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COURSE CONTENT

YEAR 1 MEDICINE

This year is designed to:

• Promote personal development and facilitate the development of skills necessary for the successful transition from secondary student to novice health care worker
• Enable students to understand the evolution of man in his environment
• Ensure a thorough and integrated knowledge of normal human structure and function and man’s relationship with society

The first medical year will comprise of the following modules accruing 60 credits in total:

• Module 1: Human Development, Behavioural Science and Ethics (15 credits)
• Module 2: Evolution and Life (10 credits)
• Module 3: Human Form and Function (30 credits)
• Module 4: Science and Humanities (5 credits)

The Subjects which contribute to these modules are: Biology, Anatomy, Biochemistry, Behavioural Science, Ethics, Physiology, Psychology, Public Health & Primary Care and Sociology.

Multiple modes of delivery of course content are used. These include lectures, small-group learning tutorials, practical classes and e-learning. This facilitates the development of a balanced and active approach to learning for all students.
General Information

Textbooks

Medical textbooks generally are very expensive to buy new in Ireland. If you have the opportunity to buy new books abroad, do so.

Second-hand books are often available from the Student Union Bookshop or from students who have finished this section of their course. However, beware of buying an old edition of a text, since the pagination at least will have changed and perhaps the contents also. Also, be cautious about disposing of your own books as you move on through the course. In particular, most students find it very valuable to be able to consult textbooks on anatomy, biochemistry and physiology during their clinical years and beyond. As well, you will be asked questions bearing on these disciplines in the clinical year of the course.

Recommended texts for the various components of the Junior Freshman Year may be found in the following section, Course Structure.

Sources of Support and Help in College

- **Student Counselling Service** - 199 - 200 Pearse Street, Tel: 896 1407, or email: student-counselling@tcd.ie Emergency appointments are available. (Entrance to the Service via College Campus adjacent to the Creche). This service is confidential and free to students.
- **Chaplains** - House 27, chaplaincy@tcd.ie Tel: Paddy Gleeson and Peter Sexton: 896 1260, Darren McCallig: 896 1402; Julian Hamilton: 896 1901 - The Chaplains run a Bereavement Support Group for those who have experienced loss (please contact the Chaplains). The Chaplains will also help you make contact with other religious communities in Dublin. http://www.tcd.ie/Chaplaincy/
- **College Health Service** - House 47 (beside the rugby pitch), Tel: 896 1556. Appointments may be made in person or by telephone. This service is free to most students. http://www.tcd.ie/College_Health
- **College Tutors and Senior Tutor’s Office**, House 27. Tel: 896 2551. stosec@tcd.ie You can find your tutor's name and contact number on the Student Information System : http://isservices.tcd.ie/portal
- **Niteline** - A confidential help-line for students run by students is available during term-time, by telephone between 9pm and 2.30am from Thursday to Sunday at 1800 793 793.
- **Student 2 Student** - A group of Trinity students trained in listening and support skills who are available for face-to-face supportive chats. Confidential, free, and flexible. Email: peer@tcd.ie, phone: 896 2438.
Module 1: Human Development, Behavioural Science and Medical Ethics

ECTS VALUE
15 credits. A separate handbook pertaining to this all aspects of the course will be provided to each student at the introductory lecture.

LECTURERS
The course is taught by staff from the discipline of Public Health and Primary Care (Family Case Study), the Department of Psychiatry (Behavioural Science tutorials) and the School of Medicine Ethicists. The lecture course is further supported by the Departments of Paediatrics and Psychology and with inputs from other guest/occasional lecturers.

CONTACT HOURS
The course will consist of 29 lecture hours over the course of the year, along with tutorials as described below.

The lectures provided included the following:

<table>
<thead>
<tr>
<th>Course introduction</th>
<th>Dr Aisling Ní Shuílleabháin Dr Gary Donohoe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Looking after your health as a TCD student</td>
<td>Dr David McGrath, Director of Student Health Service</td>
</tr>
<tr>
<td>Be wise, immunise!</td>
<td>Dr Aisling Ní Shuílleabháin</td>
</tr>
<tr>
<td>Developmental Milestones</td>
<td>Dr. Haroon Mansoori, Paediatrics</td>
</tr>
<tr>
<td>Pregnancy and birth video</td>
<td>Ms Deirdre Daly, School of Nursing &amp; Midwifery</td>
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<tr>
<td>Common childhood illnesses</td>
<td>Prof Tom O'Dowd, Public Health &amp; Primary Care</td>
</tr>
<tr>
<td>Medicine and the arts</td>
<td>Mr Paul O’Connor</td>
</tr>
<tr>
<td>Growth in infancy &amp; childhood</td>
<td>Dr. Tim Savage, Paediatrics</td>
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<tr>
<td>Infant feeding &amp; nutrition</td>
<td>Dr. Tim Savage, Paediatrics</td>
</tr>
<tr>
<td>Introduction to Behavioural Science</td>
<td>Dr Gary Donohoe</td>
</tr>
<tr>
<td>Predictors of good development in 1st year of life</td>
<td>Dr Tara Murphy</td>
</tr>
<tr>
<td>Psychological and personality development: child</td>
<td>Prof Michael Fitzgerald</td>
</tr>
<tr>
<td>Introduction to learning theory</td>
<td>Dr. Gary Donohoe</td>
</tr>
<tr>
<td>Impact of adversity on children and adolescents</td>
<td>Dr Tara Murphy</td>
</tr>
<tr>
<td>Psychological and personality development: adolescent &amp; adult</td>
<td>Prof Michael Fitzgerald</td>
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<tr>
<td>Introduction to the cognitive model</td>
<td>Dr Brian Fitzmaurice</td>
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<tr>
<td>Why do I feel nervous when I walk into a room?</td>
<td>Dr Yvonne Tone</td>
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<tr>
<td>Intro to systems theory - how families work</td>
<td>Dr Tricia White</td>
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<tr>
<td>Peer groups</td>
<td>Ms Maria Pertl</td>
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<tr>
<td>Challenges of later life</td>
<td>Dr Robert Cohen</td>
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<tr>
<td>Appreciation of transcultural differences</td>
<td>Prof Mac MacLachlan</td>
</tr>
<tr>
<td>Examination/assessment review</td>
<td>Dr Aisling Ni Shuilleabhain</td>
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</tbody>
</table>
**Family Case Study tutorials**
There will be 2 tutorials in each semester. These will vary in length, depending on your GP tutor and the needs of your tutorial group. The time scheduled is 2.5 hours.

You are expected to make 3 visits to your assigned family between the first and last Family Case Study tutorials. Please note that these are not shown on your timetable as you will have to fit in with the family's timetable to facilitate the visits. You will have free slots on most alternate Thursday afternoons when the other half of your class is attending Behavioural Science tutorials.

**Behavioural Science tutorials**
There will be 7 over the course of the year, each of 1.5 hours duration.

**Medical Ethics**
5 of the lecture hours will be devoted to this topic along with 10-12 tutorial hours over the course of the year.

**RATIONALE AND AIMS**
The overall aims of the course are:
- To give you an understanding of the concepts of normality in physical and psychological human development and behaviour, based on a lifespan developmental perspective.
- To enable you to understand the development of the individual, and how this is influenced by social and environmental factors.
- To introduce you to the main theories of psychological development, including learning theory, attachment theory and systems theory.
- To initiate you in the study of medical ethics and help you to develop the skills to recognize and evaluate ethical concerns.

**COURSE CONTENT**
The Human Development, Behavioural Science and Medical Ethics Course consists of four elements:
1. Lecture course
2. Family Case Study small group tutorials and family visits
3. Behavioural Science small group tutorials
4. Medical Ethics small group tutorials

The course takes place over the two semesters, Michaelmas and Hilary. Human Development and Behavioural Science lectures are delivered on Thursday mornings with small group tutorials timetabled for Thursday afternoons. Medical Ethics lectures take place on Wednesday mornings during the first semester. Please refer to timetables for scheduling of Medical Ethics small group work.

The course as a whole strives to give you a basic understanding of human behaviour which will inform all aspects of your future clinical practice. Information on physical, psychological and social development is delivered via lectures and small group sessions. These are incorporated with experiential learning through visits to families with young babies over the span of the year and problem based learning through behavioural science scenarios.
The course will cover development from childhood through the different human life stages up to and including ageing and death.

The Medical Ethics course comprises both large group lectures and small group PBL sessions. Where appropriate, aspects of the problems from your small-group sessions will be incorporated in the lectures. Group discussion will be used in tandem with the traditional lecture format, and weekly reading assignments will be central.

**INDICATIVE RESOURCES**

**Key Texts**

**Human Development**
Sheridan M.D. From birth to five years – children’s developmental progress. Revised

**Behavioural Science**

**Medical Ethics**

In your Family Case Study logbook you will find a list of websites to supplement your reading in relation to the public health essay you must write as part of your coursework.

Lecture notes and presentations will be available from the Public Health and Primary Care website:  [http://www.medicine.tcd.ie/public_health_primary_care/](http://www.medicine.tcd.ie/public_health_primary_care/)
LEARNING OUTCOMES

On successful completion of the course you should be able to:
1. Describe the key developmental milestones for a new baby, in terms of nutrition, physical development and communication
2. Recognise the importance of your duty of confidentiality in establishing a professional doctor-patient relationship and an awareness of the duties and responsibilities of students of medicine
3. Explain the social determinants of health
4. Describe the basic determinants of psychological development from childhood through adolescence to adulthood and old age.
5. Demonstrate an awareness of how adversity impacts on psychological development
6. Describe the factors that predict the influence of family and peer groups on individual attitudes and health behaviours
7. Demonstrate your knowledge (using core terminology) of medical ethics / bioethics as a discipline, its foundation in the philosophical tradition of ethics and its central role in medical training.

METHODS OF TEACHING AND STUDENT LEARNING

You will be encouraged to learn actively, that is by curiosity and exploration.

- The lecture course will provide the theoretical underpinning to practical observations.
- The Behavioural Science small groups will be in the format of ‘problem based learning’, designed to promote ‘broader understanding’ or ‘deep learning’.
- The Family Case Study will give you the opportunity to work in a practical and independent way. You will establish a professional relationship with your assigned family, allowing you to obtain demographic, social, health and development information, and to observe human behaviour and family dynamics. Small group tutorials with your Family Case Study tutor will give the opportunity of discussing relevant issues pre and post visits.
- The medical ethics component initiates your study by exploring the key principles and concepts of the subject. With the use of sample cases, you will begin to develop the skill of recognizing and evaluating ethical concerns, in addition to articulating ethical arguments on more than one side of a variety of issues.

METHODS OF ASSESSMENT

A. Summative

At the end of the course you will be assessed by means of:
1. a written paper based on the behavioural sciences lectures
2. the Family Case Study tutorials, visits and logbook
3. the Behavioural Science tutorials and reflective diaries
4. a written essay applying ethical concepts to an aspect of your experience from the family case study

Students who fail the course will be required to attend a pass-fail viva. Students who have a possibility of achieving first class honours will be requested to attend for an honours viva. Assessment of the course is overseen by the External Examiner.
B. Formative

Formative assessment will be undertaken by your Family Case Study and Behavioural Science Tutors. Should it be deemed necessary, you may be asked to discuss your progress with the relevant Course Director.

ECT CREDITS

(15 credits) will be awarded based on the various elements of the course as follows:

Family case study 30%
Ethics tutorials 5%
 Behavioural Science tutorials 15%
Behavioural Science & Ethics written paper 50% (40% Behavioural science, 10% ethics)

EVALUATION

The School of Medicine will ask you to complete course evaluation forms at the end of the year. Additional evaluation may be undertaken by the participating departments for a deeper exploration of specific aspects of the course. Your evaluation is important in helping the directors and administrators to address problem areas or fill perceived gaps in the course.

