

MACQUARIE
UNIVERSITY



FACULTY OF
SCIENCE

BIOL257

Neurophysiology Unit Outline

Semester 1, 2012

FACULTY OF SCIENCE

Biology Department

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Students enrolled in Biol 257 should read this unit outline carefully at the start of semester. It contains important information about the unit. If anything in it is unclear, please consult one of the staff in the unit.

Unit Description

This unit explores the function of nerves and hormones in the regulation of body functions. We begin by understanding the chemical gradients across a cell membrane and how these lead to the electrical properties and the function of nerves. We look at the role of neurotransmitters and receptors in the flow of messages between different parts of the nervous system, and explore the functional organisation of the nervous system (somatic, enteric, autonomic). We follow neural pathways from the somatic and special sensory receptors and along sensory afferents to the central nervous system where integration occurs. The motor efferent pathways to organs are then covered, and we investigate muscle structure, muscle contraction, and the importance of proprioceptors in maintaining muscle tone.

The link between the central nervous system and the peripheral endocrine system is explored before looking at the function of the main groups of hormones. Finally, the maintenance of homeostasis via the interaction between the nervous and endocrine systems will be investigated.

This unit is designed to serve BSc, BMedSci and BChirSci students and is also of interest to students studying psychology with an emphasis on physiology.

1. GENERAL INFORMATION

Convener, Lecturer and General enquiries

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2. ACADEMIC CONTENTS

Year and Semester:	D1, Xc1, X1 - Semester 1, 2012
Prerequisites / Co-requisites:	BIOL114 & BIOL115 or BIOL108, or PSY104 or PSY105 or admission to Grad.Dip.Chir.Sc.
Co-badge unit(s):	None
NCCW:	BIOL246 or BIOL357
Credit points:	3
Contact hours:	5

Graduate Capabilities

Graduate capabilities are interdisciplinary skills, knowledge and attitudes that equip students to live and work in a rapidly changing and complex world. The nine graduate capabilities identified by Macquarie are located in a framework that represents the values of Scholarship, Ethical Practice, Engagement and Sustainability.

Cognitive Capabilities

1. 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.

2. Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analyzing, 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.

3. Problem Solving and Research Capability

Our graduates should be capable of researching; of analyzing, 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.

4. 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.

Interpersonal or Social Capabilities

5. 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.

6. 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.

7. 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.

Personal Capabilities

8. 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.

9. 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.

From

http://www.mq.edu.au/ltc/projects/curriculum_renewal/docs/GraduateCapabilitiesFramework.pdf

Accessed Dec 14, 2009

It is important to note that the learning experiences which you have in any single unit only partially contribute to the development of a specific capability. They are frequently just a stepping stone upon which other units will build. The combination of experiences over a number of units will eventually culminate in the attainment of that graduate capability.

General Unit Learning Outcomes

(See the specific learning outcomes for each topic covered in this unit on the unit website)

By the end of this unit students should be able to:

1. Describe the systems, concepts and principles which underlie neural and endocrine physiology
2. Discuss how properties of biological membranes are utilised in nervous and endocrine systems
3. Explain how the nervous and endocrine systems, both separately and jointly, control much of the human body's need for homeostasis.
4. Execute some of the techniques used in physiological measurement
5. Collect experimental data and draw conclusions from a simple analysis
6. Follow an experimental protocol
7. Link function with structure in the nervous and endocrine systems
8. Research and prepare written accounts of physiological topics from the scientific literature
9. Use the correct style of writing scientific manuscripts including citing references and writing a reference list in the correct form
10. Follow the requirements of Occupation, Health and Safety legislation that apply in the laboratory

3. DELIVERY AND RESOURCES

Delivery mode

This unit is characterised by a moderate degree of flexibility. It incorporates a variety of learning tools and media. It will comprise:

1. 2 × 1 hour lectures per week, weeks 1 - 13:
2. 1 × 2 hour laboratory/tutorial class per week, weeks 2 - 13: Students must register for a practical/tutorial slot on e-student

Class times and locations

Lecture: Monday 9:00 – 10:00am and Thursday 11:00 – 12:00am in C5C T1

Practicals: Friday 10:00 – 1:00pm and 2:00 – 5:00pm in E8A 120, 150 and 160.

