



MOLS7211

Protein Discovery and Analysis

Session 1, In person-scheduled-weekday, North Ryde 2023

School of Natural Sciences

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General Information

Unit convenor and teaching staff Alison Rodger alison.rodger@mq.edu.au
Credit points 10
Prerequisites Admission to MRes
Corequisites
Co-badged status
Unit description This unit outlines molecular principles underlying today's developments in protein science and biomedical research. As well as detailing modern separation technologies, the course addresses structural biology, protein analysis and bioinformatics. Practices common in the biotechnology and pharmaceutical industries to isolate recombinant proteins are emphasized. Analysis methods are introduced in relation to proteomics, genomics and biochemical research. Molecular properties leading to the 3D shape of proteins are detailed and contemporary structure methods outlined.

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:

- ULO1:** Design appropriate procedures for isolating and handling proteins
- ULO2:** Demonstrate a chemical understanding of proteins (gene products), in vivo and in vitro
- ULO3:** Utilise contemporary web tools for protein analysis
- ULO4:** Describe protein topology forms and architectures, and recognise how these are encoded within a primary sequence
- ULO5:** Extract and interpret information from literature sources concerning proteins

General Assessment Information

Requirements to Pass this Unit: MOLS8211/7211 is a completely assessment-based unit. To pass you must get 50% or higher.

Late Assessment Submission Penalty: Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is 11:55 pm. A 1-hour grace period will be provided to students who experience a technical problem.

Postponement of the final Pet Protein presentation requires an approved Special Consideration.

Assessments where Late Submissions will be accepted with standard late penalties: all written assignments except quizzes

Assessments where Late Submissions will NOT be accepted: quizzes and the presentation

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>In class quizzes</u>	40%	No	Weeks 3, 7, 9, 11
<u>"Pet Protein" Sequence Analysis & Purification</u>	15%	No	Week 5
<u>Molecular graphics</u>	10%	No	Week 6
<u>Protein Production Practical</u>	15%	No	Week 9
<u>"Pet Protein" Model and Seminar</u>	20%	No	Week 12, 13

In class quizzes

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 25 hours

Due: **Weeks 3, 7, 9, 11**

Weighting: **40%**

Short answer quizzes for continual assessment

On successful completion you will be able to:

- Demonstrate a chemical understanding of proteins (gene products), in vivo and in vitro
- Describe protein topology forms and architectures, and recognise how these are

encoded within a primary sequence

"Pet Protein" Sequence Analysis & Purification

Assessment Type ¹: Case study/analysis

Indicative Time on Task ²: 15 hours

Due: **Week 5**

Weighting: **15%**

Each student will be assigned a protein of industrial/medical importance as a case study throughout this Unit. You will conduct a literature search to discover the purification procedures historically used to isolate this protein, and report on the background chemistry underlying these procedures.

On successful completion you will be able to:

- Demonstrate a chemical understanding of proteins (gene products), in vivo and in vitro
- Utilise contemporary web tools for protein analysis
- Extract and interpret information from literature sources concerning proteins

Molecular graphics

Assessment Type ¹: Case study/analysis

Indicative Time on Task ²: 14 hours

Due: **Week 6**

Weighting: **10%**

You will use molecular graphics (program PyMOL) to view the 3D structure of a GTP-ase protein to understand its binding and function.

On successful completion you will be able to:

- Demonstrate a chemical understanding of proteins (gene products), in vivo and in vitro
- Describe protein topology forms and architectures, and recognise how these are encoded within a primary sequence
- Extract and interpret information from literature sources concerning proteins

Protein Production Practical

Assessment Type ¹: Lab report

Indicative Time on Task ²: 10 hours

Due: **Week 9**

Weighting: **15%**

Follow the procedures for preparation and isolation of a protein, and analyse the characteristics of your sample.

On successful completion you will be able to:

- Design appropriate procedures for isolating and handling proteins
- Demonstrate a chemical understanding of proteins (gene products), in vivo and in vitro
- Utilise contemporary web tools for protein analysis

“Pet Protein” Model and Seminar

Assessment Type ¹: Creative work

Indicative Time on Task ²: 20 hours

Due: **Week 12, 13**

Weighting: **20%**

Research the literature concerning the 3D structure and structure determination method for your assigned protein. Construct a model that shows the three-dimensional shape of this macromolecule, and present this in a class presentation.

On successful completion you will be able to:

- Demonstrate a chemical understanding of proteins (gene products), in vivo and in vitro
- Utilise contemporary web tools for protein analysis
- Describe protein topology forms and architectures, and recognise how these are encoded within a primary sequence
- Extract and interpret information from literature sources concerning proteins

¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Protein structure and function are intrinsically related, so it is important to be able to produce pure protein that is correctly folded into the correct shape for its biological activity. The goal of this unit is to lead you to understand how to do this, how to prove you have done it, and how the correct structure relates to protein's function.

This unit outlines molecular principles underlying today's developments in protein science and biomedical research. As well as detailing modern separation technologies, the course addresses structural biology, protein analysis and bioinformatics. Practices common in the biotechnology and pharmaceutical industries to isolate recombinant proteins are emphasized. Analysis methods are introduced in relation to proteomics, genomics and biochemical research. Molecular properties leading to the 3D shape of proteins are detailed, and contemporary structure methods outlined.

The assessed work for the unit includes skills-based workshops and a block laboratory class in the mid semester break. These are designed to give you the skills to enable you to understand the origin, structure and function of your pet protein - which you will be assigned early in the unit. The unit runs from week 1 to week 13 and includes a practical session in the mid semester break. Each week on Tuesday afternoons from 2 pm to 5 pm. We formally have 2 lectures and 1 SGTA. It should be noted that lectures include problem solving and SGTAs will include some content delivery. You are strongly advised to organise your timetable to be present for all the contact hours of this unit.

The unit convenor may be contacted by email. Please use MOLS8211/7211 in the subject line to avoid your email getting lost. In an emergency you could try texting or phoning her: 0426627077.

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: <https://www.mq.edu.au/about/coronavirusfaqs>. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn. You will be required to wear a mask during laboratory sessions and implement hand and bench hygiene measures.

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)

- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies](https://students.mq.edu.au/support/study/policies) (<https://students.mq.edu.au/support/study/policies>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

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.

Changes since First Published

Date	Description
03/02/2023	Only changed some submission dates