NOËL BROWNE PRIZE

Noël Browne is best remembered for virtually eradicating tuberculosis from Ireland, and for setting up the Mother and Child Scheme for antenatal care in 1951, when he was Minister for Health. A prize in his honour may be awarded by the examiners of the Family Case Study, for the student(s) who:

a. contribute to the educational and/or pastoral welfare of their allocated family

b. demonstrate an exceptional understanding of the link between social deprivation and ill health.
Module 2: Evolution and Life

LECTURER(S)
Biochemistry: Dr. Richard Porter, Dr. Ken Mok, Dr. Tim Mantle, Dr. Paul Voorheis, Prof. John Scott, Prof. Keith Tipton, Prof. Andrew Bowie, Dr. Daniela Zisterer, Dr. Jack Bloomfield, Prof. Luke O’Neill, Dr. Joe Carroll. Genetics: Prof P. Humphries

CONTACT HOURS
Set out the number of lecture, tutorial, seminar, laboratory, etc, hours. Specify also indicative hours for assignments, self-study, etc.

Summary headings of lecture topics to be covered – 56 hours:
Introduction to Cellular Biochemistry (Porter)[1]
Protein (and macromolecule) structure and function (Mok)[5]
Enzymology (Mantle)[3]
Membranes (Porter) [1]
Membrane Transporters (Porter) [1]
Cell division and cell cycle (Voorheis)[4]
Carbohydrate metabolism (Porter)[4]
Lipid metabolism (Mantle)[4]
Nitrogen metabolism (Mantle)[4]
Bioenergetics [2] (Porter)
Integration of Metabolism [1] Porter
Cholesterol and Bile salts/acid (Porter)[1]
Gene expression/replication/transcription/translation (Bowie/Zisterer)[5]
Folate/B₁₂/anaemias [5](Scott)
Alcohol metabolism (Tipton)[2]
Inflammation (Bloomfield)[4]
Hormones and cell signalling (Voorheis)[6]
Growth factors, oncogenes and apoptosis (O'Neill)[3]

Summary of Practicals (4 hours each):
Spectroscopy (Carroll) Subcellular fractionation (Porter)
Enzyme kinetics (Mantle) Oxidative phosphorylation (Porter)

Tutorial on Practical Biochemistry (2h)

ECTS VALUE
10 Credits

RATIONALE AND AIMS
The purpose of the module for Junior Freshman medical students, is to provide medical students with knowledge and understanding of the molecular basis of normally functioning mammalian cells and how diseases and mutations can disrupt normal metabolism. The course has been designed to be vertically integrated with the following courses also taught to medical students: clinical biochemistry, endocrinology, immunology, pharmacology, pathology, haematology and molecular medicine. The course is mandatory. Prerequisite subjects from School for getting to grips with the course is biology and/or chemistry. The lecturer is there to guide through the fundamentals of the course. Don’t hesitate to ask her/him questions.
COURSE CONTENT

Michaelmas Term Lecture Synopses

INTRODUCTORY LECTURE: (1 LECTURE) DR RICHARD PORTER
Introduction to Biochemistry and its role in medicine, summary of lecture course, practical classes in biochemistry, examination structure and format.

PROTEINS: (5 LECTURES) DR KEN MOK

Learning Objectives:
To appreciate how peptides and proteins are formed
To discover and analyse protein structure
To appreciate the dynamics of ligand binding to proteins

ENZYMES: (3 LECTURES) DR TIM MANTLE
Overview of the reactions catalysed by enzymes, systematic names, general aspects of catalysis, Kinetics of enzyme-catalysed reactions. Tissue distribution and functions. One-substrate rate equations (rapid equilibrium and steady state methods), reversible inhibition mechanisms, competitive, uncompetitive, mixed inhibitors, diagnostic plots, calculation of kinetic parameters \(K_m\) \(V_{max}\), and \(K_i\). Time-dependent irreversible inhibition, pseudo-first order kinetics, two substrate mechanisms, diagnostic plots. Factors involved in rate-enhancement, proximity effects, “effective concentration” covalent catalysis, general acid-base catalysis, strain, chemical models. Regulation of enzyme activity, mechanisms that involve modulating the steady state level of enzyme. Allosteric regulation. Structure, function and mechanism of specific examples: serine protease, lactate dehydrogenase, aspartate transcarbamylase and phosphorylase.

Learning objectives:
To realize that in many instances “genes means nanomachines”
To know the fundamentals of initial rate enzyme kinetics.
To understand the behaviour of reversible enzyme inhibitors..
To understand the mechanisms by which enzyme activity is regulated in vivo.
**The Composition of Membranes and Their Function in Biochemistry,**
(1 Lecture) Dr Porter


**Learning Objectives:**
To know the components that make up membranes.
To understand the physical nature of membranes
To be able to describe the evidence for the dynamic nature of membranes
(To describe the process of glycosylation of membrane proteins)

**Membrane Transporters and Their Function in Biochemistry**
(1 Lecture) Dr Porter

Summary of topics covered in Transporter lectures:

Learning objectives:
To know the principles of transport processes
To understand the classification of transporters
To describe examples of transport structure and mechanism
To learn examples of transporter function and physiological roles and examples of transporter dysfunction and disease

**Cell Cycle - Dr Paul Voorheis (4 Lectures)**

I. Cell cycle overview and cell synchrony: Components of cell reproduction, rate of cell reproduction in adult humans, generation time, sections of cell cycle: G1, S, G2 & M or D, cell cycle arrest - "start" / restriction point, G0, growth during cycle, cell synchrony: natural synchrony -- sea urchin system, experimental synchrony -- selection synchrony - induced synchrony, inhibitors of DNA synthesis, , amino acid deprivation, release from density-dependent growth.

II. Characteristics of early phase: G1: variable length, absence of G1, requirement for RNA & protein synthesis; cells with more than one nucleus, mitochondrial genome. S: Initiation, nuclear - cytoplasmic interactions, nuclear transplantation expts, cytoplasm transfer expts, independence of micronuclear & mitochondrial DNA replication
G2: Chromosome condensation & construction of spindle, arrest in G2, cell fusion expts, G2 progress inhibited by G1+S factor, RNA & protein synthesis requirement, protein expression restricted to G2

M: initiation, phosphorylation of histone F1, cell fusion expts, M-phase cytosolic factors, reversible changes in nuclear membrane & nucleolus, cell surface changes during cycle

III. Regulation of cell cycle: Dominance of cell cycle stages - cell fusion experiments, embryonic & somatic cell cycles, meiotic & mitotic divisions, role of progesterone; maturation producing factor, discovery, temporal activity, concept of the cell cycle engine & downstream events, discovery of cyclins & role of ubiquitin. Genetic analysis of the cycle, purification of MPF, antibodies reveal identity of cyclin and kinase subunits, Thr/Ser & Tyr phosphorylation in MPF, tyrosine kinase & protein phosphatase activities.

IV. Membranes and organelles during mitosis and cytokinesis: The nuclear envelope & chromosomal receptors, nuclear lamina, lamin A & lamin B, homotetramers as repeating units of lamina filaments, dissolution by MPF-mediated ser phosphorylation, specific locations of lamin A & B during mitosis, re-polymerization of lamina after end of M.

Text and other reading material for Cell Cycle:

Carbohydrate Metabolism - Dr Richard Porter (4 Lectures)

Learning Objectives:
To be familiar with the biochemical steps through principle biochemical pathways of carbohydrate metabolism
To understand the control of flux through principle biochemical pathways of carbohydrate metabolism
To understand how physiological context effects the principle biochemical pathways of carbohydrate metabolism
How medical conditions can effect principle biochemical pathways of carbohydrate metabolism

Lipid Metabolism - Dr Tim Mantle (4 lectures)
Lipids (or fat) Chemical nomenclature and chemical structures of the important lipids - triglycerol, monoacylglycerol, phospholipids etc. Enzymes that metabolise phospholipids - important in signal transduction - Fatty acid nomenclature. Overview of

**Learning Objectives:**
To be familiar with the biochemical steps through principle fatty acid metabolism and lipoprotein metabolism pathways in man
To understand the control of flux through principle biochemical pathways of fatty acid metabolism
To understand how physiological context effects the principle fatty acid and lipoprotein metabolism pathways
To understand the medical conditions resulting from defective lipoprotein metabolism

**Cholesterol and Biles Salts Dr Richard Porter (1 lecture)**
The objective in this lecture is to understand cholesterol metabolism and the biosynthetic pathways to bile salt/acid synthesis, the role of bile salts, enterohepatic circulation and how bile salts regulate cholesterol synthesis.

**Learning Objectives:**
To be familiar with the how cholesterol levels are controlled in humans
To be familiar with origins and role of bile salts/acids

**BIOENERGETICS DR RICHARD PORTER (2 LECTURES) [N.B. DETAILED PRACTICAL CLASS ON SUBJECT]**

**LEARNING OBJECTIVE:**
To understand how mitochondria make ATP

**Bioenergetics reference:**

**Nitrogen Metabolism – Dr Time Mantle (4 lectures)**
Learning Objectives:
To be familiar with the biochemical steps through principle biochemical pathways of amino acid interconversion, deamination and oxidation
To understand the control of flux through principle biochemical pathways of amino acid interconversion, deamination and oxidation
To understand how physiological context effects the principle biochemical pathways of amino acid interconversion, deamination and oxidation
How medical conditions can effect the principle biochemical pathways of amino acid interconversion, deamination and oxidation

Biochemical aspects of ethanol and alcohol-related diseases - Prof. Keith Tipton (2 lectures)
Definitions – tolerance and dependence. Enzymes, and isoenzymes, of ethanol metabolism; individual and species variations. "Japanese flushers" and antabuse (disulfiram). Consequences of metabolic changes in terms of NADH/NAD levels and competition with other metabolic systems. Lipid and neurotransmitter alterations. Alcohol related liver disease.

Learning Objectives:
To be able to describe the pathways and enzymes involved in ethanol metabolism.
To understand the ways in which metabolism of ethanol may affect the normal cellular processes.
To understand the effects of ethanol on membranes and membrane-related processes.
To appreciate the genetic and personality factors contributing to alcoholism
To be able to relate the primary and secondary effects of ethanol to alcohol-related diseases.

Nutritional Anaemias - Professor John Scott (5 lectures)
Almost everybody under clinical investigation will have a full blood count (FBC). The mainobjective of this is to determine the presence of absence of anaemia. Should such be present a significant proportion will be due to iron deficiency. The other main cause of a nutritional anaemia will be folate or to a lesser extent, vitamin B_{12} deficiency. To understand this area one needs a knowledge of the underlying causes of iron deficiency (and its counterpart, iron overload or haemochromatosis). Also, it is essential to understand the causes and effects of folate deficiency and how vitamin B_{12} deficiency causes an identical megaloblastic anaemia are essential. This background in folate biochemically leads to an understanding of the mode of action of some of the most important anti-cancer drugs (Methotrexate, Fluorouracil) and the most important antimicobial drugs (Trimethoprim and the Sulpha drugs).all of which are anti folates and work directly or indirectly to disrupt folate metabolism.

Learning Objectives
1. The role of the folate in cell division and how this results in anaemia and risk of Spina Bifida and other neural tube defects (NTDs).
2. Vitamin B12 metabolism and how when the vitamin is deficient either through diet (vegans) or more commonly, due to mal-absorption (pernicious anaemia or gastric atrophy) an anaemia and neuropathy develop. How excess folic acid prevents the diagnosis of the anaemia allowing the neuropathy to progress undiagnosed.

