

# UNSW



**SCHOOL OF MEDICAL SCIENCES  
DEPARTMENT OF PHYSIOLOGY**

**SECOND YEAR PHYSIOLOGY  
PHSL2201 PHSL2221 PHSL2502  
SESSION 2 2013**

**INTRODUCTION**

Course Information  
Lecture/Practical Timetables  
Lecture Outlines  
Physiology Practical Manual

**PRACTICALS**

1. Body Temperature and Cutaneous Circulation
2. Thyroid Gland Physiology
3. Reproductive & Endocrine Physiology
4. Respiratory Gas Exchange
5. Gastrointestinal System: Computer Class
6. Control of Respiration
7. Renal Endocrine Physiology: Computer Class
8. Volume and Solute Control

**SELF STUDY SESSIONS**

**PAST EXAM PAPERS**

# **COURSE INFORMATION**



## **UNSW LEARNING OUTCOMES**

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UNSW aims to provide an environment that fosters students achieving the following generic graduate attributes:

1. the skills involved in scholarly enquiry
2. an in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context
3. the capacity for analytical and critical thinking and for creative problem-solving
4. the ability to engage in independent and reflective learning
5. information literacy - the skills to appropriately locate, evaluate and use relevant information
6. the capacity for enterprise, initiative and creativity
7. an appreciation of, and respect for, diversity
8. a capacity to contribute to, and work within, the international community
9. the skills required for collaborative and multidisciplinary work
10. an appreciation of, and a responsiveness to, change
11. a respect for ethical practice and social responsibility
12. the skills of effective communication.

Not every course addresses all these attributes evenly. In second year physiology, attributes 1-4 are most relevant. The following are more specific learning outcomes for this course designed to incorporate some of the generic graduate attributes listed above in a more context specific form.

## **SPECIFIC LEARNING OUTCOMES**

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By the end of this course students are expected to have gained a basic understanding of the fundamental processes and mechanisms that serve and control the various functions of the body. More specifically students should have a basic knowledge of

### Temperature Regulation

- normal body temperature and how it is regulated

### Endocrine Physiology

- the mechanisms of hormone action
- simple feedback-loop endocrine systems
- hypothalamus and pituitary gland
- thyroid gland
- adrenal gland

### Reproduction

- male reproductive system
- female reproductive system
- pregnancy

### Respiratory System

- anatomical features and their physiological significance
- ventilation
- oxygen transport
- carbon dioxide transport and blood buffering
- respiratory mechanics
- control of respiration

### Gastrointestinal System

- overview of the gastrointestinal tract
- gastric secretion, motility and emptying
- digestive processes of the small intestine

- liver and biliary system
- chemical digestion and absorption of nutrients
- appetite control
- digestive processes of the large intestine

#### Kidney and Body Fluids

- body fluids
- renal structure, renal blood flow and glomerular filtration
- reabsorption and secretion
- evaluation of renal function
- tubular structure and function along the nephron
- renal water homeostasis
- urinary concentrating mechanisms
- renal sodium and potassium balance
- renal acid-base balance

### ASSESSMENT

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**%Total  
Marks**

#### **Mid-session Theory Exam (50 minutes duration)**

The mid-session exam will be held on Wednesday 11<sup>th</sup> September 2013 and will consist of the following:

**30%**

- 15 multiple choice questions on material covered in all Temperature Regulation, Endocrine, Reproduction and Respiration lectures and tutorials (25 minutes).
- Two short answer questions; one on Endocrine and one on Respiration (25 minutes in total).

#### **End of Session Exam (2 hours duration)**

**50%**

The end of session exam will consist of the following:

- 15 multiple choice questions on all Gastrointestinal Tract and Kidney and Body Fluids lectures and tutorials.
- Three short answer questions (approximately 13 minutes each); one on Reproduction, one on Gastrointestinal Tract and one on Kidney and Body Fluids.
- 30 multiple choice questions on material pertaining to the practical classes in Session 2. You will **not** be able to take your prac books into the exam.

#### **Online Feedback Quizzes**

**10%**

There will be a series of 5 online feedback quizzes throughout the session covering each topic. These quizzes will be made available online a few days after the conclusion of each lecture series. These quizzes are to be used as a study aid and you will receive immediate detailed feedback after submitting your answers. The quizzes are to be attempted in your own time and each quiz will be accessible for a period of one week. You may attempt these quizzes as many times as you wish within this period. You will receive 2% towards your overall grade for each quiz provided you achieve a minimum score of 90% for the quiz.

