Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Department of Physiology

Allied Health Sciences (AHS)

Student Handbook & Study Guide

2025–2026

School……. Name……

Allied Health Sciences (AHS)

JS Biomedical Engineering (EEU33BM1)

Msc Biomedical Engineering (ME7B04)

Course Co-ordinator: Prof. Mark Cunningham

Dr. Roisin McMackin

Discipline of Physiology

Trinity College Dublin, The University of Dublin.

Note. In the event of any conflict or inconsistency between the general regulations published in the *University Calendar* and information contained in this *Handbook*, the provisions of the General Regulations will prevail.

Contents

Introduction

Welcome to the Department of Physiology, Trinity College, Dublin. Physiology is the science of how the body works. It describes how cells operate, how they combine their functions in specific organs, and how these organ systems work together to maintain a stable environment inside the body. Physiology is the functional basis of the health sciences because most disease states are the result of disturbances of physiological processes. A basic knowledge of Physiology is therefore essential for all students whose professional careers will be involved with aspects of health and patient care. This course in *Allied Health Sciences (AHS) Physiology,* which runs in Hilary Terms, is designed to provide you with core knowledge of normal bodily function as the basis for your future application of Physiology to therapeutic practice. By the end of the course, you should *be able to*:

- Describe the structural characteristics of the basic mammalian cell types.
- Explain the functional roles of these cell types and how they interact in the various organ systems studied during the course.
- Explain the mechanisms by which these different organ systems are controlled in the normal human body.
- Give examples of the functional interrelationships that normally exist between the organ systems during daily life.
- List typical normal values for those physiological variables commonly used in clinical practice.

We strongly recommend that you actively engage with course and study for deep knowledge as the course proceeds. Do not give in to the temptation to leave Physiology until later. Physiology needs to be integrated; it is very hard to 'learn off'. It gets easier the more you know, so be prepared to go over the material more than once.

Prof Mark Cunningham (October 2025)

Staff Details:

Teaching Staff:

Prof Mark Cunningham (*Module Co-ordinator*)	Email: mark.cunningham@tcd.ie
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Prof Áine Kelly	Email: aikelly@tcd.ie
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Administration Staff:

Physiology Department Website: https://www.tcd.ie/medicine/physiology/

Admin Officer Physiology: Ms Danielle Fernandes Email: fernand3@tcd.ie

General Information

Academic Support

- For help or advice about **specific lecture topics**, talk to the lecturer involved.
- For advice on **assessment procedures**, talk to the Module Co-ordinator.
- For additional supports related to a **disability**, talk to Dr Áine Kelly, the Contact Person for Disability Support in the Department of Physiology.
- For **personal** or **College matters**, contacting your College Tutor should be your first recourse.

How to Use this Handbook

This handbook has been designed to help you orientate yourself within the course and to provide important information regarding the lecture series, staff contacts, assessment, revision, and timetabling. Please take the time to read through it before commencing your studies and use it as the key reference to the course and to help you plan your work week by week.

Student Evaluation of the Course

The Department is very interested in the student reaction to its teaching and there is an active programme of obtaining and examining student evaluation of the course. The process of evaluation has no relation to any academic assessment and is part of the development of the course. Evaluation is carried out principally by questionnaires. Simple questionnaires will be given out at intervals during the course and should be completed and returned as indicated by the lecturer. We very much appreciate your co-operation in this, and we will ensure that there is ample room for general comments as well as answering specific questions.

General Teaching Information

Syllabus

The course commences in Academic Week 22 (Week 1, Hilary Term) with lectures presented in *units* (denoted by abbreviation) on various organs/physiological systems:

- Cells, tissues and body organisation (C&T)
- Nervous and sensory systems (N&S)
- Muscle function (MSC)
- Cardiovascular system (CVS)
- Respiratory system (RESP)
- Digestion and metabolic processes (D&M)
- Renal system (REN)
- Reproduction (REP)

Thus, the first three units are mainly concerned with basic functions of organelles, cells, and tissues. This knowledge forms the basis of systems physiology. Systems Physiology *is concerned with how tissues combine to form organ systems that work together for particular functions (cardiovascular, respiratory, digestive, etc). This integration implies a degree of control or regulation, and this is the aspect on which you should focus.*

Lectures

Attendance at lectures is essential (apart from being a Trinity requirement in JF and SF years; and a requirement for some professional courses). *The lecture course defines the level of knowledge that*

you should have in order to pass the final examination. Some essential facts may be given in lectures that are NOT contained in the recommended textbook. Therefore, attendance at lectures is to your benefit. The recommended textbook contains MORE information than is given in the lectures. This may be helpful to you in understanding the lecture material; you will be guided by your lecturers on what information is required for this course. The lecture synopses in this handbook include recommended reading in the course textbook. It is good practice to read this material *before* each lecture. Students frequently state that they are unsure of the level of detail required. Attendance at the lectures is the only reliable way to determine this.

Mutual respect

Students are expected to arrive on time, to refrain from using mobile phones and to respect other students and the lecturer by suspending unnecessary conversation.

With respect to punctuality, all lectures will be held according to the timetable in this handbook, unless otherwise announced. Lectures are scheduled to commence on the hour and finish at 10 minutes to the hour. Most lectures start with an outline and, unless you arrive on time, you may miss important information and disadvantage yourself in future classes or even in the examinations.

Lecture Slides.

Lecturers will make their PowerPoint slides available as pdf documents on Blackboard. They are intended to serve as a reminder of the lecture content to supplement your own notes and contain key illustrations based on those in the course textbook. These are *not* lecture notes. Do not use the lecture slides as a substitute for attendance at lectures.

Announcements

The main means of communication is by email or Blackboard announcement. The only official source of information about examination setup and timetables is Examinations Office via the Academic Registry website: https://www.tcd.ie/academicregistry/exams/student-guide/

Textbooks

The following is the core textbook for this course and is available in various libraries on campus and from Hodges Figgis bookshop in Dawson St, Dublin, on the Academic floor.

Stanfield, C & Germann, WJ. *Principles of Human Physiology* 4th edition Pearson (ISBN 9780321733672).

Students are advised to own, or at least to have guaranteed access to, a copy of this book. It is **strongly recommended** that you take the time to read the relevant pages in Stanfield & Germann as outlined for each lecture topic *before the beginning of the lecture*. If you understood everything in Stanfield & Germann, you would be sure of a top-class performance in the examination. However, few reference sources are perfect and, on occasion, lecturers may provide additional information or draw your attention to errors or outdated information within the book. Similarly, lecturers may refer you to a more specialised textbook for critical information.

No Biology?

Students who have not previously studied Biology should make a special effort to get a basic grounding from a Leaving Certificate or JF Biology text as soon as possible. The key areas are cell structure and function and basic functions of the organs of the body. Important general concepts are basic vertebrate anatomy, evolution and basic genetics.

The JF Biology text is:

Biology by Campbell, NA & Reece, JB.

There are multiple copies in the Hamilton reserve collection and the Hamilton lending collection.

Study Skills

The Student Learning Development have a collection of learning resources to help support you in your study. You will find these at the following website:

https://student-learning.tcd.ie/learning-resources/study-skills/

Assessment

The Allied Health Sciences course in Physiology is assessed by formal exam as 100% of your module. This module uses 2 forms of standard assessment in the annual examination paper. Please read the descriptions below carefully and familiarise yourself with the assessment procedures that will be used in this course.

Annual Examination

All student groups undertaking this course will be assessed *via* a written examination in the Trinity Term. The examination is 1.5 hours in duration for JS and Msc Biomedical. As soon as times are announced by the Examinations Office, they will be posted via your student portal and the Academic Registry website. *Remember that the only official source of information for exams is the Examination Office website and you should check it carefully.*

The paper will consist of:
A multiple-choice section. This section is allocated 100% of the time and is worth 100% of the marks. (There is no negative marking).

In accordance with Trinity's regulations, anonymous marking is used. After marking and careful checking, examination results are scrutinised by the Departmental Court of Examiner's Meeting, who ratify the final marks for the module. The final results for each school are discussed at the School's Court of Examiners and approved for release to students.

The pass mark for JS is 40% and Msc Biomedical Engineering is 50%.

If a student fails to achieve the required Pass Mark for the module at the annual examination sitting, they will be required to sit a reassessment during Supplemental Session in August/September. As with the annual exams dates are set and released to students by Examinations Office.

IMPORTANT: Under no circumstances will Physiology staff discuss performance in the examination, or release any marks, before the formal release of marks set down by Examinations Office.