3. Why some of the most important anti-cancer and anti-microbial drugs have a mechanism of action that directly or indirectly inhibits folate metabolism.

4. The antifolate methotrexate is the drug of choice to treat rheumathroid arthritis. Why?

5. The dynamics of iron distribution and metabolism in the body.

6. Haemochromatosis as an example of an infrequent medium penetrance, genetic variant compared to the genetic variants involved in NTDs which are very common but of low penetrance.

**CORE AND OPTIONAL READING LIST**

**TWO COPIES OF EACH ARTICLE BE GIVEN TO CLASS REPRESENTATIVE AND ONE COPY WILL BE BEHIND THE COUNTER IN THE HAMILTON LIBRARY**

**FOLATE/ VITAMIN B\textsubscript{12}**


4) Weir D.G., Scott J.M. “Vitamin B\textsubscript{12}: Cobalamin”, Modern Nutrition in Health and Disease, Editors: Shils M.E., Olson J.A. Shike M and Ross A.C. Williams and Wilkins, Baltimore, Maryland, USA.


**IRON**


These last two articles can be downloaded from PubMed.
**Gene Structure and Expression Course (2 lectures) - Dr Daniela Zisterer**

**DNA replication (1 lecture)**  
**Summary of topics covered in Replication lecture:** DNA replicated by polymerases that take instruction from templates. General features of DNA polymerases. Problems associated with replication. Synthesis of DNA at replication fork: leading strand, lagging strand (Okazaki fragments). Enzymes at the replication fork. DNA replication of E. Coli as a model system. Comparison of prokaryotic and eukaryotic replication. Regulation of replication initiation in eukaryotes. Many enzymes involved in replication as targets for anti-cancer drugs e.g. topoisomerase.

**Learning Objectives:**  
To know the general features of DNA polymerases  
To be able to describe how DNA is synthesised at the replication fork  
To understand the problems associated with DNA replication  
To be able to compare prokaryotic and eukaryotic DNA replication

**Translation (protein synthesis) (1 lecture)**  
**Summary of topics covered in Translation lecture:** Modifications to primary RNA transcript (capping, polyadenylation, splicing). Exon/Introns. How does splicing machinery target introns? Alternative splicing. Abberant splicing. Transport of mature mRNA to cytoplasm. Explanation of translation. Three types of RNA involved—mRNA, tRNA, rRNA. Amino acid activation. Eukaryotic translation divided into three steps—Initiation (‘start codon’ AUG, initiates translation), Elongation, Termination (involvement of ‘stop codons’). Protein synthesis inhibited by many antibiotics and toxins e.g. mode of action of tetracyclines, chloramphenicol & diptheria toxin.

**Learning objectives:**  
To understand how nascent RNA become mature mRNA  
To know the different RNA molecules involved in protein synthesis  
To be able to describe the process of translation  
To learn examples of therapeutic drugs that target protein synthesis

**Recommended Textbooks:**  

**Structure of DNA (1 lecture) - Prof Andrew Bowie**  
**Summary of topics covered in DNA structure lecture:**  
Introduction to genome complexity. Content of the human genome. Chemical structure of DNA. The double helix. The need for the cell to ‘package’ DNA. Role of histones and nucleosomes in organising DNA. Euchromatin and heterochromatin. Chromosome structure. Human chromosomes. How chromatin is re-modelled to allow proteins and enzymes to access DNA when necessary. The role and relevance of modification of histone protein tails in making DNA more accessible, for example during gene expression.

**Learning objectives:**  
To know the chemical components that make up DNA.  
To understand why DNA has to be tightly packaged yet also readily accessible.  
To be able to describe how DNA is packaged in a cell.  
To understand the purpose of chromatin remodelling and histone modification.  
To understand basic chromosome structure

**Gene expression and transcription (2 lectures) - Prof Andrew Bowie**
Summary of topics covered in Gene expression and transcription lectures:

Transcription by RNA Polymerase II: The formation of the pre-initiation complex, and the role of the GTFs TFIID, A, B, E, F, and H. Structure of TFIID. General features of transcription factors, and how they interact with DNA. DNA response elements allow cells to respond to signals from the extracellular environment. Example of glucocorticoid and steroid hormone receptors. Common DNA binding motifs found in transcription factors. How amino acid sequence in these motifs determines specificity for a particular DNA sequence. Activation domains.

Learning objectives:
To appreciate the importance of transcription in regulating cellular processes.
To be able to describe the DNA elements in a gene that allow initiation and regulation of transcription.
To be able to define and describe different classes of transcription factors
To be able to describe how transcription is initiated for RNA Polymerase II promoters.
To learn the different DNA-binding motifs common to transcription factors, and know how these allow specific interaction with DNA.

Textbooks
Lewin’s Genes X. Krebs, Goldstein and Kilpatrick (Chapters 1, 4, 20, 28).

Biochemistry of the Inflammatory Process: - Dr Jack Bloomfield (4 lectures)
Definition of inflammation and inflammatory diseases.
Degranulation causes release of inflammatory mediators.
Treatment of inflammatory diseases. Anti-inflammatory drugs.
Psoriasis as a model of inflammatory skin disease.
Role of neutrophil in the perpetuation of chronic inflammation.
Role of leukotrienes in pathogenesis of psoriasis.
Neutral proteinases in psoriasis.
Role of prostaglandins and leukotrienes in inflammation.
Helicobacter pylori in peptic ulcer disease.
Effect of H2-receptor antagonists on peptic ulcers.
Study of prostaglandin and leukotriene production in peptic ulcer disease.
Anti-inflammatory effects of H2-receptor antagonists.
Mechanisms of hormone action: - Dr Paul Voorheis (6 lectures)

Overview: Major types of cell-cell communication, differential response of different cells to the same hormone, response time and general mechanism, amplification, termination of response, sensitisation and down-regulation, hydrophilic versus hydrophobic hormones, second messengers versus first messengers.

Receptors: Single transmembrane segment receptors, EGF & insulin receptors as examples, functional domains determined from cloning & sequencing expts., tyrosine kinase activity, self & G-protein phosphorylation, entry by receptor-mediated endocytosis, P1-glycan linkages & possible 2nd messenger activity, receptor regulation by serine/threonine phosphorylation, oncogene analogues.

Receptors: Seven-transmembrane-segment receptors, β-adrenergic receptor as example, transmembrane disposition & charged residues, agonist-antagonist binding within transmembrane portions 2/3 & 5/6/7, G-protein coupling domain in cytoplasmic segments 5/6 & C-terminus, fatty acylation of receptor, oncogene analogues; cerb A receptors for steroid hormones & thyroid hormone, cytoplasmic & nuclear locations, nuclear translocation, cloning & sequencing, functional domains, Zn2+-fingers, DNA binding & promoter activity, ovalbumin gene activation by progesterone & role of nuclear scaffold proteins, oncogene analogues.

G-proteins: Gs, Gi & Go, α/β/γ subunit structure/function, GTP-GDP binding/exchange, open & closed nucleotide binding site, transient coupling to & function of hormone-receptor complex, GTP – a subunit coupling to target protein & activation, GTP hydrolysis, decoupling & termination of signal, cholera toxin, pertussis toxin, NAD-dependent ADP-ribosylation, other G-proteins, oncogene analogues.

Cyclic nucleotide signalling: Discovery & structure of cAMP, adenylate cyclase catalytic reaction, cloning, sequencing & membrane disposition of cyclase, functional domains, regulation of cytoplasmic phosphorylation consensus site, structural similarity of transmembrane segments to ion channel transmembrane segments, possible bifunctional protein, cAMP-depnding protein kinase, subunit structure/function, substrate specificity, summary of steps in adrenalin signalling.

IP3, Ca2+ & Protein kinase C signalling: Structures of D-my-o-inositol & phosphatidyl inositol, location in inner leaflet of PM, PI kinase & IP-4,5-bis-phosphate, inositol-specific phospholipase C, location, functional domains derived from cloning/sequencing expts, hormone-receptor interaction, catalytic reaction & products, inositol-1,4,5-tris-phosphate binding to ER/SE Ca2+ channel, basal & stimulated cytoplasmic Ca2+ levels, Ca2+ transients, calmodulin structure & Ca2+ binding, binding/activation of target enzymes, IP3 verses IP4 & entry of external Ca2+ termination of signal by signal by OP3 degradation, Li+ sensitive phosphatase; protein kinase C, location & diglyceride activation, phorbol ester & tumour promotors, phosphorylation of G-protein (ser/thr) & other proteins, regulation of endocytosis/exocytosis, phosphorylation & mitogenesis, AP3: fos/jun, helix-turn-helix & leucine zipper DNA – binding motifs, trans-acting factors, other oncogene analogues, summary of steps in IP3/ Ca2+ & protein kinase C signalling.

Growth Factors and Apoptosis: - Prof Luke O'Neill (3 lectures)

Lecture 1 Growth factor signalling:
To understand how cells normally grow and divide. How growth factors were discovered and what are they? EGF, PDGF and NGF as examples. Understanding the first growth

Lecture 2 Dysregulation of growth factor signalling pathways:
Key features of cancer: dysregulated cell growth. Discovery of viral oncogenes and proto-oncogenes. Description of Ras, Raf and RTK as examples. How mutations in oncogenes can initiate a cellular transformation event. Weinberg experiments. Available therapeutics for dysregulated growth factor signalling pathways.

Lecture 3 Apoptosis:
Key early discoveries: microscopic changes during development. The nematode as a key model system. Identification of caspases as key participants. The extrinsic and intrinsic pathways which lead to apoptosis. TNF family and Fas as key activators. Role of mitochondria: cytochrome c release. Inhibitors of apoptosis. Role of apoptosis in cancer cancer.

Basic Genetics (8 lectures)
Basic principles: the Human genome; structure of chromosomes revealed by modern methods of analysis (facs, multicolour spectral karyotyping etc), structure of DNA, gene structure and the genetic code, the Central Dogma. Aberrations of the genetic material: types of mutation – single base, frameshift, deletion, etc to whole chromosome. How chromosomes segregate – Mendel's Laws of segregation and independent assortment using human pedigrees (not peas).

The impact of genetic disease in medicine: congenital disease syndromes caused by chromosomal imbalance; the spectrum of mendelian disease, including examples of common autosomal dominant, recessive and X-linked conditions; definition of multifactorial inheritance with examples of common multifactorial diseases; cancer as a genetic disease,

The practical value of medical genetics: knowledge of genetics enables accurate diagnosis and genetic counseling of patients and families. The work of regional genetics advisory services, using the activities of the National Centre for Medical Genetics and the North Eastern Regional Genetics Advisory service in the UK as examples; genetically-based and novel pharmacological approaches to therapy using specific examples – gene therapy for severe combined immunodeficiency (at a price); gene therapy now in use for restoration of vision in Leber amaurosis, and more examples depending on time.
### MICHAELMAS TERM 2010 SEMESTER 1 LECTURE TIMETABLE

**Venues:** Goldhall, Goldsmith Hall: MacNeill 3, The Hamilton Building; LTEE 1, Basement Hamilton Building; CLLT, Chemistry Large Lecture Theatre, St. James, Department of Radiotherapy, FRED and Seminar room are in School of Biochemistry and Immunology.

