BSc Biomedical Science

Year 1 Modules: Cellular Biochemistry and Biology

Module Description

The aim of this module is to provide a basic understanding of protein biochemistry and build from this to provide an overview of the key processes in cell biology. Description of the fundamental elements of protein structure and function together with the relevant chemical principles will provide a context for understanding the basic quantitative elements of biochemistry and an appreciation of the applications for proteins in biomedicine. This will provide the student with sufficient background to understand the second phase of the module, where the fundamental elements of the cell will be discussed, including cell structure, motility, adhesion, signalling, proliferation, trafficking and regulation.

Learning Outcomes

By the end of the module students should be able to:

1. Describe the principle of chemical ionisation and apply this knowledge quantitatively in the context of pH, buffers and protein action
2. Give an overview of protein structure, including its origin during biosynthesis, the forces responsible for its maintenance and its relevance to macromolecular assembly and protein substrate interaction, and to apply this in the context of structure/function relationships
3. Describe the basic aspects of enzyme kinetics and its analysis and apply this knowledge to interpret a simple experimental data set
4. Describe the basis of the key methodologies used to purify and analyse proteins and use this information to design a simple preparative or analytical process
5. Describe the underlying structure of the cell and the contributions of the cytoskeleton, cell adhesion and membrane compartments to cell function
6. Describe the basic strategies used by cells to communicate and how this influences cell proliferation and to apply this knowledge to design experimental outlines to investigate its consequences
7. Describe key intracellular trafficking events used to transport cargoes between compartments of the cell and the relationship of these processes to the activation and degradation of proteins

Assessment

Module assessment will comprise a combination of a written unseen paper and in-course assessments:

Examination (2 hours; 2 from 4 essays and 6 SAQs): 75%
In course assessment 25%: Students will give individual 10 minute oral presentations, each covering a specified aspect of the module (12.5%) and a January MCQ (50 questions, 1 hour, 12.5%).

Hours

Total Contact Hours: 59 (32hr Lectures, 21 Tutorials (includes 3 hours of student presentations) and 6 practical classes/workshops. 141 hours guided independent study.
BSc Biomedical Science

Year 1 Modules: Cardiovascular Science

Module Description

This module will provide students with a detailed understanding of the functioning and control of the heart and vasculature. The module will be delivered by scientific and clinical research experts within the College to ensure a broad perspective to the subject rooted in current state-of-the-art research knowledge. This module will provide a foundation from which the student will build their knowledge, skill and experience in this area should they choose to study the subject further in the third year or in postgraduate studies. The module is organised into a series of themes: the heart, the vascular system and control mechanisms. In each theme a combination of lectures, small group discussion, practical work and interactive sessions will be used to encourage the students to apply their knowledge about the system and develop generic skills that can be applied to other modules.

Learning Outcomes

By the end of the module students should be able to:

1. Describe the basic structure and function of cardiovascular system and how it enables oxygen and metabolic fuel to reach tissues, and carbon dioxide and waste products to be removed.
2. Evaluate the use of genetic, molecular, cell, tissue and whole organism (including man) approaches to the study of the cardiovascular system.
3. Apply knowledge gained from reference to experimental research models about cardiac structure and function in normal circumstances and disease.
4. Apply knowledge gained from reference to experimental research models used for understanding vascular structure and function in normal circumstances and disease.
5. Describe the central mechanisms responsible for controlling the cardiovascular system using knowledge gained from an understanding of the research methods currently used in this area.

Assessment

Module assessed by one piece of in course assessment and a written, unseen examination

End of year 1 hr examination (75%) – 1 hr: a selection of 15 MCQs, 2 from 4 SAQs, 1 from 2 Essays

ICA (25%) – Data interpretation exercise

Hours

Total contact hours: 36: 19 hr Lectures; 10 hr Tutorials; 7 hr practical classes/workshops; 64 hrs guided independent study
BSc Biomedical Science

Year 1 Modules: Drug Action

Module Description

The module aims to familiarise the students with the principles of pharmacology as a quantitative science. Coverage of the basic principles is supported by a systems based consideration of some of the potential mechanisms for the pharmacological manipulation of the peripheral and central nervous systems, the gastrointestinal tract, inflammatory processes, infection and cancer.