Supplemental Examination

In most circumstances, students who fail at the final examination stage may sit a Supplemental examination in August/September. The format of the Supplemental is the same as that of the Final Examination. After marking and careful checking, examination results are scrutinised by the Departmental Court of Examiner's Meeting, who ratify the final marks for the module.

The final results for each school are discussed at the School's Court of Examiners and approved for release to students.

Any further information regarding examinations in individual Schools and subjects can be obtained from the Trinity College *Calendar* either in hard copy, or on the web at:
https://www.tcd.ie/calendar/

Examination Technique

Format of examination papers

The general format of the paper and the types of question asked can be seen by looking at previous papers on the College website or in this handbook. However, different questions are asked from year to year and some of the material covered in the course also changes over time. Staff changes may result in a different emphasis in the questions. Therefore, DO NOT rely solely on old examination papers to guide your revision of a subject.

Special Accommodations. Students registered with Disability Services may have extra time and other supports by arrangement with the Disability Services Team.

Use of time

Make sure you are familiar with the recommended times to be spent on each section of the paper.

- For the written answers, we recommend that you do not spend more than about 10-12 minutes on any one question. (This allows 3-4 minutes for *planning* each answer, 3-4 minutes for *writing* the answer, and 3-4 minutes to *review* it.)
- For the multiple-choice section, we recommend that you do not spend more than about 1½ minutes on any one question.

Using these time guidelines, the **best strategy** for planning the 2- or 3-hour period is:

1. Answer the questions you feel surest about in both sections of the paper, keeping to the recommended times for each section.
2. **Only then**, go back to the questions you are unsure about and spend the remaining time on them. When returning to these more difficult questions, remember that each written answer question carries the same number of marks as approximately 10 multiple-choice questions.
3. Please ensure that you complete the cover page of your exam paper with your name, student number, seat number and anonymous number in the designated spaces provided.
4. Follow the instructions on the front cover and within the exam booklet (see pages 12-13 for details).
5. Make sure that you answer each SAQ in the space provided in your exam paper. This is essential in order for the examiners to find the answers. Please ensure that all rough work is also included in your exam booklet. (See page 16 for sample layout)
6. Your name and ID number should only appear in the box in the bottom right of the cover page. Put your **Exam (Anon) number** and **Seat Number** in the boxes provided.
7. All MCQs should be Answered on the pink MCQ sheet only. Future details will be provided on this below on how to complete the sheet in (

Exam Cover Page Template

FACULTY OF HEALTH SCIENCES

Disciplines of Physiology

JF Pharm/SF RT/JF CSLS Hilary Term 2026

Allied Health Sciences
Paper 1 - MCQ

X May 2026 Venue Start Time: X am/pm

Prof Mark Cunningham

Time allowed: 2.5 hours

Instructions to candidates:

ANSWER ALL QUESTIONS IN THIS QUESTION-ANSWER BOOK OR MCQ SHEETS PROVIDED ONLY.

- Write your ID number on the MCQ answer sheet.
- Instructions can be found at the beginning of the section.
- Please read all instructions carefully before you begin.
- Please turn to next page to begin.

Materials permitted for this examination:

Calculator

MCQ Form A-E

Instructions for the Exam Paper

SECTION MCQ Instructions for candidate

- Write your name, and your seat, exam and student number on the MCQ form provided.
- Indicate your **student number by shading in the boxes.**
- Answer the multiple-choice questions below by shading in the appropriate boxes with a **HB pencil** on the MCQ form provided.
- Rub out clearly with an eraser if you wish to make corrections.
- Each correct answer is awarded **1 mark**.
- Each unanswered or unclearly marked answer will not receive any marks.

Physiology MCQs

Answer on the pink MCQ form provided using a pencil. - **Note carefully the instructions given on this form.**

Recommended time: 75/60 mins: Questions 1 – 45

Give the single most correct answer.

These are *not* intended to be answered in essay form and you *must* answer in the *requested form*.

- If the question asks for a written response ('write notes on…', 'briefly describe…' etc), make sure that your answer is short and that it is relevant to the question.
- Avoid writing an answer to another related question that you have prepared.
- If the question asks for a **list** or a **table**, answer in this form to get full marks.
- If the question asks for a **diagram**, make sure you answer it with a diagram and label it appropriately. Even if you can't draw well, the examiners can assess your knowledge of the topic better than if you try to give a written answer.
- DO NOT write a long explanation to accompany a diagrammatic answer.
- You should never write more than a page — if you do, you are probably off the point and are wasting time.
- If you are asked to **calibrate** a graph, do it. Even if you are unsure about calibration values, try to indicate the parameters and their units.

- It is always worth making a few notes first. Then review them to make sure that you have answered all parts of the question and not gone off the point.

The purpose of the course is to equip you with knowledge of basic Physiological principles. The majority of the examination questions are intended to test this knowledge, even though they may be phrased in relation to a specific situation. Concentrate on physiological mechanisms and their regulation.

Multiple-choice questions (MCQ)

MCQs allow students to demonstrate their factual and conceptual knowledge more widely than is possible with the limited number of written questions that can be fitted into a single examination. We use MCQs that allow you to choose the one most appropriate answer out of five possibilities. Question formats are identical to those used in the US Medical Licensing Board examinations and several other professional examinations. Familiarity with these formats may be helpful for further professional examinations.

There are two distinct formats in which questions may be presented (examples below).

Type 1. The 'stem' is a statement or question; and a list of 5 possible answers. You must choose which ONE answer that is MOST correct; for example:

Question. The normal average height for a young adult European man is:

12 cm

18 cm

120 cm

180 cm

220 cm (Correct Answer D)

Type 2. This type of MCQ uses a stem consisting of five labelled features on a graphic, or five written statements, followed by one or more questions that refer to the stem. Each question involves matching a specific definition to the MOST APPROPRIATE of the five options in the stem, for example:

A. London
B. Dublin
C. Paris

D. Singapore

E. New York

Question. Where would you go to see the Statue of Liberty? (Correct Answer E)

Question. .....is NOT the capital city of its country. (Correct Answer E)

Notes

You should attempt *all* questions in the Physiology MCQ papers. Marks are not deducted for incorrect answers (that is, no negative marking).

Some questions take longer to read and interpret, but all are of equal value.

MCQs samples

Sample Questions from 2007-8 Exam paper

Answer on the pink form provided using a pencil

Note carefully the instructions given on this form

Fill in your student number carefully - Recommended time : 1 hour

Questions 1 – 45

Give the single most correct answer.

1. A patient complaining of respiratory problems is tested on a spirometer. The results show: FEV_1: 1.3L, FVC: 3.1L, Percentage: 42%

   Which of the following is the patient most likely to be suffering from?

   A. Chronic bronchitis.

   B. Pulmonary fibrosis.

   C. Blocked nose.

   D. Obesity.

   E. Anorexia.

2. At the summit of Mount Everest, the pressure of the dry atmospheric air (humidity = 0) is 231mmHg. Therefore the ambient partial pressure of oxygen (PO_2) is:
   A. 40 mmHg.
   B. 48 mmHg.
   C. 84 mmHg.
   D. 100 mmHg.
   E. 760 mmHg.

3. Phonation occurs:
   A. when the vocal chords are closed very tightly.
   B. when puffs of air burst up and 'excite' the air within the bronchioli and alveoli.
   C. normally during inspiration.
   D. all of the above.
   E. none of the above.

4. The basic function of epithelia is:
   A. to influence the differentiation of adjacent tissues.
   B. absorption.
   C. to regulate the passage of material across them.
   D. secretion.
   E. excretion.

5. Which of the following is a property of a membrane pump but not of a membrane carrier?
   A. Can be saturated.
   B. Affinity greater on one side.
   C. Flux depends on electrical gradient.
   D. Requires energy.
   E. Does not require energy.