<table>
<thead>
<tr>
<th>Week</th>
<th>Day/ Date</th>
<th>Time</th>
<th>Topic</th>
<th>Venue</th>
<th>Lecturer</th>
<th>Class</th>
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<td><strong>W1 (w5)</strong></td>
<td>Mon 27 Sep</td>
<td>11am</td>
<td>Introduction</td>
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<td>Wed 29 Sep</td>
<td>11am</td>
<td>Proteins 1</td>
<td>MacNeill 3</td>
<td>Mok</td>
<td>JF Pharmacy &amp; JF Meds</td>
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<td></td>
<td>Thur 30 Sept</td>
<td>11am</td>
<td>Proteins 2</td>
<td>Goldhall</td>
<td>Mok</td>
<td>JF Pharmacy &amp; JF Meds</td>
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<td><strong>W2 (w6)</strong></td>
<td>Mon 4 Oct</td>
<td>11am</td>
<td>Proteins 3</td>
<td>Ed Burke 1008</td>
<td>Mok</td>
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<td></td>
<td>Wed 6 Oct</td>
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<td>Proteins 4</td>
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<td>Thurs 7 Oct</td>
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<td>Proteins 5</td>
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<td>11am</td>
<td>Enzymes 1</td>
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<td>Mantle</td>
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<td>Tues 12 Oct</td>
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<td>Enzymes extra</td>
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<td>Membranes 1</td>
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<td>Wed 20 Oct</td>
<td>11am</td>
<td>Transporters 1</td>
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<td>11am</td>
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<td>Carbohydrates 2</td>
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<td>Thurs 28 Oct</td>
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<td><strong>W6 (w10)</strong></td>
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<td>Carbohydrates 4</td>
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<td></td>
<td>Wed 3 Nov</td>
<td>11am</td>
<td>Cell Cycle 1</td>
<td>MacNeill3</td>
<td>Voorheis</td>
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<td>Thurs 4 Nov</td>
<td>11am</td>
<td>Cell Cycle 2</td>
<td>Goldhall</td>
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<td>Thurs 4 Nov</td>
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<td>Membrane transporters</td>
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22
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<td>W7 (w11)</td>
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<td>CLLT</td>
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<td>11am</td>
<td>Cell Cycle 4</td>
<td>MacNeill 3</td>
<td>Voorheis</td>
<td>JF Pharmacy, SF Radiotherapy &amp; JF Meds</td>
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<td>Thurs 11 Nov</td>
<td>11am</td>
<td>Lipids 1</td>
<td>Goldhall</td>
<td>Mantle</td>
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<td>Mon 15 Nov</td>
<td>11am</td>
<td>Lipids 2</td>
<td>Ed Burke 1008</td>
<td>Mantle</td>
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<td>11am</td>
<td>Lipids 3</td>
<td>MacNeill 3</td>
<td>Mantle</td>
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<td>11am</td>
<td>Lipids 4</td>
<td>Goldhall</td>
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<td>Amino acids 1</td>
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<td>Amino acids 2</td>
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<td>Amino acids 3</td>
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<td>Thurs 2 Dec</td>
<td>11am</td>
<td>Bioenergetics 1</td>
<td>Goldhall</td>
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<td>Fri 3 Dec</td>
<td>9am</td>
<td>Bioenergetics 2</td>
<td>Gold Hall Porter</td>
<td>JF Pharmacy &amp; SF Radiotherapy JF Meds</td>
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<td>W11 (w15)</td>
<td>Revision Week</td>
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<td>No Study Week for Pharmacy</td>
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<td>Exams</td>
<td>For Meds &amp; RT's</td>
<td>MCQ Exam for Pharmacy in May</td>
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**NOTE:** SF Pharmacy will get Transcription and translation lecture in Term 1.
# Junior Freshman Medical Students

## Hilary Semester 2 Timetable 2011

Venues: LTEE 1, Basement Hamilton Building; Edmund Burke Theatre (1008) & Robert Emmet Theatre (2037), are in the Arts Building; Joly 4, Hamilton Building

<table>
<thead>
<tr>
<th>Week</th>
<th>Day/Date</th>
<th>Time</th>
<th>Topic</th>
<th>Venue</th>
<th>Lecturer</th>
<th>Class</th>
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<tr>
<td>W1 (w21)</td>
<td>Monday 17 Jan</td>
<td>10am</td>
<td>Integration of metab 1</td>
<td>McNeill 3</td>
<td>Porter</td>
<td>JF Meds &amp; SFRadiotherapy</td>
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<tr>
<td></td>
<td>Wed 19 Jan</td>
<td>11am</td>
<td>Cholesterol and bile salts 1</td>
<td>1008</td>
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<tr>
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<td>Thurs 20 Jan</td>
<td>10am</td>
<td>Alcohol Metab 1</td>
<td>Joly 4</td>
<td>Tipton</td>
<td>SF Pharmacy &amp; JF Meds</td>
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<td>Monday 24 Jan</td>
<td>10am</td>
<td>Alcohol metabolism 2</td>
<td>McNeill</td>
<td>Tipton</td>
<td>SF Pharmacy &amp; JF Meds</td>
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<td></td>
<td>Wed 26 Jan</td>
<td>11am</td>
<td>Folate/B12/Haem Met 1</td>
<td>1008</td>
<td>Scott</td>
<td>SF Pharmacy, SF Radiotherapy &amp; JF Meds</td>
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<tr>
<td></td>
<td>Thurs 27 Jan</td>
<td>10am</td>
<td>Folate/B12/Haem Met 2</td>
<td>Joly 4</td>
<td>Scott</td>
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<tr>
<td></td>
<td>Wed 2 Feb</td>
<td>11am</td>
<td>Folate/B12/Haem Met 4</td>
<td>1008</td>
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<td>Thurs 3 Feb</td>
<td>10am</td>
<td>Folate/B12/Haem Met 5</td>
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<td>Inflammation 1</td>
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<td>11am</td>
<td>Inflammation 2</td>
<td>1008</td>
<td>Bloomfield</td>
<td>JF Meds &amp; SFRadiotherapy</td>
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<td>Thurs 10 Feb</td>
<td>10am</td>
<td>Inflammation 3</td>
<td>Joly 4</td>
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<td>10am</td>
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<td>Tues 15 Feb</td>
<td>2-5pm</td>
<td>Postpractical tutorial SF RT</td>
<td>FRED</td>
<td>Carroll/Mantle/Porter</td>
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<td>Wed 16 Feb</td>
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<td>11am</td>
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<td>10am</td>
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<td>Goldsmith</td>
<td>Carroll/mantle/Porter JF Med only</td>
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<td></td>
<td>Wed 30 Mar</td>
<td>11am</td>
<td>Growth Fact/Apoptosis 1</td>
<td>1008</td>
<td>Corr JF Meds &amp; SFRadiotherapy</td>
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<td></td>
<td>Thurs 31 Mar</td>
<td>10am</td>
<td>Growth Fact/Apoptosis 2</td>
<td>Joly 4</td>
<td>Corr JF Meds &amp; SFRadiotherapy</td>
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<tr>
<td><strong>W12 (W32)</strong></td>
<td>Mon4 Apr</td>
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<td>Wed 6 Apr</td>
<td>11am</td>
<td>Growth Fact/Apoptosis 3</td>
<td>1008</td>
<td>Corr JF Meds &amp; SFRadiotherapy</td>
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<td></td>
<td>Thurs 7 Apr</td>
<td>10am</td>
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<td>Joly 4</td>
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<tr>
<td><strong>W13(w33)</strong></td>
<td>Mon 11 Apr</td>
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<tr>
<td><strong>W14(w34)</strong></td>
<td>Mon 18 Apr</td>
<td>Revisi Wk</td>
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<td><strong>W15(w35)</strong></td>
<td>Mon 25 Apr</td>
<td>Exam s</td>
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PRACTICAL LAB SESSIONS
Hilary Semester 2 Timetable 2011

BIOCHEMISTRY
SEMESTER 2 (HILARY TERM) BIOCHEMISTRY PRACTICAL TIMETABLE 2011

Venues: Ground Floor of the School of Biochemistry and Immunology

<table>
<thead>
<tr>
<th>WEEK</th>
<th>DAY</th>
<th>DATE</th>
<th>TIME</th>
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<tr>
<td>Wk1</td>
<td>F</td>
<td>7 Jan</td>
<td>2pm</td>
<td>spectroscopy (Groups A &amp; B)</td>
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<td>Wk2</td>
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<td>14 Jan</td>
<td>2pm</td>
<td>enzyme kinetics (Groups A &amp; B)</td>
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<td>2pm</td>
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<td>Wk4</td>
<td>F</td>
<td>28 Jan</td>
<td>2pm</td>
<td>oxidative phosphorylation (Groups A &amp; B)</td>
<td>Porter</td>
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<td>Wk5</td>
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<td>Wk6</td>
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<td>Wk7</td>
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<td>Wk8</td>
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<td>Porter</td>
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<td>Wk9</td>
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<td>post-practical tutorial Goldsmith (Groups A, B, C &amp; D)</td>
<td>Carroll/Mantle/Porter</td>
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BRING YOUR OWN WHITE COAT AND LAB MANUAL

Venue: Ground Floor of the School of Biochemistry and Immunology (Wellcome Building, Trinity College campus).

All practical classes in Biochemistry will take place in the Teaching Laboratory located on the ground floor of the School of Biochemistry and Immunology Wellcome Building, Trinity College campus.

Students must bring your own white coat and lab manual
**INDICATIVE SOURCES**

**Core texts:**


**LEARNING OUTCOMES**

On successful completion of this course, students will be able to:

1. To appreciate the importance of DNA replication, transcription and translation in regulating cellular processes in mammals.
2. To appreciate the central role played by proteins and enzymes in the functions of the mammalian cell.
3. To be familiar with the principle biochemical pathways that dictate metabolism in mammals, to appreciate how they are physiologically regulated and be familiar with diseases associated with their dysfunction and how drugs, targeted to these pathways, can benefit humans.
4. To be familiar with membrane structure(s) and how it defines mammalian cells and organelles
5. To be familiar with how signals for a physiological processes that arrive on the outside of cells are translated into function inside mammalian cells
6. To be familiar with how the chronological development and growth of a cell is coordinated
7. To be familiar with examples of human cells with specialized functions

**METHODS OF TEACHING AND STUDENT LEARNING**

Indicate the range of strategies employed in teaching delivery. In what learning activities are the students expected to engage? Mention what approach is taken towards ensuring an inclusive curriculum.

Students experience Biochemistry through Lectures, Practical classes, Tutorials and Small Group Learning and direct interaction with staff. The course has been designed to be vertically integrated with the following courses also taught to medical students: clinical biochemistry, endocrinology, immunology, pharmacology, pathology, haematology and molecular medicine.
METHODS OF ASSESSMENT

(a) **Summative** -

Semester 1 (40%): [10% MCQ; 30% essay questions]
Semester 2 (60%): [10% MCQ; 50% practical question/essay questions].

The total of these assessments will be adjusted to 95% of the mark for this module.

The Small Group Learning tutorials continuous assessment will account for the remaining 5%.

(b) **Formative** -

1. Knowledge of course work and informal feedback on course work is discussed with each student during practical biochemistry
2. Feedback for those who struggled in their first semester examinations is given to individual students in the second semester.
3. Breakdown of results is given to all students on request
4. Course co-ordinators can be contacted with any reasonable requests about the course and the examinations.

