

Module Catalogue

School of Life and Medical Sciences

*Department of Clinical, Pharmaceutical and Biological
Sciences (CPBS)*

**A DIRECTORY OF UNDERGRADUATE MODULES FOR
EXCHANGE AND STUDY ABROAD STUDENTS**

SEMESTER A, B AND AB 2023/24

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List of Programmes included in this catalogue

- ✓ [HHBIO Biochemistry](#)
- ✓ [HHBIO Biological Science](#)
- ✓ [HHBIO Biomedical Science](#)
- ✓ HHBIO Molecular Biology
- ✓ [HHBIO Pharmacology](#)

Relevant contacts

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INTRODUCTION

This module directory is specifically designed for exchange students to select modules at School of Life and Medical Sciences, Clinical, Pharmaceutical, University of Hertfordshire.

1. Please see the box below explaining the module codes:

4LMS0149		
4	LMS	0149
Module level	School of study	Module code

2. As an exchange student you can choose modules from levels 5, 6 and exceptionally at level 4.

Level 4	Level 5	Level 6
First Year module	Second year module	Third Year module

3. Co-requisites, pre-requisites and prohibited combinations.

Some of the modules may have co-requisites or pre-requisites which you will find indicated in each module. Please note for you, as an exchange student, *if a module has co-requisites or pre-requisites you must have previously studied the subject and have completed the relevant module(s) at your home institution*. When sending your application, please include a copy of your transcript to show that you have taken the minimum required co-requisites or pre-requisites module(s) at your home institution. Additionally, we may require you to provide a module description in order to evidence prior study.

If you are in the process of completing the required module(s) at the time of the application and you do not have the final copy of the transcript, please include a letter from your home institution clearly listing the modules that you are registered on.

Prohibited combinations- please note if there are modules listed under prohibited combinations you can only study one of the modules.

BIOSCIENCES UNDERGRADUATE COURSES

Compulsory Modules								
Level	Module Title	Module code	Credit Points	Language Delivery	% Examination	% Coursework	% Practical	Semester
4	Cell and Microbiology	4LMS0155	15	English	50	50	0	A
4	Chemistry for the Biologist	4LMS0004	15	English	0	100	0	A
4	Molecular Structure and Reactivity	4LMS0040	15	English	50	50	0	A
4	Human Physiology with Pharmacology	4LMS0002	30	English	0	100	0	AB
4	Practical and Transferable Skills	4LMS0006	30	English	0	70	30	AB
4	Core Biochemistry	4LMS0154	15	English	50	50	0	B
4	Molecular Biology and Genetics	4LMS0007	15	English	50	50	0	B
5	Biochemistry for Pharmacology	5LMS0103	15	English	50	50	0	A
5	Genes and Genomes	5LMS0091	15	English	50	50	0	A
5	Microbiology of Disease	5LMS0005	15	English	50	50	0	A
5	Principles of Immunology	5LMS0009	15	English	50	50	0	A
5	Biochemistry	5LMS0147	30	English	50	40	10	AB
5	Bioscience Research Methods	5LMS0001	15	English	0	100	0	AB
5	Blood Science	5LMS0007	30	English	50	50	0	AB
5	Chemistry and Analytical Science	5LMS0104	30	English	50	50	0	AB
5	Pharmacology	5LMS0025	30	English	50	50	0	AB
5	Biology of Disease	5LMS0022	15	English	50	50	0	B
5	Cell and Molecular Biology	5LMS0092	15	English	50	50	0	B
5	Cytology and Histopathology	5LMS0006	15	English	50	50	0	B
6	Applied and Integrated Biomedical Science	6LMS0141	15	English	0	100	0	A
6	Cells Differentiation and Development	6LMS0033	30	English	50	50	0	A
6	Cellular Differentiation and Development	6LMS0033	30	English	50	50	0	A
6	Clinical Microbiology	6LMS0005	15	English	50	35	15	A
6	Molecular Medicine	6LMS0032	15	English	50	50	50	A
6	Therapeutic Pharmacology	6LMS0152	30	English	50	50	0	A
6	Translation of Science into Medicine	6LMS0030	15	English	50	50	0	A
6	Advance Biochemistry	6LMS0196	30	English	50	50	0	AB
6	Cellular and Molecular Pathology	6LMS0140	30	English	50	50	0	AB
6	Clinical Biochemistry and Immunology	6LMS0094	30	English	50	50	0	AB
6	Neurobiology and Disease	6LMS0029	30	English	50	50	0	AB
6	Applied and Integrated Molecular Science	6LMS0053	15	English	0	100	0	B
6	Applied and Integrated Pharmacological Science	6LMS0027	15	English	0	100	0	B

Module name: Cell and Microbiology

Module code: 4LMS0155

Semester: A

Credits: 15

Module Aims:

Understand how cell structure relates to function in prokaryotic and eukaryotic organisms and to appreciate the diversity of micro-organisms and their impact on human health.