6. Blood cell types involved in combating infection include:
   A. platelets.
   B. megakaryocytes.
   C. monocytes.

D. erythrocytes.

E. stem cells.

7. The haematocrit is:

A. the proportion of blood volume consisting of plasma.

B. higher in veins than in capillaries.

C. lower in men than in women.

D. normally around 55%.

E. none of the above.

8. In undamaged blood vessels, platelet adhesion is prevented by:

A. prothrombin.

B. prostacyclin.

C. plasmin.

D. Factor XII.

E. thromboplastin.

9. Chylomicrons enter lymph vessels BECAUSE:

A. lymph vessels are more permeable than capillaries.

B. fat is not distributed via the blood-stream.

C. lymph vessels are arranged countercurrent.

D. lymph vessels are nearer to the absorptive cells.

E. lymph vessels actively absorb chylomicrons.

10. Adaptive immunity is mediated by:

A. B and T cells.

B. phagocytosis.

C. inflammation.

D. skin.

E. mucous membranes.

11. Moderate haemorrhage will cause:

A. a fall in renal reabsorption of sodium.

B. decreased potassium loss in the urine.

C. elevated circulating levels of vasopressin.

D. decreased aldosterone secretion.

E. all of the above.

12. Ovulation is triggered by a surge in plasma concentration of:

A. follicle-stimulating hormone (FSH).

B. luteinising hormone (LH).

C. gonadotrophin-releasing hormone (GnRH).

D. testosterone.

E. prolactin.

13. During pregnancy, plasma oestrogens are essential for:

A. uterine quiescence.

B. proliferation of mammary ducts.

C. stimulation of placental progesterone synthesis.

D. induction of uterine prolactin receptors.

E. none of the above.

14. Maintenance of normal labour involves:

A. uterine stimulation by prolactin.

B. synthesis of catecholamines in the damaged uterine membranes.

C. activation of uterine beta-adrenoreceptors.

D. reflex release of oxytocin.

E. all of the above.

15. When the blood pressure falls slightly, the kidney releases:

A. angiotensinogen.

B. renin.

C. aldosterone.

D. erythropoietin.

E. vasopressin.

16. Gluconeogenesis is stimulated by:

A. glucagon.
B. insulin.
C. vitamin D.
D. intrinsic factor.
E. none of the above.

17. The diameter of an axon influences its:

A. resting membrane potential.
B. refractory period.
C. conduction velocity.
D. action potential amplitude.
E. both C and D above.

18. Influx of which ion into the presynaptic terminal triggers synaptic transmission?

A. Sodium.
B. Potassium.
C. Calcium.
D. Magnesium.
E. Chloride.

19. The main structure responsible for focusing light onto the retina is the:

A. cornea.
B. lens.
C. iris.
D. aqueous humour.
E. vitreous humour.

20. Contraction of the ciliary muscles of the eye:

A. focuses the eye on distant objects.
B. focuses the eye on near objects.
C. dilates the pupil.
D. constricts the pupil.

E. closes the eyelid.

21. A sound level of 50dB has an intensity:

A. 5 times greater than threshold.

B. 10 times greater than threshold.

C. 50 times greater than threshold.

D. 1000 times greater than threshold.

E. 100,000 times greater than threshold.

22. The vestibular apparatus in the ear can NOT detect:

A. orientation of the head.

B. linear acceleration of the body.

C. linear motion of the body at constant velocity.

D. angular (rotational) acceleration of the head.

E. none of the above (it can detect them all).

23. When a skeletal muscle fibre contracts:

A. the myosin filaments shorten.

B. the actin filaments shorten.

C. the I bands shorten.

D. the number of sarcomeres decreases.

E. each sarcomere remains constant in length.

24. During the phase of excitation-contraction coupling in skeletal muscle:

A. an action potential propagates along the T tubules.

B. calcium diffuses into the muscle from the extracellular fluid.

C. calcium is released from the T tubules.

D. calcium interacts with tropomyosin.

E. the intracellular free calcium level exceeds 10^{-2}M.

25. Recruitment of muscle fibres in skeletal muscle is due to:

A. more motoneurons being excited.

B. more transmitter being released from each motor axon terminal.

C. faster conduction of the muscle action potential.

D. increased Ca^{2+} release in the muscle fibre.

E. faster spread of muscle action potentials from fibre to fibre.

26. Visceral smooth muscle cells function together as a tissue because:

A. there is cytoplasmic continuity between neighbouring cells.

B. there are areas of membrane fusion between neighbouring cells.

C. there is chemical transmission between neighbouring cells.

D. each cell is innervated by autonomic axons.

E. the tissue is arranged in a large sheet.

27. Cardiac muscle exhibits:

A. tonic activity.

B. pacemaker activity.

C. modulation by alpha-motor neurons.

D. both A & B above.

E. all of the above.

28. The P wave of an ECG represents:

A. depolarisation of the AV node.

B. depolarisation of the atrial myocardium.

C. repolarisation of the atrial myocardium.

D. depolarisation of the ventricular myocardium.

E. repolarisation of the ventricular myocardium.

29. In the heart:

A. increasing plasma calcium concentration decreases the force of contraction.

B. the atrioventricular valves are open throughout most of diastole.

C. recruitment of muscle fibres increases the force of contraction.

D. the semilunar valves are open during isometric ventricular contraction.

E. blocking the action of the sympathetic nerves causes tachycardia.

30. Cardiac stroke volume:

A. equals end-systolic volume minus end-diastolic volume.
B. is approximately equal to end-diastolic volume at rest.
C. is increased when ventricular filling increases.
D. is decreased at heart rates above 120 beats per minute.
E. all of the above.

31. During the isovolumetric phase of ventricular relaxation:

A. blood flows from aorta to ventricle.
B. right coronary blood flow increases.
C. the intra-atrial pressure is at its minimum.
D. aortic pressure is falling.
E. the atrioventricular valves are open.

32. The flow of blood through any tissue is normally affected by all of the following EXCEPT:

A. the viscosity of the plasma.
B. the diameter of the arterioles.
C. the perfusion pressure gradient.
D. the haematocrit.
E. the sympathetic vasoconstrictor tone.

33. In normal circumstances the largest volume of blood is located in the:

A. heart.
B. large arteries.
C. capillaries.
D. systemic veins.
E. pulmonary veins.

34. During the initial phase of inspiration:

A. intra-abdominal pressure falls.
B. intrapleural pressure falls.
C. intrapulmonary pressure falls.
D. both A & B.
E. both B & C.

35. At the end of inspiration (no air flow), alveolar gas pressure is:

A. equal to pulmonary capillary blood pressure.
B. equal to intrapleural pressure.
C. equal to central venous pressure.
D. dependent on the gas composition of the air breathed.
E. none of the above.

36. At the normal resting PO_2 of mixed venous blood, haemoglobin is saturated to:

A. 98.5%.
B. 75.0%.
C. 30.0%.
D. 10.0%.
E. 1.5%.

37. Bacterial infection produces fever by:

A. release of endogenous pyrogens from macrophages.
B. a direct effect of bacterial toxins on muscle metabolism.
C. a direct effect of bacterial toxins on the hypothalamus.
D. elevation of the threshold for vasomotor neuron activation.
E. inhibition of prostaglandin release in the hypothalamus.

38. The thermoregulatory centre in the posterior hypothalamus responds most sensitively to changes in:

A. metabolic rate.
B. arterial blood temperature.
C. rate of heat loss.
D. average body temperature.
E. skin temperature.

39. The main site of ATP synthesis is:

A. mitochondrial cristae.
B. mitochondrial matrix.

C. rough endoplasmic reticulum.

D. Golgi apparatus.

E. the cytosol.

40. Cell types which secrete proteins are characterized by a high concentration of Golgi apparatus BECAUSE the Golgi apparatus is the site of:

A. protein synthesis.

B. protein packaging.

C. ribosome production.

D. aerobic energy production.

E. messenger RNA transport.

41. Which of the following statements is correct?

A. Glycogenolysis is the term which describes formation of glycogen from glucose.

B. Carbohydrate digestion is initiated in the stomach.

C. Carbohydrate is stored as glycogen.

D. The respiratory quotient for carbohydrate is 0.7.

E. Carbohydrate digestion results in amino acids.

42. Bile secretion is controlled by:

A. absorption of fat.

B. secretin.

C. HCl.

D. gastric emptying.

E. none of the above.

43. Secretin:

A. is a digestive enzyme in the small intestine.

B. stimulates the pancreas to secrete an alkaline juice.

C. is released by the walls of the stomach in the presence of HCl.

D. is one of the exocrine secretions of the pancreas.

E. stimulates gastric secretion.

44. In the absence of pancreatic secretion, the faeces contain more fat because:

A. intestinal secretions contain no lipase activity.
B. pancreatic secretion is necessary for adequate emulsification of fat.
C. pancreatic bicarbonate is needed to activate the intestinal enzymes.
D. pancreatic trypsin is essential to release fat from ingested adipose tissue.
E. pancreatic secretion is necessary to stimulate bile production.