There are 3 practicals running simultaneously at both times. Students must enrol into the one practical session (morning or afternoon) of their choice.

External Student Sessions: 19 – 20 April in E8A, 150 and 160

26 – 27 May in E8A, 150 and 160

Practicals

You must attend the practical/tutorial class in which you enrolled. Students must not exchange their class time. In special circumstances, students may request a specific change. These requests are to be submitted to the scientific officer.

Attendance Requirements

If you miss your assigned practical in any week, you may request attendance at an alternative session, through written request and appropriate documentation to the unit convenor. This allowance may be used on a maximum of 2 occasions.

Unit Web Page

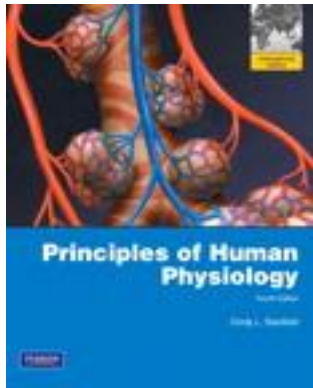
You can log in to iLearn through <http://ilearn.mq.edu.au>

All lecture powerpoint graphics will be posted on the Blackboard Learning System, and there is also a link to [iLectures](#) for Audio recordings of the lectures.

Required and recommended resources

Required:

Vpack Principles of Human Physiology with Interactive Physiology® 10-System Suite: International Edition + Mastering A&P, 4/E



Cindy L. Stanfield, *University of South Alabama, Mobile, Alabama*

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ISBN-13: 9314994249194

Publisher: Pearson Education Australia

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- BIOL257 *Laboratory Course Manual* – available on iLearn website

Recommended:

- Silverthorn, DE (2010) *Human Physiology An Integrated Approach*, 5th Edition. Benjamin Cummings. Pearson International, CA

4. UNIT SCHEDULE

The content is divided into 10 topics.

Topic 1: Membrane Characteristics

Topic 2: Membrane Potential and Changing Potentials: localised potentials, action potentials, compound action potentials

Topic 3: Nerve Transmission, synapses, receptors and neurotransmitters. Excitatory and inhibitory post synaptic potentials

Topic 4: Functional Organisation of the Nervous System: central nervous system, peripheral nervous system (somatic, autonomic, enteric)

Topic 5: Sensory receptors and sensory pathways

Topic 6: Central Integration and Motor output pathways. Simple spinal reflexes

Topic 7: The Physiology of the Special Senses

Topic 8: Muscle structure, contraction (twitch → tetany) and maintaining muscle tone

Topic 9: Neuroendocrinology

Topic 10: Maintaining Homeostasis: the integration of the brainstem, hypothalamus and endocrine system

Specific Learning Outcomes for BIOL257

Adapted from Stanfield CL (2011) Principles of Human Physiology 4th edition Benjamin Cummings, CA

By the end of this unit, the student should be able to

Topic 1: Cell membrane characteristics and membrane transport

1. Describe the structure and major functions of the plasma cell membrane
2. Explain the role of the chemical, electrical and electrochemical driving forces in the passive transport of substances across the membrane, and distinguish between passive and active transport.
3. Identify the significant contribution of voltage and patch clamping to our understanding of the plasma cell membrane
4. Explain the components of Fick's Law in simple diffusion.
5. Describe facilitated diffusion through channels and by carriers and give specific examples. Compare the movement of molecules across the plasma membrane by carriers and through channels.
6. Differentiate between primary and secondary active transport and give specific examples
7. Identify the 3 general factors that influence the rate at which a substance can be passively transported across a membrane and identify the 2 general factors that influence the rate of active transport
8. Identify 4 factors affecting the permeability of membranes to molecules that cross by simple diffusion and explain how and why each affects permeability

9. Define endocytosis and exocytosis and explain the primary difference between these and other mechanisms of cellular transport

Topic 2: Membrane Potential and Changing Potentials: localised potentials, action potentials, compound action potentials

