



# BIOL376

## Advanced Human Physiology

S2 External 2015

*Dept of Biological Sciences*

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#### **Disclaimer**

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## General Information

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Credit points

3

Prerequisites

(BIOL247 and BIOL257) or (admission to BHumanSc and 6cp at 200 level including BIOL247)

Corequisites

HLTH306 or HLTH310 or HLTH316 or HLTH317 or BIOL345 or BIOL367 or CBMS306 or CBMS335 or CBMS337 or PSY354 or STAT395

Co-badged status

Unit description

This unit follows on from BIO257 and BIOL247. We will investigate the interaction of the renal and respiratory systems in the control of body pH. The next topic is the control of blood pressure leading to a discussion of hypertension and exercise. We continue with endocrinology discussing signal transduction and messenger pathways, and the role of hormones in the regulation of plasma potassium, calcium and glucose concentrations. A discussion of neuroendocrine systems and function of thyroid, sex, growth, mineralocorticoid and glucocorticoid hormones leads into a discussion of stress and the stress hormones. As obesity is currently a major threat to human health we will consider energy balance and the neurological basis for homeostatic and hedonic control of appetite before investigating other factors involved in weight control including genetics, foetal programming, protein leverage and the gut microbiota. The final two lectures will be on the neurobiology of the reward systems involved in hedonic eating and drug addiction. Practical classes make use of computer-assisted learning, as well as laboratory experiments. We will measure physiological parameters such as blood pressure during exercise, acid and base in the urine and stress hormones in the saliva. In these classes students will act both as investigators and experimental subjects.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

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

1. Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body
3. Recognise that the controls of energy balance evolved for the fitness of ancestral hunter gatherers are no longer effective when highly appetising food is available in abundance
4. Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
5. Produce written work and oral presentations to the level expected by future employers or for progression into postgraduate programs
6. Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
7. Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results
8. Measure blood pressure in control and stressed subjects, the change in the chemical composition of urine from subjects ingesting acid or base, the diurnal rhythm of cortisol concentration in saliva, and the hydrogen produced by gut bacteria in exhaled breath

## Assessment Tasks

Name	Weighting	Due
<u>Practical Assignment</u>	10%	9/9/2015
<u>Mid-semester test</u>	10%	17/9/2015
<u>Essay</u>	10%	6/10//2015
<u>Seminar</u>	10%	17/9/2015
<u>Final exam</u>	60%	In formal examination period

### Practical Assignment

Due: **9/9/2015**

Weighting: **10%**

## *Assignment on the acid base balance experiment*

In this assignment results of the experiment will be plotted to compare the excretion rates and the urine pH of the three treatment groups and the control over the time course of the experiment. To complete the assignment students will answer a series of questions that are designed to probe the physiological mechanisms that produce the experimental results.

The assignment must be converted to PDF files and submitted through Turnitin.

On successful completion you will be able to:

- 1. Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- 2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 4. Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- 5. Produce written work and oral presentations to the level expected by future employers or for progression into postgraduate programs
- 6. Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
- 7. Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results
- 8. Measure blood pressure in control and stressed subjects, the change in the chemical composition of urine from subjects ingesting acid or base, the diurnal rhythm of cortisol concentration in saliva, and the hydrogen produced by gut bacteria in exhaled breath

## Mid-semester test

Due: **17/9/2015**

Weighting: **10%**

This test will include 30 multiple choice questions to be completed in 40 minutes. All the material in lectures 1-12 and the material presented in the practical classes will be included in the test.

On successful completion you will be able to:

- 1. Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- 2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body

## Essay

Due: **6/10/2015**

Weighting: **10%**

The essay will be of 1,500 words and the topic will be chosen from the list in your unit guide. The essay must be written in your own words. For references, I suggest you start with a text book or review article to give you an overview of the field then you can move to experimental papers. For your essay I would expect you to cite about 10 recent articles. Only articles from books or refereed scientific journals are appropriate references. Postings on WEB sites may only be used if they come from a reputable source (e.g., Heart Foundation, National Health and Medical Research Council). The main criterion for marking will be the physiological content of the essay (see marking rubric in unit guide).

The source of all statements and diagrams obtained from the literature must be cited. The reference list only contains the articles that you have actually cited in the essay. Citations and the reference list should be in Harvard Style.

On successful completion you will be able to:

- 4. Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- 5. Produce written work and oral presentations to the level expected by future employers or for progression into postgraduate programs

## Seminar

Due: **17/9/2015**

Weighting: **10%**

Your seminar topics will be the same as your essay topic. You will present your seminar as part of a team of three students. There will be time during the practical sessions for you to decide on the distribution of tasks between team members. All three must present part of the seminar and answer questions at the end of the seminar.

The main criterion for marking will be the quality of presentation although the physiological content will also be considered and the rubric used to mark the seminar is included below.

To ensure that the seminars cover a variety of topics on each practical day, internal students will choose a topic at the second practical session. If too many people choose the same topic, some will have to do their second preference. External students will form groups and select a topic on their first day of the first on campus session.