EVALUATION

A lecturer based feedback form is distributed to students. The data is collated, plotted and analyzed assessments are given to the lecturers.
Module 3: Human Form & Function (30 credits)

Co-ordinators:
- Dr Paul Tierney, Anatomy Department (ptierney@tcd.ie) 896 1280
- Professor Veronica Campbell, Physiology Department (vacmpbll@tcd.ie) 896 1192

Lecturer(s)
Anatomy:
- Mr. P. Glacken (pglacken@tcd.ie)
- Dr. W. Ryan (wmryan@tcd.ie)
- Dr. N. Mahony (njmahony@tcd.ie)
- Dr. P. Tierney (ptierney@tcd.ie)

Physiology:
- Professor Veronica Campbell (vacmpbll@tcd.ie)
- Professor Roger Anwyl (ranwyl@tcd.ie)
- Professor Kumlesh Dev (devk@tcd.ie)
- Professor Thomas Connor (connort@tcd.ie)
- Dr Áine Kelly (aikelly@tcd.ie)
- Dr Mikel Egāna (eganam@tcd.ie)
- Dr Alice Witney (awitney@tcd.ie)
- Dr Daniel Ulrich (ulrichd@tcd.ie)
- Dr Neil Docherty (dochertn@tcd.ie)
- Dr Nicole Burns (nburns@tcd.ie) - responsibility for Physiology laboratory classes

Contact Hours
109 lectures; 72h small group learning (SGL)
27h laboratory classes in Physiology
60h laboratory classes in Anatomy

ECTS
30

Rationale and Aims
The aim of Human Form and Function is to provide the students with a sound understanding of the human body from the structural, cellular and organ perspectives. For convenience and because of the way in which available textbooks are named, we will be referring often to these perspectives in terms of histology, anatomy and physiology but you should remember that such a distinction is quite artificial – the body operates as a whole, structure and biological function are inherently linked and disease processes that affect any structure or activity will have consequences for the entire organism. As far as is practicable, the course teachers will try to emphasise this integration of form and function as the module progresses, since understanding this principle is essential for you to develop a good grasp of clinical practice.
**COURSE CONTENT**

- Organization of the human body
- Blood, immune system and lymphatic drainage
- Structure, function and development of the musculoskeletal system
- The endocrine system and homeostasis
- Structure, function and development of the cardiorespiratory system
- Structure, function and development of the gastrointestinal system
- Structure, function and development of the genitourinary system

**RECOMMENDED TEXTS:**

**Anatomy**

1. A core textbook in anatomy is absolutely essential. We recommend Monkhouse for its brevity and clarity. However, there are other basic textbooks listed below, that offer valuable additional insights and will take your knowledge to a higher level.

2. It is also essential to have an atlas of anatomy. There are four popular atlases listed below, each with its strong and weak points. The department provides copies of all four in the Dissecting Room. Look at each before buying one. We strongly suggest that students should form study groups; therefore it would be good if individual students in a study group obtained different atlases so that the group would have access to all.

3. A book on neuroanatomy is absolutely essential in Second Year and is desirable in First Year. Crossman and Neary is an excellent core text. FitzGerald and Folan is more advanced but is one you will keep through your clinical years.

4. Reference books are useful in three main ways. Firstly they are helpful when your main textbook seems inadequate or unclear. Next, they are useful in learning how to systematically describe any structure. Finally, the introductory chapters to each system give an overview not provided in general textbooks. It is unnecessary to buy a reference book, as there are copies in the library.

| Main Textbooks | • Clinical Anatomy: Monkhouse: Churchill Livingstone  
| • Anatomy – Regional and Applied: Last: Churchill Livingstone  
| • Clinically Oriented Anatomy: Moore: Williams & Wilkins |
| Atlasses | • Atlas of Human Anatomy: Netter: CIBA-Geigy  
| • A Colour Atlas of Human Anatomy: McMinn & Hutchings: Wolfe  
| • Grant’s Atlas of Human Anatomy: Grant: Williams & Wilkins  
| Neuroanatomy | • Neuroanatomy - An Illustrated Colour Text: Crossman & Neary: Churchill Livingstone  
| • Clinical Neuroanatomy,: FitzGerald and Folan: W B Saunders |
| Reference | • Gray’s Anatomy for Students: Drake et al: Elsevier  
| • Gray’s Anatomy: Williams et al: Longman  
| • Principles of Neural Science: Kandel and Schwartz [Ed]:Elsevier |

**SUMMARY**

*You must get a main textbook and an atlas.*

*You should probably get a book on Neuroanatomy.*

*You should not get a reference book, but you should refer to one from time to time.*
PHYSIOLOGY

The core text for the course is


OR


All students are advised to own or at least to have regular guaranteed access to a copy of this book. It is strongly recommended that you take time to read the relevant chapter in Sherwood before the beginning of the lecture sequence dealing with a particular body system. This is important because it will help you to be familiar with the terminology and with the basic concepts that will be expanded by the lecturer. If you understood everything in Sherwood, then you would be sure of a good performance in the examination. However, few reference sources are perfect and on occasions lecturers may provide additional information or draw your attention to mistakes in the book. The majority of slides will be taken from this book.

Another good text is


For more information on clinical aspects of the subject, you can consult one of the following, which will also be referred to specifically in some parts of the lecture course


Kumar & Clark's Clinical Medicine is the recommended textbook for Clinical Medicine, so you will need to have this book by then and may wish to purchase it in advance.

The course starts with a sequence of lectures on basic tissue structure (=histology). A manual to accompany these lectures can be downloaded from the departmental website (http://www.tcd.ie/Physiology/text/software/download.html). There is no need to buy a textbook, but a number of useful books are available in the Hamilton Library. The recommended textbook is:


Any other books less than ten years old and with good colour plates in the Hamilton Library at 611.018 are useful alternatives.
**DISCIPLINE-SPECIFIC INFORMATION**

The anatomy course component of the Human Form & Function module is delivered through lectures and small group teaching in practical classes. Lectures provide an overview of a region or topic and emphasise points of clinical significance. **Lecture notes** can be downloaded from WebCT via the College network and should be studied before attending the lecture to minimise the need to take notes.

The class is divided into two groups for **anatomy practical classes**. Here the emphasis is on cadaveric dissection, surface anatomy and radiology. A Lecturer and Demonstrators are in attendance to advise students. Practical manuals are provided via WebCT and should be consulted before attending the class. The first 2 hours of each practical class are spent at dissecting stations in the DR. The remaining hour is spent learning surface anatomy and radiologic anatomy of the region under study. The relevance of these activities to clinical practice should be obvious.

The physiology course component of the Human Form & Function module is delivered through lectures and small group teaching in practical classes. **Lecture notes** and **timetable** can be downloaded from: http://www.medicine.tcd.ie/physiology/undergraduate/human_form_function/ via the College network and should be studied before attending the lecture to minimise the need to take notes. Sample **revision questions** are available at: http://www.medicine.tcd.ie/physiology/undergraduate/human_form_function/

The class is divided into four groups for **physiology practical classes**. Here the emphasis is on measurement of physiological variables. A Lecturer and Demonstrators are in attendance to advise students. Practical manuals must be purchased in the Physiology Department and will be available ONLY during a restricted period early in Michaelmas Term. Details of this will be announced at the beginning of Term. It is essential that you read the section of the manual dealing with each day's experiment before you come to class.

Students will complete an assessment for each laboratory practical. Normally, marks for a physiology practical assessment will be awarded ONLY to students who have attended the practical class (signed the attendance record and handed in data sheets where appropriate) with their correct group. A change of group will be considered only in special circumstances e.g. illness (on production of a medical certificate) or representing the College in a recognised sport (on production of a letter from the team captain). Absence due to late arrival in, or early departure from, college is not considered an acceptable reason. Students are reminded that the laboratory classes are a compulsory component of the module.

Interactive tutorials on all segments of the physiology component of the module are available on Macintosh computers within the Departmental teaching laboratories and in the College computer laboratories. The Departmental machines are accessible between 0900-1700 hours, dependent on whether classes are scheduled in the lab. The College Computer laboratories are open 24 hours per day. All students are advised most strongly to spend time throughout the year on these tutorials. They are important to help you to understand the subject and also they provide useful training in handling multiple-choice questions.
Dr Alan Tuffery’s course manual containing all the relevant information for lectures in the first week of term can be found at: www.tcd.ie/physiology/tissuestructure.html

**LEARNING OUTCOMES**

On successful completion of this module the student will be able to:

- Recognise the structural characteristics of the basic mammalian cell types.
- Recognise, describe and classify bones and joints.
- Recognise and describe the blood supply and lymphatic drainage of the limbs.
- Describe the development of the pre-embryo and the limbs.
- Describe the gross and microscopic structure and function of nerves and muscles.
- Record and take accurate measurements of nerve and muscle activity.
- Recognise, describe and classify the circulating blood cells and outline their functions.
- Demonstrate competency in the methods used to obtain and handle a blood sample.
- Describe the specialized functions of endocrine glands and tissues, including mechanisms of feedback regulation.
- Define the principal actions of the classical hormones and their regulated release mechanisms.
- Recall typical normal values for physiological variables commonly used in clinical practice.
- Apply physiological and anatomical knowledge to explain the pathogenesis and natural history of common clinical disorders of the musculoskeletal, haematological and endocrine systems.
- Describe the gross and microscopic structure and function of the cardiorespiratory system.
- Record and take accurate measurements of cardiac and respiratory function and recall typical normal values for cardiorespiratory variables commonly used in clinical practice.
- Describe the development of the cardiovascular and respiratory systems and related congenital abnormalities.
- Apply physiological and anatomical knowledge to explain the pathogenesis and natural history of common clinical disorders of the cardiorespiratory system.
- Describe the gross and microscopic structure and function of the gastrointestinal and genitourinary systems.
- Recall typical normal values for gastrointestinal and genitourinary variables commonly used in clinical practice.
- Describe the development of the gastrointestinal and genitourinary systems and related congenital abnormalities.
- Apply physiological and anatomical knowledge to explain the pathogenesis and natural history of common clinical disorders of the gastrointestinal and genitourinary systems.

**METHODS OF TEACHING AND STUDENT LEARNING**

Methods of teaching and learning include Lectures, Practical Classes and Small Group Tutorials in which all students are required to participate.
Small Group Learning

The overall aim of the small group learning tutorials is to promote self-directed and cooperative learning. This allows the exploration and integration of the knowledge presented in the lecture series in the Human Form & Function and Evolution & Life modules. There is an increased emphasis in medical education in developing key skills that will enable you as a graduate to handle the enormous advances made in health care every year.

On successful completion of the tutorials you should be able to:
- gain, assess, apply and integrate new knowledge
- communicate effectively at individual, group and community level with respect to the issues related to medical practice
- demonstrate effective team-working and leadership skills
- reflect on your practice and be proficient in realistic self assessment
- identify your own learning needs
- use different techniques to record, organise and present information
- manage your own time and that of others

This is the beginning of your medical education; the small group tutorials are a non-threatening environment to practice communication, team-working and self assessment skills with your peers and your tutor. The tutorials use scenarios as a starting point for the acquisition of new knowledge and to practice the skills outlined. This approximates the future situation in which the knowledge will be applied. Information is no longer presented in separate disciplines e.g. Anatomy, Physiology, Biochemistry, necessitating integration by you at some later date. Each scenario presented will include elements from a number of disciplines. The scenario is discussed by a small group of students and the resultant discussion, explanation and debate results in better understanding of basic principles and highlights areas where more information is needed so that learning is done on the basis of need to know.

Each of the problems is accompanied by a list of specific learning objectives relevant to anatomy, biochemistry and physiology. These objectives will be regarded as examinable material within the formal examinations for Evolution and Life and Human Form and Function modules. The performance of individual students in small-group sessions and self-directed learning will be assessed continuously through a process self-assessment in consultation with the tutors.

