# BIOL257

**Neurophysiology**

S1 Day 2016

*Dept of Biological Sciences*

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General Information

Unit convenor and teaching staff
Convener & Lecturer
A/Prof. Nathan Hart
nathan.hart@mq.edu.au

Credit points
3

Prerequisites
6cp(P) from BBE100 or BIOL108 or BIOL114 or BIOL115 or BIOL116 or BIOL122 or HLTH108 or HLTH109 or PSY104 or PSY105 or PSYC104 or PSYC105

Co-requisites

Co-badged status

Unit description
This unit considers the function of nerves and hormones in the regulation of body functions. We begin with a discussion on how the selective permeability of the cell membrane gives rise to the electrical properties of cells, in particular nerve and muscle cells. The function and organisation of nerves into central and peripheral nervous systems, as well as specialised nerves and organs giving rise to the sensory system, is investigated in detail before we examine their role in homeostasis and muscle control. We then cover the neuroendocrine system, which is the link between the central nervous system and the endocrine system, before looking at the function of the main groups of hormones and their interrelationship with the immune system.

This unit is designed to serve science, medical science and chiropractic students and is also of interest to students studying psychology with an emphasis on physiology.

Important Academic Dates
Information about important academic dates including deadlines for withdrawing from units are available at https://students.mq.edu.au/important-dates

Learning Outcomes

1. Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
2. Explain how neural signals are generated, propagated and transmitted.
3. Identify the major structural features of the central and peripheral nervous systems.
4. Differentiate between the major functional subdivisions of the nervous system.
5. Summarise the diverse sensory receptors and pathways found in the human body.
6. Explain how muscles work and how the nervous system coordinates motor activity.
7. Describe how the nervous system and endocrine system interact to regulate physiological processes.
8. Evaluate the scientific literature and summarise topics in a concise written format.
9. Collect experimental data and draw conclusions from simple analyses.
10. Interpret the results of simple tests of neural function on human subjects.

**Assessment Tasks**

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly online quizzes</td>
<td>15%</td>
<td>Weeks 1-12</td>
</tr>
<tr>
<td>Mini-test</td>
<td>10%</td>
<td>Week 3</td>
</tr>
<tr>
<td>Essay</td>
<td>10%</td>
<td>Week 7</td>
</tr>
<tr>
<td>Mid-semester test</td>
<td>15%</td>
<td>Week 10</td>
</tr>
<tr>
<td>Final exam</td>
<td>50%</td>
<td>TBA</td>
</tr>
</tbody>
</table>

**Weekly online quizzes**

**Due:** *Weeks 1-12*
**Weighting:** 15%

From Week 1 → 12, every student will need to complete the weekly online quizzes that are based on the topic(s) covered in that week's lectures. Collectively, these quizzes are worth 15% of your final mark.

This Assessment Task relates to the following Learning Outcomes:

- Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
- Explain how neural signals are generated, propagated and transmitted.
- Identify the major structural features of the central and peripheral nervous systems.
- Differentiate between the major functional subdivisions of the nervous system.
- Summarise the diverse sensory receptors and pathways found in the human body.
- Explain how muscles work and how the nervous system coordinates motor activity.
- Describe how the nervous system and endocrine system interact to regulate physiological processes.
Mini-test
Due: **Week 3**
Weighting: **10%**

This short (<1hr) test will be given during your normal laboratory class time in Week 3 (internal students). The questions will be on the first 4 lectures and the tutorials conducted in Week 2.

This Assessment Task relates to the following Learning Outcomes:
- Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
- Explain how neural signals are generated, propagated and transmitted.
- Collect experimental data and draw conclusions from simple analyses.

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

Each student will be required to submit a 1,000 word Essay on a topic selected from a list provided on iLearn. The Essay should describe and discuss the selected neurophysiological system as it relates to normal function and/or disease.

This Assessment Task relates to the following Learning Outcomes:
- Evaluate the scientific literature and summarise topics in a concise written format.

Mid-semester test
Due: **Week 10**
Weighting: **15%**

This longer (<1.5hr) test will be given during your normal laboratory class time in Week 10 (internal students). The questions will be on lecture topics and laboratory practicals/tutorials covered in weeks 1-9.

This Assessment Task relates to the following Learning Outcomes:
- Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
- Explain how neural signals are generated, propagated and transmitted.
- Identify the major structural features of the central and peripheral nervous systems.
- Differentiate between the major functional subdivisions of the nervous system.
- Summarise the diverse sensory receptors and pathways found in the human body.
- Explain how muscles work and how the nervous system coordinates motor activity.
• Evaluate the scientific literature and summarise topics in a concise written format.
• Collect experimental data and draw conclusions from simple analyses.
• Interpret the results of simple tests of neural function on human subjects.