**ALL MULTIPLE CHOICE QUESTIONS EXAMINING LECTURE AND TUTORIAL MATERIAL IN THE MIDSESSION AND END OF SESSION EXAMS WILL BE DRAWN FROM THE BANK OF QUESTIONS USED IN THE ONLINE QUIZZES THROUGHOUT THE SESSION.**

**PLEASE NOTE THAT THIS DOES NOT APPLY TO MULTIPLE CHOICE QUESTIONS BASED ON PRACTICAL CLASS MATERIAL – THESE QUESTIONS WILL NOT HAVE BEEN SEEN BY YOU PRIOR TO THE END OF SESSION EXAM.**

A timetable of online quiz dates and periods of accessibility will be posted up on blackboard early in the session.

**Please note that online feedback assessments are intended to motivate your study, provide feedback on your progress and to stimulate your learning. There is published data which demonstrates that students who participate in online feedback assessments perform significantly better than their peers in end of course examinations.**

When attempting each online feedback assessment, please complete it under exam conditions (by exam conditions, we mean you should do it by yourself, don't look up the answers as you do it, and commit yourself to an answer), at least the first time you attempt it. This will provide the most realistic appraisal of your performance.

Give yourself plenty of time, and attempt the feedback assessment in a place where you won't be interrupted. If you are attempting to simulate exam conditions, you should allow up to 2 minutes per question.

Write down items that you are not sure about as you go. Even if you get the question right you should still read further about anything that is unclear to you.

If you don't agree with, or can't understand the reason for an answer, ask the appropriate member of academic staff. If you are not sure who that is, ask your colleagues or the course convenor.

Technical problems regarding access to the assessment should be directed to Fiona Wilson (f.wilson@unsw.edu.au).

### **Practical Quizzes**

These are conducted immediately before some of the practical classes. These quizzes will contain a mixture of questions on that day's work and on the previous supervised practical class that you did. Please note that the self-directed learning classes on GIT and Renal Endocrine are not supervised practicals and questions on these practicals **will not** be included in the practical quizzes, however these practicals **will** be examined in the end of session exam. A minimum of three quizzes will be given throughout the session and your mark for this component will be an average of all of the quizzes you are given.

**10%**

### **TEXTBOOK**

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PRINCIPLES OF HUMAN PHYSIOLOGY by Cindy L. Stanfield, Benjamin Cummings, 5<sup>th</sup> edition, 2013. Books are available from the UNSW bookshop.

This textbook comes with an Interactive Physiology CD. Several self study sessions based on this Interactive Physiology CD have been designed to allow you to revise the lecture material in your own time. There is no set time allocated for these suggested self study sessions – you are encouraged to work through these sessions in your own time as a supplement to lectures and tutorials. Please refer to the end of this practical manual for further details on the self study sessions.

### **GENERAL INFORMATION**

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The Department of Physiology is part of the School of Medical Sciences and is within the Faculty of Medicine. It is located on the 3<sup>rd</sup> floor of the West Wing and the 5<sup>th</sup> floor of the East Wing of the Wallace Wurth Building. General inquiries can be made to the school teaching administrator

Carmen Robinson (9385 2464, carmen.robinson@unsw.edu.au) who is located on the Ground Floor of the Biological Sciences Building room G27.

**Professor Gary Housley** is Head of Department and appointments to see him may be made through email (G.Housley@unsw.edu.au).

**There is an honours program conducted by the School.** The Honours program is co-ordinated by Dr Andrew Moorhouse (a.moorhouse@unsw.edu.au). Any students considering an Honours year should discuss the requirements with the co-ordinator. Outstanding students may be considered for scholarships offered by the University and School and these are offered annually.

#### **Postgraduate research degrees**

The Department of Physiology offers students the opportunity to undertake a **Doctorate (Ph.D)**. For further information contact the co-ordinator, Dr Pascal Carrive (P.Carrive@unsw.edu.au).

