CBMS731

Molecular and Medical Biotechnology

S2 Day 2015

Dept of Chemistry & Biomolecular Sciences

Contents

General Information

Unit convenor and teaching staff
Helena Nevalainen
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Credit points
4

Prerequisites
Admission to MRes

Corequisites

Co-badged status
The lectures and practicals in this unit are co-taught with CBMS331 and CBMS880. The specific postgraduate learning outcomes for CBMS731 are aimed at gaining an understanding of scientific literature and current practices in the relevant fields of modern biotechnology. The ability to communicate science to a broader audience is especially addressed. Students are required to research the questions presented in the practical manual in depth, and make this additional inquiry evident in the answers. The practical laboratory reports are expected to show aptitude to interpret the results, i.e. the ability and curiosity to move beyond 'what was done' to explaining 'what does it mean'.

Unit description
The unit explores particular areas of contemporary molecular and medical biotechnology building on students' existing knowledge and importantly, showing how science is translated to applications in health, industry and the environment. Lecture topics range from the production of recombinant biomolecules in various cell factories, applications of stem cells to joint repair, and applications of nanoparticles for diagnostics. We will look into recent technical and conceptual developments and how these relate to our personal lives, society and industry. Visiting lecturers from industry and various academic disciplines will lead discussion on their areas of expertise. A special feature for the 700-level students is an exercise on science communication. The unit also has a significant hands-on laboratory component with tutorials and assignment tasks.

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:

Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: 'What does this mean?". The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Assessment Tasks

Name	Weighting	Due
Primer design quiz	5%	04/09/2015
Report on Practical 1	12%	11/09/2015
Fluorescence quiz	5%	29/09/2015
Report on Practical 2	8%	08/10/2015
Report on Practical 3	10%	27/10/2015
Press release	6%	03/11/2015
The Great Debate	4%	NA
Final exam	45%	TBA
Continuing assessment	5%	10/11/2015

Primer design quiz

Due: **04/09/2015**

Weighting: **5%**

The ability to design oligonucleotide primers for DNA amplification is one of the most essential skills in molecular biology. Your brief is to design primers for the isolation of a specific gene. You will be given material to work with and specific questions to answer. This quiz will require some literature research and must be returned by the due date.

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Report on Practical 1

Due: **11/09/2015**
Weighting: **12%**

There arethree major reports describing the laboratory experiments in detail with references to literature. The reports must be submitted to iLearn for checking in turnitin by the due date.

The three separate reports (P1, 2 and 3) should follow the format:

Introduction (stating aims in the last paragraph)

Materials and Methods (main points and procedures)

Results (with tables and graphs where applicable)

Discussion (reflecting on the results)

References (choose one style and stick to it)

Answers to questions (separate from other text)

Results should consist of tables, diagrams and **words in between to tie them together**. Presenting tables, graphs, etc. without any explanation is not acceptable. Every table, graph and diagram should be numbered and have a caption, and you should refer to them in the text by their number. Length of each report differs depending on the duration of the practical. About 10 double spaced typewritten pages plus figures and tables is not unusual. Please answer the questions after the actual report text under a heading 'Answers to questions' and number your answers.

On successful completion you will be able to:

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: 'What does this mean?". The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Fluorescence quiz

Due: **29/09/2015**
Weighting: **5%**

This quiz will feature questions addressing matters discussed in the lectures and a tutorial conducted during Practical 2. You are expected to find and record most of the answers to these questions during the time allocated to the tutorial. The completed paper must be returned by the due date.

On successful completion you will be able to:

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of

the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: 'What does this mean?". The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Report on Practical 2

Due: **08/10/2015**
Weighting: **8%**

The report (P2) should follow the format:

Introduction (stating aims in the last paragraph)

Materials and Methods (main points and procedures)

Results (with tables and graphs where applicable)

Discussion (reflecting on the results)

References (choose one style and stick to it)

Answers to questions (separate from other text)

Results should consist of tables, diagrams and **words in between to tie them together**. Presenting tables, graphs, etc. without any explanation is not acceptable. Every table, graph and diagram should be numbered and have a caption, and you should refer to them in the text by their number. Length of each report differs depending on the duration of the practical. About 10 double spaced typewritten pages plus figures and tables is not unusual. Please answer the questions after the actual report text under a heading 'Answers to questions' and number your answers.