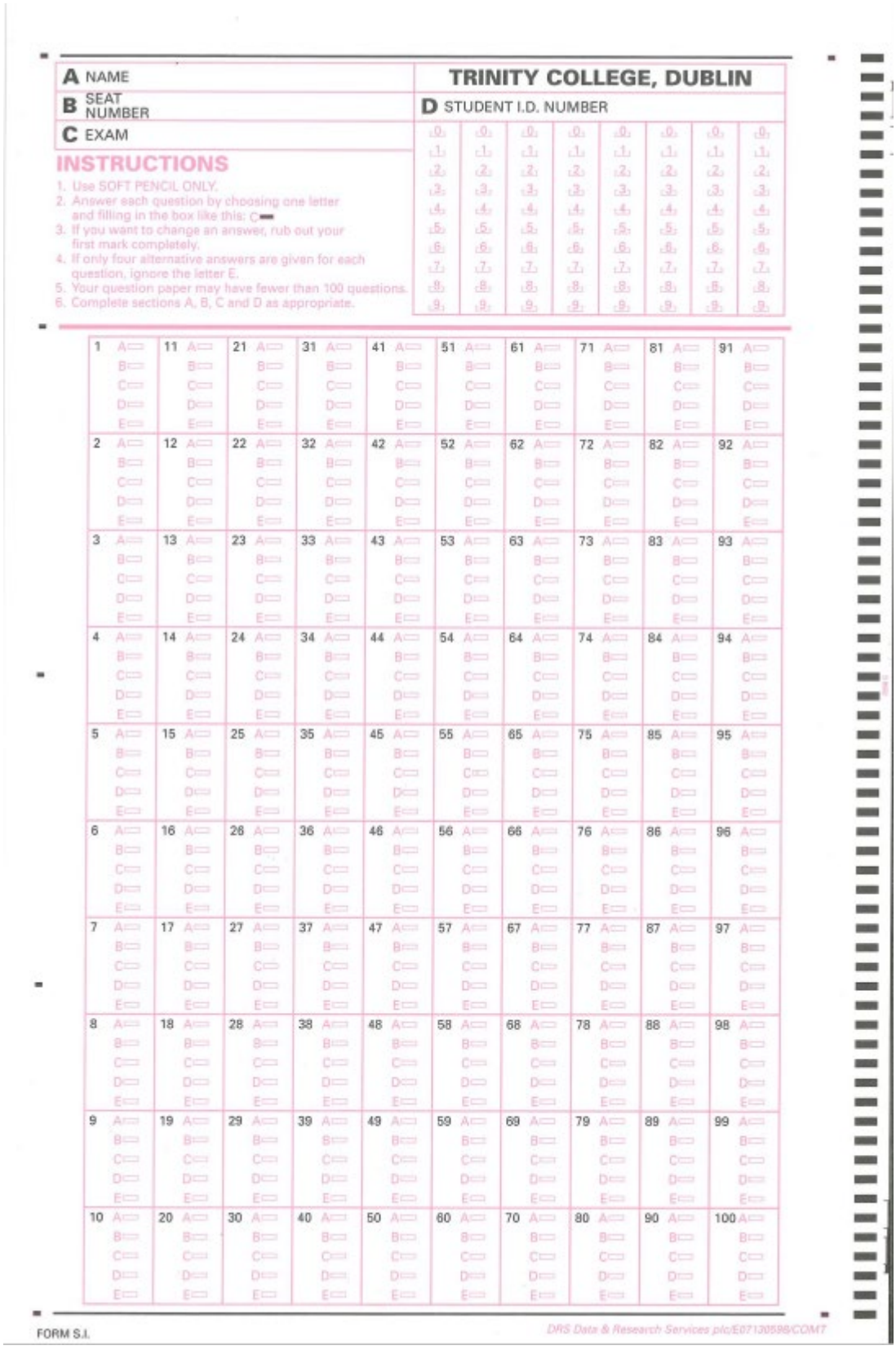
45. Glomerular filtration rate:

A. is about 120 $ml.min^{-1}$ in a 70 kg man.
B. is regulated by tubuloglomerular feedback.
C. is estimated by creatinine clearance.
D. is decreased in renal failure.
E. all of the above.

Answering MCQs in College Examinations

MCQs are answered by filling in boxes on a standard pink form (see below). This form is marked by an optical mark reader (OMR). The machine will only read carefully filled boxes. All other marks are either ignored or may invalidate your answer or even the whole paper. Therefore, do not add comments or make any other mark on your form. Do not crease the form and do not attach it with tags to your scripts. Just place the form inside the first answer book. Use a soft pencil to fill the boxes, and don't press too hard. Any errors can then be corrected with a clean eraser.

MCQ answer Sheet Template



A NAME

B SEAT NUMBER

C EXAM

TRINITY COLLEGE, DUBLIN

D STUDENT I.D. NUMBER

INSTRUCTIONS

1. Use SOFT PENCIL ONLY.
2. Answer each question by choosing one letter and filling in the box like this: C
3. If you want to change an answer, rub out your first mark completely.
4. If only four alternative answers are given for each question, ignore the letter E.
5. Your question paper may have fewer than 100 questions.
6. Complete sections A, B, C and D as appropriate.

1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

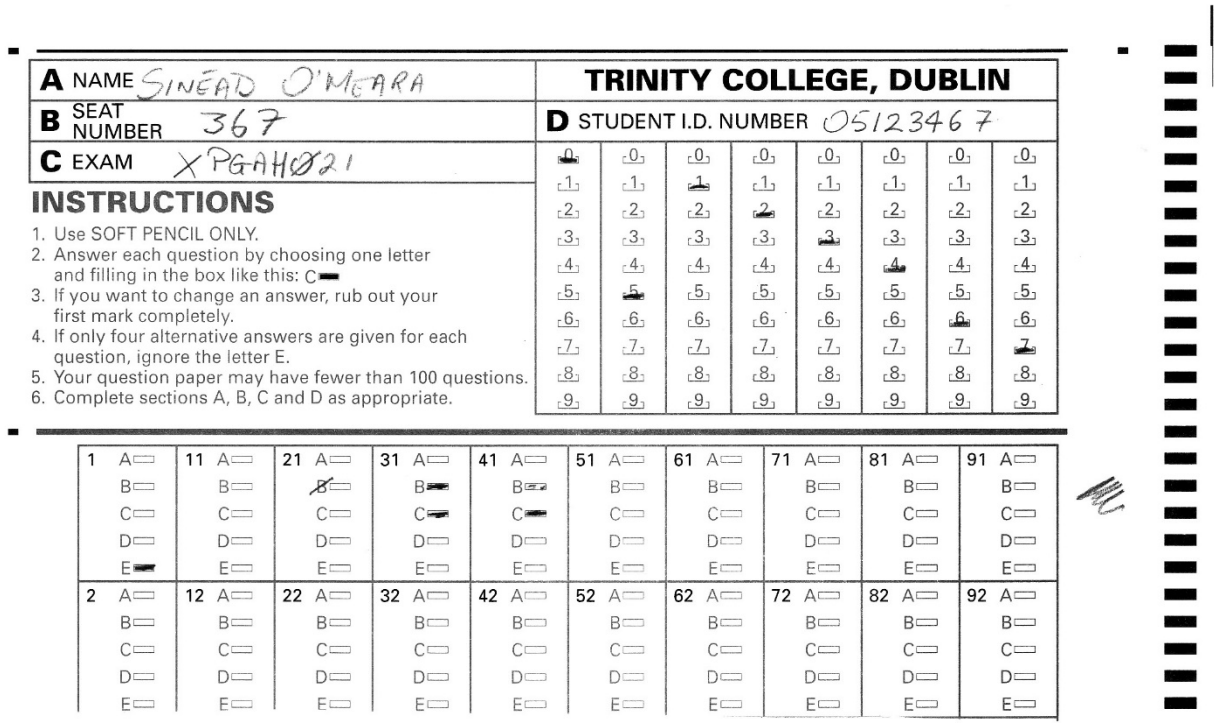
FORM S.I.

DRS Data & Research Services plc/E07130598/COM7

Remember also, that in order for your marks to be credited to you, the machine must be able to read your *student ID number* ***[NOT your examination number!]***, which you must *write* in the box at the top of the form. However, the OMR cannot read numbers, therefore, and more crucially for you, **your student number must also be indicated by filling in the boxes** in the section below your ID number. We strongly recommend that you also write your name as a check against errors. (This will not compromise the anonymity of the marking process.)

Reasonable efforts are made to find and correct errors in form reading, but it is up to you to ensure that there are no errors.

Sample of Completed MCQ Form



The top section of name, seat number, ID No. etc is correctly filled in. Note that the student ID number must be entered twice: as a *written* number and as *filled boxes* for machine reading.

Q1. This box is correctly filled in.

Q11. Unanswered question. This is acceptable, but since there is no negative marking, you might as well attempt an answer!