**Departmental Vacation Scholarships:** The Department of Physiology supports several summer vacation scholarships each year to enable good students to undertake short research projects within the department. For information go to: <http://medicallsciences.med.unsw.edu.au/students/undergraduate/summer-research-awards>

### **ATTENDANCE REQUIREMENTS**

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**Attendance at practical classes is compulsory FOR ALL STUDENTS, and must be recorded in the class roll ON THE DAY OF THE CLASS. It is your responsibility to ensure that the demonstrator records your attendance and no discussions will be entered into after the completion of the class.** Satisfactory completion of the work set for each class is essential and **IS A REQUIREMENT FOR PASSING PHYSIOLOGY.** Non-attendance for other than documented medical or other serious reasons may make you ineligible to successfully complete this course. At the very least you may be required to pass an additional oral examination on the practical classes, as well as undertaking the normal practical exam and quizzes. Students who miss practical classes due to illness or for other reasons must submit a medical certificate to academic staff during lab time or leave it with a member of the technical staff located in room 118 East Wing Wallace Wurth Building **WITHIN 7 DAYS (practical classes only)** of missing a class. If received after this time, no consideration will be given and the student will be marked absent from that class. **The following details must be attached: Name, Student number, Course number, Group number, Date of the class, Name of class missed.**

**The practical component of the final exam is compulsory FOR ALL STUDENTS.**

**PLEASE NOTE** that missing any examination requires lodging a medical certificate with Student Central within **3 DAYS** (refer to UNSW Student Gateway @ [www.student.unsw.edu.au](http://www.student.unsw.edu.au) for further details).

### **OFFICIAL COMMUNICATION BY EMAIL**

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All students in courses PHSL2201, 2221 and 2502 are advised that e-mail is the official means by which the School of Medical Sciences at UNSW will communicate with you. All e-mail messages will be sent to your official UNSW e-mail address (e.g., z1234567@student.unsw.edu.au) and, if you do not wish to use the University e-mail system, you **MUST** arrange for your official mail to be forwarded to your chosen address. The University recommends that you check your mail at least every other day. Facilities for checking e-mail are available in the School of Medical Sciences and in the University library. Further information and assistance is available from DIS-Connect, ph. 9385 1777. Free e-mail courses are run by the UNSW Library.

## NOTICES

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All current timetables, notices and information relevant to you will be available on Blackboard. It is your responsibility to check Blackboard regularly.

All lectures are taped by either the Echo360 or the iletecture system and can be accessed via UNSW Blackboard. Textbooks and some reference materials are available through open reserve.

## TEACHING RESOURCES IN PHYSIOLOGY

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The Department of Physiology has chosen to use the UNSW Blackboard Learning platform to provide teaching material for all of its courses. Lecture notes and various learning materials will also be made available on Blackboard either before or shortly after the lecture.

For Blackboard direct access point your browser to:

<http://lms-blackboard.telt.unsw.edu.au/webapps/portal/frameset.jsp>

*System Requirement for Blackboard:*

<http://teaching.unsw.edu.au/blackboard-students-system-requirements>

UNSW Blackboard supports the following web browsers for Windows XP or VISTA.

- Internet Explorer (IE) version 7 or 9
- Firefox 3.0x (must run version 3.0.3 and above)

UNSW Blackboard supports the following web browsers for Mac 10.4 or 10.5 (Mac OS 10.3 is not supported)

- Firefox 3.0.x(must run version 3.0.3 and above)
- Safari 2 or 3

*Firefox is the preferred browser in both PC & Mac environment.*

## HANDWRITING

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Students whose writing is difficult to understand will disadvantage themselves in their written assessment. Make every effort to write clearly and legibly. Do not use your own abbreviations.

## APPLICATIONS FOR SPECIAL CONSIDERATION FOR MISSED ASSESSMENTS / EXAMS

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**Please note the following Statement regarding Special Consideration.**

If you believe that your performance in a course, either during session or in an examination, has been adversely affected by sickness or for any other reason, you should ask for special consideration in the determination of your results. Such requests should be made as soon as practicable after the problem occurs. **Special consideration sought more than three days after an examination in a course WILL NOT be accepted except in TRULY exceptional circumstances.**

An application for special consideration must be made via Online Services in myUNSW. **You must obtain and attach Third Party documentation (e.g. medical certificates) before submitting the application. Failure to do so may result in the application being rejected.** Log into myUNSW and go to My Student Profile tab > My Student Services channel > Online Services > Special Consideration. Once completed, submit to [UNSW Student Central](#). In addition to this, you should also inform the course convenor that you have applied for special consideration.

If you miss an assessment and have applied for Special Consideration, this will be taken into account when your final grade is determined. You should note that marks derived from completed assessment tasks may be used as the primary basis for determining an overall mark e.g. by extrapolating from your percentile rank on those tasks. Where appropriate, supplementary examination may be offered, but only when warranted by the circumstances.

Normally, if you miss an exam (without medical reasons) you will be given an absent fail. If you arrive late for an exam no time extension will be granted. It is your responsibility to check timetables and ensure that you arrive with sufficient time.