Practicals 1 and 2 are interconnected and the students are requested to provide **one page** executive summary linking them together. The summary will be handed in together with the

detailed report on Practical 2.

On successful completion you will be able to:

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: 'What does this mean?". The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Report on Practical 3

Due: **27/10/2015**
Weighting: **10%**

The report (P3) should follow the format:

Introduction (stating aims in the last paragraph)

Materials and Methods (main points and procedures)

Results (with tables and graphs where applicable)

Discussion (reflecting on the results)

References (choose one style and stick to it)

Answers to questions (separate from other text)

Results should consist of tables, diagrams and **words in between to tie them together**. Presenting tables, graphs, etc. without any explanation is not acceptable. Every table, graph and diagram should be numbered and have a caption, and you should refer to them in the text by their number. Length of each report differs depending on the duration of the practical. About 10 double spaced typewritten pages plus figures and tables is not unusual. Please answer the

questions after the actual report text under a heading ‘Answers to questions’ and number your answers.

On successful completion you will be able to:

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: ‘What does this mean?”. The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Press release

Due: **03/11/2015**
Weighting: **6%**

Communication seminar and Press release: You are given a task to introduce and explain a product made by biotechnology, currently on the market, to a wider non-specialist audience in a seminar presentation. You will also prepare a snappy A4 Press release to go with the product. The convener will reveal the products you will work with two weeks before the seminar.

On successful completion you will be able to:

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does this mean?". The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

The Great Debate

Due: **NA**
Weighting: **4%**

For this Debate, the students will be divided into groups of 3-5 people (depending on the total student number) who will be given a topic in the area of biotechnology (drawn out of a hat) which they either have to defend or oppose. The topics will be chosen from those suggested by the students and teaching staff. The groups will know their topic in the previous week so that they can plan ahead their debating strategy. Each debate, chaired by the course convener, will last for 10 minutes followed by questions from the audience. The audience will participate in the assessment by voting for the winning team after each debate. This is a good opportunity to practice ethical voting, *i.e.* voting based on a successful argument and not *e.g.* because you are good buddies with some individuals in one of the debating teams. There will be no individual marks but the collective mark goes to everyone in the group.

On successful completion you will be able to:

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: 'What does this mean?". The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning

goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Final exam

Due: **TBA**
Weighting: **45%**

The final course examination will be 3 hours plus 10 min reading time. The examination will cover **all sections of the unit** and consist of short answers, problem solving tasks and essay questions. In their answers the students are encouraged to practise critical thinking and expanding on ideas rather than just listing facts and figures with no discussion. Dot point-style answering is not allowed. Take a calculator to the examination.

The date of the final examination will be posted by the University during the semester. You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations (https://timetables.mq.edu.au/Scientia/Web/index.html).

The only exception to sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for Special consideration. Please consult **http://www.mq.edu.au/policy/docs/disruption_studies/policy.html**.

If a Supplementary Examination is granted as a result of the Special consideration process the examination will be scheduled after the conclusion of the official examination period. The offer of a supplementary examination is at the discretion of the academic staff and you should not automatically assume that it will be provided. Supplementary Examinations are **not make-up exams**, *i.e.* a poor result in the final examination is not reason to request a supplementary examination.

It is Macquarie University policy to **not set early examinations** for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period.

On successful completion you will be able to:

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the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: 'What does this mean?". The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Continuing assessment

Due: **10/11/2015**
Weighting: **5%**

A continuing assessment that involves providing a brief answer to 20 questions (from the total of 26 lectures) is set up on iLearn. You are expected to listen to each of these lectures and submit a brief answer to a particular question arising from the lecture, posted on iLearn by the convener by 5 pm on the day of the lecture. Your answers to each week's lectures must be in by the following Mon 5 pm. Best answers will be displayed on iLearn.