Intended Learning Outcomes:

Successful students will typically: describe the relationship between structure and function of prokaryotic and eukaryotic cells and the origin of the cellular components. explain the fundamental aspects of the nature of genetic information and the processes of DNA replication, transcription and translation. describe the key features and growth characteristics of microbes and show how these are used in their classification and identification. explain how the structures and products of microbes contribute to their ability to cause disease of animals and plants as well as their roles in industry and in the environment and explain the importance of public health measures to monitor and control infectious diseases Successful students will typically: locate and communicate information within the context of cell biology and microbial disease of humans identify microbes using classification keys and tables

Module Content:

The module will cover key areas of cell biology and microbiology: the nature of cells and how they divide; how the genetic information in cells is converted into functioning components; and then there will be a focus on one particular group of cells, the microbes, to investigate their importance in human health. Key topics covered will include the following 1. The structure of both prokaryotic and eukaryotic cells with an emphasis on the evolutionary origins of the cell components. Cell division. 2. The nature of the genetic material and its organisation in the cell. DNA replication, transcription and translation. 3. a. The structure and components of bacteria, fungi and viruses with relation to their identification and disease causing ability. b. The basic principles of microbial growth. c. Microbes as infectious agents; transmission and control to include basic principles of public health and epidemiology. The taught material will be delivered as lectures supported by small group tutorials where key concepts and applications of the knowledge will be discussed.

Pre and Co requisites:

None

Assessment:

Coursework Weighting: 50% Examination Weighting: 50% Coursework: literature based exercise. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%

Exam	Coursework	Practical
50%	50%	0%

Module name: Chemistry for the Biologist

Module code: 4LMS0004

Semester: A

Credits: 15

Module Aims:

Apply chemical principles to the study of biological sciences. Gain an understanding of physical science applied to biological systems and measurements. Gain knowledge of techniques for characterisation and separation of biological molecules. Appreciate the chemistry of functional groups and their behaviour in biological molecules and relate structure and molecular shape to biological mechanisms.

Intended Learning Outcomes:

Successful students will typically: Identify functional groups and their relationship to chemical behaviour; Understand the principles to apply physical chemistry concepts to biological systems; Understand how molecular structure and shape affect biological processes; Describe techniques for characterisation and separation of biological molecules Use computer software and molecular models to represent chemical structure; Perform relevant calculations relating to concentration, equilibrium, pH and buffers; Use chemical concepts to explain the structure and behaviour of biological molecules;

Module Content:

The philosophy of this module is to prepare students for their future studies in the biological sciences. The module introduces the chemical and physical principles that underlie biological processes. Students on this module will learn techniques for characterisation and separation of biological molecules, perform physicochemical calculations appropriate to biological systems and understand how the structure and reactivity of functional groups relates to their biological function. Students will gain experience of computer software packages to draw and understand the structures and shapes of molecules of relevance in biology

Pre and Co requisites:

none

Assessment:

The written assignment will contain a number of structured, short answer questions which require the student to demonstrate application of knowledge and their problem-solving abilities related to topics they have covered in lectures and workshops, and have supplemented with wider directed reading.

Exam	Coursework	Practical
0%	100%	0%

Module name: Molecular Structure and Reactivity

Module code: 4LMS0040

Semester: A

Credits: 15

Module Aims:

Appreciate the central role of chemistry (especially organic and physical chemistry) in the biomolecular sciences; develop their abilities to predict chemical reactivity and properties of biologically and pharmaceutically important classes of molecules on the basis of molecular structure; understand the chemistry associated with the key functional groups found in biological and pharmaceutical molecules.

Intended Learning Outcomes:

Successful students will typically: describe features of atomic and molecular structure and the organic chemistry of the major functional groups demonstrate a knowledge of pH, buffers and buffer capacity demonstrate a knowledge of thermodynamics, introductory chemical kinetics orders of reaction and chemical half life describe phase behaviours of biological and pharmacological systems Successful students will typically: predict how molecules will behave in biological and/or pharmaceutical situations from an understanding of their physiochemical properties; manipulate both quantitative and qualitative chemical data; interrogate chemical data bases

Module Content:

The module covers aspects of: Organic, structural and physical chemistry appropriate for the biochemical and pharmaceutical sciences including: a study of the key organic functional groups, introductory kinetics and thermodynamics and their role in the biomolecular and pharmaceutical sciences and an introduction to the chemistry associated with basic pharmaceuticals. This module will cover introductory chemical kinetics and thermodynamics, the structural basis of organic chemistry and the relationship of physical properties to chemical structure and organisation, the properties of solutions, buffers, electrolytes and associated properties (pH, pKa, LogP).Tutorials, seminars and workshops will support the lecture material. The taught material will be supported by examples that are relevant to the biochemical and pharmaceutical sciences.