You have 15 minutes to present your seminar and 5 minutes of question time. In a seminar, it is most important to tell a story, and to do it clearly, concisely and logically. Visual material serves two purposes, as cues for you and to reinforce your points for the audience.

On successful completion you will be able to:

- 3. Recognise that the controls of energy balance evolved for the fitness of ancestral hunter gatherers are no longer effective when highly appetising food is available in abundance
- 4. Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- 5. Produce written work and oral presentations to the level expected by future employers or for progression into postgraduate programs

## Final exam

Due: **In formal examination period**

Weighting: **60%**

The exam is a three hour, closed-book paper. One third of the marks will be for multiple choice questions, and the rest from short answer questions (a paragraph or dot points or a diagram). There will be some choice for the short answer questions.

All the lecture and practical material is examinable. A non-programmable scientific calculator will be required in the exam but dictionaries are not allowed.

On successful completion you will be able to:

- 1. Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- 2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 3. Recognise that the controls of energy balance evolved for the fitness of ancestral hunter gatherers are no longer effective when highly appetising food is available in abundance
- 4. Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- 5. Produce written work and oral presentations to the level expected by future employers or for progression into postgraduate programs

## Delivery and Resources

### Unit material and Textbooks

The textbook for this unit is “Principals of Human Physiology” 4th edition by Cindy L Stanfield, published in 2011 by Pearson. However, much of the material covered in BIOL376 is not available in text books. When this is the case I have included relevant references in the lecture graphics.

## iLearn

Your iLearn site will contain the unit outline, lecture graphics, lecture notes, practical manual, a link to Echo 360, announcements and discussion areas. Later, marks for in semester assessments tasks will be added. Please check this site and your student email regularly.

## Unit Schedule

### Timetable

There will be two lectures each week and these lectures will be pre-recorded and available on iLearn. Each week there is also one tutorial session from 9 to 10 am on Wednesday in W5C 220 and also one practical class on Thursday from 1 to 4 pm in F7B 102, 105 and 110.

Practical sessions for external students will be held on Saturday 29<sup>th</sup> & Sunday 30<sup>th</sup> August and on Thursday and Friday the 17<sup>nd</sup> & 18<sup>th</sup> September. Note that the external classes will only run if sufficient students chose this option.

### External Practical Timetable 2015

Practical sessions for external students will be held on Saturday 29<sup>th</sup> & Sunday 30<sup>th</sup> August and on Thursday and Friday the 17<sup>nd</sup> & 18<sup>th</sup> September. The classes start promptly at 9.00 am and will be held in F7B 110.

<b>Saturday 29/8/2015</b>	<b>Thursday 17/9/2015</b>
Introduction	<b>mid-semester test</b>
Acid-base balance computer tutorial and discuss ethics and protocol for the acid base pracs, organise subjects and sign consent forms	<b>student seminars</b>
The effect of net acid or base ingestion on the pH, hydrogen ion and bicarbonate excretion in the urine ( <b>lab coats</b> )	Cortisol in the saliva
<b>Sunday 30/8/2015</b>	<b>Friday 18/9/2015</b>
Analysis of the acid-base prac results	Analysis of cortisol results
Exercise and the cardiovascular system	Lactose intolerance, bacterial overgrowth and the intestinal transit time

Please note that for external students, the mid-semester test on the cardiovascular and renal systems, which is worth 10% of the marks, is on Thursday, 17/9/2015.

## 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](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

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

Grievance Management Policy [http://mq.edu.au/policy/docs/grievance\\_management/policy.html](http://mq.edu.au/policy/docs/grievance_management/policy.html)

Disruption to Studies Policy [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](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/](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).

### [Macquarie University Policy Examination](#)

Students are directed to consult the "University Handbook" at the beginning of the year to determine the commencement and finishing dates of both University examination periods in order to ensure their availability to attend compulsory examinations. Failure to attend an examination can only be explained within the definition of 'unavoidable disruption' which can be found in the "University Handbook".

Useful information is available at: <http://www.student.mq.edu.au/>

### [Special Consideration Requests](#)

## During Semester:

All requests for special consideration during semester should be submitted with supporting documentation via the "Advice of Absence or Other Circumstances" form. This form can be accessed online at: <http://www.registrar.mq.edu.au/Forms/USSAbsence.pdf> or by visiting the Student Enquiry Service, Lincoln Building level 1. You must submit one complete set of documents before the last day of classes each semester to the Student Enquiry Service, and one set to each Division that has been affected by the absence. You must also provide your



Lecturer with a copy of the documentation lodged at the Student Enquiry Service when submitting assignments. We strongly recommend that you see your Lecturer or Tutor on all such occasions to discuss the matter with them.