Please refer to <https://my.unsw.edu.au/student/atoz/SpecialConsideration.html> for further details regarding special consideration.

## **REPEATING STUDENTS**

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Practical class exemptions may be granted to repeat students but students **must** check with the course co-ordinator whether they have exemption **prior** to their first practical class. All students must be familiar with the material covered in the practical classes. All students must do the practical component of the final exam.

## **CONTINUAL COURSE IMPROVEMENT**

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Periodically student evaluative feedback on the course is gathered, using among other means, UNSW's Course and Teaching Evaluation and Improvement (CATEI) Process. Student feedback is taken seriously, and continual improvements are made to the course based in part on such feedback. Significant changes to the course will be communicated to subsequent cohorts of students taking the course.

## **STUDENT SUPPORT SERVICES**

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Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course co-ordinator prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or <http://www.studentequity.unsw.edu.au/>). Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

## **STUDENT RIGHTS AND RESPONSIBILITIES**

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Refer to UNSW Student Gateway @ [www.student.unsw.edu.au](http://www.student.unsw.edu.au)

## **ACADEMIC HONESTY AND PLAGIARISM**

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The School of Medical Sciences will not tolerate plagiarism in submitted written work. The University regards this as academic misconduct and imposes severe penalties. Evidence of plagiarism in submitted assignments, etc. will be thoroughly investigated and may be penalised by the award of a score of zero for the assessable work. Flagrant plagiarism will be directly referred to the Division of the Registrar for disciplinary action under UNSW rules.

The following material has been taken from the University's guidelines entitled "Student Academic Integrity and Managing Plagiarism: Guidelines for Staff" (Version: 1.0 20 February 2012). The full document can be viewed at:

(<https://www.gs.unsw.edu.au/policy/documents/studentacademicintegrityandmanagingplagiarismguidelines.pdf>)

*“Plagiarism is the presentation of the thoughts or work of another as one’s own. It can take many forms, from deliberate cheating to accidentally copying from a source without proper acknowledgement. In many cases, plagiarism may be the result of inexperience or poor academic skills, rather than the deliberate intention to deceive.*

*UNSW groups plagiarism into the following categories:*

- **Copying:** using the same or very similar words to the original text or idea without acknowledging the source or using quotation marks. This also applies to images, art and design projects, as well as presentations where someone presents another’s ideas or words without credit.
- **Inappropriate paraphrasing:** changing a few words and phrases while mostly retaining the original structure and information without acknowledgement. This also applies in presentations where someone paraphrases another’s ideas or words without credit. It also applies to piecing together quotes and paraphrases into a new whole, without referencing and a student’s own analysis to bring the material together.
- **Collusion:** working with others but passing off the work as a person’s individual work. Collusion also includes providing your work to another student before the due date, or for the purpose of them plagiarising at any time, paying another person to perform an academic task, stealing or acquiring another person’s academic work and copying it, offering to complete another person’s work or seeking payment for completing academic work.
- **Duplication:** submitting your own work, in whole or in part, where it has previously been prepared or submitted for another assessment or course at UNSW or another university.

*Plagiarism can vary in its nature, extent and level of seriousness. In consideration of this, UNSW has adopted a four stage approach to deal with allegations about students’ work.”*

Further information on plagiarism and its management can be found at the web address given above.

*“The Learning Centre serves as the central UNSW resource on academic integrity and understanding and avoiding plagiarism.*

*Resources are available at [www.lc.unsw.edu.au/plagiarism](http://www.lc.unsw.edu.au/plagiarism).*

*The Learning Centre provides a range of programs and resources for staff and students including website materials, workshops, individual tuition and online tutorials to aid students in:*

- correct referencing and citation practices
- paraphrasing, summarising, essay writing, and time management
- appropriate use of and attribution for, a range of materials including text, images, formulae and concepts.”

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

## **APPEAL PROCEDURES**

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Refer to UNSW Student Gateway @ [www.student.unsw.edu.au](http://www.student.unsw.edu.au).

## **GRIEVANCE RESOLUTION OFFICER**

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In case you have any problems or grievance about the course, you should try to resolve it with the Course Co-ordinator (Dr Lesley Ulman 9385 3601). If the grievance cannot be resolved in this way, you should contact the School of Medical Sciences Grievance Officer, Dr P.Pandey (9385 2483, [P.Pandey@unsw.edu.au](mailto:P.Pandey@unsw.edu.au)).

