated are now being solely covered in other Faculty of Science units. For example, all immunology found in your textbook is now covered in BIOL367 *Immunobiology*, whilst all development of multicellular organisms material is covered in BIOL208 *Animal Structure & Function* and BIOL247 *Systems Physiology*). This has allowed CBMS337 to now focus upon the important aspects of the biochemistry and molecular cell biology of eukaryotic organisms..

Unit Schedule

CBMS337/837/737 Biochemistry & Cell Biology 2014 Lecture Plan (max 25 lecture slots), subject to minor changes

Unit Coordinator: Prof Mark Baker (yellow) Lecturers: A/Prof Rob Willows (green), Dr Abidali Mohamedali (teal)

Tuesday: C5C230 Collaborative Forum (9am-10am) and Friday C5C230 Collaborative Forum (9am-10am)

Date/ Day	Lecture	Topic	*MBC Chapter*
05 Aug Tues	01	**CBMS337 Introduction - Cells and Genomes:** Universal Features of Cells; Diversity of Genomes & Tree of Life	**1-3**
08 Aug Fri	02	**Enzyme Kinetics** 1	See iLearn
12 Aug Tues	03	**Enzyme Kinetics** 2	See iLearn
15 Aug Fri	04	**Enzyme Kinetics** 3	See iLearn
19 Aug Tues	05	**Evolution of Biochemical Pathways 1**	See iLearn
22 Aug Fri	06	**Evolution of Biochemical Pathways 2**	See iLearn
26 Aug Tues	07	**Membrane Transport of Small Molecules & the Electrical Properties of Membranes 1:** Principles of Membrane Transport; Transporters and Active Membrane Transport	**10/11**
29 Aug Fri	08	**Membrane Transport of Small Molecules & the Electrical Properties of Membranes 2:** Ion Channels and the Electrical Properties of Membranes	**10/11**
02 Sept Tues	09	**Intracellular Compartments & Protein Sorting 1:** The Compartmentalization of Cells; The Transport of Molecules Between the Nucleus and the Cytosol	**12**
05 Sept Fri	10	**Intracellular Compartments & Protein Sorting 2:** The Transport of Proteins into Mitochondria and Chloroplasts; Peroxisomes, Endoplasmic Reticulum	**12**
09 Sept Tues	11	**Intracellular Vesicular Traffic 1:** Molecular Mechanisms of Membrane Transport & Maintenance of Compartments	**13**
12 Sept Fri	12	**Intracellular Vesicular Traffic 2:** Transport: ERàT*rans* Golgi NetworkàLysosomes; CellàPlasma Membrane; Trans Golgi NetworkàCell Exterior	**13**

16 Sept Tues	13	**Cell Communication 1:** Cell Communication General Principles	**15**
19 Sept Fri	14	**Cell Communication 2:** GPCRS and Small Intracellular Mediators	**15**
		Mid-semester Break **(Mon 22 Sept – Mon 6 Oct)**	
07 Oct Tues	15	No Lecture - Complete Human Cell Atlas Assignment	**-**
10 Oct Fri	16	**Cytoskeleton 1:** Self Assembly and Dynamic Structure of Cytoskeletal Filaments	**16**
14 Oct Tues	17	**Cytoskeleton 2:** How Cells Regulate Cytoskeletal Filaments, Molecular Motors	**16**
17 Oct Fri	18	**Cell Junctions, Adhesion & ECM 1:** Cadherins and Cell-Cell Adhesion	**19**
21 Oct Tues	19	**Cell Junctions, Adhesion & ECM 2:** Tight Junctions, Epithelia, Gap Junctions, Plasmodesmata, Integrins, ECM	**19**
24 Oct Fri	20	**Cell Communication 3:** Signaling Through Enzyme-Coupled Cell-Surface Receptors	**15**
28 Oct Tues	21	**Cell Cycle:** Overview, Cell-Cycle Control System, S Phase; Mitosis Cytokinesis; Control of Cell Division/ Growth	
31 Oct Fri	22	**Apoptosis/Cell Death**	**18**
04 Nov Tues	23	**Cancer:** A Microevolutionary Process; Preventable Causes; Finding Cancer Critical Genes	**20**
07 Nov Fri	24	**Cancer:** Cancer Metastasis	**20**
21/4 Nov	25	Unit Review Study Week	**1-20**

CBMS337/837/737 Biochemistry & Cell Biology 2014 Practical Session Plan

Practical Demonstrator: A/Prof Rob Willows + relevant staff as numbers require

Mondays 10am-1pm E7B349-0 and 2pm-5pm E7B349-0 (only if required)

