



# CBMS880

## Molecular and Medical Biotechnology

S2 Day 2015

*Dept of Chemistry & Biomolecular Sciences*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Helena Nevalainen

[helena.nevalainen@mq.edu.au](mailto:helena.nevalainen@mq.edu.au)

Credit points

4

Prerequisites

Admission to MBiotech or MBiotechMCom or MRadiopharmSc or MBioBus

Corequisites

Co-badged status

The lectures and practicals in this unit are co-taught with CBMS331 and CBMS731. The specific postgraduate learning outcomes for CBMS880 are aimed at gaining an understanding of scientific literature and current practices in the relevant fields of modern biotechnology.

Unit description

This unit is composed of lectures, a significant hands-on laboratory component, student debate, tutorials, assignments and reports. A visit to local industry will be arranged. We will discuss examples of cutting-edge research and biotechnology-related recent. This 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 area of expertise. A special task for the 800-level students is to compose an essay on ethical issues in modern biotechnology according to their own area of interest. 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:

At the end of this unit, you should have a good grasp of the selected areas of

biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?'. 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.

## Assessment Tasks

Name	Weighting	Due
<a href="#"><u>Primer design quiz</u></a>	5%	04/09/2015
<a href="#"><u>Report on Practical 1</u></a>	12%	11/09/2015
<a href="#"><u>"You decide" essay</u></a>	9%	29/10/2015
<a href="#"><u>Fluorescence quiz</u></a>	5%	29/10/2015
<a href="#"><u>Report on Practical 2</u></a>	8%	09/10/11
<a href="#"><u>Report on Practical 3</u></a>	10%	27/10/2015
<a href="#"><u>Continuing assessment</u></a>	5%	10/11/2015
<a href="#"><u>The Great debate</u></a>	4%	NA
<a href="#"><u>Final exam</u></a>	42%	TBA

### 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.

On successful completion you will be able to:

- At the end of this unit, you should have a good grasp of the selected areas of

biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?'. 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.

## Report on Practical 1

Due: **11/09/2015**

Weighting: **12%**

These are three 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. Expected length for an average report is about 10 double spaced typewritten pages plus figures and tables. 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:

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?'. 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.

## “You decide” essay

Due: **29/10/2015**

Weighting: **9%**

This essay will be written in the “Times magazine style”, *i.e.* to a broader audience. The optional topics are listed below. Please pick one topic you find especially intriguing. You can take a strong standing on the topic you are writing about in order to engage the reader and prove the value of your point of view. Expected length of the paper is about 5-10 double spaced typewritten pages. Use illustrations and references if applicable. The essay will be submitted to turnitin as above.

### **Essay topics:**

1. Genetically modified foods- friend or foe?
2. Who benefits from recombinant drugs?
3. Should DNA sequences from naturally living organisms be patentable?
4. Would you like to have your genome sequenced and access to the resulting information?
6. Risks of the release of recombinant microbes into the environment.
7. Should pathogen genome sequences remain in public database?
9. Should pets be cloned?
10. DNA analysis, a crime-fighting tool or invasion of privacy?
11. Are genetically engineered species a risk to biodiversity?
12. Should reproductive cloning of humans be banned?

You can also suggest another topic of general interest.

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- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?’. 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.

## Fluorescence quiz

Due: **29/10/2015**

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:

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?'. 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.

## Report on Practical 2

Due: **09/10/11**

Weighting: **8%**

***The report (P2) should follow the same format as Report 1.***

In addition: 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:

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?'. 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.

## Report on Practical 3

Due: **27/10/2015**

Weighting: **10%**

***The report (P3) should follow the same format as Reports 1 and 2.***

On successful completion you will be able to:

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?'. 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.

## 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.

On successful completion you will be able to:

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual

topics further by consulting relevant scientific literature. 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, what can I learn from this?'. 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.

## 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:

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?'. 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.

## Final exam

Due: **TBA**

Weighting: **42%**



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 practice 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](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:

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?’. 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.

## **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](mailto: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: E8A150

Phone: 02-9850 8233 (Office)

E-mail [elsa.mardones@mq.edu.au](mailto: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 general 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, 3<sup>rd</sup> 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 visit 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 are required to 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 all 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. 11. Using an iPad, tablet or any other electronic device for making lab notes is not recommended.

Instructions for the laboratory experiments can be downloaded from iLearn.

## 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](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](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](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/](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](http://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](http://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](http://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**

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?’. 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.

## **Assessment tasks**

- Primer design quiz
- Report on Practical 1
- “You decide” essay
- Fluorescence quiz
- Report on Practical 2
- Report on Practical 3
- The Great debate
- Final exam

## **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**

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?’. 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.

## **Assessment tasks**

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- Fluorescence quiz
- Report on Practical 2
- Report on Practical 3
- The Great debate
- Final exam

## **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**

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?’. 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.

## **Assessment tasks**

- Primer design quiz
- Report on Practical 1

- “You decide” essay
- Fluorescence quiz
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- Report on Practical 3
- Continuing assessment
- 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

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?’. 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.

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- 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**

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?'. 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.

## **Assessment tasks**

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- Final exam

## **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**

- At the end of this unit, you should have a good grasp of the selected areas of biotechnology discussed in the unit so that they will be able to pursue the individual topics further by consulting relevant scientific literature. 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, what can I learn from this?’. 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.

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