Learning Outcomes
By the end of the module students should be able to:

1. understand the concept of a drug receptor and appreciate the nature of these receptors
2. define the terms agonist, antagonist, partial agonist, affinity and efficacy, and understand the importance of these parameters in determining the properties of drugs
3. realise the importance of pharmacokinetics in influencing the response to a drug
4. know the mechanisms of action and side effects of selected drugs affecting a) the peripheral nerves, b) the central nervous system, c) the gastrointestinal tract, d) inflammatory processes and e) infectious organisms and cancer cells
5. appreciate the ways in which differences between individuals can influence the response to, and toxic effects of, drugs
6. present and interpret data from simple pharmacological experiments
7. work as a group to prepare and deliver an oral presentation

Assessment
The module is assessed by a combination of a 1 hr written, unseen examination and in course assessment.

Examination 75% (Semester 2)
ICA 25% (Semester 2)
The examination will comprise 25 MCQs and 4 SAQs from a choice of 6.
The ICA component will comprise the following:
Group seminar presentation

Hours
Total contact hours: 26: 20 hr Lectures; 6 tutorials. 74 hours guided independent study.
BSc Biomedical Science

Year 1 Modules: Digestion and Renal Sciences

Module Description

The module links the function of the main nutritive inputs (through Digestion) and their waste outputs (Renal Sciences). The processes of digestion, absorption and excretion in the gastrointestinal tract and associated organs are introduced to provide a system-based appreciation of specific function/dysfunction. The Digestive science component covers the physiology of the gastrointestinal tract with a strong relevance to gastrointestinal disease. The Renal Science component covers the anatomy, physiology and toxicology of the kidney and urinary tract, and the role of the kidneys in homeostasis of osmolarity, volume and acid-base. Most pertinently both aspects of the module align with research performed within the college of MDS and thus provides students with the opportunity to experience cutting edge research within the college of MDS.

Learning Outcomes

By the end of the module students should be able to:

Understand the gross anatomy of the organs of the digestive, renal and urinary systems (including their relations to other organs in the abdomen and pelvis), and demonstrate an understanding of their functions and processes.

1. Appreciate the mechanisms of digestion, motility, absorption and elimination as applied to the major organs and classes of food.
2. Understand the special features of the renal blood supply which adapt the organ for filtration and reabsorption, and how blood flow and GFR can be measured
3. Describe the transport properties of the nephron and how these relate to excretory function of the kidneys
4. Understand the role of the kidneys in regulating body fluid osmolarity, volume and acid-base balance; and the methods of investigation used to obtain this knowledge.
5. Understand the cause and types of the major diseases of the gastrointestinal tract and how this impacts on its function
6. Understand the role of food in society, of nutrition and disordered nutrition and metabolic disturbance in diabetes.
7. Understand the role of the kidneys in regulating body fluid osmolarity, volume and acid-base balance; and the methods of investigation used to obtain this knowledge.
8. Understand how drugs, including anti-ulcer treatments and diuretics, can modify digestive and renal function.
9. Use independent thought processes to discuss and evaluate scientific material.

Assessment

The module is assessed by a combination of written examination (2 hours, consisting of 20MCQs, 4 from 6 SAQs and 2 from 4 essays) and course work.

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<thead>
<tr>
<th>Examination</th>
<th>75% (Semester 2)</th>
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<tr>
<td>Course work</td>
<td>25% (Semester 2)</td>
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The course work component will consist of an essay (2000 words excluding references).

Hours

Total contact hours: 57: 37 hr Lectures; 12 tutorials (includes 2hrs Journal Club presentations) 2hr demonstration; 6 practical classes/workshops
BSc Biomedical Science

Year 1 component: Employability Skills passport (Level C) non credit-bearing

Component Description
The purpose of this component is to encourage students to develop a number of skills which are critical for their on-going development on the course but also for their future employability prospects. To achieve this goal, the component will focus on the non-module specific skills acquired during the year. This will not require any additional assessment but emphasises and rewards engagement of students with these elements. Furthermore, it ensures that students are not progressing with deficiencies in their skills which could put them at a significant disadvantage in subsequent years.

Students shall normally be required to:

1. Attend, engage with and contribute to all identified compulsory teaching sessions, including anatomy, laboratory and computer practicals, small group teaching sessions, tutorials and progress tutorials.

2. Engage with their Personal Tutor during Progress Tutorials and reflect on the subject and transferable / employability skills that they are developing with the aid of feedback that they have received.

