



BIOL376

Advanced Human Physiology

S2 Day 2014

Dept of Biological Sciences

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General Information

Unit convenor and teaching staff

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Unit Convenor

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E8A 207

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Credit points

3

Prerequisites

BIOL247 and BIOL25

Corequisites

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:

- Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 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
- Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- Present written and oral work to the level expected by future employers or for progression into postgraduate programs
- Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
- Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results
- Measure blood pressure in control and stressed subjects, the change in the chemical components (particularly carbon dioxide, hydrogen ions and bicarbonate) in the urine of subjects ingesting acid or base and hydrogen produced by gut bacterial in the exhaled breath

Assessment Tasks

| Name | Weighting | Due |
|-------------------------------------|-----------|-----------------|
| Practical Report I | 5% | 7/9/2014 |
| Mid semester test | 10% | 19/9/2014 |
| Essay | 10% | 12/10/2014 |
| Seminar | 10% | 17 & 24/10/2014 |
| Practical Report II | 5% | 2/11/2014 |

| Name | Weighting | Due |
|--------------------------|-----------|--------------------|
| <u>Final examination</u> | 60% | Examination period |

Practical Report I

Due: **7/9/2014**

Weighting: **5%**

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.

Assignment on the effect of exercise on the cardiovascular system

In this assignment the exercise practical will be written up in the form of a scientific paper with a title, aims, methods and results sections. The discussion session will be replaced by a series of questions that are focussed on the changes in cardiovascular function underlying the increased muscle activity during exercise.

On successful completion you will be able to:

- Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- Present written and oral work to the level expected by future employers or for progression into postgraduate programs
- Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
- Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results
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Mid semester test

Due: **19/9/2014**

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:

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

Essay

Due: **12/10/2014**

Weighting: **10%**

The essay is of 2,000 words and you have a choice of 13 topics. Emphasis is to be on physiological aspects of each topic.

On successful completion you will be able to:

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

Seminar

Due: **17 & 24/10/2014**

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. All three can present part of the seminar or there could be only one presenter as long as all team members contribute equally to the preparation. All three members will be expected to answer questions on the topic 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. You will have 15 minutes to present your seminar and 5 minutes of question time.

On successful completion you will be able to:

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

Practical Report II

Due: **2/11/2014**

Weighting: **5%**

We will carry out experiments to determine the effect of different types of exercise on heart rate and arterial blood pressure in different individuals. Using our results we will identify the underlying causes of changes in BP during exercise. We will also consider the regulatory systems controlling BP during exercise. Each student will write up a report of 750 words on the results and significant findings of their experiments.

On successful completion you will be able to:

- Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
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- Present written and oral work to the level expected by future employers or for progression into postgraduate programs
- Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
- Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results
- Measure blood pressure in control and stressed subjects, the change in the chemical components (particularly carbon dioxide, hydrogen ions and bicarbonate) in the urine of subjects ingesting acid or base and hydrogen produced by gut bacterial in the exhaled breath

Final examination

Due: **Examination period**

Weighting: **60%**

The exam is a three hour paper 33% 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.

On successful completion you will be able to:

- Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
- Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- 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
- Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence

Delivery and Resources

Staff

| | | |
|--|--|--|
| Convenor | Scientific Officer | Names and contact details of the tutors will be available on the iLearn site |
| Dr Julia Raftos | Monika King | |
| E8A 207 | E8A 174 | |
| 9850 6275 | 9850 8208 | |
| julia.raftos@mq.edu.au | monika.king@mq.edu.au | |

Timetable

There will be two lectures each week and one practical class or tutorial session. Lectures are at 4 pm on Monday in W6B 336 and 9 am on Friday in E6A 133. Pracs are at 10 am and 2 pm on Friday in F7B 105 and F7B 110.

Practical sessions for external students will be held on Saturday 6th September & Sunday 7th September and on Thursday and Friday the 2nd & 3rd October. Note that the external classes will only run if sufficient students chose this option.

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. Where this is the case I have included relevant references in the lecture graphics.

iLearn

Your iLearn site will contain the unit outline, lecture graphics, 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

Lecture Timetable 2014

| Week | Lecture |
|------|---|
| 1 | 1. Acid base regulation in the body |
| | 2. Disturbances acid/base balance |
| 2 | 3. Short term control of BP |
| | 4. Long term control of BP |
| 3 | 5. Hypertension |
| | 6. Exercise |
| 4 | 7. Exercise and hypertension |
| | 8. Hormones, signal transduction and cell messengers |
| 5 | 9. Regulation of plasma K ⁺ concentration |
| | 10. Regulation of plasma Ca ²⁺ concentration |
| 6 | 11. Neuroendocrinology |
| | 12. Regulation of plasma glucose concentration |
| 7 | 13. Catch up lecture |
| | Mid-semester test (conception day) |

