CBMS331

Molecular and Medical Biotechnology

S2 Day 2017

Dept of Chemistry & Biomolecular Sciences

Contents

General Information

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Credit points
3

Prerequisites CBMS215 and CBMS224
Corequisites
Co-badged status CBMS731 and CBMS880
Unit description This unit provides an overview of contemporary biotechnology, emphasising the molecular aspects of this growing field. Several examples will be provided to demonstrate how the basic molecular sciences translate into environmental and industrial applications as well as to better health and wealth. We will discuss functional genomics and proteomics, the use of surrogate hosts for protein production, and the roles of sugars on proteins and cells. Other topics include forensics, stem cells and applications of fluorescence in biotechnology. Students will carry out hands-on laboratory work applying recombinant DNA techniques, visualise organisms and molecules using confocal fluorescence microscopy, assess production capabilities of an industrially exploited fungal cell factory, and analyse the sugars on a commercially available recombinant product.

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:

1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

General Assessment Information

Practical Reports

These are major reports describing the laboratory experiments in detail with references to literature. The reports must be submitted to iLearn by the due date (see below) for checking in turnitin. In addition to the electronic copy, a hard copy is to be submitted to the Science and Engineering Student Centre MUSE, where a submission box will be set up. Campus maps are available at http://www.bgo.mq.edu.au/maps_campus.htm. The Centre is open from 8.30 am to 5.30 pm from Monday to Friday.

The reports 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)

Other

Bonus tasks

The students will have an opportunity to earn extra marks (5 altogether) from tasks presented during the practicals and tutorials, which are run during prac time.

Submission

All reports and assignments must be submitted by 5.30 pm on the due date.

Late Submission

Written tasks 10% or less - No extensions will be granted. Students who have not submitted the task prior to the deadline will be awarded a mark of 0 for the task, except for cases in which an application for disruption of studies is made and approved.

Written tasks above 10% - No extensions will be granted. There will be a deduction of 10% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late. This penalty does not apply for cases in which an application for disruption of studies is made and approved. No submission will be accepted after solutions have been posted.

What is Required to Complete the Unit Satisfactorily

Students should actively take part in the lectures, tutorials and laboratory classes. This means that you are encouraged to ask questions in the lectures, and particularly at the tutorials and during laboratory classes. Do not be afraid to ask questions – many others will probably wonder about the same thing. There are no stupid questions, really.

The lectures and practicals link together to support the overall learning. The questions related to the practicals are formulated so that you will have the opportunity to use the information acquired in the class and provided in the lectures. You are expected to consult scientific literature for additional information and inspiration. The students will have plenty of time for hands-on laboratory work and opportunities to discuss any practical problems with the demonstrator and class mates. **It is important to keep in mind that experiments with living organisms can produce surprising results or sometimes no results at all!** If that should happen, your task would be to find reasons for the unexpected outcome(s). There are no pre-set 'correct' results to the laboratory work and it is important to learn how to continue with the experiment in the face of the unexpected. Similarly, there may be modifications or additions to the instructions printed in the practical notes provided, depending on the course the experiments may take.

Attendance to practicals is compulsory. Returning all written assignments (practical reports and the primer design task) is required for satisfactory performance. You will also need to pass the final exam with 40% of the marks available. Participation in the Great Debate is required to pass the unit satisfactorily.

Assessment Tasks

Name	Weighting	Hurdle	Due
Practical report 1	13%	No	15/09/2017
Practical report 2	10%	No	23/10/2017
Practical report 3	10%	No	06/11/2017
Namesake peptide task	12%	No	11/09/2017
The Great Debate	5%	No	Week 11 or 12
Continuing assessment	5%	No	Week 13
Final examination	45%	No	November 2017

Practical report 1

Due: **15/09/2017**
Weighting: **13%**

Written report on practical 1, composed of the results from the practical work carried out over five weeks. The report will be marked over **the mid-semester break** to provide early feedback on the developing skills in report writing and extracting relevant information from various paper and electronic sources. The report provides an indication of the student's ability to interpret, analyse and explain experimental results. Related approaches have been discussed in lectures 1-14. There are two additional questions for the students to answer and explore as part of the report.

On successful completion you will be able to:

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Practical report 2

Due: **23/10/2017**
Weighting: **10%**

Written report on practical 2. The students have received feedback on their first report and thus should take the advice on board when compiling report 2. This report involves presenting confocal microscopy image material produced in the practical and discussing the observations in detail. Also, the students are requested to answer three additional questions on the topic of fluorescence and produce an executive summary linking together practicals 1 and 2, as part of the report.