Final exam

Due: TBA
Weighting: 50%

The final exam (2 hours) will consist of 40 multiple choice questions and 6 short answer questions. The short answer questions will be split across two sections that relate to material covered in the first and second halves of the Unit, respectively. Students will need to select 3 out of the 4 short answer questions offered in each section. All lecture and practical/tutorial material is examinable.

This Assessment Task relates to the following Learning Outcomes:
• Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
• Explain how neural signals are generated, propagated and transmitted.
• Identify the major structural features of the central and peripheral nervous systems.
• Differentiate between the major functional subdivisions of the nervous system.
• Summarise the diverse sensory receptors and pathways found in the human body.
• Explain how muscles work and how the nervous system coordinates motor activity.
• Describe how the nervous system and endocrine system interact to regulate physiological processes.
• Evaluate the scientific literature and summarise topics in a concise written format.
• Collect experimental data and draw conclusions from simple analyses.
• Interpret the results of simple tests of neural function on human subjects.

Delivery and Resources

Delivery Mode

This Unit will be delivered through:

1. Two (consecutive) 1 hour lectures per week (Weeks 1 → 13).
2. One 3 hour laboratory-based practical/tutorial class per week (Weeks 2,3,5 → 13). There is no lab class in Week 4 due to the Easter Good Friday holiday on 25 April.

Practical/tutorial classes - attendance requirements

• Practical/tutorial classes are compulsory and students must attend the class in
which they have enrolled.

- There are 3 practical/tutorial classes running simultaneously during each time slot. Students must enrol into one of the practical/tutorial classes through eStudent.
- Students must not exchange their class time. However, in special circumstances, students may request a specific change. These requests are to be submitted by emailing BIOL257@mq.edu.au.

Class times and locations

**Lectures**

- Wednesday 08:00 - 10:00 in X5B T1 Theatre

**Practical/tutorial classes**

- Thursday 10:00 - 13:00 in F7B science labs 102, 105 & 110
- Thursday 14:00 - 17:00 in F7B science labs 102, 105 & 110
- Friday 10:00 - 13:00 in F7B science labs 102, 105 & 110
- Friday 14:00 - 17:00 in F7B science labs 102, 105 & 110

**Important dates**

- Study period start (Week 1) - Monday 29th February 2016
- Teaching census - Saturday 26th March 2016
- Last withdrawal without fail - Thursday 28th April 2016
- Last withdrawal - Sunday 12th June 2016

**Required and recommended resources**

**Required text:**

- BIOL257 Laboratory manuals - available on the iLearn website.

**Other recommended resources:**

- Details of any other relevant resources will be posted on the iLearn website.
### Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture (Wednesday)</th>
<th>Lab session (Thursday/Friday)</th>
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<tbody>
<tr>
<td>1</td>
<td>Cell physiology I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cell physiology II</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cell physiology III</td>
<td>Lab induction</td>
</tr>
<tr>
<td></td>
<td>Electrical signalling</td>
<td>Tutorial: Resting membrane potential</td>
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<tr>
<td>3</td>
<td>Synapses I</td>
<td>Lab-based mini-test</td>
</tr>
<tr>
<td></td>
<td>Synapses II</td>
<td>Tutorial: Action potentials and nerve conduction</td>
</tr>
<tr>
<td>4</td>
<td>Principles of sensory physiology</td>
<td>No lab session (Easter Friday)</td>
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<tr>
<td></td>
<td>Special senses I</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Central Nervous System I</td>
<td>Practical: PhysioEx Exercise 3 - Neurophysiology of nerve impulses</td>
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<tr>
<td></td>
<td>Central Nervous System II</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Special senses II</td>
<td>Practical: Brain anatomy</td>
</tr>
<tr>
<td></td>
<td>Special senses III</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Mid-semester break 11 – 22 April</strong></td>
<td></td>
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<tr>
<td>7</td>
<td>Somatosensory system I</td>
<td>Practical: Special senses</td>
</tr>
<tr>
<td></td>
<td>Somatosensory system II</td>
<td>Essay Due</td>
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<tr>
<td>8</td>
<td>Muscle structure I</td>
<td>Practical: Somatosensation</td>
</tr>
<tr>
<td></td>
<td>Muscle structure II</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Muscle physiology I</td>
<td>Tutorial: Muscle Physiology</td>
</tr>
<tr>
<td></td>
<td>Muscle physiology II</td>
<td>Practical: PhysioEx Exercise 2 - Skeletal muscle physiology</td>
</tr>
<tr>
<td>10</td>
<td>Muscle control I</td>
<td>Mid-semester test</td>
</tr>
<tr>
<td></td>
<td>Muscle control II</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Autonomic nervous system I</td>
<td>Practical: Reflexes &amp; motor control case studies</td>
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<tr>
<td></td>
<td>Autonomic nervous system II</td>
<td></td>
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</tbody>
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**Unit guide** BIOL257 Neurophysiology

**Unit website**

All lecture material, laboratory manuals and other essential Unit information will be posted on iLearn (http://ilearn.mq.edu.au).