Unacceptable marks

Q21. The stroke has missed the box and the OMR will not read it: no score for this question!

Q31. Two marks. The OMR will not know which you intended and so produce an error. No score.

Q41. Incomplete erasure (Answer B). The OMR will still detect the mark in B. Therefore it will see two marks and produce an error. No score.

Notes

Blue/black ink is not guaranteed to be read by the machine, But even if read you will not be able to change aby answers!

Red ink cannot be read.

Notes/scribble (even in the margin) may prevent the machine from reading your sheet and will invalidate the paper!

Damage to the solid black lines or timing marks (on right), for instance by pushing a treasury tag through the top of the page, will make your paper unreadable. (If you correctly label your form and put it in your answer book, it will be found and correctly identified).

Past Examination Paper

The first step in planning for exams is to get the past papers. It helps you to become familiar with the structure and format of the exam. They are useful for identifying types of questions you may be asked and planning your revision strategy.

By practising answering exam questions, you can considerably improve your performance. You can test yourself using past examination papers.

Make sure you find out if there will be any changes from the norm.

Past Papers can be found on the following webpage:
https://www.tcd.ie/academicregistry/exams/past-papers/annual/

Approach to Study

- Physiology is a subject that requires careful, logical thinking. It is important to keep up during the year so that you *understand* the material; concepts are repeated and built on so you will get useful reinforcement.

- Look for the underlying themes and organisation of information and focus on the basic physiological mechanism (e.g. compartments, the negative feedback loop).

- Lectures are crucial. They define the content, especially the level of detail required. Missing lectures will put you at a disadvantage. The copies of the lecture slides that are available on the Physiology website are not a substitute for your own notes made at the time.

- Preparation for lectures is important. You should at least review the lecture synopses before each lecture and, if possible, read the related sections of the textbook indicated in the synopses.

- The learning outcomes should be reviewed weekly and used as the basis for your private study. Careful examination will show that they are in many respects to versions of exam questions.

- Do not rely on rote-learning and question-spotting. Past papers are useful to see what types of question have been asked before, but do not use your prepared answers as your primary form of revision. Staff do not ask the same questions year after year!

- In short, get actively engaged in your Physiology course — it won't learn itself! Use all the learning opportunities including the Discussion Boards to discuss Physiology.

Plagiarism

Understanding Plagiarism:

Plagiarism is using someone else's ideas, charts, concepts or words in your assignments and using them as if they were your own, and without giving credit to the actual author. Plagiarism is considered a serious offence in Trinity and carries penalties depending on the severity of the plagiarism.

To ensure that you have a clear understanding of what plagiarism is, how Trinity deals with cases of plagiarism, and how to avoid it, you will find a repository of information at http://tcd-ie.libguides.com/plagiarism

We ask you to take the following steps:
(i) Visit the online resources to inform yourself about how Trinity deals with plagiarism and how you can avoid it at http://tcd-ie.libguides.com/plagiarism. You should also familiarize yourself with the 2018-19 Calendar entry on plagiarism located on this website and the sanctions which are applied;
(ii) Complete the 'Ready, Steady, Write' online tutorial on plagiarism at http://tcd-ie.libguides.com/plagiarism/ready-steady-write. Completing the tutorial is compulsory for all students.
(iii) Familiarise yourself with the declaration that you will be asked to sign when submitting course work at http://tcd-ie.libguides.com/plagiarism/declaration;
(iv) Contact your College Tutor, your Course Director, or your Lecturer if you are unsure about any aspect of plagiarism.
Correct referencing is essential when crediting your sources and avoiding plagiarism. Your course handbook will tell you what style of referencing you should use in your assignments so be sure to check that out before you start any assignments. You will waste a lot of time if you have to redo your references.

Resources

Referencite, University of Auckland, New Zealand has some good interactive resources to help you understand plagiarism and how to avoid it: http://www.cite.auckland.ac.nz/index.php?p=home

Lecture Synopses
Hilary Term 2025/26

Introduction. Tissue and organ composition (C&T1) - Dr. Áine Kelly

- Introduction to the study of Physiology
- Types of tissue
- Structure, function, and location of: epithelia, connective tissue, bone, muscle (skeletal, smooth, cardiac), nerve.
- Organisation of cells, tissues and organs

  Reading: pp 2-6, p323 Figs 1.2, 1.3, 1.4, 21.13, 12.32, 12.2

Principles of cellular function (C&T2) - Dr. Áine Kelly

- Cellular ultrastructure
- Structure and function of: plasma membrane, nucleus, mitochondria, ribosome, endoplasmic reticulum, Golgi, cytoskeleton
- Protein synthesis
- Regulation of body systems
- Set points
- Feedback (positive and negative)

  Reading: pp 9-12, pp29-38, Fig 2.14, Fig 2.17-2.24 (Table: 2.2),

Composition of the blood (C&T3) - Dr. Áine Kelly

- The composition of plasma
- Characteristics of blood cells and platelets
- The haematocrit
- Clotting and coagulation
- pathophysiology: atherosclerosis
- Haematopoiesis
- Anaemia

  Reading: pp 437-448; Figs: 15.2-15.6, 15.8-9; Tables: 15.2-3

Homeostasis, Body composition and water distribution (C&T4) - Dr. Áine Kelly

- Body fluid compartments:
- Intracellular and extracellular fluids: Composition and boundaries
- Fluid balance (inputs and outputs; pathophysiology)
- Movement between compartments (Starling's law of capillary)
- Principles of osmosis and tonicity

  Reading: pp 6-8 (Fig: 1.5), Fig 1.24; pp112-116, Fig 4.17-4.20; pp 413-417, p421 (The Lymphatic system)

Composition of the blood (C&T5) - Dr. Áine Kelly

- Role & components of the immune system
- Leucocytes: structure and function
- Innate Immunity: interferon, complement, natural killer cells, phagocytosis, inflammation
- Adaptive immunity: B cells, Macrophages, T cells
- Immune memory
- Immune disorders

  Reading: pp 670-679, 681-2

Membrane transport & membrane potential (C&T6) - Dr. Áine Kelly

- Electrochemical gradients
- Transport by diffusion
- Facilitated diffusion of glucose and amino acids
- Transport of ions through membrane ion channels
- Na^+/K^+/ATPase pump
- Membrane potential

  Reading: pp 95-101, 105-111, Figs:4.1, 4.2, 4.10, 4.14-4.16

Organisation of the nervous system (N&S1) - Dr Kate Connor

- Structure of the neuron
- Supporting cells
- Myelin sheath
- Neurone protection & regeneration
- Central NS & peripheral NS
- Somatic NS
- Sensory and motor
- Autonomic NS
- Interneuron connections

  Reading: pp 167-173, 304-310

Electrical activity in nerve pathways (N&S2) - Dr Kate Connor

- Action potential
- *Nerve conduction*
- Information coding
- Synaptic transmission
- EPSPs and IPSPs
- Information processing

Reading: pp 179-191, 197-209

Sensory perception (N&S3) - Dr Kate Connor

- Modalities of sensory perception
- Transduction of sensory stimuli
- Receptor and generator potentials
- Sensory receptive fields
- Coding of sensory information
- Sensory adaptation
- Lateral inhibition

Reading: pp 254-263

The eye (N&S4) - Dr Kate Connor

- Structure of the eye
- Physics of light transmission through eye
- Regulation of amount of light entering eye
- Accommodation & visual defects
- Retinal photoreceptors: rods and cones
- Perception of light by photoreceptors
- Visual acuity
- Visual fields and binocular vision

Reading: pp 269-283

The ear (N&S5) - Dr Kate Connor

- Physics of sound; the dB scale
- Structure of the ear
- Function of ossicles
- The cochlea
- Hair cells
- Transduction
- Pitch discrimination
- Normal hearing
- Location of sound
- The vestibular apparatus

Reading: pp 284-296

Skeletal muscle structure and contraction (MSC1) – Dr Bahman Nasseroleslami

- Skeletal muscle structure
- The sarcomere
- The cross-bridge cycle
- Excitation-contraction coupling
- The motor unit

Reading: pp 323-331, Figs 12.1-12.10, 12.26, 12.27

Mechanisms of force generation (MSC2) - Dr Bahman Nasseroleslami

- Muscle metabolism
- The twitch
- Factors affecting the force generated by individual muscle fibres
- Regulation of the force generated by whole muscle

Reading: pp 332-343, Fig: 12.11-12.22

Muscle-fibre types and muscle receptors (MSC3) – Dr Bahman Nasseroleslami

- Skeletal muscle-fibre types (I, IIa, IIb)
- Skeletal muscle receptors: muscle spindle and Golgi tendon organ