On successful completion you will be able to:

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Practical report 3

Due: **06/11/2017**
Weighting: **10%**

Written report on practical 3. The report concerns detailed analysis of the results obtained in the

class. There are two additional questions for the students to answer and explore as part of the report.

On successful completion you will be able to:

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Namesake peptide task

Due: **11/09/2017**
Weighting: **12%**

In this exercise, you will design your namesake peptide end express it in a designated host organism. The task sources from the lectures, codon optimisation tutorial and teaches you to design oligonucleotide primers for DNA amplification, which is one of the most essential skills in molecular biology. You will also learn how to make DNA ready for cloning. During the tutorial, you will be given a brief, material to work with and specific questions to answer. This assignment will be completed at home and requires some independent literature/web research. Submission on iLearn.

On successful completion you will be able to:

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

The Great Debate

Due: **Week 11 or 12**
Weighting: **5%**

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 10-20 minutes including 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 friends 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:

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Continuing assessment

Due: **Week 13**
Weighting: **5%**

Continuing assessment involves providing a brief answer to a weekly question appearing on iLearn each Wednesday by 5 pm. The question concerns a topic discussed either on the Mon or Tue lecture. You are expected to attend lectures/listen to the lecture recordings and submit a brief answer to the question on iLearn. Your answers must be in by 5 pm on the following Monday. There will be 12 questions overall. The mark will be calculated according to the number of questions answered. Answering all questions will give you the full 5%. This exercise is voluntary; however, it is great practice for the final exam.

On successful completion you will be able to:

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected

areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Final examination

Due: **November 2017**
Weighting: **45%**

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

On successful completion you will be able to:

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Delivery and Resources

Technology Used

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

All calculations during practicals can be carried out using a smart phone. It is also recommended

that you will take pictures from the cultivation plates etc to be included in the prac report. Do not use gloves when handling the phone. Laboratory reports 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: There are two one-hour lectures per week, Mon at 12-1 pm in EMC G240 and Tue from 12-1 pm in E6A102. The material presented in the lectures is examinable. Please note that there is no text book coverage for a fair amount of the presented material. Therefore, regular attendance to the lectures and careful listening of the recordings is highly recommended. Lecture topics and dates can be found on the unit webpage on iLearn (CBMS331 http://ilearn.mq.edu.au). Lectures will be delivered as scheduled with eCHO recording available through iLearn.

Lecture graphics will be uploaded on CBMS331 iLearn (http://ilearn.mq.edu.au) the day before each lecture. The site also provides you with lecture recordings, videos, images and general data generated in the practicals, and material required for the assignment(s). Announcements facility will be used to communicate information from the unit convener.

Laboratory work: Please note that **laboratory sessions commence in Week 2**; Practical topics and the timetable are available on iLearn. 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. Should a student miss a practical for a valid or unavoidable reason, he or she should consult the working pair and other class mates for results and other information generated and shared during the missed session in order to be able to produce a report. The student can also join the other weekly prac class (in consultation with the convener) as a temporary guest and then return to his or her allocated class.

Laboratory procedures: This course will involve laboratory work with microorganisms, DNA samples, proteins and sugars. The experimental techniques feature molecular biology, microbial cultivation, fluorescence 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 provided on iLearn.

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.

The Great Debate: Attendance to the debate is compulsory. The debate will be carried out in the CBMS Tea room F7B322 at the time slot allocated for the laboratory class (*i.e*. 2-6 pm on Tue or 9 am-1 pm on Wed).

Tutorials: Tutorials (codon optimisation, primer design and fluorescence) are run as part of the practical sessions, thus attendance is compulsory. Previously announced locations for these activities may change so stay tuned (please consult iLearn). Tutorial material, which forms part of the material submitted for assessment and/or examination, will be made available on iLearn.

Required Materials and/or Recommended Readings

Biotechnology draws from different disciplines and technologies. The recommended textbooks will give you a good general introduction to (Thieman and Palladino) or deeper knowledge of these areas (Clark and Pazdernik) and provide further reading as well as useful websites for more in depth studies. The books also provide good questions at the end of each chapter to test your learning.

Textbooks:

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

David P. Clark and Nanette J. Pazdernik (2016): Biotechnology, 2nd edition. Elsevier, China. This book also provides an online study guide made available with the textbook.

The books is available at the University Bookshop. Please note that while the books provide 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 find interesting. Getting familiar with the format in which scientific papers are presented will be of great help in your own report writing.

In the Laboratory:

You are required to wear a decent labcoat and safety glasses whenever in the lab. Preferably bring your own. It is recommended that you carry a marking pen (permanent), spatula, scissors and tweezers (and a phone).