Pre and Co requisites:

A level chemistry or equivalent qualification

Assessment:

Coursework 50% Weighting: 50% Exam 50% Weighting: 50% One unseen 2 hour examination, Computer-based assignment (30%). Progress test (20%) A pass in the coursework overall is required to pass the coursework component of the assessment. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%

Exam	Coursework	Practical
50%	50%	0%

Module name: Human Physiology with Pharmacology

Module code: 4LMS0002 Semester: AB Credits: 30

Module Aims:

Describe the appearance of normal cells, tissues and organs within the human body. Identify a range of organ structures in relation to specialised functions. Describe the interactions between major body systems through understanding the principles of homeostasis and other control mechanisms. Explain how drugs interact with cells to alter their function, and how this enables their therapeutic use.

Intended Learning Outcomes:

Successful students will typically: 1. gain an appreciation of human anatomy and identify the gross structure of selected organ systems and tissues 2. appreciate normal cellular microscopic appearance of commonly investigated tissues 3. describe a range of physiological processes at cell, tissue, organ and organism level (for humans) 4. identify the mechanisms involved in the regulation of body functions and appreciate the integrative aspects of body function 5. define drug action in terms of interaction with receptors and how drugs can be used as research tools and for treatment 6. describe the fate of a medicine after it is administered to humans.

Successful students will typically: 1. collect and communicate physiological information 2. solve problems in physiological experimentation 3. use computer simulation software to understand how drugs act in the body 4. interpret and explain a range of physiological data

Module Content:

This module has been designed to provide students with an understanding of human physiology, enabling them to describe physiological processes at cell, tissue, organ and organism levels. Topics covered will include: * Homeostasis and control mechanisms * Cell differentiation, basic tissues and musculature * Nervous system (electrical signalling, autonomic nervous system and central nervous system) * Cardiovascular system and blood * Respiratory system * Digestive system * Renal system * Endocrine system and reproduction * Immune system * Integrative physiology * Basic pharmacology including receptor theory and pharmacokinetics to show how medicines may be effectively used to treat disease. *Drug discovery, design and the process of drug development. The importance of clinical trials.

The module will be delivered via a mixture of learning experiences including lectures, tutorials/workshops and set assignments. Teaching will be further supported by the use of learning materials and computer software packages.

Pre and Co requisites:

none

Assessment:

Coursework Weighting: 100%. (i) An unseen progress test at the end of semester A 30%. (ii) An unseen progress test at the end of semester B 40%. (iii) Group poster with peer assessment 30%

Practical Attendance:

The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
0%	100%	0%

Module name: Practical and Transferable skills

Module code: 4LMS0006

Semester: AB

Credits: 30

Module Aims:

Carry out scientific methodologies safely and accurately; develop the transferable skills /graduate attributes necessary for success in their chosen degree pathway.

Intended Learning Outcomes:

Successful students will typically: describe the application of basic techniques in chemical and biological investigations interpret scientific data appropriate for level 4 students use appropriate calculations and statistics in the planning and analysis of biological experiments Successful students will typically: carry out key laboratory scientific methodologies both accurately and safely; communicate the results of basic scientific experiments; find and collate key information in scientific literature and understand the importance of referencing in science work in teams to complete a mini project on a biological topic reflect on the value of personal transferable skills and graduate attributes in personal development and future professional roles.

Module Content:

The content of this module is designed to develop: Practical laboratory skills in: Safe laboratory practice. Accurate pipetting and measurement, making up solutions. Measurement of pH. Sample preparation, staining and microscopy. DNA isolation and analysis. Cell counting methodologies. Chemistry methodologies to include purification, extraction, synthesis and analysis of biological molecules. Analytical techniques including centrifugation, chromatography, spectroscopy and electrophoresis o Use of dye-binding assays and standard curves in biological measurement. Microbiology skills including aseptic technique, viable counting, diagnostic methods. Enzyme activity assays and enzyme kinetics methodology. Measurement of physiological parameters. Transferable skills/Graduate attributes as follows: o Mathematics required for biological calculations, statistical analysis, scientific recording, presentation of data, scientific writing, use of literature and literature searching, referencing, avoiding plagiarism. Development of graduate attributes around research skills, professionalism, employability and enterprise. Practical work will be supported by lectures introducing the methodology. Tutor group meetings with a personal tutor will be used to support the development of transferable skills and graduate attributes. Students will produce a portfolio of evidence demonstrating their skills development including a reflection on their personal development and acquisition of graduate attributes throughout the year.

Pre and Co requisites:

none

Assessment:

Coursework Weighting: 70% Practical Weighting: 30% Practical skills will be assessed by two Direct Observed Practical Skills (DOPS) sessions (30%). Coursework will include: Scientific writing based on laboratory work including data analyses (40%), group presentation (10%), progress test (10%), skills development portfolio (10%). An overall pass mark of 40% is required to pass the module which must include a pass mark of at least 40% in the practical component (DOPS).