Terms used in respect of Small Group Learning:

The Seven Steps
1. Clarify any terms and concepts that are unclear in the problem
2. Define the problem, i.e. list the phenomena to be explained OR write “Problem statements”
3. Explain the problem using prior knowledge and common sense to produce as many possible explanations as possible (“brainstorming”)
4. Arrange the explanations to form a coherent description of the processes that seem to underlie the phenomena
5. Formulate learning goals
6. Fill the knowledge gaps through individual study
7. Share the findings in a group discussion and integrate the knowledge into a comprehensive explanation of the phenomena (i.e. “solve the problem”)
Scenario (Problem)
The scenario is the basic unit of Small Group Learning and is structured by the planning group with due consideration of the level of knowledge of the students. Scenarios are constructed to encourage the affirmation of prior knowledge and acquisition of new knowledge. There are many types of scenarios, some are actually written descriptions of patients with disease but others relate to normal structure and function. They may be presented as a picture or a diagram. They will have a title which should provide a clue to the meaning. Sometimes a scenario description will finish with a task.

Block
A block is a collection of 5/6 scenarios related to a topic presented in a “Block Book”. This typically contains the following: Aims and Objectives, List of Planning Group Members, List of Student Tutorial Groups and Location of Tutorials, Set scenarios, Recommendations for reading

Tutorial Group
The tutorial group is composed of up to 12 students who work as a team in resolving each scenario. The tutorial group first meets to clarify and define what the problem is and the component pieces of information which are necessary in order to understand the problem. As a group it develops a reservoir of information for discussion, debate and further development through individual study. The composition of the tutorial group is altered randomly at the end of each block.

Chairperson
The chairperson’s job is to guide the discussion through the seven steps and to ensure proper attention at each phase. They must be aware of the contributions made by each member and should draw silent members into the discussion. The chairperson is most likely to fail by getting too involved in the discussion or by being too timid or too forceful.

Secretary
The secretary must record the discussion. They cannot carry out this role if heavily engaged in the discussion. It is not the secretary’s job to evaluate the discussion; matters, which the secretary considers to be irrelevant, must still be recorded. The secretary must check with the chairperson if the seven step process has been abandoned or curtailed or is in danger of being abandoned. If the secretary does not follow the discussion then it is probable that no one else can so the secretary must alert the chairperson as soon as they lose the thread. The chairperson must ensure the secretary is doing the job properly.
The group should agree a schedule at the beginning of the block. If you have scant experience of these roles inform the tutor that you would like to act as Chair or Secretary early on in the block.

Tutor
The tutor must ensure that all students participate in the tutorials. The tutor must avoid direction in order to promote self-directed learning by the students but can help stimulate the learning process through questions, suggestions and appropriate information. It is very difficult for an experienced lecturer to stand back and allow the principle of self directed learning to take place. Students are asked to score the tutor performance in order to promote constructive development of Small Group Learning.
Michaelmas Term Learning Objectives

Week 1
ANATOMY
To learn basic terminology concerning anatomical relations and movement
To identify the bones of the pectoral girdle, side them and name their features
To know the surface anatomy and radiologic anatomy of these bones
To understand the general anatomy of joints and their classification

PHYSIOLOGY
To be able to relate images of histological preparations to living tissues
To know the main characteristics of epithelial tissues, and connective tissue
To know the components of skin

Week 2
ANATOMY
To know the sternoclavicular and acromioclavicular joints
To know the anatomy of the breast
To know the attachments, actions and nerve supply of the muscles of the pectoral and scapular regions
To describe the axilla and identify its contents

PHYSIOLOGY
To understand the processes involved in bone formation and repair
To know typical sizes of the main body water compartments and be able to outline
To be able to define osmotic pressure, oncotic pressure and osmolality
To be able to define oedema and understand the basic processes by which this can occur

Week 3
ANATOMY
To understand the shoulder joint and demonstrate its movements
To identify the muscles of the shoulder joint, their attachments and nerve supply
To explain the actions of these muscles on the shoulder joint
To define the cubital fossa and identify its contents
To understand the elbow joint and the joints of pronation and supination
To demonstrate the movements of these joints

PHYSIOLOGY
To be able to describe the basic organization of the brain and spinal cord
To know typical normal concentrations of sodium, potassium, calcium, bicarbonate and chloride in intracellular and extracellular fluids
To know the structural characteristics of neurons and how these relate to their function
To understand the ionic basis for the resting membrane potential and the role of energy in its maintenance
To understand the ionic changes that underlie local (electrotonic) and propagated depolarizations of an excitable cell membrane
To understand why action potentials are ‘all-or-none’ phenomena
To be able to explain the roles of myelin and axon diameter in determining axonal conduction velocity

**Week 4**
**ANATOMY**
To identify all the muscles of the arm and forearm, their attachments and nerve supply
To explain the actions of these muscles
Know the surface anatomy of the arm and forearm

**PHYSIOLOGY**
To understand the processes involved in chemical neurotransmission
To understand the processes by which sensory information is detected and processed
To know the roles of spinal cord, hindbrain, thalamus and cerebral cortex in processing somatosensory information

**Week 5**
**ANATOMY**
To understand the joints of the hand and wrist
To demonstrate the movements of these joints
To identify all the muscles of the hand, their attachments and nerve supply
To explain the actions of hand muscles and forearm muscles in hand movement
To identify all the nerves of the upper limb and explain their functions
To know how to test them
To identify all the blood vessels of the upper limb
To know the surface anatomy of the hand

**PHYSIOLOGY**
To know the roles of the iris, lens and retina in vision
To understand the cellular basis of colour vision
To know the brain pathways that carry visual information and how these affect the image that is detected
To understand the functional anatomy of the ear in relation to audition
To understand the functional anatomy of the vestibular system
To know how the semicircular canals and macula enable control of balance and posture

**Week 6**
**ANATOMY**
Be able to identify all of the bones of the hip and thigh, side them and name their features
To know the surface anatomy of these bones
To understand the sacro-iliac joint and pubic symphysis
To understand the hip joint
To demonstrate the movements of the hip joint
To know the surface anatomy of the hip

**PHYSIOLOGY**
To comprehend the distinctions between the somatic and autonomic nervous systems
To be able to define the main differences between sympathetic and parasympathetic components of the autonomic nervous system and to appreciate their overall functional roles
To understand the 3-dimensional structure of a skeletal (somatic) muscle cell
To know the functional organization of the sarcomere and understand how it contracts
To appreciate the main differences between transmission at the skeletal neuromuscular junction and at other chemical synapses
To appreciate the vulnerability of neuromuscular transmission to poisons

**Week 7**
**ANATOMY**
To identify the muscles of the gluteal region, their attachments and nerve supply
To explain the actions of these muscles on the hip joint
To identify the muscles of the thigh, their attachments and nerve supply
To explain the actions of these muscles on the knee joint
To demonstrate the movements of the knee joint
To know the surface anatomy of the knee

**PHYSIOLOGY**
To understand the factors which affect the amount of muscle tension that results from muscle activation under different circumstances
To comprehend the differences in structure and functional behaviour between skeletal, cardiac and smooth muscles.
To be able to define a reflex
To understand the circuitry and functional importance of the tendon jerk reflex and the withdrawal (crossed-extensor) reflex
To understand how the brain has control over even simple reflexes

**Week 8**
**ANATOMY**
To identify the muscles of the leg, their attachments and nerve supply
To explain the actions of these muscles on the ankle and subtalar joints
To demonstrate the movements of these joints
To know the surface anatomy of the ankle and foot

**PHYSIOLOGY**
To know the basic composition of plasma
To know typical values for red blood cell size, circulating numbers and turnover rate
To understand the basic processes involved in blood cell formation (haemopoiesis) and the sites at which red blood cell formation and breakdown occur
To be able to recognize the different types of white blood cell (leucocyte) and know their functions
**Week 9**

**ANATOMY**
- To identify all the nerves of the lower limb and explain their functions
- To identify all the blood vessels of the lower limb

**PHYSIOLOGY**
- To understand the principle of feedback regulation of endocrine function
- To know the normal range of plasma free calcium concentrations
- To know the principles of hormonal regulation of calcium balance
- To know how hypocalcaemia is most commonly caused and the consequences of this
- To be able to describe the hypothalamo-pituitary axis and how this relates to regulation of peripheral endocrine function

**Week 10**

**ANATOMY**
- To understand the thoracic wall including its bones, muscles, joints and nerves.
- To recognise and describe the structures of the superior and anterior mediastina, and have a detailed knowledge of the heart

**PHYSIOLOGY**
- To be able to list the peripheral effects produced by each of the pituitary hormones
- To understand that all adrenal and gonadal steroid hormones are synthesised through a common pathway
- To comprehend the major role of the pineal gland in endocrine regulation
- To understand how growth is regulated by hormones
- To understand why puberty initiates both growth and its cessation
- To understand why abnormal growth hormone levels before and after puberty have different effects

**Week 11** - Revision week

**Week 12** - Examinations
Hilary Term Learning Objectives

**Week 1**

**ANATOMY**
- To understand the thoracic wall including its bones, muscles, joints and nerves.
- To recognise and describe the structures of the superior and anterior mediastina, and have a detailed knowledge of the heart.

**PHYSIOLOGY**
- To be able to describe the overall organization of the respiratory tract
- To recognize the notations used to identify different respiratory parameters
- To be able to define TLC, FRC, RV, VC, TV and FEV
- To appreciate the absolute pressure gradients involved in respiratory air movements and how these relate to flow rate during inspiration and expiration
- To understand the concepts of anatomical and physiological dead spaces
- To be able to describe the mechanisms that normal regulate airways resistance
- To be able to describe cellular processes that underlie development of asthma

**Week 2**

**ANATOMY**
- To recognise and describe the structures of the posterior mediastinum and be familiar with the structure of the lungs;
- To be able to explain the structure of the diaphragm and the mechanics of respiratory movements.

**PHYSIOLOGY**
- To be able to explain the major reasons for ventilation/perfusion mismatching
- To be able to recall the percentage composition and partial pressures of O₂, CO₂, H₂O and N₂ in atmospheric and alveolar air and understand the factors that can make these values vary
- To know why pressures in the pulmonary circulation are less than those in the systemic circulation and recognise the functional consequences
- To understand the non-respiratory importance of the lungs
- To know why pneumonia and pulmonary oedema prejudice respiratory function
- To be able to define obstructive and restrictive lung disease and be able to predict how each of these types of disease will affect respiratory mechanics and gas exchange
- To understand the different functional roles of dissolved and haemoglobin-bound oxygen and know their absolute normal values in arterial and venous blood
- To know how the relationship of plasma oxygen concentration to blood oxygen content is altered by variations in haematocrit and by haemoglobin binding capacity
**Week 3**

**ANATOMY**
- To recognise and describe the structures of the posterior mediastinum and be familiar with the structure of the lungs;
- To understand the diaphragm and the mechanics of respiratory movements.

**PHYSIOLOGY**
- To appreciate the principles of respiratory control and the implications of changed oxygen and carbon dioxide concentrations
- To appreciate the consequences of ambient pressure on gas exchange and handling by the body
- To have an approximate knowledge of the absolute pressure changes experienced as one ascends to high altitude
- To comprehend the acute and chronic effects of breathing a hypoxic gas mixture
- To know the rate at which absolute atmospheric pressure increases with descent below the surface level of water
- To comprehend the diverse effects of hyperbaric environments on the body

**Week 4**

**ANATOMY**
- To consolidate knowledge of the thorax;
- To recognise and describe the actions of the muscles of the abdominal wall, and their nerve supply.