1. Explain the ionic basis of the resting membrane potential
2. Define and explain the significance of the electrochemical driving forces, Nernst equation, and the Goldman-Hodgkin-Katz equation in our understanding of the resting membrane potential
3. Describe the various properties of localised or graded potentials, including direction of change in potential, magnitude of change and temporal and spatial summation. Explain how graded potentials in neurons trigger an action potential
4. Describe the basic anatomy and anatomical classification of neurons. Compare the functions of each part of the neuron.
5. Explain the ionic basis of an action potential. Describe the gating mechanisms for voltage-gated sodium and potassium channels, and the significance of the positive and negative feedback loops
6. Describe refractory periods, including what causes the absolute and relative refractory periods and explain their physiological significance
7. Discuss how the amplitude, duration and intensity of a stimulus is coded in the action potential
8. Compare the action potential in skeletal, cardiac and smooth muscle
9. Describe how the compound action potential is measured, what it represents and how it varies with stimulus intensity.

Topic 3: Nerve Transmission, synapses, receptors and neurotransmitters.

Excitatory and inhibitory post synaptic potentials

1. Describe propagation of action potentials from axon hillock to axon terminal and compare propagation in myelinated and unmyelinated axons
2. Discuss the factors affecting propagation
3. Describe the communication across chemical synapses. Explain how neurotransmitters are released and describe their action after release
4. Give an example of long-term potentiation at a synapse

5. Discuss how an excitatory or inhibitory postsynaptic potential is formed, and compare fast and slow responses at synapses
6. Explain temporal and spatial summation of postsynaptic potentials
7. Describe the criteria for defining a molecule as a neurotransmitter, and the classification into the major classes of neurotransmitters
8. Give details of specific examples of neurotransmitters within each major class, including release, degradation and specific function at major sites of release
9. Describe the four major functional classes of receptors
10. Give the components of the signalling pathway, the types of signalling pathways and the importance or significance of these pathways.

Topic 4: Functional Organisation of the Nervous System: central nervous system, peripheral nervous system (somatic, autonomic, enteric)

1. Tabulate and describe the anatomical and functional classification of the nervous system.
2. Describe the anatomy, physiology and consequences of the blood brain barrier
3. Describe the energy supply of the brain, and explain why blood flow is so critical
4. Define the spinal reflex arc: the spindle stretch reflex, withdrawal reflex and crossed-extensor reflex
5. Describe the areas of the brain that contribute to voluntary control of skeletal muscle and the basic roles these areas play
6. Describe the function of the two language areas
7. Describe the different types of learning and memory. Define neural plasticity and explain how it contributes to learning and memory

Topic 5: Sensory receptors and sensory pathways

1. Give the classification of the senses
2. Give the various classifications of sensory receptors, and discuss them in detail with specific examples

3. Discuss aspects of sensory coding e.g. for the intensity and duration of a stimulus
4. Describe the function of specific sensory receptors and explain how they perform their function
5. Indicate what two-point discrimination is and how is it determined
6. Tabulate the two main classifications of nerve fibres
7. Describe the structure and function of spindles, golgi tendon organs and joint kinaesthetic proprioceptors
8. Indicate what adaptation is, and discuss fast and slow adaptation and its significance
9. Define the sensory unit and receptive field, and give their significance
10. Describe the various sensory afferent pathways

Topic 6: Central Integration and Motor output pathways. Simple spinal reflexes

1. Discuss the integration of sensory and motor function at the level of the cerebral cortex
2. Construct a composite picture of the inputs and feedback loops that affect pyramidal and extrapyramidal motor output. Include the roles of the cerebellum and basal ganglia in modulating motor function
3. Contrast and compare the anatomy and function of the pyramidal and extrapyramidal tracts.
4. Define upper and lower motor neurons, and what is meant by the final common pathway
5. Discuss the somatotopic organisation of the ventral gray horn
6. Discuss the specific spinal reflexes, the mechanisms that control them, and why they are significant
7. Define what is meant by the motor unit, and compare small and large motor unit in their structure and function

8. Give the structure and function of the neuromuscular junction, and give examples of agents that affect this junction
9. Describe each of the specific motor efferent pathways