Date/Day	Prac	Topic
29 Jul Mon		No Practical Classes Week 1 (You must be assigned your practical group Monday AM or PM during this week)
11 Aug Mon	P1	**Subcellular Organelle Challenge Assessment Item** ("1-in-a-million" scale cell model)
18 Aug Mon	P2	**Enzyme kinetics** - Muscle pyruvate kinase Day 1
25 Aug Mon	P2	**Enzyme kinetics** - Muscle pyruvate kinase Day 2 [Combined Report (P2) to be written on both practicals]
1 Sept Mon	P3	**Enzyme inhibition** - Yeast hexokinase Day 1 **Select "Human Cell Atlas" Cell Type and Select "Molecular Cell Biology Hot Topic"**
8 Sept Mon	P3	**Enzyme inhibition** - Yeast hexokinase Day 2 [Combined Report (P3) to be written on both practicals]
15 Sept Mon		**Mid-Semester Exam (E7B349; all CBMS337/737/837 students, 1-2pm sharp, Lectures 1–12 examinable)** **Prac Reports 2 and 3 Due 15th September 2014 (or agreed with Prof. Willows)**
		Mid-semester Break **(Mon 22 Sept – Mon 6 Oct)**
30 Sept Mon	P4	**Serpin Bioinformatics**
06 Oct Mon		No Practicals - Labour Day Public Holiday (NSW)
13 Oct Mon	P5	**Immunolocalization Staining**
20 Oct Mon	P5	**Immunolocalization of RuBisCO C3 Vs C4 plants** **Human Cell Atlas Project Due**
27 Oct Mon	P6	**Molecular Cell Biology Hot Topics Talks 1** (all students must attend) **Practical Reports 5 and 6 Due**
03 Nov Mon	P6	**Molecular Cell Biology Hot Topics Talks 2** (all students must attend)

Lecture & Practical timetable subject to change

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of 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/support/student_conduct/

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

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

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

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
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- Define the key experimental methodologies by which cell biologists understand how cell function;
- Be able to successfully communicate advanced molecular cell biological concepts and research verbally and in writing;
- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of molecular cell biology; and

Assessment tasks

- Subcellular Challenge

- Mid-Semester Exam
- Practical Reports
- Human Cell Atlas Assignment
- Hot Topics Seminar
- Final Examination

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

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
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- Contribute to the generation of new data and where appropriate entries in scientific databases.

Assessment tasks

- Subcellular Challenge
- Mid-Semester Exam

- Practical Reports
- Human Cell Atlas Assignment
- Hot Topics Seminar
- Final Examination

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

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
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Assessment tasks

- Subcellular Challenge
- Mid-Semester Exam
- Practical Reports
- Human Cell Atlas Assignment
- Hot Topics Seminar

- Final Examination

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

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
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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

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
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Assessment tasks

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- Final Examination

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

- Have a detailed understanding of the biochemistry (e.g., kinetics and pathways) and molecular cell biology (e.g., molecular composition, detailed processes, cross-talk, integration and signaling) concerning how cell work in health and disease;
- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
- Define the major biological systems and control points involved in a range of fundamental cell processes;
- Describe qualitative and quantitative relationships between cellular structure and function;
- Be able to design experiments to characterise, quantitate and measure a range of fundamental cell processes;
- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of molecular cell biology; and
- Contribute to the generation of new data and where appropriate entries in scientific databases.

Assessment tasks

- Subcellular Challenge
- Mid-Semester Exam
- Practical Reports
- Human Cell Atlas Assignment
- Hot Topics Seminar
- Final Examination

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

- Be able to successfully communicate advanced molecular cell biological concepts and research verbally and in writing;
- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of molecular cell biology; and
- Contribute to the generation of new data and where appropriate entries in scientific databases.

Assessment tasks

- Subcellular Challenge
- Practical Reports
- Human Cell Atlas Assignment
- Hot Topics Seminar

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

- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
- Be able to successfully communicate advanced molecular cell biological concepts and research verbally and in writing;
- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of molecular cell biology; and
- Contribute to the generation of new data and where appropriate entries in scientific databases.

Assessment tasks

- Subcellular Challenge
- Mid-Semester Exam

- Practical Reports
- Human Cell Atlas Assignment
- Hot Topics Seminar
- Final Examination

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

- Possess an understanding of the application of various genomics and proteomics methodologies fundamental to an understanding of normal cell biological processes (e.g., cell division, cell growth, mutation, cell death, cell signaling, cell adhesion, cell movement,) and how disturbances in these are involved in disease;
- Be able to successfully communicate advanced molecular cell biological concepts and research verbally and in writing;
- Extract information from and communicate to their peers a summary of a recent publication in a contemporary area of molecular cell biology; and

Assessment tasks

- Subcellular Challenge
- Mid-Semester Exam
- Practical Reports
- Human Cell Atlas Assignment
- Hot Topics Seminar
- Final Examination