# TIMETABLES

**SESSION 2: 2013**

**LECTURES AND TUTORIALS**

Week No. Commencing	LECTURE Tuesday 9am CLB 7	LECTURE Wed 9am CLB 7	LECTURE Friday 3pm Lecture-CLB 7 Tutorials-Mathews A, C & D, Biomed B & E, LG03, CLB 7
1 29-Jul	<b>Introduction</b> ULMAN	<b>Temperature Regulation</b> GIBSON	<b>Endocrine 1</b> LEWIS
2 5-Aug	<b>Endocrine 2</b> LEWIS	<b>Endocrine 3</b> LEWIS	<b>Endocrine 4</b> LEWIS
3 12-Aug	<b>Endocrine 5</b> LEWIS	<b>Reproduction 1</b> HAN	<i>Tutorial – Endocrine</i>
4 19-Aug	<b>Reproduction 2</b> HAN	<b>Reproduction 3</b> HAN	<b>Respiration 1</b> SANDOW
5 26-Aug	<b>Respiration 2</b> SANDOW	<b>Respiration 3</b> SANDOW	<b>Respiration 4</b> SANDOW
6 2-Sep	<b>Respiration 5</b> SANDOW	<b>Respiration 6</b> SANDOW	<i>Tutorial – Respiration</i>
7 9-Sep	<b>Gastrointestinal Tract 1</b> BRITTON	<b>MID SESSION EXAM</b>	<b>Gastrointestinal Tract 2</b> BRITTON
8 16-Sep	<b>Gastrointestinal Tract 3</b> BRITTON	<b>Gastrointestinal Tract 4</b> GIBSON	<b>Gastrointestinal Tract 5</b> BRITTON
9 23-Sep	<b>Gastrointestinal Tract 6</b> <b>Appetite control</b> MORRIS	<b>Gastrointestinal Tract 7</b> BRITTON	<i>Tutorial – GIT</i>
<b>MID-SEMESTER BREAK 28<sup>TH</sup> Sept – 7<sup>th</sup> Oct</b>			
10 7-Oct	<b>NO LECTURE</b>	<b>Kidney &amp; Body Fluids 1</b> GIBSON	<b>Kidney &amp; Body Fluids 2</b> GIBSON
11 14-Oct	<b>Kidney &amp; Body Fluids 3</b> GIBSON	<b>Kidney &amp; Body Fluids 4</b> GIBSON	<b>Kidney &amp; Body Fluids 5</b> GIBSON
12 21-Oct	<b>Kidney &amp; Body Fluids 6</b> GIBSON	<b>Kidney &amp; Body Fluids 7</b> GIBSON	<i>Tutorial –Kidney</i>
13 28-Oct	<b>NO LECTURE</b>	<b>NO LECTURE</b>	<b>NO LECTURE</b>

**SESSION 2: 2013**

**PRACTICAL TIMETABLE**

	<b>day &amp; time</b>	<b>date</b>	<b>group</b>	<b>Supervised practical Wallace Wurth East Wing LAB 115</b>	<b>group</b>	<b>Self-directed computer class Wallace Wurth East Wing LAB 116</b>
1	Tues 10-1 Tues 2-5 Wed 10-1	30/7 30/7 31/7	All groups	<b>NO PRACTICALS</b>		
2	Tues 10-1 Tues 2-5 Wed 10-1	6/8 6/8 7/8	1&2 3&4 5&6	<b>TEMPERATURE REGULATION</b>		
3	Tues 10-1 Tues 2-5 Wed 10-1	13/8 13/8 14/8	7&8 9&10 11&12	<b>TEMPERATURE REGULATION</b>		
4	Tues 10-1 Tues 2-5 Wed 10-1	20/8 20/8 21/8	1&2 3&4 5&6	<b>THYROID PHYSIOLOGY</b>		
5	Tues 10-1 Tues 2-5 Wed 10-1	27/8 27/8 28/8	7&8 9&10 11&12	<b>THYROID PHYSIOLOGY</b>		
6	Tues 10-1 Tues 2-5 Wed 10-1	3/9 3/9 4/9	1&2 3&4 5&6	<b>ENDO/REPRO PHYSIOLOGY</b>		
7	Tues 10-1 Tues 2-5 Wed 10-1	10/9 10/9 11/9	7&8 9&10 11&12	<b>ENDO/REPRO PHYSIOLOGY</b>		
8	Tues 10-1 Tues 2-5 Wed 10-1	17/9 17/9 18/9	1&2 3&4 5&6	<b>RESPIRATORY GAS EXCHANGE</b>		
9	Tues 10-1 Tues 2-5 Wed 10-1	24/9 24/9 25/9	7&8 9&10 11&12	<b>RESPIRATORY GAS EXCHANGE</b>	1&2 3&4 5&6	<b>SELF DIRECTED LEARNING GIT</b>
<b>MID-SEMESTER BREAK 28<sup>TH</sup> Sept – 7<sup>th</sup> Oct</b>						
10	Tues 10-1 Tues 2-5 Wed 10-1	8/10 8/10 9/10	1&2 3&4 5&6	<b>CONTROL OF RESPIRATION</b>	7&8 9&10 11&12	<b>SELF DIRECTED LEARNING GIT</b>
11	Tues 10-1 Tues 2-5 Wed 10-1	15/10 15/10 16/10	7&8 9&10 11&12	<b>CONTROL OF RESPIRATION</b>	1&2 3&4 5&6	<b>SELF DIRECTED LEARNING RENAL ENDOCRINE</b>
12	Tues 10-1 Tues 2-5 Wed 10-1	22/10 22/10 23/10	1&2 3&4 5&6	<b>VOLUME &amp; SOLUTE CONTROL</b>	7&8 9&10 11&12	<b>SELF DIRECTED LEARNING RENAL ENDOCRINE</b>
13	Tues 10-1 Tues 2-5 Wed 10-1	29/10 29/10 30/10	7&8 9&10 11&12	<b>VOLUME &amp; SOLUTE CONTROL</b>		