Exam	Coursework	Practical
0%	70%	30%

Module name: Core Biochemistry

Module code: 4LMS0154

Semester: AB

Credits: 30

Module Aims:

Understand the basis of the three-dimensional structure of macromolecules and the relationship to their function appreciate the role of key catabolic and anabolic pathways in the functioning of cells and organisms appreciate the study of kinetic parameters and their importance to enzyme activity

Intended Learning Outcomes:

Describe the structure of key macromolecules and their relevance to their function in cells and organisms describe the main catabolic and anabolic pathways and develop knowledge of their relationship to health and disease describe the basis of energy production and utilisation in metabolic processes appreciate the principles of kinetics and how these relate to the control of metabolic processes in the cell. apply an understanding of metabolism to problems of biochemical relevance relate experimental data to kinetic theory access protein databases and use specific software to explore protein structure

Module Content:

The module will provide an introduction to biochemistry and will also incorporate aspects of chemistry specific to the study of biological systems. Subjects covered will include: the structure of key macromolecules and how this relates to their function in a cell or organism; major catabolic and anabolic pathways and their integration including glycolysis and gluconeogenesis, the TCA cycle, substrate and oxidative phosphorylation, oxidation of fatty acids, storage and mobilisation of glycogen, triglyceride storage and mobilisation, proteins for energy; kinetics including Michaelis–Menton kinetics of enzymes and the calculation of key enzyme parameters; radioactivity and its application to the study of biochemistry, thermodynamics and its application to bioenergetics.

Pre and Co requisites:

none

Assessment:

The coursework will comprise a Progress Test (20%) and an interpretative exercise with a word count of up to 1500 words. (30%). A pass in the coursework overall is required to pass the coursework component of the assessment. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%.

Exam	Coursework	Practical
50%	50%	0%

Module name: Molecular Biology and Genetics

Module code: 4LMS0007

Semester: B

Credits: 15

Module Aims:

Understand the principles of genetic inheritance and the use of molecular biological techniques in fundamental and applied bioscience

Intended Learning Outcomes:

Successful students will typically: explain the principles behind genetic inheritance and gene variation. describe at a fundamental level how gene expression may be regulated describe the molecular biological techniques used to analyse nucleic acids and discuss their application in clinical and industrial settings. Successful students will typically: explain and interpret genetic and molecular data. use computer based technologies to examine genetic inheritance patterns

Module Content:

The genetics component covers: Mendelian inheritance including meiosis and the production of primordial germ cells and gametes (oogenesis, spermatogenesis); linkage and basic human genetic epidemiology. The relationship of mutation to genetic variation and disease is included as well as an introduction to gene regulation. Molecular methods used to study DNA and inheritance are covered and the application of these methods to research, diagnosis and treatment of disease is discussed. The taught material will be delivered as lectures supported by small group tutorials where key concepts and applications of the knowledge will be discussed. Students will carry out specific tasks delivered using specialist computer software

Pre and Co requisites:

none

Total hours: 150

Assessment:

Coursework Weighting: 50% Examination Weighting: 50% Coursework: Computer based exercise (25%); data interpretation exercise (25%) A pass in the coursework overall is required to pass the coursework component of the assessment. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%.

Exam	Coursework	Practical
50%	50%	

Module name: Biochemistry for Pharmacology

Module Aims:

Develop an understanding of metabolic pathways and the biological macromolecules involved, how they are integrated, and their investigation with particular reference to the application to pharmacology.

Intended Learning Outcomes:

1. Discuss aspects of the significant biosynthetic pathways, their importance, and the relationship between them and the major catabolic pathways. 2. Discuss concepts involved in enzyme regulation and inhibition. 3. Be familiar with the principles of selected analytical techniques related to the study of metabolic pathways and enzyme regulation. 4. Interpret selected biochemical data. 5. Analyse enzyme action/inhibition. 6. Execute calculations relevant to biochemistry.

Module Content:

The module will build on the core biochemistry studied at level 4. Metabolic pathways including those involved in carbohydrate and lipid assimilation, their integration with catabolic pathways and importance in selected metabolic states will be considered. Nitrogen metabolism will also be considered including the process of protein degradation. Selected metabolic pathways involved in disease will also be explored. In addition the role of selected vitamins and cofactors in metabolism will be addressed. Enzyme regulation and inhibition will be considered including the methods involved in their study, the determination of K_i values, and their importance in the treatment of disease.

Pre and Co requisites:

none

Assessment:

Coursework 1, 50% Coursework: Data interpretation assignment (50%), with a word count range from 750 to 1500 words. Exam 1,50% Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade

Exam	Coursework	Practical
50%	50%	0%

Module name: Biochemistry

Module code: 5LM50147

Semester: AB

Credits: 30

Module Aims:

Develop an understanding of metabolic pathways and the biological macromolecules involved, how the pathways are integrated and regulated, and their investigation; Appreciate the post-translational regulation of proteins and how this affects protein activity in biological systems; Understand the techniques used for the investigation of protein structure and function.