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Delivery and Resources

Teaching staff

Unit convenor: Prof. Helena Nevalainen

Office: E8C302, Lab: E8C320

Phone: (BH) 02-9850 8135

Fax: (BH) 02-9850 8313

E-mail: helena.nevalainen@mq.edu.au

There are no formal office hours for this unit. I am happy to receive students outside the lecture and tutorial hours other duties permitting. Please be aware that I may not be found in my office at all times so it is advisable to organise an appointment in advance.

Unit technician: Ms. Elsa Mardones

Office: E8A 172, Lab: several

Phone: 02-9850 8233 (Office)

E-mail elsa.mardones@mq.edu.au

Elsa is involved in the preparation of all practical material. She is available for technical advice and to answer any questions concerning biosafety and occupational health and safety. Please note Elsa's working hours that are posted on her office door.

Required and Recommended texts and/or materials

Biotechnology draws from different disciplines and technologies. The recommended textbook will give you a good introduction to these areas and provide further reading and websites for more in depth studies. There are also good questions at the end of each chapter to test your learning.

Textbook: William J. Thieman and Michael A. Palladino (2012): Introduction to Biotechnology, 3rd edition. Pearson Benjamin-Cummings Publishing Company, San Francisco CA.

The book is available at the University Bookshop. Please note that while the book provides an anchor for the studies, plenty of **additional and examinable information** will be provided in the lectures.

Almost every issue of the mainstream biotechnology journals will contain scientific papers related

to the lecture material. Journals such as 'Biotechnology' and 'Trends in Biotechnology' are subscribed by the MQ Library and a good amount of the relevant journals are accessible through electronic databases such as PubMed (http://www.ncbi.nlm.nih.gov/pubmed/). Please take some time to browse through the journals for papers that you may find interesting. Getting familiar with the format in which scientific papers are presented will be of great help in your own report writing.

There are also many web resources, but material placed on the web is not necessarily checked for accuracy, so be careful when using it.

Instructions for the laboratory experiments can be downloaded from iLearn. It is essential that you bring the notes with you to each class. Additional material may be provided in the class.

Technology Used

Ability to access the Internet is necessary. General use computers are provided by the University, but it would be advantageous to have your own computer and internet access.

It would be helpful to have a (scientific) calculator to carry out various calculations during practicals. They are also needed when preparing reports and in the final examination. Text-retrieval calculators are not allowed in the final examination. Laboratory reports and essays can be produced using standard Microsoft Office software.

Classes

Timetable: Please check http://www.timetables.mq.edu.au/ for the official timetable of the unit.

Lectures: The material presented in the lectures is examinable. **Please note that there is no text book coverage for a fair amount of the material presented.** Therefore, regular attendance to the lectures and careful listening of the recordings is highly recommended. Lecture topics and dates can be found at the end of this guide. Lectures will be recorded and made available on iLearn. A continuing assessment that involves providing a brief answer to 20 questions (from the total of 26 lectures) is set up on iLearn.

Tutorials and Industry exposure: Attendance at the tutorials and the Industry exposure is compulsory, a medical certificate or other relevant documentation will be required for any absences. Previously announced locations for these activities may change so stay tuned. Tutorial material, which forms part of the material submitted for assessment and/or examination, will be distributed at the beginning of the class.

Laboratory work: Laboratory sessions commence in **Week 2**; Practical topics and the timetable are listed at the back of this guide. The 4-hour practical sessions will be offered on Tue afternoon from 2-6 pm (Group 1) or Wed morning 9 am-1 pm (Group 2) in E7B349-50. Each student should enrol in **one** of these sessions and stay within that group throughout the entire semester. Practical laboratory sessions are compulsory and a medical certificate or other relevant documentation will be required for any absences. It should be noted that missing any practical will make the reporting very difficult since some of the practicals continue over several weeks and plenty of data will be generated every week.

Laboratory procedures: This course will involve laboratory work with microorganisms, DNA samples, proteins and sugars. The experimental techniques feature molecular biology, microbial cultivation, fluorescent microscopy, biochemical analyses and mass spectrometry. Note that

there are safety requirements concerning the use of these techniques. All students must adhere to the guidelines for safe laboratory conduct as detailed below.

