BIOL257

Neurophysiology

S1 Day 2016

Dept of Biological Sciences

Contents

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

Corequisites

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://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

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

Name	Weighting	Due
Weekly online quizzes	15%	Weeks 1-12
Mini-test	10%	Week 3
Essay	10%	Week 7
Mid-semester test	15%	Week 10
Final exam	50%	TBA

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.

On successful completion you will be able to:

- 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.

On successful completion you will be able to:

- 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.

On successful completion you will be able to:

- 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.

On successful completion you will be able to:

- 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.

On successful completion you will be able to:

- Relate cellular physiology and the properties of cell membranes to the generation of membrane potentials.
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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:

- Stanfield, C. L. (2012) *Principles of Human Physiology* (5th Edition). Essex, UK; Pearson Education.
- BIOL257 Laboratory manuals - available on the iLearn website.

Other recommended resources:

- Guyton, A. C. & Hall, J. E. (2011) *Textbook of Medical Physiology* (12th Edition). Philadelphia, USA; Saunders/Elsevier.
- Details of any other relevant resources will be posted on the iLearn website.

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.

Unit Schedule

Week	Lecture (Wednesday)	Lab session (Thursday/Friday)
1	Cell physiology I Cell physiology II	
2	Cell physiology III Electrical signalling	Lab induction Tutorial: Resting membrane potential
3	Synapses I Synapses II	**Lab-based mini-test** Tutorial: Action potentials and nerve conduction
4	Principles of sensory physiology Special senses I	**No lab session (Easter Friday)**
5	Central Nervous System I Central Nervous System II	Practical: PhysioEx Exercise 3 - Neurophysiology of nerve impulses
6	Special senses II Special senses III	Practical: Brain anatomy
	Mid-semester break 11 – 22 April	
7	Somatosensory system I Somatosensory system II	Practical: Special senses **Essay Due**
8	Muscle structure I Muscle structure II	Practical: Somatosensation
9	Muscle physiology I Muscle physiology II	Tutorial: Muscle Physiology Practical: PhysioEx Exercise 2 - Skeletal muscle physiology
10	Muscle control I Muscle control II	**Mid-semester test**

11	Autonomic nervous system I Autonomic nervous system II	Practical: Reflexes & motor control case studies
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**

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

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.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 http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://stu

dents.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:

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.
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- Differentiate between the major functional subdivisions of the nervous system.
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Assessment tasks

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

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.
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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.
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- 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.
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Assessment tasks

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- 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.
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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

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