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 the notes taken should allow you to repeat the experiment. Tablets and laptops may be used for note-taking but using them may be tricky as you should not wear gloves when typing notes. You are required to write three formal reports on the practical work, a task that will be a lot less painful experience with good notes in hand.

Unit Website

The official CBMS331 website is: **ilearn.mq.edu.au**

You will be asked for a username and password. Your username is your student number. If you have trouble logging in, please follow the help instructions given on the web page before contacting your lecturer academic staff. You may also contact the

Help Desk:

Phone: 9850-HELP (4357)

Freecall: 1800 063 191

Email: http://help.mq.edu.au/

Unit Schedule

CBMS331 Molecular and Medical Biotechnology, lecture topics 2017

Two one-hour lectures per week, on Mon at 12-1 pm in EMC G240 and Tue from 12-1 pm in E6A102

The many faces of biotechnology- the big picture

1. Course introduction - contribution of biotechnology to modern life (HN) -31.7

Molecular biotechnology:

Molecular aspects of biotechnology revisited

2. The toolbox for genetic engineering-making a recombinant protein (HN) -1.8
3. Genetic engineering- power tools and considerations (HN) -7.8
4. Biotechnology pipeline- linking the 'omics' (HN) - 8.8
5. Protein secretion and quality control (HN) -14.8
5. Protein secretion, the way out (HN) -15.8
7. Modern approaches into protein engineering (AS) -21.8
8. Basic concepts in synthetic biology (LB) -22.8

Making recombinant products

9. Microbes as cell factories (HN) -28.8
10. Cell cultures and transgenic animals (HN) -29.9
11. What about transgenic plants (HN) -4.9
12. The art of making a biotech product on a large scale (HN) -5.9

Fluorescence in biotechnology

13. Fluorescence instrumentation and applications in biotechnology (LP) -11.9
14. Flow cytometry as a tool in biotechnology (MO) -12.9

BREAK 16.9. – 2.10.

Medical biotechnology:

15. Bioinformatics and combinatorial chemistry in drug design (SR) -3.10

Sweet biotechnology

16. Basic aspects of protein glycosylation (MA) -9.10

17. Biological functions of protein glycosylation (MA) -10.10

Nanobiotechnology in action

18. Application of nanoparticles in cancer diagnostics (AC) -16.10
19. Surface nanofabrication towards smart sensing interfaces (GL) -17.10

Biomolecules and their applications

20. Making a synthetic yeast chromosome (HG or HK) -23.10
21. The promise of biopharmaceuticals (HN) -24.10
22. Cancer and biotechnology (MM) -30.10
23. DNA as evidence in forensic science (HN) -31.10
24. Quick guide to stem cells and their applications (HN) -6.11
25. Course summary (HN) -7.11

Please note that there may be changes to the visiting lecturers; these changes will be announced on iLearn Announcements.

Lecturers:

HN- Prof Helena Nevalainen, MQ CBMS (helena.nevalainen@mq.edu.au)

LB- Dr Louise Brown, MQ CBMS (louise.brown@mq.edu.au)

AS- Dr Anwar Sunna, MQ CBMS (anwar.sunna@mq.edu.au)

LP- Dr Lindsay Parker, MQ, Biological Sciences (lindsay.parker@mq.edu.au) ARC Centre of Excellence for Nanoscale BioPhotonics (CNBP)

MO- Dr Martin Ostrowski, MQ, CBMS (martin.ostrowski@mq.edu.au)

SR- Prof Shoba Ranganathan, MQ CBMS (shoba.ranganathan@els.mq.edu.au)

MA- Dr Morten Thaysen-Andersen, MQ CBMS (morten.andersen@mq.edu.au)

MM- A/Prof Mark Molloy, MQ CBMS and APAF (mark.molloy@proteome.org)

AC- Dr Andrew Care, MQ CBMS (andrew.care@mq.edu.au) ARC Centre of Excellence for Nanoscale BioPhotonics (CNBP)

GL- Dr Guozhen Liu, MQ CBMS (guozhen.liu@mq.edu.au)

Attendance to the lectures is not compulsory but is strongly encouraged. Some lectures will be supported by video material also made available on iLearn.

Pratical sessions

The 4 hour practical sessions will be offered on Tue afternoon from 2-6 pm in E7B349-50 (Group 1) or Wed morning 9 am-1 pm in E7B350 (Group 2). Each student should enrol in **one** of these

sessions and stay within that group throughout the entire semester. Please note that **practicals and tutorials are compulsory** and you will need a Doctor's certificate or other relevant documentation to justify an absence.