1. Study the practical notes so that you understand the experimental procedures. Reading the notes beforehand is highly recommended and will speed up your work.
2. **Wear a decent laboratory coat and safety glasses** at all times within the laboratory area. Preferably bring your own.
3. Tie back long hair before starting laboratory work.
4. Do not wear open-toe shoes in the laboratory.
5. No eating, drinking, smoking, listening to music, chatting on a mobile phone, surfing the net for fun or applying makeup is allowed in the laboratory.
6. No children, friends or spouses are allowed in the laboratory.
7. Wash your hands and disinfect your work space before commencing work and repeat this after finishing the experiments.
8. Dispose of all microbiological waste in the autoclave bags and place sharps (needles, scalpels etc.) in the sharps container. How to dispose of other materials is instructed by the tutor.
9. **Report ALL accidents and spills immediately.**
10. If you don't know, ASK! We love to explain.
11. Treat all chemicals and reagents with respect and read the labels. Also label your plates, test tubes etc.
12. You will need full concentration in the lab, so do not drink alcohol or use other substances that may interfere with your ability to carry out experiments safely in the classes.

It is recommended that you carry a marking pen (permanent), spatula, scissors and tweezers and a calculator. Perform the experiments in an orderly fashion and clean up afterwards.

You will be required to keep a laboratory book in which the details, results and conclusions of experiments will be recorded. The best format is an A4 ruled notebook that opens flat. This book is to be used in the practicals and notes should allow you to repeat the experiment. You are also expected to write three formal reports on the practical work, which will be a lot less painful experience with good notes in hand. In addition to handing in a hard copy of the reports, all practical reports must be submitted to turnitin available at the unit iLearn site. Submission dates are found on p. 10. Using an iPad, tablet or any other electronic device for making lab notes is allowed but not recommended.

Instructions for the laboratory experiments can be downloaded from iLearn. Please take the notes with you to the class.

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/

Results

Results shown in *iLearn*, 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.

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

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcome

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: ‘What does this mean?”. The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Assessment tasks

- Primer design quiz
- Report on Practical 1
- Fluorescence quiz
- Report on Practical 2
- Report on Practical 3
- Press release
- The Great Debate
- Final exam
- Continuing assessment

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcome

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: ‘What does this mean?”. The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Assessment tasks

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- Final exam
- Continuing assessment

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcome

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: ‘What does this mean?”. The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Assessment tasks

- Primer design quiz
- Report on Practical 1
- Fluorescence quiz
- Report on Practical 2
- Report on Practical 3
- The Great Debate
- Final exam

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcome

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: ‘What does this mean?”. The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Assessment tasks

- Report on Practical 1

- Fluorescence quiz
- Report on Practical 2
- Report on Practical 3
- Final exam

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcome

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: ‘What does this mean?”. The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Assessment tasks

- Primer design quiz
- Report on Practical 1
- Fluorescence quiz
- Report on Practical 2
- Report on Practical 3

- Press release
- The Great Debate
- Final exam
- Continuing assessment

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcome

- Learning goals and outcomes: At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that you will be able to pursue the individual topics further. You will have developed practical skills in the hands-on laboratory work using contemporary experimental techniques as well as skills to critically assess and discuss experimental findings. The important question is: ‘What does this mean?”. The skills developed will be valuable when seeking employment or progressing into higher degree studies. Also, you will have developed good skills in scientific report writing including understanding the format, extracting relevant information from scientific literature, and arguing your point of view. Specific learning goals and outcomes are: (1) Ability to understand the scientific language and concepts in the published literature relevant to the topic. (2) Ability to relate information published in the scientific literature to the research questions in hand. (3) Ability to explain and interpret results from the laboratory experiments carried out at the practicals reflecting published literature and relevant technical and theoretical concepts. (4) Ability to communicate biotechnology-related topics to a wider, non-specialist audience both verbally and in writing. (5) Become introduced and engaged with curiosity-driven learning.

Assessment tasks

- Press release
- The Great Debate
- Final exam
- Continuing assessment