**COMPULSORY LAB COATS REQUIRED FOR "SHADED" CLASSES**

# **LECTURE OUTLINES**

### TEMPERATURE REGULATION

1. Normal body temperature. Core and shell. Heat transfer, heat production, heat loss by conduction, convection, radiation and evaporation. Temperature regulation – concept of set point; hypothalamic centres, afferent and efferent mechanisms. CVS homeostasis in heat. Heat acclimatization. Fever.

### ENDOCRINOLOGY

1. **Mechanisms of hormone action.** The endocrine glands: common characteristics of endocrine glands. Hormones are chemical signals: amines, peptides, proteins and steroids. Transport of hormones. Endocrine, paracrine and autocrine action. Control of hormone secretion; concepts of hierarchical and feedback control mechanisms. Receptor signaling cascades.
2. **Simple feedback-loop endocrine systems.** Structure and function of the pancreas. Control of insulin and glucagon secretion: regulation of plasma glucose. Type I and type II diabetes. The heart and atrial natriuretic peptides: regulation of plasma volume. The kidneys and erythropoietin. The thymus gland.
3. **The hypothalamus and pituitary gland.** Interactions between the hypothalamus and pituitary. Control of the hypothalamus. Hypothalamic releasing hormones. Anterior and posterior pituitary hormones. Control of synthesis, secretion and actions of pituitary hormones. Hypothalamic-pituitary feedback. Pituitary hormone dysfunction.
4. **The thyroid gland.** Thyroid structure and histology. Synthesis of thyroid hormones. Control of thyroid secretion. Function of thyroid hormones. Hyperthyroidism and hypothyroidism. Parathyroid hormone and calcitonin.
5. **Adrenal gland.** Adrenal structure and histology; adrenal cortex and medulla. Synthesis and secretion of adrenal steroids from the cortex and catecholamines from the medulla. Function of adrenal hormones. Interaction of aldosterone with the renin-angiotensin system of the kidneys.

### REPRODUCTION

1. **Male reproductive system.** A description of the function of each component of the male reproductive tract. The hormonal control of testosterone production and spermatogenesis by the hypothalamic-pituitary axis. Composition of semen. Actions of testosterone.
2. **Female reproductive system.** A description of the function of each part of the female reproductive tract. Hormonal control of the menstrual cycle: the growth of a follicle in the ovary and the hypothalamic-pituitary axis. Actions of oestrogen and progesterone.

3. **Pregnancy.** The process of fertilization of an ovum by sperm and the implantation of the developed blastocyst in the uterine lining. The production of hormones by the placenta to maintain pregnancy. The interaction between the mother, the placenta and the fetus in steroid hormone synthesis.