Intended Learning Outcomes:

Discuss aspects of significant biosynthetic and catabolic pathways, including their importance, regulation and the relationship between them; Discuss concepts involved in enzyme regulation and inhibition; Understand the principles of selected analytical techniques related to the study of metabolic and enzyme regulation, and selected biophysical and structural techniques related to the study of protein structure and function.

Module Content:

The module will build on the core biochemistry studied at level 4. Metabolic pathways including those involved in carbohydrate and lipid assimilation, their integration with catabolic pathways and importance in selected metabolic states will be considered. Nitrogen metabolism will also be considered including the process of protein degradation. Selected metabolic pathways involved in disease will also be explored. In addition the role of selected vitamins and cofactors in metabolism will be addressed. Enzyme regulation and inhibition will be considered including the methods involved in their study, the determination of K_i values, and their importance in the treatment of disease. Students will gain a theoretical understanding and appreciation of structural biology, including the various techniques currently used and their application in determining protein structure and function, including: crystallography, protein NMR, electron microscopy.

Pre and Co requisites:

none

Assessment:

Coursework 1, 40%: consisting of a unseen, closed-book progress test (15%), and a written laboratory report (25%);

Practical 1, 10%: consisting of a *viva voce* (10%).

Exam 1, 50%: unseen closed-book examination, 3 hours in length.

Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade

Exam	Coursework	Practical
50%	40%	10%

Module name: Bioscience Research Methods

Module code:5LMS0001

Semester: AB

Credits:15

Module Aims:

Understand how problems in science are researched in the scientific literature; investigated in the laboratory through the construction of hypotheses, the design of experiments and the analysis of data; and the importance of subsequent communication of the results in scientific papers.

Intended Learning Outcomes:

Assess the different sources of information (literature, field data, laboratory data, interview/questionnaire responses, etc) that contribute to existing knowledge on the selected topic explain how the philosophy of Scientific Methodology informs research. Comprehend the importance of safe, professional and ethical scientific practice. Select appropriate methods for analysing information and data so as to address the hypotheses/questions/ problems/issues associated with a selected topic, Identify and apply the skills, responsibilities and relevant standards required of a working scientist.

Undertake a review of literature appropriate to the subject area and demonstrate the correct use and citation of references. design experiments, conduct quantitative and statistical analyses and appreciate quality assurance in ensuring integrity of data in research. Critically interpret data within the context of existing published material, produce a research proposal including a rationale, aims and objectives. Reflect on the relevance of personal transferable skills and graduate attributes to their study, employability and future professional development.

Module Content:

In this module the principles and methods that underpin ethical scientific research are explored. This knowledge provides a foundation upon which students can build in order to successfully complete their final year project and contributes to the professional development of the student as a bioscientist. A knowledge of research methods enables students to: build new sets of critical thinking skills that can be used to better comprehend the academic literature; and to test established theory as well as recognise new questions that need to be investigated. A very important aspect of this course is that it provides an overview of the reality of being a researcher and can therefore help students with their career choice.

Pre and Co requisites:

none

Assessment:

Targets Progress & Achievement (TPA) (30%); written assignment incorporating a literature review and research proposal up to 2500 words (35%); laboratory report based on a pro forma (15%) statistics and mathematic tests (20%). An overall coursework mark of at least 40% is required to pass the module. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade. Further details: Targets Progress and Achievement (TPA) includes the Assessment Centre Experience, a portfolio which includes evidence of the acquisition of transferable skills leading to the development of Graduate Attributes, and a reflective piece on the application of the taught component of the module to the world of work.

Exam	Coursework	Practical
0%	100%	0%

Module name: Genes and Genomes

Module code: 5LMS0091

Semester: A

Credits: 15

Module Aims:

Develop an understanding of genetics and genomics with an emphasis on eukaryotic organisms

Intended Learning Outcomes:

Appreciate the organisation and control of gene expression explain the principles of eukaryotic genetics explain the organisation and evolution of eukaryotic genomes appreciate the relevance of genetics to population structure and dynamics evaluate the importance of genetics and genomics in a medical context. perform experiments in the field of molecular biology and interpret a range of experimental data seek and communicate information within the context of eukaryotic molecular biology, genetics, genomics and bioinformatics evaluate whole genome relative to target specific approaches for research in genetics and molecular biology

Module Content:

Chromosome structure, gene organisation and regulation of expression including basic intercellular signalling, epigenetics, transcription factors, differential mRNA processing and microRNA. Gene and gene family evolution. Repetitive DNA sequences. The elucidation of the organisation of eukaryotic genomes from DNA reassociation kinetics to the human genome sequence. Whole genome analyses and comparative genomics. Recombinant DNA technology and the manipulation of DNA. Introduction to databases and bioinformatics tools and resources for the analysis of biological sequence data. Methods for the analysis of DNA and RNA (including real-time PCR, DNA microarrays, mouse knockout technology, RNAi). Cytogenetics. Principles of population genetics, DNA polymorphism and human diseases. An introduction to pharmacogenetics, personalised medicine and molecular diagnostics.