  Reading: pp 344-350, Fig: 12.23-12.25, 12.28-12.31, Table: 12.1

Smooth and cardiac muscle (MSC4) - Dr Bahman Nasseroleslami

Smooth muscle:

- Properties
- Excitation-contraction coupling
- Classification: single and multi-unit smooth muscle

Cardiac muscle:

- Similarities with skeletal and smooth muscle

  Reading: pp 351-355, Fig: 12.32-12.37, Table 12.2

Organisation of the respiratory system (RESP1) - Dr Mikel Egaña

- Overview of respiratory function
- Anatomy of the respiratory system

Reading: pp 454-461, Fig: 16.1-16.7

Mechanics of breathing (RESP2) - Dr Mikel Egaña

- Forces for pulmonary ventilation
- Factors affecting pulmonary ventilation
- Clinical significance of respiratory volumes and air flows

Reading: pp 462-474, Fig: 16.8-16.13, 16.16,16.17

Gas exchange (RESP3) - Dr Mikel Egaña

- Partial pressures of gases (O_2 & CO_2)
- Solubility of gases in liquids
- Determinants of alveolar PO_2 and PCO_2
- Gas exchange in the lungs
- Gas exchange in respiring tissue

Reading: pp 478-486, Fig: 17.1, 17.3-17.5

Gas transport (RESP4) - Dr Mikel Egaña

- Oxygen transport in blood
- O_2-Haemoglobin dissociation curve
- Carbon dioxide transport in blood

Reading: pp 487-493, Fig: 17.6-17.13

Regulation of breathing (RESP5) - Dr Mikel Egaña

- Central and peripheral Chemoreceptors
- Chemoreceptor reflex

Reading: pp 497-500, Fig: 17.14, 17.17-17.22

Swallowing/laryngeal function (RESP6) - Dr Mikel Egaña

- Overview of swallowing
- Phases of swallowing
- Anatomy and functions of the larynx
- Phonation (voicing)
- Disorders

Reading: pp 574, 575,597, 598 Fig: 20.4, 20.29

Introduction to cardiovascular physiology (CVS1) – Dr Wilby WIlliamson

- Introduction to the cardiovascular system: overview of anatomy, components and function
- Anatomy of the heart
- Function of the heart as a pump
- Anatomy and function of arteries, arterioles, capillaries, venules and veins

  Reading: pp 361-367, 399-402, 404-405, 412-414, 418-419. Fig: 13.1-13.8, 12.32, 14.6, 14.7, 14.17, 14.19, 14.21

The heart & blood vessels (CVS2) – Dr Wilby Williamson

- Electrical activity of the heart leading to contraction of cardiac muscle
- Anatomy and function of arteries, arterioles, capillaries, venules and veins

  Reading: pp 367-371, 375-377, 399-402, 404-405, 412-414, 418-419. Fig: 13.9, 13.11, 13.16, 14.6, 14.7, 14.17, 14.19, 14.21

The cardiac cycle (CVS3) - Dr Wilby Williamson

- Phases and events of the cardiac cycle
- Systole and diastole
- Pressure and volume changes during the cardiac cycle

  Reading: pp 379-383, Fig: 13.18-13.22

  Reading: pp 367-371, 375-377, 379-383. Fig: 13.9, 13.11, 13.16, 13.18-13.22

Regulation of cardiac output (CVS4) – Dr Wilby Williamson

- The autonomic nervous system
- Control of heart rate and stroke volume
- Changes with exercise

  Reading: pp 384-392, 410, 420, Fig: 13.23, 13.27-13.31, 14.15, 14.23

Haemodynamics (CVS5) – Dr Wilby Williamson

- Principles governing blood flow and resistance to flow
- Regulation of Central Venous Pressure

  Reading: pp 396-399, 405-407, 410, 411, 419-421, Fig: 14.2-14.4, 14.10, 14.11

Regulation of blood pressure (CVS6) Dr Wilby Williamson

- Determinants and regulation of Mean Arterial Pressure
- Baroreceptors and the baroreceptor reflex

  Reading: pp 422-431, Fig: 14.26-14.30

Organisation & motility of the digestive system (D&M1) - Dr Eric Downer

- Gross anatomy including innervation
- Bulk liquid flow in/out of the gut
- pH changes through the gut
- Movement of gut contents
- Functions of the stomach, esp. motility

  Reading: pp 570-579, 596-599, Figs: 20.26, 20.28
- Nature and function of movement of the intestine: segmentation, peristalsis
- Regulation of gut motility
- Defaecation reflex

Digestion and absorption of nutrients (D&M2) - Dr Eric Downer

- Absorption of water
- Digestion and absorption of carbohydrate, protein, fat
- digestive enzymes: sources, activation, optimal pH
- Pancreatic secretions: exocrine and endocrine
- Coeliac disease: causes and effects

  Reading: pp 581-586, Fig: 20.10, 20.13, 20.18, 20.20

Regulation of digestive function (D&M3) - Dr Eric Downer

- Phases: cephalic, gastric, intestinal
- Gastric secretion
- Pancreatic function

  Reading: pp 590-593; Figs: 20.13-20.25, Table: 20.2
- bicarbonate (HCO_3^-), hormones
- Bile: secretion storage, release
- Gut hormones: multiple effects

Functions of the liver and gall bladder (D&M4) - Dr Eric Downer

- Liver — structure and function

- Plasma proteins (pathophysiology)
- Hormonal function
- Cholesterol: structure, sources, fate
- plaque and thrombus formation (atherosclerosis)
- Glucose, fat, protein
- Blood glucose concentration: insulin, glucagon and diabetes

  Reading: pp 579-581, 26-27, 589 (box); Figs: 20.10, 20.25

Regulation of metabolism (D&M5) - Dr Eric Downer

- Glucose homeostasis in feeding and fasting
- Insulin, glucagons, diabetes
- Amino acid homeostasis
- Lipid homeostasis
- Fuelling exercise

  Reading: pp 607-610, 614-617, 697-701; Fig. 24.5

Regulation of temperature (D&M6) - Dr Eric Downer

- The heat balance equation
- Heat production effectors (shivering and non-shivering thermogenesis)
- Heat loss effectors (vasodilation and sweating)
- Hypothalamic central regulation of thermal balance
- Heat stress

  Reading: pp 9-14; Fig. 1.9

Endocrine regulation of reproduction (REP1) - Dr Alice Witney

- Sex steroids (oestrogen, progesterone, testosterone) and their functions in the reproductive tract
- The control and regulation of steroid and gonadotrophin (FSH, LH) secretion in male and females

  Reading: pp 636-647

Menstrual cycle (REP2) - Dr Alice Witney

- Phases of the ovarian menstrual cycles

- The roles of hormones in each phase
- The corpus luteum
- Endometrial changes during the menstrual cycle

  Reading: pp 648-653

Pregnancy, labour and lactation (REP3) - Dr Alice Witney

- Fertilisation, implantation, foetal development, labour and lactation
- The specific roles of hormones in these events

  Reading: pp 653-661

Organisation & function of the urinary system as transport (REN1) - Dr Alice Witney

- Functions of the kidney
- Structure of the nephron
- Summary of renal processes
- Glomerular filtration
- Juxtaglomerular apparatus

  Reading: pp 511-523

Regulation of body salt and water (REN2) - Dr Alice Witney

- Cellular mechanisms of tubular water reabsorption
- Renin-angiotensin-aldosterone system in salt balance
- Antidiuretic hormone and water balance

  Reading: pp 537-554

Regulation of body pH (REN3) - Dr Alice Witney

- Renal buffer systems (bicarbonate, phosphate, ammonia)
- Role of the kidney in pH balance
- Micturition

  Reading: pp 532-533, 553-564

Weekly Study Guide (Hilary Term)

Note that the production of learning outcomes is a continuing process and may not be complete. Further amendments may appear during the course.

The lectures will start with the physiology of organelles, cells and tissues and build to focus on Systems Physiology: how tissues combine to form organ systems which work together for particular functions (cardiovascular, respiratory, digestive, reproductive). This integration implies a degree of control or regulation and this is the aspect on which you should focus.