Topic 7: The Physiology of the Special Senses

1. Describe the sensory transduction mechanism for each of the special senses
2. Describe the basic anatomy and the neural pathway of each of the special senses, from sensory receptor to cerebral cortex. Compare and contrast these pathways for the various special senses
3. Compare and contrast the special sensory receptor with the somatic general receptor, and how action potentials are generated along the sensory afferent neuron in each case
4. Describe the transference of sound energy from the pinna to the cochlea, and give the relevant anatomy and function of the structures involved that ensure and amplify transmission of the energy to the point of transduction
5. Indicate how the inner ear interpretes intensity and pitch of sound
6. Give the safe sound intensity range and the normal frequency range heard by humans
7. Explain the coding for the quality of sound in the cochlea
8. Describe the various types of hearing loss, and how the Rinne's and Weber's tests can help to identify whether hearing loss has occurred and the type of hearing loss.
9. Describe the structure and function of the semicircular canals and vestibule, and how each codes for acceleration
10. Describe the possible mechanism behind motion sickness
11. Describe how light is focused on the retina. In your answer, explain eye accommodation and how it is controlled neurally
12. Explain presbyopia, myopia and hyperopia

13. Describe how the iris regulates the amount of light that enters the eye
14. Explain the difference between rods and cones anatomically and functionally
15. Explain how colour is perceived
16. Discuss the process of adaptation to light and dark
17. Give the anatomy and function of the papilla and taste buds and how taste buds code for taste
18. Discuss how flavour is perceived
19. Explain how olfaction is anatomically and functionally unique compared to the other special senses

Topic 8: Muscle structure, contraction (twitch → tetany) and maintaining muscle tone

1. Name the major structural features of the skeletal muscle cell and briefly describe each feature's role in muscle contraction
2. Describe the mechanism of force generation: the sliding filament model.
3. Define what a twitch contraction is and describe the phases of the contraction
4. Identify the various factors that affect the force generated by a muscle fibre: change in fibre length (length-tension relationship), fibre diameter, frequency of stimulation (summation, tetany, treppe) and onset of fatigue (discuss the causes of muscle fatigue)
5. Define recruitment of motor units, and discuss the mechanism of the stimulus-tension relationship
6. Discuss the relationship between the load placed on a muscle and muscle shortening velocity
7. Contrast and compare isometric and isotonic contraction
8. Name the 3 types of skeletal muscle fibres, and describe the major differences between them

9. Discuss muscle adaptation to use, in response to aerobic and anaerobic exercise
10. Explain how the muscle metabolises fuels in relation to duration, intensity and type of exercise
11. Describe the major characteristics of smooth and cardiac muscle and compare these muscle types to skeletal muscle
12. Compare and contrast muscle contraction in skeletal, cardiac and smooth muscle

Topic 9 and 10: Neuroendocrinology and maintaining homeostasis

1. Define homeostasis
2. Discuss by means of flowcharts the control of homeostasis by negative feedback mechanisms, and define the terminology used
3. Contrast positive and negative feedback loops, and say why positive loops are not a feature of homeostasis
4. Use examples to illustrate the role of the nervous system and the endocrine system in maintaining the homeostasis outlined in these flowcharts
5. Classify the endocrine organs into primary and secondary
6. Describe the neural, humeral and circadian rhythm control of hormone release
7. Give the anatomical features and physiological functioning of the major primary endocrine organs and relate the axes (e.g. HPA, HPT) to the feedback loops that maintain homeostasis. Give specific detailed examples of these axes; what can cause an imbalance, how target effects are controlled by negative feedback mechanisms, and what the target effects are.

Lecture schedule

Wk	Date	Lecture (2 × 1hr/week)	Practical (1 × 2hr/week)
1	27 Feb	Introduction to Neurophysiology Membrane Characteristics	
2	5 Mar	Membrane Transport Resting Membrane Potential	Lab induction Properties of cell membranes, resting membrane potential (RMP) Patch Clamping
3	12 Mar	Changing Potentials Localized, action and compound potentials	local and action potentials PhysioEx Exercise 3: Neurophysiology of Nerve Impulses
4	19 Mar	Nerve Transmission Synapses, receptors and neurotransmitters	Sciatic nerve compound action potentials Practical mini test
5	26 mar	Organisation of the Nervous System (somatic, autonomic, enteric)	Human brain prosections
6	2 April	Organisation of the Nervous System (somatic, autonomic, enteric)	Good Friday
		9 – 20 April Mid-semester Break	
7	23 April	Sensory receptors, sensory afferent pathways	Mid-semester theory test
8	30 April	Central Integration, motor efferent pathways	Somatic sensory receptors, proprioceptors
9	7 May	Physiology of Special Senses	UMN vs LMN symptoms and signs, deep tendon reflexes
10	14 May	Muscle structure, function and tone	Special Senses: vision, hearing, taste
11	21 May	Muscle structure, function and tone	PhysioEx Chapter 12: Skeletal Muscle Physiology
12	28 May	Neuroendocrinology	Smooth and Cardiac muscle Revision and Review
13	4 June	Maintaining Homeostasis: role of neuroendocrine system	Practical test