*iLearn should be checked regularly for any updates.*
**Policies and Procedures**

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


In addition, a number of other policies can be found in the [Learning and Teaching Category](http://www.mq.edu.au/policy/docs/) 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/](http://students.mq.edu.au/support/)

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| 12 | Neuroendocrine system I  
|    | Neuroendocrine system II  
|    | Tutorial: Autonomic nervous system and case studies  
| 13 | Catch-up/review lecture(s)  
|    | Review/revision  
| TBA | Final exam  

https://unitguides.mq.edu.au/unit_offerings/56221/unit_guide/print
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 Enquiry Service

For all student enquiries, visit Student Connect at ask.mq.edu.au

Equity 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.

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

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
- Explain how neural signals are generated, propagated and transmitted.
- Identify the major structural features of the central and peripheral nervous systems.
- Differentiate between the major functional subdivisions of the nervous system.
• Summarise the diverse sensory receptors and pathways found in the human body.
• Explain how muscles work and how the nervous system coordinates motor activity.
• Describe how the nervous system and endocrine system interact to regulate physiological processes.
• Evaluate the scientific literature and summarise topics in a concise written format.
• Collect experimental data and draw conclusions from simple analyses.
• Interpret the results of simple tests of neural function on human subjects.

Assessment tasks

• Weekly online quizzes
• Mini-test
• Essay
• Mid-semester test
• Final exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

• Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
• Explain how neural signals are generated, propagated and transmitted.
• Identify the major structural features of the central and peripheral nervous systems.
• Differentiate between the major functional subdivisions of the nervous system.
• Summarise the diverse sensory receptors and pathways found in the human body.
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Assessment tasks

• Weekly online quizzes
• Mini-test
• Essay
• Mid-semester test
• Final exam

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

• Evaluate the scientific literature and summarise topics in a concise written format.
• Collect experimental data and draw conclusions from simple analyses.
• Interpret the results of simple tests of neural function on human subjects.

Assessment tasks

• Essay
• Mid-semester test
• Final exam

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

• Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
• Explain how neural signals are generated, propagated and transmitted.
• Identify the major structural features of the central and peripheral nervous systems.
• Differentiate between the major functional subdivisions of the nervous system.
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- Summarise the diverse sensory receptors and pathways found in the human body.
- Explain how muscles work and how the nervous system coordinates motor activity.
- Describe how the nervous system and endocrine system interact to regulate physiological processes.
- Evaluate the scientific literature and summarise topics in a concise written format.
- Collect experimental data and draw conclusions from simple analyses.
- Interpret the results of simple tests of neural function on human subjects.

Assessment tasks
- Weekly online quizzes
- Mini-test
- Essay
- Mid-semester test
- Final exam

Critical, Analytical and Integrative Thinking
We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes
- Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
- Explain how neural signals are generated, propagated and transmitted.
- Identify the major structural features of the central and peripheral nervous systems.
- Differentiate between the major functional subdivisions of the nervous system.
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- Interpret the results of simple tests of neural function on human subjects.
Assessment tasks

- Weekly online quizzes
- Mini-test
- Essay
- Mid-semester test
- Final exam

Creative and Innovative

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

This graduate capability is supported by:

Learning outcomes

- Evaluate the scientific literature and summarise topics in a concise written format.
- Collect experimental data and draw conclusions from simple analyses.
- Interpret the results of simple tests of neural function on human subjects.

Assessment tasks

- Essay
- Mid-semester test
- Final exam

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Evaluate the scientific literature and summarise topics in a concise written format.
- Interpret the results of simple tests of neural function on human subjects.

Assessment task

- Essay
**Socially and Environmentally Active and Responsible**

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

**Learning outcomes**

- Evaluate the scientific literature and summarise topics in a concise written format.
- Interpret the results of simple tests of neural function on human subjects.

**Assessment task**

- Essay

**Commitment to Continuous Learning**

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

**Learning outcomes**

- Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
- Explain how neural signals are generated, propagated and transmitted.
- Identify the major structural features of the central and peripheral nervous systems.
- Differentiate between the major functional subdivisions of the nervous system.
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- Evaluate the scientific literature and summarise topics in a concise written format.
- Collect experimental data and draw conclusions from simple analyses.
- Interpret the results of simple tests of neural function on human subjects.

**Assessment tasks**

- Weekly online quizzes
• Mini-test
• Essay
• Mid-semester test
• Final exam