## RESPIRATORY SYSTEM

- 1 **Anatomical features of the mammalian respiratory system and their physiological significance.** Basic lung-airway anatomy; relation to function. Airway and air flow properties in respiration. Pulmonary circulation, bronchial tree, alveoli and particle removal mechanisms. Gas laws. Gas solubility. Gas tension in a solution. Composition of air.
- 2 **Ventilation.** Lung volumes and capacities. Spirometry. Residual volume. Ventilation. Dead space and alveolar ventilation. Oxygen uptake / carbon dioxide output / respiratory exchange ratio.
- 3 **Oxygen transport.** Composition of alveolar air at rest. Venous and arterial blood gas tensions. Blood oxygen transport - need for a carrier. The haemoglobin molecule. Oxygen capacity, saturation and content. Hb-O<sub>2</sub> equilibrium curve (OEC) and its features (shape, CO<sub>2</sub> and pH (Bohr), temperature effects, 2,3 DPG). Haemoglobin compared to myoglobin. Carbon monoxide poisoning.
- 4 **Carbon dioxide transport and blood buffering.** CO<sub>2</sub> transport in blood. Effect of oxygenation on CO<sub>2</sub> transport (Haldane effect). Blood CO<sub>2</sub> equilibrium curves. Acids and bases - fundamental concepts. Henderson Hasselbalch Equation. Blood buffering systems. Importance of haemoglobin. Acid-base disorders (briefly).
- 5 **Respiratory Mechanics.** Muscles of respiration. Elastic properties of the lung. Compliance. Surface tension. Surfactant. Elastic properties of the chest wall. Compliance of lungs and chest wall. Relaxation pressure-volume curves. Airway resistance. Intrapleural and intra-alveolar pressures and gas flow during the respiratory cycle.
- 6 **Control of Respiration.** 'Central controller' (pre-Botzinger complex - critical for rhythm generation in breathing) and role of the medulla and pons. Respiratory related neurones. Sensors: Chemical control of breathing via central chemoreceptors and peripheral chemoreceptors (carotid and aortic bodies). Other receptors in lungs, upper airways etc. Interaction of O<sub>2</sub> and CO<sub>2</sub> in control of respiration. Role of pH. Control of respiration in exercise.

## GASTROINTESTINAL SYSTEM

1. **Overview of gastrointestinal tract (GIT).** Structure and function of the GIT. Anatomy of the GIT wall. Patterns of GIT motility. Physiological basis of GIT motility. Enteric nervous system. Digestive reflex processes. Digestive processes occurring in the mouth, composition of saliva and control of salivation. Swallowing. (FB)
2. **Gastric secretion, motility and emptying.** Stomach anatomy. Composition and function of gastric secretions. Mechanism of gastric acid secretion. Factors regulating gastric acid secretion. Overview of gastric motility, filling and emptying. Vomiting. Gastric ulcers. (FB)

3. **Digestive processes of the small intestine.** Structure of the small intestine and its role in digestion and absorption. Composition of pancreatic juice. Regulation of pancreatic juice secretion. Pancreatic enzymes and brush border enzymes. Motility in the small intestine. Motility disorders. (FB)
4. **Liver and biliary system.** Functional anatomy of the liver. Liver blood flow. Functions of the liver. Formation and secretion of bile. Bile salts. Bilirubin metabolism and secretion. The gall bladder. Factors causing gall bladder contraction. Gallstones. (KG)
5. **Chemical digestion and absorption of nutrients.** Enzymatic hydrolysis of carbohydrate, protein and lipid. Trans-epithelial absorption and active transport of nutrients. Absorption of vitamins, electrolytes and water. Food allergies. (FB).
6. **Appetite control:** Factors that control appetite in the short and long term. Role of the brain in appetite control - brain:gut communication and the importance of adipose tissue as an endocrine organ. What goes wrong in obesity? (MJM)
7. **Digestive Processes of the Large Intestine.** Structure and function of the large intestine. Absorption of water and electrolytes. The role of bacterial flora in the colon. Motility of the large intestine. Defecation. (FB)