**PHYSIOLOGY**
- To know the organisation of the cardiovascular system
- To understand the main factors that affect resistance to and velocity of fluid flow in the bloodstream and be able to relate these factors, using equations
- To comprehend the structural properties of arteries, arterioles, capillaries, veins and lymphatics and how these relate to the specialized functions of these vessels
- To know the absolute effect of gravity on intravascular hydrostatic pressures in the vasculature of the lower limbs when standing
- To understand how gravity affects venous return and water movement between plasma and interstitium
- To comprehend the electrical properties of the heart and the principle of the ECG

**Week 5**

**ANATOMY**
- To recognise and describe the structures forming the posterior abdominal wall, the aorta, the inferior vena cava and the lumbar plexus.

**PHYSIOLOGY**
- To be able to define cardiac output, cardiac index, preload and afterload
- To know typical values for the distribution of cardiac output at rest
- To understand the principle of auscultatory measurement of blood pressure
- To comprehend the electrical properties of the heart and the principle of the ECG

**Week 6**

**ANATOMY**
- To consolidate your knowledge of the thorax
- To recognise and describe the actions of the muscles of the abdominal wall, and their nerve supply.
PHYSIOLOGY

- To be able to recognize typical normal values for systolic and diastolic arterial pressures and appreciate how each of these is affected by heart rate, cardiac contractility, aortic compliance and peripheral resistance.
- To recognize the importance of a stable arterial blood pressure and understand the main processes by which blood pressure is regulated.
- To understand the principle of auscultatory measurement of blood pressure.
- To appreciate that total peripheral resistance and specific regional resistances may be regulated independently.
- To comprehend the processes by which local regulation of regional blood flow can occur.

Week 7 READING WEEK

Week 8
ANATOMY

- To know the inguinal canal and the testis, the stomach and spleen;
- To know the general topography of the peritoneal cavity.

PHYSIOLOGY

- To comprehend the functional architecture of the gastrointestinal tract (g.i.t.)
- To appreciate the interactions of hormonal and neural factors in regulation of digestive function.
- To revise Michaelmas Term material on properties of smooth muscle and to know the basis of g.i.t. motility.
- To know which segments of the g.i.t. depend on somatic muscle and which on smooth muscle.
- To understand the roles of the salivary glands and stomach in processing of ingested food.
- To understand the mechanisms that underlie ulceration of the wall of stomach or duodenum.
- To know the processes by which carbohydrates, proteins and lipids are digested and absorbed.
- To comprehend the volume of water normally entering the large intestine daily and to understand how this water is handled.
- To understand the regional specialization of absorptive function in the G.I.T. and the consequences for surgical resection of different areas.
- To comprehend the common causes of overt malabsorption syndromes of nutrients or water.
- To understand the basis of diarrhoea and the different ways in which this might be triggered.
- To appreciate the different causes of insulin-dependent and insulin-independent diabetes.

Week 9
ANATOMY

- To know the entire small bowel and the colon, the liver and the extrahepatic biliary apparatus.
PHYSIOLOGY

- To understand the roles of the biliary system in lipid absorption
- To understand the roles of the liver in nutrient processing
- To comprehend the wide range of other functions fulfilled by the liver
- To comprehend the wide range of abnormalities that are consequently associated with liver damage
- To understand the unique circulatory supply of the liver and the functional consequences of this
- To be able to define jaundice, understand the three ways in which it may occur and know how to distinguish between these

Week 10

ANATOMY

- To know the anatomy of the bladder, including the important relations in the male and female pelvis.

PHYSIOLOGY

- To revise Michaelmas Term material on body water compartments
- To understand the functional architecture of the kidney and its blood supply
- To know typical normal values for renal plasma flow, glomerular filtration rate and urine production
- To understand the forces involved in filtration, secretion and reabsorption and appreciate the roles of passive and active mechanisms in creating these forces
- To understand the principles employed for evaluation of the adequacy of renal function
- To comprehend in general how the kidney handles filtered solutes
- To understand in detail the processes by which sodium and potassium are handled in the nephron
- To comprehend the mechanisms by which osmolality of the tubular filtrate is altered in different segments of the nephron
- To understand the renal processes that maintain water balance
- To know the absolute limits to urinary osmolality and volume
- To know how urine is handled in the post-renal urinary tract

Week 11

ANATOMY

- To know the anatomy of the bladder, including the important relations in the male and female pelvis.
- To know the anatomy of the uterus, broad ligament, uterine tubes and ovaries, and their important relations.

PHYSIOLOGY

- To understand the renal processes that maintain acid-base balance
- To appreciate the interaction of renal and respiratory systems in acid-base regulation
- To understand how prerenal, renal and postrenal factors can cause failure of effective renal function
- To understand the roles of gonadal hormones in prenatal sexual development
- To understand the importance of adrenal androgens in female development
• To be able to predict the consequences of foetal deprivation of testosterone, dihydrotestosterone or dihydroepiandrosterone
• To recognise the major differences between germ cell maturation in males and females
• To understand the roles of gonadal hormones in postnatal sexual development
• To understand the hormonal control of spermatogenesis
• To know the organization of the male and female reproductive tracts

Week 12
ANATOMY
• To know the anatomy of the perineum in the male and female.

PHYSIOLOGY
• To know the organization of the male and female reproductive tracts
• To understand the functional significance of the different components of semen
• To be able to describe the sequence of hormonal changes that occurs during the menstrual cycle and its functional consequences
• To be able to describe the processes that occur between fertilisation and implantation of the conceptus
• To know the functional organisation of the placenta and appreciate its roles
• To understand the hormonal changes that occur during pregnancy and how these contribute to maternal and foetal functions
• To appreciate the main maternal adaptations to pregnancy
• To know the events that are important in initiating and regulating the progress of labour (parturition)
• To understand the processes that are involved in the growth and function of the mammary glands

Week 13 – Revision week

ASSESSMENT
This module will be assessed through a combination of written examinations, physiology laboratory practical reports, anatomy practical & spot tests and small group learning. Students must achieve an overall aggregate mark of at least 50% in order to pass the module.

A written assessment will be held in December 2010 and another in May 2011. Students achieving an aggregate mark of between 45% and 50% will be invited to a pass/fail viva voce examination with the external examiner(s) of the Human Form & Function module. The viva voce examinations will take place during the annual examination period in May-June 2011.
**The structure of the assessment is:**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>% of overall mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written paper</td>
<td>70</td>
</tr>
<tr>
<td>Short answer questions (SAQs) x 10</td>
<td></td>
</tr>
<tr>
<td>- 3 Anatomy, 6 Physiology SAQs</td>
<td></td>
</tr>
<tr>
<td>- 1 SAQ on SGL sessions incorporating anatomy &amp; physiology material</td>
<td></td>
</tr>
<tr>
<td>- Multiple choice questions x 30 (physiology only)</td>
<td></td>
</tr>
<tr>
<td>Anatomy spot</td>
<td>5</td>
</tr>
<tr>
<td>Anatomy practical</td>
<td>20</td>
</tr>
<tr>
<td>Physiology lab practicals</td>
<td>5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

This mark will be amended to 95% and the remaining 5% will be based on the overall mark awarded for the small group learning sessions.

**The assessments for each term are weighted as follows:**

**Term 1 - 40% of module**
Assessment includes written examination (December 2010); continuous assessment of Physiology practicals; Anatomy practical; Anatomy spot exam and SGL mark.

**Term 2 - 60% of module**
Assessment includes written examination (May 2011); continuous assessment of Physiology practicals; Anatomy practical; Anatomy spot exam and SGL mark.

A sample examination paper will be available at:
http://www.medicine.tcd.ie/physiology/undergraduate/human_form_function/

**Supplemental examination**
The supplemental examination papers will have the same format as the annual papers. Marks for the Anatomy spot and Physiology lab assessment will not be carried forward. Students must achieve an overall mark of at least 50% in the supplemental assessment in order to pass the module. Students achieving an aggregate mark of between 45% and 50% in the supplemental assessment will be invited to a pass/fail viva voce examination with the external examiner(s) to the Human Form & Function module.
Module 4: Student Selected Module in Science and the Humanities

LECTURER (S)
Dr. Aileen Patterson and Dr. Maria Benito are the coordinators of the module: patteram@tcd.ie; benitom@tcd.ie

Professor Shaun McCann
Professor Davis Coakley
Professor Joe Barry
Professor Des O’Neill
Dr. Maria Benito
Dr. Louise Campbell
Dr. Martin Dyar
Dr. Martina Hennessy
Dr. Brenda Moore-McCann
Dr. Paul O’Grady
Dr. Paul O’Connor
Dr. Aileen Patterson
Dr. Matthew Phillips
Dr. Ruth Pilkington

CONTACT HOURS
Hours: the contact hours will vary slightly between options, please refer to table 1.

ECTS VALUE
5 credits

RATIONALE AND AIMS
The use of student selected modules and the application of the Medical Humanities was recommended in the GMC Tomorrow’s Doctors\(^1\). Since then, increasing attention has been given to the inclusion of the Arts and Humanities into the medical education framework. It is intended that this will act as a complimentary strand to the scientific approach in achieving the outcome of a humane doctor. Jane MacNaughton\(^2\) describes the “humane doctor” as a doctor “with understanding, assisted by interpretive ability and insight, governed by ethical sensibility, (and able) to apply this scientific evidence and skills to the individual patient”. The aim of the module is to provide you with an opportunity to reflect on medical practice through the study of the philosophy of scientific thinking and medical humanities.

\(^1\) General Medical Council 2003 Tomorrow’s Doctors
THE LEARNING OUTCOMES ARE:
• to encourage insight into, and concern for, different aspects of the human condition
• to recognise the role of medicine to enable individuals to participate fully in life unhampered as far as possible by illness or disability
• to develop the students’ ability to listen, interpret and communicate
• to develop the analytical skills and the ability to present ideas and construct arguments
• to promote an appreciation of the convergence between medicine and the humanities

COURSE CONTENT
The module involves a choice of medical humanities electives in areas such as philosophy, art, literature, history, film and ethics. These provide a different yet complimentary view of the human condition. The modules are aimed at novice level. The climate fostered will be one where ideas can be exchanged and challenged in a safe, non-threatening environment.
The learning outcomes for each module, delivery methods and assessment requirements for each are published in a separate handout.

METHODS OF TEACHING AND LEARNING
The module is student centred, where small group learning is encouraged and the numbers per group are limited.
Various teaching methods will be used; including a mixture of lectures, small group tutorials, workshops, seminars and e-learning formats. The educational philosophy is to make the elective components interactive and to encourage student engagement regardless of the teaching method employed.

METHODS OF ASSESSMENT
The format of the assessment will depend on the module. There may be a continuous assessment mark included to represent the work carried out during the module. Attendance is mandatory.