Study break: 22/9/14 – 3/10/14

| | |
|---|-------------------------------------|
| 8 | 14. Stress hormones |
| 15. The obesity epidemic and energy balance | |
| 9 | 16. Homeostatic control of appetite |
| 22. Reward and addiction | |
| 10 | 23. Reward and addiction |
| 17. Reward systems and hedonic eating | |
| 11 | 18. Genetics of obesity |
| 19. Foetal effects and epigenetics | |
| 12 | 20. Protein and energy balance |
| 21. The microbiota | |
| 13 | no lecture |
| no lecture | |

Internal Practical Timetable 2014

| Wk | Practical Group A |
|-----------|---|
| 1 | no practical |
| 2 | Introduction to BIOL376 and acid-base balance computer tutorial Organise seminar groups Discuss ethics and protocol for the acid base pracs, organise subjects and sign consent forms |

| | |
|---|--|
| 3 | The effect of net acid or base ingestion on the pH and the hydrogen ion and bicarbonate excretion in the urine (lab coats) |
| 4 | Analysis of acid-base practical results/Exercise and the cardiovascular system-revision tutorial |
| 5 | The effect of exercise on the cardiovascular system-planning and experimental (acid base assignment due 7/9 for internal students) |
| 6 | The effect of exercise on the cardiovascular system- experimental, data analysis and presentation |
| 7 | Conception day – no practical classes (mid-semester test at 9.00 am in lecture for internal students) |

Study break: 22/9/14 – 3/10/14

| | |
|----|--|
| 8 | Revision of the mid-semester test; seminar preparation (essay due; 12/10, internals) |
| 9 | Student Seminars |
| 10 | Student seminars |
| 11 | Salivary cortisol (lab coats) and lactose/fructose intolerance (exercise prac report; 2/11 internals) |
| 12 | Salivary cortisol results and revision session based on the 2013 exam paper |
| 13 | No practical |

Attendance and participation in practical sessions is **compulsory** and assessable.

Please note that in order to pass this unit, all assessment tasks must be completed and you must pass the 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

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

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/

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) 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://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

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

- Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
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- Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results

Assessment tasks

- Mid semester test
- Essay
- Practical Report II
- Final examination

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

- Explain how the cardiovascular, renal and respiratory systems contribute to the maintenance of blood pressure and acid base balance in the body
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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

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

- Mid semester test
- Essay
- Seminar
- Final examination

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

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

- Practical Report I
- Mid semester test
- Essay
- Seminar
- Practical Report II
- Final examination

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

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

- Practical Report I
- Mid semester test
- Essay
- Seminar
- Practical Report II
- Final examination

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

- Apply a critical approach to information and demonstrate the ability to develop a logical

argument based on experimental evidence

- Present written and oral work to the level expected by future employers or for progression into postgraduate programs
- Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results

Assessment tasks

- Practical Report I
- Mid semester test
- Essay
- Seminar
- Practical Report II
- Final examination

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

- Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- Present written and oral work to the level expected by future employers or for progression into postgraduate programs
- Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
- Collect experimental data accurately and analyse, graph and apply statistical methods and then to interpret the physiological significance of the results
- Measure blood pressure in control and stressed subjects, the change in the chemical components (particularly carbon dioxide, hydrogen ions and bicarbonate) in the urine of subjects ingesting acid or base and hydrogen produced by gut bacterial in the exhaled breath

Assessment tasks

- Practical Report I

- Essay
- Seminar
- Practical Report II
- Final examination

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

- 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
- Present written and oral work to the level expected by future employers or for progression into postgraduate programs
- Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
- Measure blood pressure in control and stressed subjects, the change in the chemical components (particularly carbon dioxide, hydrogen ions and bicarbonate) in the urine of subjects ingesting acid or base and hydrogen produced by gut bacterial in the exhaled breath

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

- Identify the components of the neural and endocrine systems that maintain energy balance in the human body
- Apply a critical approach to information and demonstrate the ability to develop a logical argument based on experimental evidence
- Present written and oral work to the level expected by future employers or for

progression into postgraduate programs

- Carry out experiments using human subjects safely following protocols sanctioned by the Macquarie University Human Ethics and Biohazard Committees
- Measure blood pressure in control and stressed subjects, the change in the chemical components (particularly carbon dioxide, hydrogen ions and bicarbonate) in the urine of subjects ingesting acid or base and hydrogen produced by gut bacterial in the exhaled breath

Assessment task

- Practical Report II