### KIDNEY AND BODY FLUIDS

1. **Body fluids and introduction to the kidney.** Properties of solutions. Osmosis, osmolality, osmolarity, tonicity, osmotic pressure, colloid osmotic pressure. Volume and composition of the body fluid compartments. Functions of the kidneys. Basic anatomy of the urinary system.
2. **Renal structures, renal blood flow and glomerular filtration.** Structure of the nephron. Cortical and juxtamedullary nephrons. The juxtaglomerular apparatus. Basic steps in forming urine. Renal blood flow and pressure in the renal vessels. Autoregulation. The renin angiotensin system. Renal sympathetic nerves. Glomerular filtration and glomerular filtration rate (GFR). Equation for single nephron GFR. Filtration fraction. Effects of arteriolar tone on RBF and GFR.
3. **Reabsorption and secretion; Evaluating renal function.** Measurement of GFR. Measurement of renal plasma flow. Concept of effective renal plasma flow. Definition and calculation of clearance. Calculation of filtered load, excretion rate, net reabsorption or secretion. Comparison of filtrate and urine. Basic mechanisms of transepithelial transport. Transepithelial transport of sodium, water, glucose. Tm limited reabsorption.
4. **Tubular structure and function along the nephron; Renal water homeostasis.** Structure and function of the proximal tubule. Glomerulotubular balance. Transport properties of the loop of Henle, distal convoluted tubule and collecting duct. Water balance. Regulation of plasma osmolality. Thirst. Making a dilute or concentrated urine. Obligatory water loss.
5. **Urinary concentrating mechanisms; Renal sodium homeostasis.** The medullary osmotic gradient and its generation and maintenance: countercurrent multiplication, urea recycling and countercurrent exchange. Antidiuretic hormone. Aquaporins, Protecting renal medullary cells from hypertonicity. Sodium balance. Sodium and

extracellular volume. Detecting changes in sodium intake. Efferent mechanisms to vary sodium output.

6. **Renal sodium and potassium balance.** Hormones involved in sodium balance. Angiotensin II. Aldosterone. Atrial natriuretic peptide. Potassium balance. Exchange of potassium between extracellular and intracellular fluid. Renal handling of potassium. Mechanism of potassium secretion by principal cells. Factors affecting potassium secretion.
7. **Renal acid-base balance.** Brief revision of fundamental concepts and body acid base balance. Role of the kidneys in acid-base balance. Equation for net acid excretion. Bicarbonate reabsorption. Secretion of H<sup>+</sup> and manufacture of bicarbonate. Urinary buffers and excretion of acid as titratable acid and ammonium. Renal response to acidosis and alkalosis.

## LABORATORY REGULATIONS AND BEHAVIOUR

Health and Safety is a primary concern for both students and staff working in any laboratory.

**The following regulations MUST be adhered to when participating in Physiology practical classes:**

- Each practical class has a student risk assessment (SRA) and a student safe working procedure (SSWP) associated with it.
- The SRA identifies the hazards and risks associated with the particular practical and outlines appropriate controls that must be followed to minimize these risks. The SRA also lists the personal protective equipment (PPE) that students are required to wear for that class, emergency procedures and clean up and waste disposal instructions.
- The SSWP provides background information relating to the class and outlines the procedures to be carried out in that class.
- Students must read the practical notes and sign the SRA prior to commencing the class.
- In each laboratory there are also more comprehensive school approved risk assessments, associated safe work procedures and safety data sheets (SDS) for each particular class. You may refer to these if you require further information. First aid kits and specific spill kits are also located in the laboratories.
- If any accidents or incidents occur they should be reported immediately to the demonstrator in charge of the class who will record the incident and recommend what further action is required.
- Random tests will be given throughout the session prior to the class, to encourage adequate preparation by the students. The results of these tests will contribute 10% of your assessment for the session.
- Students are required to wear the appropriate PPE for each class. Enclosed shoes are mandatory for entering any laboratory (other than computer classes) and you will not be permitted to participate in the practical if you are not wearing appropriate footwear. Most practical classes will also require a lab coat which you must provide. You must regularly wash your lab coat. If you do not bring your lab coat to these classes you will not be able to participate.
- Many classes will require you to wear gloves (which will be provided). Gloves must be removed before writing in lab books and using computers or other electrical equipment.
- You must not wear lab coats or gloves outside the laboratory.
- You must not eat or drink in any laboratory.
- Students are expected to arrive on time. Any student arriving more than 10 minutes late may be refused entry.
- Mobile phones should be turned off before entering the class.
- Laboratory computers may only be used for work relating to the practical class.
- It is expected that students behave appropriately in laboratory classes. In the event of inappropriate behavior students may be asked to leave.
- It is of course vital that animals used in practical classes **MUST** be treated humanely and with respect. Taking photos is **ABSOLUTELY UNACCEPTABLE**, and will result in removal from the class and a referral to the Head of Department.

The procedures used in the laboratory classes involving the use of animals have been approved by the Committee on the Use of Animals in Research and Teaching (CUART registration number ACEC 13/66B expiring 10/6/16).

Experiments in this manual, which involve the use of human subjects, have been considered and approved by the University's Committee on Experimental Procedures Involving Human Subjects. Practical classes involving your participation as a subject require you to sign a witnessed, informed consent form.