EVALUATION
Students will be provided with questionnaires at the end of the module to allow feedback. Among other items there will be a section on suggestions for future improvement of the course. The questionnaires will be filled in anonymously and submitted to the Course Coordinators.
<table>
<thead>
<tr>
<th>Elective Module</th>
<th>Student Numbers</th>
<th>Dates</th>
<th>Coordinator</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Languages</td>
<td>20</td>
<td>Course runs over 2 semesters</td>
<td>Dr. Lorna Carson</td>
<td>24 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EU language accreditation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power and Secrecy</td>
<td>12</td>
<td>Term 1</td>
<td>Dr. Matthew Phillips</td>
<td>12 hours</td>
</tr>
<tr>
<td>Creative Writing</td>
<td>12</td>
<td>Term 1</td>
<td>Dr. Martin Dyar</td>
<td>12 hours</td>
</tr>
<tr>
<td>Literature in Medicine</td>
<td>12</td>
<td>Term 1 Term 2</td>
<td>Dr. Paul O’Connor</td>
<td>12 hours</td>
</tr>
<tr>
<td>Perception</td>
<td>12</td>
<td>Term 1 Term 2</td>
<td>Dr. Brenda Moore McCann</td>
<td>12 hours</td>
</tr>
<tr>
<td>Biomedical Ethics I</td>
<td>12</td>
<td>Term 1</td>
<td>Dr Louise Campbell</td>
<td>12 hours</td>
</tr>
<tr>
<td>Biomedical Ethics II</td>
<td>12</td>
<td>Term 2</td>
<td>Dr Ruth Pilkington</td>
<td>12 hours</td>
</tr>
<tr>
<td>Arts and Health</td>
<td>12</td>
<td>Term 2</td>
<td>Prof O’Neil</td>
<td>12 hours</td>
</tr>
<tr>
<td>Advocacy</td>
<td>12</td>
<td>Term 2</td>
<td>Prof Joe Barry /Dr. Martina</td>
<td>12 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hennessy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Film Studies</td>
<td>12</td>
<td>Term 2</td>
<td>Dr. Martin Dyar</td>
<td>12 hours</td>
</tr>
<tr>
<td>History of Medicine</td>
<td>12</td>
<td>Term 2</td>
<td>Prof. Davis Coakley</td>
<td>12 hours</td>
</tr>
<tr>
<td>Narratives of Illness</td>
<td>12</td>
<td>Term 2</td>
<td>Prof Des O’Neill</td>
<td>12 hours</td>
</tr>
<tr>
<td>Philosophy in Medicine</td>
<td>16</td>
<td>Term 2</td>
<td>Dr. Paul O’Grady</td>
<td>10 hours</td>
</tr>
</tbody>
</table>
Scholarships

Benefits

Award of scholarship entitles a student to:
• free Commons,
• free accommodation in college during the nine months of the formal teaching year,
• reduction in fees and a stipend.

These benefits may be held for up to four years, provided that the awardee remains a registered student.

Eligibility to sit

In view of the prestige and the practical benefits of obtaining Scholarship, the School of Medicine would like to see all students who have a realistic expectation of succeeding, sitting for the examination. The process is non-competitive, so an individual's chance of succeeding is not altered by the number of other candidates. All students may enter but, realistically, students who have not been achieving relatively high marks are not likely to succeed.

We recommend students achieving consistent First Year marks of 65% or above to sit. Students are encouraged to talk with their tutors and with the Director of Undergraduate Education before making a final decision. Students who are interested in sitting should contact the Medical School Office at an early date and must give notice of their intention to take the examination on the prescribed form, available from the Senior Lecturer's Office, by the date specified in the Calendar. If they wish to withdraw their application, they are asked to do so at least two weeks before the first day of the Hilary examination period.

Examination procedure

The Examination procedure is being revised and will be circulated at the beginning of Term 1 2010.
Distinctions

First Medical Year

Distinction in physiology
Students achieving an overall mark of 75% or more in the physiology component of both Human Form & Function modules will be eligible for a Distinction in Physiology, subject to a successful viva voce examination with the external examiner.

Second Medical Year

Distinction in Anatomy
Students achieving an overall mark of 75% in anatomy, calculated as the average of the marks of the first and second medical years, will be eligible for a Distinction in Anatomy, subject to a successful viva voce examination with the external examiner.

Distinction in biochemistry
Students achieving an overall mark of 75% in Biochemistry, calculated as two-thirds of the marks of the first medical year plus one-third of those of the second medical year, will be eligible for a Distinction in Biochemistry, subject to a successful viva voce examination with the external examiner.

Prizes and Awards

A large number of prizes and awards are available to students of Trinity College. A full list may be found in the Calendar at http://www.tcd.ie/calendar/assets/pdf/prizesawards.pdf.

For ease of reference, below is a summary of those of the first and second medical years.

First Medical Year

Andrew Francis Dixon Prize
This prize was founded in 1946 by a gift from a former student of the School of Physic in memory of Andrew Francis Dixon, University Professor of Anatomy 1903-36. It is awarded annually to the best student of anatomy in the first medical year. Value, €64.

Second Medical Year

Walter Rennison Book Prize
This prize was founded in 1971 by a bequest from G. G. Rennison in memory of his brother Walter Rennison. It is awarded annually to the second year medical student who is placed highest in anatomy. The book(s) selected shall be in use during the medical course in Trinity College. Value, €115.
Daniel John Cunningham Memorial Medal
This prize was founded in 1909 by subscription in memory of Daniel John Cunningham, University Professor of Anatomy 1883-1903. A bronze medal is awarded to the best student in anatomy, taking the first and second medical years into account, provided the student has been not longer than two years in the School of Medicine.

The Cunningham Medal is awarded to the student with highest distinction in anatomy as determined by the internal and external examiners.

William Robert Fearon Medal
This award was founded in 1976 by a bequest from Dr Brian Spencer in memory of William Robert Fearon, Professor of Biochemistry 1934-59. A bronze medal is awarded annually to the best student in biochemistry on the basis of studies in the first and second years provided that the student has been in the School of Medicine not longer than two years.

The Fearon Medal is awarded to the student with highest distinction in biochemistry as determined by the internal and external examiners.

John Mallet Purser Medal
This award was founded in 1899 by subscription to mark the twenty-fifth year of tenure of the King’s Professorship of the Institutes of Medicine by John Mallet Purser. A bronze medal is awarded annually to the best student in physiology and biochemistry in the first medical year.
**Plagiarism**

The following text is reprinted from the College Calendar Academic Progress (pages G12-14) and should be borne in mind by all students:

“...Plagiarism is interpreted by the University as the act of presenting the work of others as one’s own work, without acknowledgement. Plagiarism is considered as academically fraudulent, and an offence against University discipline. The University considers plagiarism to be a major offence, and subject to the disciplinary procedures of the University. Plagiarism can arise from deliberate actions and also through careless thinking and/or methodology. The offence lies not in the attitude or intention of the perpetrator, but in the action and in its consequences. Plagiarism can arise from actions such as:

(a) copying another student’s work;
(b) enlisting another person or persons to complete an assignment on the student’s behalf.
(c) quoting directly, without acknowledgement, from books, articles or other sources, either in printed, recorded or electronic format;
(d) paraphrasing, without acknowledgement, the writings of other authors;

Examples (c) and (d) in particular can arise through careless thinking and/or methodology where students:

(i) fail to distinguish between their own ideas and those of others.
(ii) fail to take proper notes during preliminary research and therefore lose track of the sources from which the notes were drawn;
(iii) fail to distinguish between information which needs no acknowledgement because it is firmly in the public domain, and information which might be widely known, but which nevertheless requires some sort of acknowledgement;
(iv) come across a distinctive methodology or idea and fail to record its source;

All the above serve only as examples and are not exhaustive. Students should submit work done in co-operation with other students only when it is done with the full knowledge and permission of the lecturer concerned. Without this, work submitted which is the product of collusion with other students may be considered to be plagiarism. It is clearly understood that all members of the academic community use and build on the work of others. It is commonly accepted also, however, that we build on the work of others in an open and explicit manner, and with due acknowledgement. Many cases of plagiarism that arise could be avoided by following some simple guidelines:

(i) Any material used in a piece of work, of any form, that is not the original thought of the author should be fully referenced in the work and attributed to its source. The material should either be quoted directly or paraphrased. Either way, an explicit citation of the work referred to should be provided, in the text, in a footnote, or both. Not to do so is to commit plagiarism.
(ii) When taking notes from any source it is very important to record the precise words or ideas that are being used and their precise sources.

(iii) While the Internet often offers a wider range of possibilities for researching particular themes, it also requires particular attention to be paid to the distinction between one’s own work and the work of others. Particular care should be taken to keep track of the source of the electronic information obtained from the Internet or other electronic sources and ensure that it is explicitly and correctly acknowledged. It is the responsibility of the author of any work to ensure that he/she does not commit plagiarism.

Students should ensure the integrity of their work by seeking advice from their lecturers, tutor or supervisor on avoiding plagiarism. All departments should include, in their handbooks or other literature given to students, advice on the appropriate methodology for the kind of work that students will be expected to undertake.

If plagiarism as referred to above is suspected, the Head of Department will arrange an informal meeting with the student, the student’s tutor, and the lecturer concerned, to put their suspicions to the student and give the student the opportunity to respond.

If the Head of Department forms the view that plagiarism has taken place, he/she must notify the Senior Lecturer in writing of the facts of the case and suggested remedies, who will then advise the Junior Dean. The Junior Dean will interview the student if the facts of the case are in dispute. Whether or not the facts of the case are in dispute, the Junior Dean may implement the procedures set out in CONDUCT AND COLLEGE REGULATIONS §2....”

Up-to-date as of academic year 2009/2010
**Exemptions**

Students may apply for exemptions from various disciplines based on previous qualifications. They may be exempted from course work only, or from course work and examinations.

**Procedure**

In order to apply for exemptions students must return a “Student Subject Exemption Form” before 5\textsuperscript{th} November 2010. Exemptions cannot be approved after this date. You will be required to submit a copy of a relevant academic qualification and evidence of a primary degree in the subject from which you are seeking the exemption.
TRINITY COLLEGE DUBLIN
School of Medicine
Student Subject Exemption Form

PLEASE REFER TO YOUR STUDENT HANDBOOK/STUDY GUIDE FOR FURTHER INFORMATION REGARDING THE GRANTING OF EXEMPTIONS

THIS FORM MUST BE RETURNED TO THE MEDICAL SCHOOL OFFICE BY 5TH NOVEMBER 2010
EXEMPTIONS CANNOT BE APPROVED AFTER THIS DATE

STUDENT NAME: ____________________________________________________________

COURSE: ___________________________ I.D. NUMBER: __________________________

EXEMPTION SOUGHT FROM (subject) __________________________
EXEMPTION FROM COURSEWORK AND EXAMS
EXEMPTION FROM COURSEWORK ONLY

JUSTIFICATION (include relevant academic qualifications and evidence of primary degree in the subject):

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

__________________________________________
I am aware of the implications for Scholarship.

STUDENT’S SIGNATURE: ___________________________ DATE: __________
TUTOR’S COMMENTS: 

______________________________________________________________

________________________________________________________________________

SIGNATURE: ___________________________ DATE:

COMMENT FROM RELEVANT COURSE COORDINATOR (IF EXEMPTION IS SOUGHT FOR HUMAN FORM & FUNCTION MODULE BOTH COORDINATORS FROM ANATOMY & PHYSIOLOGY ARE REQUIRED):

______________________________________________________________

________________________________________________________________________

SIGNATURE: ___________________________ DATE: ______

SIGNATURE: ___________________________ DATE: ______

DIRECTOR OF UNDERGRADUATE TEACHING & LEARNING’S APPROVAL

EXEMPTION FROM ___________________________ ☐

EXEMPTION FROM COURSEWORK AND EXAMS ☐

EXEMPTION FROM COURSEWORK ONLY ☐

SIGNATURE: ___________________________ DATE: ___________
This year, TAKE TO THE STREETS to support:

November 5th 2010

The Burns Unit, SJH
Colorectal Cancer Screening, AMNCH
The Cancer Care Fund, AMNCH
Trinity Access Programme (TAP)

Street Collection, Campus Games, Talent Show, Night Out, Med Cup and much more!

Get involved early. Email medday@tcd.ie