Week 22 – Tues-Thurs [C&T1-4]

By the end of this week, you should be able to:

- Outline the characteristics and basic functions of epithelium, connective tissues, nerve and muscle (smooth, cardiac, skeletal).
- Give examples of endocrine and exocrine glands.
- Describe how cells, tissues and organs are related.
- Give clear physiological examples of homeostasis, distinguishing positive and negative feedback in physiological systems.
- Outline the structure and function of mammalian cell organelles (i.e. Nucleus, membrane, mitochondria, ribosomes, endoplasmic reticulum, cytoskeleton, and golgi).
- The cellular events involved in protein synthesis.
- list the blood cells and their basic functions.
- define haematocrit.
- describe the basic principles of the stem-cell model of haematopoiesis.
- define anaemia.
- describe the general principles of anaemia
- define platelets and outline their role in clotting.
- outline intrinsic and extrinsic pathways of coagulation.
- outline the processes limiting clot formation.
- outline the process of plaque/thrombus formation in atherosclerosis.
- describe the composition of the three principal fluid compartments in the body
- explain their respective compositions in terms of the nature of their boundaries, using knowledge of osmosis and diffusion.
- explain the importance of the movement of material between compartments.

- list inputs and output of fluid and know which are regulated for water balance; give pathophysiological examples.
- explain the effects of tonicity on cell volume.

Week 23 – Tues-Wed [C&T5-6]

By the end of this week, you should be able to:

- define 'self-recognition' and its importance.
- list the principal features of Innate immunity.
- outline the roles of interferon, natural killer cells and complement.
- describe phagocytosis.
- outline inflammation and its functions.
- explain the principal changes in an example of a disorder of the immune system.
- outline the functions of B cells (including formation of immune memory).
- outline functions of T cells.
- outline the role of MHCs in antigen processing.
- list the principal features of Adaptive Immunity
- compare and contrast innate and adaptive immunity.
- give examples of active transport of ions across the plasma membrane.
- compare and contrast facilitated transport, carriers, channels and ion pumps.
- outline the role of the Na^+/K^+/ATPase pump in maintaining the resting membrane potential.
- explain the significance of the resting membrane potential and the Na^+/K^+/ATPase pump.

Week 23 – Wed-Thur [N&S1-2]

By the end of this week, you should be able to:

- outline the structure and appearance of a neuron.
- list the properties of supporting glial cells in the nervous system.
- describe the formation and explain the importance of the myelin sheath.
- explain the organisation of the nervous system into central/peripheral somatic and autonomic divisions.
- list the basic features of the autonomic nervous system.

- explain the development of action potentials in a nerve fibres and how they relate to ion fluxes in the membrane.
- explain the principles of nervous conduction in myelinated and unmyelinated axons.
- describe the structure of a synapse and explain the role of neurotransmitters.
- understand the role of EPSPs and IPSPs in information processing.

Week 24 – Tues-Wed [N&S3-4]

By the end of this week, you should be able to:

- outline the range of human sensory receptors.
- define receptor and generator potentials.
- explain how the nervous system codes for modality, location and strength of a sensory stimulus.
- explain sensory adaptation.
- define a sensory field and explain sensory acuity.
- explain lateral inhibition.
- reproduce a diagram of the eye and the light path through it.
- explain the function of the lens and how defects of the lens may be corrected.
- outline the arrangement and properties of the photoreceptors (rods & cones).
- define and explain the importance of visual acuity, visual fields and binocular vision.
- reproduce diagrams of the ear, including ossicles of the middle ear and the cochlea.
- explain the function of the ossicles, tympanic membrane, oval & round windows.
- explain how the cochlea is able to transduce sounds of a different pitch.
- define the range and levels of normal human hearing.
- outline the structure and function of the vestibular apparatus

Week 25 – Tues-Thurs [MSC1-4]

By the end of this week, you should be able to:

- identify the structures of skeletal muscle from a gross anatomical level down to the fibre and sub-cellular levels.
- describe the arrangement of organelles and protein filaments of a muscle fibre and sarcomere.
- list the steps in the process of neuromuscular transmission.

- list the steps of the Cross-Bridge Cycle.
- explain force production in terms of the Cross-Bridge Cycle.
- define Excitation-Contraction Coupling.
- list the events of Excitation-Contraction Coupling.
- describe the three main sources of ATP.
- describe the phases of a twitch.
- compare and contrast isotonic and isometric contractions.
- analyse the effect of Length on maximal muscle force.
- describe the factors affecting the force of individual muscle fibres.
- explain the recruitment of motor units.
- By the end of this week you should be able to:
- compare and contrast the three skeletal muscle-fibre types.
- identify the contractile and regulatory protein components of skeletal muscle.
- describe the arrangement of the contractile and regulatory protein components of skeletal muscle.
- compare and contrast the appearances of Skeletal, Cardiac and Smooth muscle.
- compare and contrast the two types of smooth muscle.
- list key locations of Cardiac and Smooth muscle types.
- describe the autonomic neural influence on pacemaker cells.
- compare and contrast E-C-Coupling in Skeletal, Cardiac and Smooth muscle.

Week 26 – Tues-Thurs [RESP1-4]

By the end of this week, you should be able to:

- list the structures of the respiratory system from the mouth to the alveoli.
- name the differences between airway structure and function in the conductive and respiratory zones.
- describe how respiratory muscles generate pressure gradients to drive ventilation.
- outline the different respiratory volumes and give average values (i.e. 70-kg male).
- explain the differences between the two main types of pulmonary disease, mention how can be diagnosed and give examples.
- outline partial pressures of gases in the lungs and arterial & venous blood.

- define pulmonary oedema and outline possible causes and treatments.
- explain determinants of alveolar partial pressures of oxygen and carbon dioxide.
- describe modes of oxygen and carbon dioxide transport in the blood.
- explain properties and importance of haemoglobin.
- name the factors that affect the affinity of haemoglobin for oxygen and explain how they can INCREASE/DECREASE the affinity of haemoglobin for oxygen.
- compare peripheral and central chemoreceptors.

Week 27 Tues-Wed [RESP5-6]

By the end of this week, you should be able to:

- discuss the effects of hypoventilation and hyperventilation on minute ventilation.
- mention the phases of swallowing.
- describe the production of voicing, singing and speech.
- give examples of laryngeal disorders.

Week 27 – Wed -Thurs [CVS 1-2]

By the end of this week, you should be able to:

- describe the heart valves and the layers of the heart wall.
- explain how the electrical events occurring in the heart cause the heart to beat. and how this in turn causes blood to be pumped through the vasculature.
- describe the anatomical and functional differences of the different blood vessels.

Reading Week – Week 28 – No Lectures

Week 29 – Tues-Wed [CVS 3-4]

By the end of this week, you should be able to:

- draw in a schematic diagram the changes in ventricular and aortic pressure during one complete cardiac cycle.
- explain the changes in ventricular volume during one complete cardiac cycle.
- describe when and why the two heart sounds happen.
- explain the impact of the autonomic nervous system on cardiac function.

- describe how changes in heart rate bring about changes in cardiac output (CO).
- describe how changes in stroke volume bring about changes in cardiac output.

Week 30 – Tues-Wed [CVS 5-6]

By the end of this week, you should be able to:

- explain how CO is increased during exercise.
- compare pressure gradients across pulmonary and systemic circuits.
- outline the factors affecting resistance to flow.
- describe the factors that influence Central Venous Pressure (CVP) and how CVP affect venous return.
- describe how the baroreceptor reflex controls the short-term regulation of blood pressure
- describe the effect of posture on blood pressure regulation

Week 30 – Thurs [D&M1]

- describe the general structure and function of the gut and its regions.

Week 31 – Tues-Wed [D&M2-3]

By the end of this week, you should be able to:

- list the functions of the stomach and show which are vital.
- distinguish between segmentation and peristalsis in the small intestine.
- explain how gut contents are moved by segmentation.
- list the types and functions of movements in the large intestine.
- describe the defaecation reflex.
- describe the different mechanisms of digestion and absorption of carbohydrates, fats, protein and water (including the roles of enzymes and pH and mechanisms of movement of molecules).
- simply explain the causes and consequences of coeliac disease.
- distinguish between short and long reflexes in the gut.
- define the cephalic phase of regulation and give its significance.
- describe the gastric phase of regulation.
- explain mechanisms of regulation gastric secretion and motility.
- list the source and nature and functions of the pancreatic secretions.

- explain the regulation of secretion of pancreatic enzymes, hormones and bicarbonate.
- give an example of a reflex within the gut.

