



BIOL376

Advanced Human Physiology

S2 External 2014

Dept of Biological Sciences

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General Information

Unit convenor and teaching staff

Other Staff

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Unit Convenor

Julia Raftos

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E8A 207

contact academic

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%	14/9/2014
Mid semester test	10%	2/10/2014
Essay	10%	12/10/2014
Seminar	10%	2/10/2014
Practical Report II	5%	2/11/2014

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

Practical Report I

Due: **14/9/2014**

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
- 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

Mid semester test

Due: **2/10/2014**

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: **2/10/2014**

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
- 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

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	

External Practical Timetable 2014

External students will attend practical classes on 6th & 7th September and the 2nd & 3rd October. The classes start promptly at 9.00 am and will be held in F7B 110.

Saturday 6/9/2014	Thursday 2/10/2014
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Introduction	mid-semester test
Acid-base balance computer tutorial and discuss ethics and protocol for the acid base pracs, organise subjects and sign consent forms	student seminars
The effect of net acid or base ingestion on the pH, hydrogen ion and bicarbonate excretion in the urine (lab coats)	Cortisol in the saliva
Sunday 7/9/2014	Friday 3/10/2014
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, 2nd October.

If you have any questions or difficulties during the semester please do not hesitate to contact Julia by email (preferred) or come and see me.

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/

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

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

The associated procedure can be found at:

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

[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) 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
- 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

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
- 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
- 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

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
- Present written and oral work to the level expected by future employers or for progression into postgraduate programs

- 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

- 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
- 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

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