5. ASSESSMENT IN THIS UNIT

Assessment

TASK	WEIGHT %	DUE DATE	LINKED LEARNING OUTCOMES	LINKED GRADUATE CAPABILITIES
Practical Mini Test	5	Week 4	1, 2, 4,	1
Review Article	20	7 th May, week 9	1,2,8,9	1,2,3,4,5,6,9
Mid Semester Test	10	Week 7	1,2,4	1,2,3,5
Practical Assessment	10	Week 13	1,2,3,4,7,	1,2,3,4,5,8
Final Exam	45	See timetable	1,2,3,4,7	1,2,3,5

Please note that all assessment tasks must be submitted in order to pass. Failure to submit any one of the assessment exercises will prevent your completion of this unit.

Practical Mini test

This will be given during your normal practical time in week 4 for internals and test practical material covered in the first 3 weeks of the unit. External students will do the test during the first on campus session. For this test you will need to have an understanding of nervous system fundamentals and show how they function in transmitting nerve impulses to other cells. Questions will be based on the practical exercises done in weeks 1-3.

Mid semester test

These will be given in your normal practical session, in week 7 for internal students; and during the 2nd on campus sessions for external students, on lecture topics covered in weeks 1 – 5 for internal students and weeks 1-9 for external students. The one hour test will be multiple choice questions and short answers. Lecture material will be examined and you will need to have a level of understanding in which you can describe cellular processes governing neuronal function and show how you can apply your knowledge of physiology to novel questions.

Review Article

Students should download and review the following papers on iLearn:

1. Greenhalgh T (1997) Papers that summarise other papers (Systematic reviews and meta-analyses) *BMJ*; 315: 672-675
2. Edmonds M, McGuire H and Price JR (2010) Exercise Therapy for Chronic Fatigue Syndrome (Review) *The Cochrane Library*, The Cochrane Collaboration, John Wiley & Sons, Ltd.
3. Henschke N, Lin CC (2011) Stretching before or after exercise does not reduce delayed-onset muscle soreness *Br J Sports Med*; 45: 1249-1250. Doi: 10.1136/bjsports-2011-090599

Answer the following:

1. What is the purpose of a systematic literature review (SLR)?
2. Why is it considered a more objective way of analysing the literature?
3. Outline the procedure used in a SLR

Next, use the databases mentioned in ONE of the two SLR's to find a paper that could potentially be included in ONE of the two SLRs you have just read:

- Use the same search terms used in the SLR to find the paper
 - Use the same inclusion criterion to ensure that the paper you have chosen would be included in the SLR
 - Give the full reference for the paper
4. Say what type of study it is
 5. What is/are the aims or objectives of the study?
 6. Why would the paper be included in the SLR?
 7. Describe the intervention that was done
 8. Give the outcome measures used

9. Describe the statistical methods used
10. Summarise the results – essentially what results were significant?
11. What do the results mean?
12. What were the limitations and weaknesses of the study, as stated by the authors, and as you see them?
13. Use the 'Assessment of the methodological quality' (Cochrane Collaboration Handbook Criteria) given on page 4 of the Edmonds et al SLR to assess the methodological quality of the paper you have chosen. Conclude by making a statement as to the quality of the research of the paper you have chosen.
14. Would the findings of your paper fit with the findings of the SLR on the subject?

Write up the questions and your answers in a document and attach a copy of the paper you have chosen.

For all students, the paper should be submitted by 7th May. The question and answer document must be submitted to 'Turnitin' by 5pm, which filters for plagiarism, and an additional hard-copy must be submitted to the Science Centre by 5pm with the cover sheet, the copy of the paper and the rubric (given at the end of the manual). You are required to enrol yourself into Turnitin.com. The class Id is 4594938, and the password is neurophy2012.