Week 31 – Wed-Thurs [D&M4-5]

By the end of this week, you should be able to:

- list the main general functions of the liver.
- describe bile and its role in cholesterol metabolism.
- explain the role of the liver in fat production and transport.
- outline the relationship between high-density and low-density lipids and their role in atherosclerosis.
- outline the differences between absorptive and post-absorptive states in terms of the synthesis and breakdown of fats, carbohydrates and lipids.
- explain the role of insulin and glucagon in maintaining blood glucose concentration.
- outline the utilisation of different fuels in maintained exercise.
- outline the aetiology and sequelae of diabetes.
- explain the effectiveness of shivering.
- list the mechanisms of heat transfer.
- explain the role of skin blood vessels in regulation of heat loss.
- define ‘thermoneutral zone’ and ‘basal metabolic rate’.
- outline the mechanism of heat loss by sweating and its regulation.
- explain the regulation of body temperature in terms of feedback loops.
- outline the competing physiological demands in exercise.
- outline the pathological consequences of working in a hot environment.

Week 32 – Tues [D&M6]

By the end of this week, you should be able to:

- explain the effectiveness of shivering.
- list the mechanisms of heat transfer.
- explain the role of skin blood vessels in regulation of heat loss.
- define ‘thermoneutral zone’ and ‘basal metabolic rate’.

- outline the mechanism of heat loss by sweating and its regulation.
- explain the regulation of body temperature in terms of feedback loops.
- outline the competing physiological demands in exercise.
- outline the pathological consequences of working in a hot environment.

Week 32 – Wed-Thurs [REP1-3]

By the end of this week, you should be able to:

- describe the primary sex steroids (oestrogen, progesterone, testosterone) and their major functions in male and female reproductive systems.
- describe the role of the hypothalamus and pituitary gland in gonadotrophin secretion.
- Describe the role of inhibin, progesterone and oestradiol in FSH and LH release.
- Describe the phases of the human ovarian and menstrual cycle.
- Outline the roles of FSH, LH, oestrogen, and progesterone in the menstrual cycle.
- Describe the process of fertilisation.
- Describe the events involved in blastocyst implantation.
- Summarise the role of hCG in the maternal recognition of pregnancy.
- Describe the roles of hCG, progesterone and oestrogen in the maintenance of pregnancy.
- Describe the stages of foetal development.
- Describe the factors involved in initiation of parturition.
- Describe the milk-ejection reflex.

Week 33 – Tues-Thurs [REN1-3]

By the end of this week, you should be able to:

- list the basic functions of the kidney.
- make a labelled diagram the of the nephron (vascular and tubular components) and indicate the functions of the different regions.
- describe the filtration barrier.
- explain how the forces at the glomerulus contribute to glomerular filtration.
- explain autoregulation of glomerular filtration rate (GFR): Myogenic response
- Role of the juxtaglomerular apparatus.
- list the basic functions of the kidney.

- make a labelled diagram the of the nephron (vascular and tubular components) and indicate the functions of the different regions.
- describe the filtration barrier.
- explain how the forces at the glomerulus contribute to glomerular filtration.
- explain autoregulation of glomerular filtration rate (GFR):
- Myogenic response
- Role of the juxtaglomerular apparatus.
- outline the crucial role of the ascending limb in the counter current multiplier.
- outline the role of urea and the long loop in production of hypertonic urine.
- describe the cellular mechanisms of tubular reabsorption.
- describe the role of the juxtaglomerular apparatus in the feedback control of reabsorption.
- describe the renin-angiotensin-aldosterone system in salt and water balance.
- describe the role of antidiuretic hormone in regulation of water reabsorption.
- outline renal pH buffer systems.
- describe the pathways involved in the control of micturition.

General Learning Outcomes (End of Module)

By the end of this module you should be able to:

- demonstrate knowledge of physiological processes and their regulation in normal function.
- give examples of the interaction of cells and tissues in organs.
- give a physiological example of interaction of positive and negative feedback.
- give an example of a change exceeding the body's capacity to rectify it (pathophysiology).
- give examples of the adaptability of tissues or organs.
- give examples of how cellular processes contribute to function in specific tissues or organs.
- explain some pathophysiological examples.
- give examples of the interaction of tissues in organs.
- give examples of the adaptability of tissues or organs.
- explain how cellular processes contribute to function in specific tissues or organs.
- explain some pathophysiological examples.
- give examples of different types of feedback from different systems.
- give examples of regulatory mechanisms of varying degrees of complexity.

Allied Health Sciences Physiology (ME7B04/EEU33BM1)					
Lecture times: Lectures start at 09:00 until 11:00 - Tuesdays and Thursdays					
Normally these classes would have all Standard Slots at Tue-Thurs 9-11am, but please follow your timetable on mytcd.ie					
Week No.	**Teaching Week**	**Day**	**Date**	**Topic**	**Lecturer**
22	**1**	Tue	20-Jan-26	**C&T1: Introduction. Tissue and organ composition**	Prof A Kelly
	1	Tue	20-Jan-26	**C&T2: Principles of cellular function**	Prof A Kelly
	1	Thurs	22-Jan-26	**C&T3: Composition of the blood**	Prof A Kelly
	1	Thurs	22-Jan-26	**C&T4: Homeostasis, Body composition and water distribution**	Prof A Kelly
23	**2**	Tue	27-Jan-26	**C&T5: The Immune System**	Prof A Kelly
	2	Tue	27-Jan-26	**C&T6: Membrane transport & membrane potential**	Prof A Kelly
	2	Thurs	29-Jan-26	**N&S1: Organisation of the nervous system**	Dr K Connor
	2	Thurs	29-Jan-26	**N&S2: Electrical activity in nerve pathways**	Dr K Connor
24	**3**	Tue	03-Feb-26	**N&S3: Sensory Perception**	Dr K Connor
	3	Tue	03-Feb-26	**N&S4: The Eye**	Dr K Connor
	3	Thurs	05-Feb-26	**N&S5: The Ear**	Dr K Connor
25	**4**	Tue	10-Feb-26	**MSC1: Skeletal muscle structure and contraction**	Dr Nasseroleslami
	4	Tue	10-Feb-26	**MSC2: Mechanisms of force generation**	Dr Nasseroleslami
	4	Thurs	12-Feb-26	**MSC3: Muscle fibre types and muscle receptors**	Dr Nasseroleslami
	4	Thurs	12-Feb-26	**MSC4: Smooth and cardiac muscle**	Dr Nasseroleslami
26	**5**	Tue	17-Feb-26	**RESP1: Organisation of the respiratory system**	Dr. Egaña
	5	Tue	17-Feb-26	**RESP2: Mechanics of breathing**	Dr. Egaña
	5	Thurs	19-Feb-26	**RESP3: Gas exchange**	Dr. Egaña
	5	Thurs	19-Feb-26	**RESP4: Gas transport**	Dr. Egaña
27	**6**	Tue	24-Feb-26	**RESP5: Regulation of breathing**	Dr. Egaña
	6	Tue	24-Feb-26	**RESP6: Swallowing/larygeal function**	Dr. Egaña
	6	Thurs	26-Feb-26	**CVS1: Introduction to cardiovascular physiology**	Prof Williamson
28	**7**			**READING WEEK**	
29	**8**	Tue	10-Mar-26	**CVS2: The heart and blood vessels**	Prof Williamson
	8	Tue	10-Mar-26	**CVS3: The cardiac cycle**	Prof Williamson
	8	Thurs	12-Mar-26	**CVS4: Regulation of cardiac output**	Prof Williamson
30	**9**	Tue	17-Mar-26	**CVS5: Haemodynamics**	Prof Williamson
	9	Tue	17-Mar-26	**CVS6: Regulation of blood pressure**	Prof Williamson
	9	Thurs	19-Mar-26	**D&M1: Organisation and motility of the digestive system**	Dr Downer
31	**10**	Tue	24-Mar-26	**D&M2: Digestion and absorption of nutrients**	Dr Downer
	10	Tue	24-Mar-26	**D&M3: Regulation of digestive function**	Dr Downer
	10	Thurs	26-Mar-26	**D&M4: Functions of the liver and gall bladder**	Dr Downer
	10	Thurs	26-Mar-26	**D&M5: Regulation of metabolism**	Dr Downer
32	**11**	Tue	31-Mar-26	**D&M6: Regulation of temperature**	Dr Downer
	11	Tue	31-Mar-26	**REP1: Endocrine regulation of reproduction**	Dr. Witney
	11	Thurs	02-Apr-26	**REP2: Menstrual cycle**	Dr. Witney
	11	Thurs	02-Apr-26	**REP3: Pregnancy, labour and lactation**	Dr. Witney
33	**12**	Tue	07-Apr-26	**REN1: Organisation and function of the urinary systemas transport**	Dr. Witney
	12	Thurs	09-Apr-26	**REN2: Regulation of body salt and water**	Dr. Witney
	12	Thurs	09-Apr-26	**REN3: Regulation of body pH**	Dr. Witney
34				**REVISION WEEK**	

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