Pre and Co requisites:

none

Total hours: 150

Assessment:

Coursework: Computer based practical (25%); progress assessment (25%) A pass in the coursework overall is required to pass the coursework component of the assessment. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Microbiology of Disease

Module code: 5LMS0005

Semester: A

Credits: 15

Module Aims:

Understand the structure and function of microorganisms associated with human disease, the methods used in their identification in a diagnostic laboratory and how microbial disease is monitored and controlled.

Intended Learning Outcomes:

Successful students will typically: identify the features of bacteria, fungi, viruses and parasites associated with their ability to cause human disease. explain the methods used to distinguish between different microbes in diagnostic microbiology. Assess the role of epidemiological methods and infection control in preventing or minimising the effects of microbial disease. Successful students will typically: apply microbiological techniques to isolate and grow a range of medically important bacterial and fungal genera. Use key identification techniques to distinguish between different bacteria and fungi in the laboratory. carry out methods used to measure antibiotic susceptibility.

Module Content:

The module will introduce the subject of microbial disease and the identification and treatment of the microbes involved at a general level using selected examples. Subjects covered in the module will include the following. How bacteria spread and cause disease: the role of virulence factors in pathogenicity. The role of commensal bacteria. Bacterial growth; the design and use of diagnostic media; biochemical and serological tests and other methods used in diagnostic microbiology. Fungal classification, growth and pathogenicity. How viruses proliferate and cause disease. Classification and identification of viruses in the laboratory. An introduction to parasites associated with human disease. Key features used in their identification. An introduction to epidemiological methodology and how it is used to monitor the spread of infection. The importance of nosocomial infections and opportunistic infections. Basic infection control methods including vaccines and use of antimicrobial agents. Material will be presented in lectures and in directed-learning packages. Concepts will be discussed in workshop session. Practical sessions will be used to develop the necessary laboratory skills and to help students to apply their theoretical knowledge to diagnostic microbiology. Assignments will be used to test knowledge and it's application. Practical sessions in diagnostic microbiology will include: use isolation and differential media; staining and microscopic analysis of fungi and bacteria; use of biochemical tests for microbes including standardised test strips; antimicrobial susceptibility testing.

Pre and Co requisites:

Pre-requisite: 4LMS0006 Practical and Transferable Skills; 4LMS0005 Cell and Microbiology

Assessment:

Coursework 50% (Lab test) and Exam 50% Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Principles of Immunology

Module code: 5LMS0009

Semester: A

Credits: 15

Module Aims:

Develop an understanding of the central principles of immunology and appreciate the mechanisms of natural and acquired immunity. gain awareness of the role of the immune system in hypersensitivity reactions. develop an understanding of vaccines and vaccine design.

Intended Learning Outcomes:

Successful students will typically: describe the main components of natural and adaptive immunity and explain the processes involved in generating an effective immune response. explain the immunopathology of inflammatory disease. demonstrate knowledge of microbial:host interactions and their importance in vaccine design. Successful students will typically: perform selected immunological techniques. interpret immunological laboratory data. effectively communicate information drawn from a range of sources

Module Content:

Anatomy and physiology of the immune system: cells, primary and secondary lymphoid tissues, leukocyte circulation and key phenomena including; chemotaxis, opsonisation, phagocytosis, inflammation, antigen processing and clonal expansion. Natural immunity: role of phagocytic cells, the complement system, cytokines, chemokines and the acute inflammatory response. Hypersensitivity reactions. Adaptive immunity: antigen specificity of B and T cells. Antibody structure and effector functions. T cell subsets; antigen processing and presentation to T cells, the role of the major histocompatibility complex. T-helper cell subpopulations and cytokines in determining the immune response. Immunity to microbial pathogens including bacteria, and viruses. Vaccine design strategies. Inflammation: immunology of chronic inflammation; immunopathology of selected chronic inflammatory diseases. Anti-inflammatory therapies; steroidal and nonsteroidal anti-inflammatory drugs.