Practicals:

1. Genetic transformation of the filamentous fungus *Trichoderma reesei*

2. Fluorescent labelling of fungal cell membranes and cellular localisation of the recombinant DsRed 1 protein.

3. Analysis of N-linked glycans on native human lactoferrin glycoprotein isolated from human and bovine milk

Practical 1		**Genetic transformation of the filamentous fungus *Trichoderma reesei***
Tue	8.8.	Plate conidia for bombardment
Wed	9.8.	Coat microparticles with DNA and shoot
Tue	15.8.	Count transformants and restreak on PDA-HygB plates
Wed	16.8.	Streak transformant conidia for DNA isolation
		Codon optimisation tutorial, CBMS Tea room F7B322
Tue	22.8.	Isolate chromosomal DNA from transformants for PCR
Wed	23.8.	Design primers for PCR to check the transformants
Tue	29.9.	Check the quality of chromosomal DNA
Wed	30.9.	Run PCR on transformants
		Namesake peptide task handed out and discussed in the class
Tue	5.9.	Check PCR products by agarose gel electrophoresis and take
Wed	6.9.	photographs
		Wrapping up Practical 1
Practical 2		**Fluorescent labelling of fungal cell membranes and cellular localisation of the DsRed1 protein**
Tue	12.9.	Staining of the DsRed-expressing transformants and the

Wed 13.9. non-transformant with an ER specific dye

Inspection of specimens using confocal microscopy

Imaging show by Denitza D, E7B 346

Executive summary, fluorescence clinic and refreshments, CBMS Tea room F7B322

No prac on 3 or 4 Oct

Practical 3. Analysis of N-linked glycans on the native lactoferrin glycoprotein isolated from human and bovine milk

Tue 10.10. Sample preparation of native and recombinant lactoferrin

Wed 11.10. Release of oligosaccharides by enzyme treatment

Wrapping up Practical 2

Tue 17.10. Purification and analysis of oligosaccharides by liquid

Wed 18.10. chromatography-mass spectrometry and interpretation of data

Wrapping up Practical 3

Tue 24.10. **The Great Debate I**, CBMS Tea room F7B320

Wed 25.10.

Tue 31.11. **The Great Debate II**, CBMS Tea room F7B320

Wed 1.11.

For CBMS731 only: **Seminar presentations**, E7B 346

Tue 7.11. **or** Wed 8.11. TBA

Note that the dates of the above activities are interchangeable. All practicals and the Great Debate are compulsory to all students.

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_2016.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration

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://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

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

Graduate Capabilities

Creative and Innovative

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

This graduate capability is supported by:

Assessment task

- The Great Debate

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 outcome

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Assessment tasks

- Practical report 1

- Practical report 2
- Practical report 3
- The Great Debate
- 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 outcome

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Assessment tasks

- Practical report 1
- Practical report 2
- Practical report 3
- Namesake peptide task
- Continuing assessment
- 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 outcome

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Assessment tasks

- Practical report 1
- Practical report 2
- Practical report 3
- Namesake peptide task
- The Great Debate
- Continuing assessment
- 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 outcome

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal

microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Assessment tasks

- Practical report 1
- Practical report 2
- Practical report 3
- The Great Debate
- Final examination

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:

Assessment tasks

- Practical report 1
- Practical report 2
- Practical report 3
- Namesake peptide task
- 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:

Assessment tasks

- Practical report 1

- Practical report 2
- Namesake peptide task
- The Great Debate
- Continuing assessment
- Final examination

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 outcome

- 1. Explain the broad and interdisciplinary nature of biotechnology and how the selected areas discussed in the lectures contribute to the modern society. 2. Conduct hands-on laboratory work using contemporary experimental techniques including microbial culture, DNA mediated transformation and production of a recombinant protein in fungi, confocal microscopy and glycan analysis. 3. Collect and synthesize experimental data in a coherent scientific report, which conforms to a standard biotechnology journal, including the use of appropriate scientific referencing. 4. Work in a group as well as well as an individual. 5. Extract relevant information from scientific literature, and argue a point of view in a group debate setting. 6. Discuss the ethical aspects related to recombinant DNA technology. 7. Become introduced and engaged with curiosity-driven learning.

Assessment task

- The Great Debate

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:

Assessment tasks

- The Great Debate

- Continuing assessment

Changes from Previous Offering

Some material has been modified in the theory and laboratory components. Lectures have been updated and new lectures brought in. The lecture timetable has changed. The number and weighting of assessment tasks has been modified.