Component Outcomes
By the end of the component students should be able to:

1. Demonstrate a basic level of ability to contribute to communicate orally and in writing scientific concepts and/or data.
2. Undertake laboratory work safely and competently, to the level taught at level C.
3. Demonstrate a willingness to work effectively in groups and contribute to the achievement of common goals.
4. Demonstrate a willingness to engage in reflective practice relating to their learning experiences.
BSc Biomedical Science

Year 1 Modules: Fundamentals of life science

Module Description

The module introduces basic concepts in biomedical sciences and provides a sound knowledge base for subsequent cellular and systems-based modules. It comprises a series of lectures, small group sessions and laboratory-based practical sessions that will lead to an in-depth understanding of some fundamental principles of human biology. The structure and function of DNA, RNA, proteins and lipids are introduced at the beginning of the module. Later, epigenetics and chromatin structure are discussed. The physiology of fluid compartments and the biochemistry of energy generation are considered. The fundamental principles of human embryological development, and the anatomy of some of the major structures of the body are presented. The biology of bacteria, including their structure and genetics, antibiotics and antibiotic resistance are introduced. The biology of viruses, viral infection and virus-receptor interactions are considered, and an introduction to immunology, including innate and adaptive immunity is presented.

Learning Outcomes

By the end of the module students should be able to:

1. demonstrate a basic knowledge and understanding of the structure of DNA, RNA, proteins and lipids, and the fundamental principles of replication, transcription and translation.
2. demonstrate a basic knowledge and understanding of the fundamental principles of physiology including the role of cell membranes, fluid compartments and the principles by which cell volume and composition is maintained.
3. demonstrate a basic knowledge and understanding of the fundamental principles of biochemistry including an appreciation of metabolic pathways such as glycolysis and gluconeogenesis, and the mechanisms by which energy is generated in the cell.
4. demonstrate a basic knowledge and understanding of the fundamental principles of human embryological development including fertilisation and formation of the three primary germ layers.
5. demonstrate a basic knowledge and understanding of the fundamental principles of human anatomy including an appreciation of the structure and function of epithelial tissues, connective tissues, muscle and the skin.
6. demonstrate a basic knowledge and understanding of the fundamental principles of bacteriology, including the structure of bacterial cells, the genetics of bacteria, antibiotics and antibiotic resistance.
7. demonstrate a basic knowledge and understanding of the fundamental principles of virology including viral infection and virus-receptor interactions.
8. demonstrate a basic knowledge and understanding of the fundamental principles of immunology including innate and adaptive immunity.
9. demonstrate a basic knowledge and understanding of epigenetics and chromatin structure.

Assessment

The module is assessed by a combination of written (2 hours comprising 6/8 SAQ and 2/4 essays) and course work.

Written examination 75%
Course work 25%

The course work component will comprise of:
Essay (1500 word) 12.5%
January MCQ exam (50 questions) 12.5%
Hours
Total contact hours: 60: 33 hr Lectures; 16 tutorials; 11 practical classes/workshops
BSc Biomedical Science

Year 1 Modules: Foundations of Neuroscience

Module Description

This is the first of a series of systems and/or subject based course elements in Years 1 and 2. It considers the structure and function of the nervous system and synaptic communication in general and then goes on to cover in greater detail the structure and function of the sensory, autonomic and enteric nervous systems. It is linked to the following modules: Cardiovascular Science, Digestive & Renal Systems and Drug Action. These links reflect a) the integration between the physiological control of the cardiovascular and digestive system with the nervous system and b) the importance of synapses in the peripheral and central nervous systems and as drug targets.

Learning Outcomes

By the end of the module students should be able to:

1. Appreciate the topographical organisation of the nervous system; in particular, the sensory division of the somatic, the enteric and autonomic nervous systems. Also, be familiar with the distribution and function of the cranial nerves
2. Understand the principles by which neurons are able to: receive and recognise information from the internal and external environments; to generate electrical signals; to communicate with other cells via synapses (including the multisynaptic pathways of simple reflexes)
3. Demonstrate an awareness of the structure and function of the organs involved in the special senses of sight and hearing and chemical senses
4. Demonstrate knowledge of the different glial cell types in the nervous system and their function and roles.
5. Be able to present and interpret data generated by a quantitative experiment.

Assessment

The module is assessed by a combination of written examination and course work.

Written examination 75% (semester 2)
Course work 25% (semester 1 and 2)

The examination is composed of the following sections:

A: 4 short notes, at least one of which must be on an anatomy topic (out of 6 questions in total; 4 on general module content, 2 on anatomy teaching)
B: 1 essay question (out of 2).
Examination sections will be weighted equally.