### **During Examination Period:**

During the examination period, original requests for special consideration plus one copy must be submitted to the Registrar and Vice-Principal, through the Academic Program Section, Level 4, Lincoln Building. The copy will be forwarded to your Division of Registration which will in turn forward it to the Department. Full details, and forms, are available at <http://www.reg.mq.edu.au/Forms/APSCons.pdf>. As well as submitting the appropriate documentation through the Registrar and Vice-Principal's Office, if you miss an examination, YOU MUST CONTACT YOUR LECTURER WITHIN 72 HOURS OF THE DATE OF THE EXAMINATION so that alternative examination arrangements may be made without delay. Failure to do so will result in the award of an "F" grade.

Please note that the submission of requests for special consideration is monitored by the Department. Repeated requests will result in referral of the student to the Dean of Students for discussion and advice.

Important information, including Undergraduate Student Forms and deadlines for submission, is available at: [http://www.mq.edu.au/policy/docs/special\\_consideration/policy.html](http://www.mq.edu.au/policy/docs/special_consideration/policy.html)

#### Academic Honesty

The university now has an academic honesty policy. It is important that you familiarise with this policy before you submit any written work.

[http://www.mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://www.mq.edu.au/policy/docs/academic_honesty/policy.html)

The associated procedure can be found at:

[http://www.mq.edu.au/policy/docs/academic\\_honesty/procedure.html](http://www.mq.edu.au/policy/docs/academic_honesty/procedure.html)

and the schedule of penalties:

[http://www.mq.edu.au/policy/docs/academic\\_honesty/schedule\\_penalties.html](http://www.mq.edu.au/policy/docs/academic_honesty/schedule_penalties.html)

#### Advice for Students with Disabilities

The Equity Support Unit (ESU) provides support and assistance to students with a disability/health condition in aiming to ensure that they do not experience disadvantage in reaching their academic potential. Service provision is determined on a case-by-case basis following an assessment of a student's needs and the provision of supporting documentation. Service provision is also dependent on the availability of resources.

To register with ESU, download an Advice of Disability/Health Condition form from. This form must be completed annually, irrespective of whether a disability/health condition is temporary, long-term or permanent. Students wishing to request support services from the ESU should make an appointment to see a Disability Advisor immediately after enrolling at Macquarie

University. tel: 02 9850 6494/7497; fax: 02 9850 6063; TTY: 02 9850 6493 email: ; in person: Level 2, Lincoln Building (C8A), Macquarie University; website:

## Student Support

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

### Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://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](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use 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

- 2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 4. Apply a critical approach to information and demonstrate the ability to develop a

logical argument based on experimental evidence

## Assessment tasks

- Practical Assignment
- Mid-semester test
- Essay
- Seminar
- 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

- 4. Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- 5. Produce written work and oral presentations to the level expected by future employers or for progression into postgraduate programs
- 6. Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
- 7. Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results
- 8. Measure blood pressure in control and stressed subjects, the change in the chemical composition of urine from subjects ingesting acid or base, the diurnal rhythm of cortisol concentration in saliva, and the hydrogen produced by gut bacteria in exhaled breath

## Assessment tasks

- Practical Assignment
- Essay
- Seminar
- 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 outcome**

- 4. Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence

## **Assessment tasks**

- Practical Assignment
- Essay
- Seminar
- Final exam

## **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**

- 1. Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- 2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 3. Recognise that the controls of energy balance evolved for the fitness of ancestral hunter gatherers are no longer effective when highly appetising food is available in abundance
- 8. Measure blood pressure in control and stressed subjects, the change in the chemical composition of urine from subjects ingesting acid or base, the diurnal rhythm of cortisol concentration in saliva, and the hydrogen produced by gut bacteria in exhaled breath

## **Assessment tasks**

- Practical Assignment

- Mid-semester test
- Seminar
- 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

- 1. Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- 2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 3. Recognise that the controls of energy balance evolved for the fitness of ancestral hunter gatherers are no longer effective when highly appetising food is available in abundance
- 4. Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- 5. Produce written work and oral presentations to the level expected by future employers or for progression into postgraduate programs
- 6. Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
- 7. Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results

### Assessment tasks

- Practical Assignment
- Mid-semester test
- Essay
- Seminar
- 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**

- 2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 3. Recognise that the controls of energy balance evolved for the fitness of ancestral hunter gatherers are no longer effective when highly appetising food is available in abundance
- 4. Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- 7. Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results

## **Assessment tasks**

- Practical Assignment
- Mid-semester test
- Essay
- Seminar
- 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**

- 1. Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- 2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 5. Produce written work and oral presentations to the level expected by future employers or for progression into postgraduate programs

- 7. Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results

## **Assessment tasks**

- Practical Assignment
- Mid-semester test
- Essay
- Seminar
- 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**

- 1. Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- 2. Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 3. Recognise that the controls of energy balance evolved for the fitness of ancestral hunter gatherers are no longer effective when highly appetising food is available in abundance
- 6. Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees

## **Assessment tasks**

- Practical Assignment
- Mid-semester test
- Seminar
- Final exam

## **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 outcome**

- 3. Recognise that the controls of energy balance evolved for the fitness of ancestral hunter gatherers are no longer effective when highly appetising food is available in abundance

### **Assessment tasks**

- Seminar
- Final exam