For internal students, the review must be submitted to the assignment boxes located in the reception area of the Science Centre located on the ground floor of E7A. The Centre opens from 8.30am to 5.00pm on Monday to Friday. Manuscripts must include a completed and signed coversheet stapled to the front cover. An Assignment Cover Sheet can be downloaded from www.science.mq.edu.au, click on **Information for New and Current Students** followed by **Undergraduate** where you will find **Assignment Cover Sheet**. We remind you that there is an 'afterhours' submission box. This is situated in the main door to E7A on "Wally's Walk". External students should submit assignments via the COE. To submit external assignments online go to www.coe.mq.edu.au/coeassign.html and follow the instructions there.

Late submissions will be accepted without penalty if submitted with a doctor's note and students are strongly encouraged to speak with the unit convener if having trouble submitting material on time.

Practical Assessment

The practical assessment will be conducted in week 13 for internal students and the 2nd on-campus session for externals. The assessment will cover all practical work done during the semester and will be made up of spot questions.

Final exam

The exam will comprise a 3 hour paper with multiple choice and short answer questions. All lecture and practical material is examinable. The University examination period in first semester 2012 begins on the 12th June. You are expected to present yourself for examination at the time and place designated in The University examination timetable which will be available in draft form approximately eight weeks, and in final form, four weeks, before the commencement of exams. No calculators or dictionaries may be taken in to the examination. The timetable is available from <http://www.timetables.mq.edu.au/exam>

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for Special Consideration. Please contact the unit convener Dr Sinan Ali if you have problems with sitting the exam at the designated time or if you have had unavoidable interruptions to your study during the semester and he will advise you on what best to do. Information about unavoidable disruption and the special consideration process is available at <http://www.reg.mq.edu.au/Forms/APSCon.pdf> and on page 11 of this guide.

If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled at a later date by the Faculty of Science. You must make yourself available for dates which will be set for supplementary exams.

You are advised that it is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period.

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for Special Consideration. Information about unavoidable disruption and the special consideration process is available at

<http://www.reg.mq.edu.au/Forms/APSCon.pdf>

If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled after the conclusion of the official examination period. (Individual Divisions may wish to signal when the Division's Supplementary exams are normally scheduled.)

You are advised that it is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester that is the final day of the official examination period.

Special Consideration

If the student determines that it is appropriate, and has the necessary supporting documentary evidence, an application for Special Consideration may be submitted.

Please look at the policy on Special Consideration prior to submitting an application. You can find the policy at http://mq.edu.au/policy/docs/special_consideration/policy.html.

The Special Consideration application must be completed by the student and submitted electronically to the Science Centre. The web link for submitting the form is found at http://web.science.mq.edu.au/undergraduate_programs/current/admin_central/

Plagiarism

The University defines plagiarism in its rules: "Plagiarism involves using the work of another person and presenting it as one's own." Plagiarism is a serious breach of the University's rules and carries significant penalties. You must read the University's practices and procedures on plagiarism. These can be found in the *Handbook of Undergraduate Studies* or on the web at: <http://www.student.mq.edu.au/plagiarism/>

The policies and procedures explain what plagiarism is, how to avoid it, the procedures that will be taken in cases of suspected plagiarism, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.

Work Required to Gain Credit Points: From the University Handbook:

7. (2) In order to complete a unit satisfactorily and to gain the number of credit points specified for that unit a candidate shall: (a) attend such classes; (b) complete such essays,

exercises and practical work and sit for such tests and examinations; and (c) reach a satisfactory level of achievement in such essays, exercises, practical work, tests and examinations as may be determined by the Executive Dean of the Faculty in which the unit is provided.

Returning Assessment Tasks

The mini-test, review article, mid-semester test and practical write-up will all be returned with feedback. The Final practical and theory will not be returned for feedback.

Extensions and penalties

Extensions to assignments are at the discretion of the unit convenor. It is the responsibility of the student to prove to the convenor that there has been unavoidable disruption. Marks will be deducted for late submissions in the absence of an approved extension.

Grades

Achievement of grades will be based on the following criteria:

High Distinction: provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application.

Distinction: provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the discipline and the audience.

Credit: provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; plus communication of ideas fluently and clearly in terms of the conventions of the discipline.