Pre and Co requisites:

Practical skills module, Human Physiology with pharmacology

Assessment:

Coursework 50 % Weighting: Exam 50 % Weighting: Practical % Weighting: Assessment will be by a practical report (25%), a written assignment (15%), Drop quizzes(10%) Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Biochemistry

Module code: 5LMS0147

Semester: AB

Credits: 30

Module Aims:

Develop an understanding of metabolic pathways and the biological macromolecules involved, how the pathways are integrated and regulated, and their investigation. Appreciate the post-translational regulation of proteins and how this affects protein activity in biological systems. Understand the techniques used for the investigation of protein structure and function

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Intended Learning Outcomes:

Discuss aspects of significant biosynthetic and catabolic pathways, including their importance, regulation and the relationship between them. Discuss concepts involved in enzyme regulation and inhibition. Understand the principles of selected analytical techniques related to the study of metabolic and enzyme regulation, and selected biophysical and structural techniques related to the study of protein structure and function. Interpret selected biochemical data. Design an experiment to assess protein regulation. Analyse enzyme action/inhibition. Execute calculations relevant to biochemistry.

Module Content:

The module will build on the core biochemistry studied at level 4. Metabolic pathways including those involved in carbohydrate and lipid assimilation, their integration with catabolic pathways and importance in selected metabolic states will be considered. Nitrogen metabolism will also be considered including the process of protein degradation. Selected metabolic pathways involved in disease will also be explored. In addition the role of selected vitamins and cofactors in metabolism will be addressed. Enzyme regulation and inhibition will be considered including the methods involved in their study, the determination of K_i values, and their importance in the treatment of disease. Students will gain a theoretical understanding and appreciation of structural biology, including the various techniques currently used and their application in determining protein structure and function, including: crystallography, protein NMR, electron microscopy

Pre and Co requisites:

None

Assessment:

Coursework consists of: Progress test (15%) and a laboratory report (25%). Practical consists of: Viva (10%) A pass in the coursework overall is required to pass the coursework component of the assessment. An overall average module grade of at least 40% must be achieved in order to pass the module, with neither examination or coursework being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	40%	10%

Module name: Blood Sciences

Module code: 5LMS0007

Semester: AB

Credits: 30

Module Aims:

Build on fundamentals of biochemistry and metabolism to support the clinical investigations performed in a biochemistry laboratory. Apply haematology theory to explain how blood associated disease states develop in humans, and the laboratory diagnosis of these haematological disorders. Demonstrate how immunology theory is applied in the area of blood transfusion and how this is significant to patient care. Explain how the clinical laboratory specialties in the module are related and how they work together to contribute to the investigation and treatment of disease.

Intended Learning Outcomes:

Successful students will typically: Demonstrate underpinning knowledge of biochemical pathways and relate this to changes that occur when they are disrupted in disease. Demonstrate a detailed understanding of the pathophysiology and range of laboratory investigations linked to blood cell disorders, and blood coagulation. Explain the use of different biological specimens, collection tubes and reference ranges in the clinical laboratory. Discuss good blood transfusion practice by demonstrating knowledge of blood group systems and the importance of compatibility testing, provision of blood products and regulation in blood transfusion science. Successful students will typically: Effectively analyse and interpret scientific and clinical data both in the laboratory and for case studies and demonstrate the ability to keep a good laboratory logbook. Begin to use critical appraisal skills in the assessment of the quality and content of scientific and clinical data. Demonstrate effective communication of scientific data and concepts and in a logical and systematic manner. Demonstrate an understanding and experience of methods and techniques used in routine clinical biochemistry, core and specialized haematology and blood transfusion science. Demonstrate professionalism and adherence to good laboratory practice including conforming to health and safety requirements specific to the handling of human blood.

Module Content:

Fundamental haematology: haemopoiesis, bone marrow structure and normal red cell physiology. The nature and diagnosis of red cell associated disorders including nutritional anaemias, haemoglobinopathies and haemolytic anaemias. Principles of haemostasis and understanding of bleeding, thrombotic and platelet disorders. Role of the haematology laboratory in diagnosis, monitoring and prognosis of disease. Blood transfusion science theory includes; blood group systems, the blood bank laboratory (components, regulatory bodies, guidelines, quality), hazards of transfusion, and principles of compatibility testing. Haemolytic disease of the newborn alongside the role of RhD prophylaxis will be addressed. The biochemistry will build on first year studies and incorporate the biosynthesis of lipids and amino acids. The pentose phosphate pathway in red blood cells will be addressed. The underlying biochemistry in selected diseases (eg hepatic) will be covered and students will be introduced to the role of the clinical biochemistry laboratory in the diagnosis, monitoring and treatment of disease. The module will be delivered via a mixture of learning experiences including lectures, practicals, tutorials/workshops and set assignments. Teaching will be further supported by the use of clinical case scenarios and journal based study to emphasise how these disciplines work are applied. Multidisciplinary case studies will be incorporated to demonstrate the relationship between the different disciplines in the diagnosis of disease.