The course work component will include the following:
Practical write up with questions 12.5%
MCQ test 12.5% (taken in January)

Hours

Total contact hours: 43.5: 19 hr Lectures; 13 tutorials; 11.5 practical classes/workshops; 56.5 hrs guided independent study
BMedSc Bachelor of Medical Science

Year 1 Modules: Introduction to Molecular and Experimental Genetics

Module Description

The aim of the module is to provide a basic understanding of the causes and consequences of human genetic variation. A description of the molecular methods for investigating pathological genetic variations in man will provide the student with sufficient background to be able to understand the approaches used to investigate the molecular pathology of human disorders.

Learning Outcomes

By the end of the module students should be able to:

1. Describe the basis of germline genetic variation in man. Also understand the importance and origin of the germline mutation rate in the male and female.
2. Understand at a basic level the role of mutation in evolution.
3. Describe the patterns of Mendelian inheritance in man as well as how mitochondrial inheritance is different from this.
4. Describe the range of human chromosome disorders particularly those arising from chromosomal non-disjunction and their consequences for the individual.
5. Describe the methods, at a basic level, that are used to investigate gene mutation and chromosome abnormalities in man as utilised in an NHS genetics laboratory.
6. Explain the consequences of gene mutation in terms of its effect on protein function and how this effect can be measured in the laboratory.

Assessment

Module assessment will consist of a combination of a written unseen paper and a single in course assessment.

Written examination  75% Consisting of a 1 hour written examination (15 MCQ, 2 short answer questions and 1 essay question).

Course work 25% Practical class write-up.

Hours

Total contact hours: 22: 13 hr Lectures; 4 tutorials; 5 practical classes/workshops.
BSc Biomedical Science

Year 1 Modules: Introduction to Research and Experimental Skills

Module Description

Research and experimental design are key concepts for someone working within a scientific discipline to understand. This module will teach these key skills, whilst giving the students exposure to the best biomedical research within the College. It will seek to inspire and motivate them, whilst teaching core academic skills such as literature searching and evaluation. It will look at the full life cycle of research, from project design, via practical issues of setting up a piece of research, to effectively communicating its outcomes via academic writing and presentation. We will introduce the consideration of bioethics and current experimental approaches and their use in modern biology. The module will provide training in the application of statistical methods to experimental design and data analysis.

Learning Outcomes

By the end of the module students should be able to:

1. Demonstrate an understanding of how to communicate scientific concepts (e.g. written report and poster session)
2. Perform a literature search to identify material appropriate to a given topic (poster session and written report)
3. Demonstrate an awareness of how to design an experiment and be able to propose suitable methods to address a basic research question (poster session and written report).
4. Carry out basic numerical manipulations such as calculation of cell concentrations, dilution factors and interconversion of units
5. Understand, be able to apply and interpret appropriate statistical methods to simple unseen experimental data (MCQ).
6. Demonstrate a basic knowledge and understanding of experimental procedures and routine experimental techniques used in research laboratories, for example; cloning, polymerase chain reaction, use of antibodies as experimental tools (MCQ).

Assessment

The module will be assessed by two components:

Coursework
1) A Group work poster presentation on their final Research taster visit, (including literature background, future experimental design, methods and outcomes): 20%  
   Associated individual written report (1500 words): 30%

Main Examination
2) A MCQ exam (including basic numeracy, statistics, experimental design and experimental procedures) (30, 1 from 5 MCQs in 1 h): 50%

Students MUST pass both components- i.e. both are required components to pass the module.

Students, who miss their final Researcher taster day due to a justifiable reason, will be given a handout so they are still able to complete the Poster activity and written report.

Hours

Total contact hours: 63: 23 hr Lectures; 23 tutorials (includes 4 hour student presentations); 8 hr IT cluster sessions; 9 hr supervised time in studio/workshop/lab.
BSc Biomedical Science

Year 1 Curriculum

Please set your programme to show “bookmarks”. By clicking on the bookmarks you can navigate to each separate module in the first year of the course. In addition to a description of the module, you will also find a list of the teaching sessions in the module. This will help you to gain detailed information about the Biomedical Science course.

The modules that you take in the first term are:
   - Cellular Biochemistry and Biology
   - Fundamentals of Life Science
   - Foundations of Neuroscience
   - Introduction to Research and Experimental Skills
   - Employability Skills Passport (Level C)

In the second term you will take:
   - Introduction to Research and Experimental Skills
   - Cardiovascular Science
   - Drug Action
   - Digestion and Renal Sciences
   - Introduction to Molecular and Experimental Genetics
   - Employability Skills Passport (Level C)

Please note that all modules in the first year are compulsory. Because of this, all second year modules can assume prior knowledge and take you to a deeper level of understanding in each subject area.

Most modules are assessed by in-course assessments (25%) and end of year examinations (75%).