Pass: provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of

study; and communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.

Fail: does not provide evidence of attainment of all learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; and incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.

Sometimes it helps to 'translate' these descriptions into numbers. So, what we expect from you in this unit, in order for you to attain a specific grade, is outlined below:

Grade	
Pass	50 - 64%
Credit	65 - 74%
Distinction	75 - 84%
High Distinction	85 - 100%

STUDENT SUPPORT SERVICES

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at <http://www.student.mq.edu.au>

POLICIES

Macquarie is developing a number of policies in the area of learning and teaching. Approved policies and associated guidelines and procedures can be found at Policy Central:

<http://www.mq.edu.au/policy/>

There you will find the University's policy and associated procedures on:

- Assessment
- Feedback and unit evaluation
- Special Consideration
- Appeal Against Final Grade Policy / Procedures / Guidelines

- Plagiarism

In this unit you will receive a range of verbal and written feedback on your assessment tasks and work in class or online.

To monitor how successful we are in providing quality teaching and learning, the Department of Chiropractic also seeks feedback from students. One of the key formal ways students have to provide feedback is through unit and teacher evaluation surveys. The feedback is anonymous and provides the Department with evidence of aspects that students are satisfied with and areas for improvement. At present, the Department is prioritising feedback in the areas of assessment and feedback.

CHANGES MADE TO PREVIOUS OFFERINGS OF THIS UNIT

There has been a change of convenor for 2012, and with this has been a change in the required textbook, the structure and order of the lectures and practicals, and changes to some aspects of the assessment viz. the Review Article assignment

SAFETY REQUIREMENTS

Students enrolled in this course are required to observe and co-operate with all University policies and procedures. You will be asked to sign a copy of this safety sheet to indicate you have read it and agree to follow the rules.

If you come to the lab without the correct, covered footwear you will be excluded. Footwear should be of solid construction, completely cover the front half of the foot and the heel.

Laboratory safety begins with a safe attitude.

WHEN IN A LABORATORY EVERYONE MUST:

WEAR CLOSED-IN SHOES at all times

WEAR SAFETY GLASSES when required in areas designated for safety eyewear

WEAR THE APPROPRIATE PERSONAL PROTECTIVE CLOTHING when required when working in the laboratory.

NEVER EAT OR DRINK IN THE LABORATORY (leave food items and water bottles in your bags)

MAINTAIN A CLEAN AND TIDY WORK AREA

COMPLY WITH INSTRUCTIONS GIVEN BY UNIVERSITY STAFF IN THE LABORATORY.

SEEK HELP WHENEVER NECESSARY

WASH HANDS AT THE COMPLETION OF LABORATORY WORK

BIOL257 ASSESSMENT RUBRIC for the REVIEW ARTICLE

Student Name: _____ Student number: _____

Learning outcome	1-2	3-4	5-6	7-8	9-10
Critically evaluate, analyse and synthesise data and information	superficial overview without depth and lack of reasoning or relevance	Basic overview, and lacking analysis and synthesis of data and information	Fair understanding of the key concepts and satisfactory integration, analysis and synthesis	Good understanding of the key concepts and good integration of the competencies	Thorough understanding of the key concepts and excellent integration of the competencies
Process information to generate a logically organised analysis	Poor processing of the information without coherence - chaotic	Basic processing of information and some coherence	Fair processing of information that is fairly well organised into an analysis	Good understanding derived from well processed information that creates a logically organised analysis	Excellent and well organised presentation of an integrated understanding of the review article
Communicate knowledge and the process used to generate the knowledge	Poor communication of the knowledge and the process used to generate the knowledge.	Some reasoning skills demonstrated in how the knowledge is communicated and the process used to generate the knowledge	Fair reasoning skills demonstrated in how the knowledge is communicated and the process used to generate the knowledge	Good reasoning skills demonstrated and good critical analysis demonstrated in good communication of the knowledge and the process used to generate the knowledge	Excellent reasoning skills demonstrated and thorough appraisal of the review article demonstrated in excellent communication skills
Style, grammar and spelling	Poor style, grammar and spelling	Some problems with style, grammar and spelling	Fair style, grammar and spelling	Good style, grammar and spelling	Excellent style, grammar and spelling