Pre and Co requisites:

none

Assessment:

Coursework Weighting: 50% Examination Weighting: 50% (i) An unseen progress test at the end of

semester A 15% (ii) Data Interpretation 10% (iii) Health and Safety practical competency 5% (iv) Practical competence assessment 5% (v) Diagnostics seminar 5% (vi) Drop quizzes 10% Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Chemistry & Analytical Science

Module code: 5LM50104

Semester: AB

Credits: 30

Module Aims:

1. Understand and apply the techniques used for identification, characterisation and evaluation of biologically relevant compounds. 2. Appreciate the concept of quality as related to analytical measurement. 3. Use analytical instruments to help solve problems relating to biochemical analysis. 4. Understand the structure and reactivity of organic molecules of biological interest.

Intended Learning Outcomes:

1. Understand the fundamental concepts of modern analytical science as applied in a biochemical context. 2. Describe the techniques for the analysis, identification and characterisation of compounds. 3. Understand the process of an analysis from instrument calibration and sample preparation to data analysis. 4. Describe aspects of the synthesis, structure and reactivity of organic molecules of biological interest. 5. Conduct laboratory experiments to obtain and analyse compounds of biological relevance. 6. Generate, interpret and communicate scientific data. 7. Use spectroscopic data to identify organic molecular structure. 8. Solve problems related to biochemical analysis and chemical reactivity.

Module Content:

The module builds on first year chemistry foundations to prepare students for final year study of advanced biochemical and molecular biology topics. Students will gain an understanding and appreciation of the analysis of organic compounds including chromatographic and spectroscopic techniques together with an ability to interpret the data thus generated. An understanding of the chemical structure and reactivity of some organic molecules of biological relevance will be communicated. Students will gain practical experience of the synthesis and characterisation of organic molecules and techniques for their analysis.

Pre and Co requisites:

4LMS0040 Molecular Structure and Reactivity

Assessment:

Coursework 1, 50% The coursework will comprise two assignments each worth 25%, assessing the planning, execution and reporting of experiments carried out in practical classes and the knowledge and data interpretation skills gained in practical classes and workshops. Assignment 1: practical report, maximum word limit of 1500 words. Assignment 2: data interpretation/problem-solving exercise, maximum word limit of 1500 words. Exam 50% A pass in the coursework overall is required to pass the coursework component of the assessment. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%.

Exam	Coursework	Practical
50%	50%	0%

Module name: Pharmacology

Module code: 5LM50025

Semester: AB

Credits: 30

Module Aims:

Gain a knowledge of the principles of pharmacological action of drugs, and fate of drugs in the body understand the basis of therapeutic actions of drugs in a number of specific disease areas.

Intended Learning Outcomes:

Successful students will typically: describe the fate of drugs in the body in terms of the processes of absorption, distribution, metabolism and elimination define the actions of drugs by their interaction with molecular targets and the consequent cellular and tissue responses account for the therapeutic response of a number of classes of drugs in selected disease states using clinical evidence appreciate the need for the development of new therapeutic approaches to the treatment through a detailed understanding of the pathophysiological basis of disease appreciate all factors that determine therapeutic response to drugs, including pharmacogenomics and chronopharmacology. Successful students will typically: analyse dose/concentration response relationships in the comparison of potency and efficacy of drugs interpret computer analysis of pharmacokinetic data to describe the fate of drugs in the body critically appraise evidence based clinical studies.

Module Content:

This module will describe the analysis of drugs action in the general sense, (to assess potency and efficacy through interaction with known receptors and cellular transduction mechanisms), and the mode of altered physiological function at a tissue and systems level to account for therapeutic effects in specific disease states. The fate of drugs (pharmacokinetics and drug metabolism) will also be considered as it influences the development of new drugs and as an important aspect to the success of therapeutics. Classes of drug treatments will be characterised for specific diseases of the cardiovascular system, endocrine system, central nervous system and chemotherapeutics of cancers and infectious diseases, dermatology and wound healing. The limitations of existing therapies will also be identified and the possible new target for future drug treatment discussed in terms of present understanding the pathology and genetic basis of disease. Alternative therapeutic approaches will also be discussed. This module material will be delivered primarily by lectures to cover the full range of therapeutic areas a pharmacist must be familiar with. Workshops sessions will consolidate understanding of concepts of pharmacodynamic and pharmacokinetic aspects of drugs that contribute to therapeutic outcomes, using case studies. Students will also attain an in depth knowledge of a particular area of therapeutics of their choice in preparing an extended assignment which will require a literature search from a variety of sources. Practical experience and skill in data analysis will also be an outcome of this module. Numeric skills will be tested in the analysis of pharmacokinetic data generated from computer simulations of drug administration studies. Testing and quantifying of pharmacological responses in the laboratory will reinforce taught material and demonstrate design of experimental studies.

Pre and Co requisites:

Level 4 Human Physiology and Pharmacology

Assessment:

Coursework 50% Weighting: Exam 50% Weighting: Practical % Weighting: The coursework will comprise electronic submission of analysed data from a practical (10%), a computer-based quiz on theory and methodology of a practical (10%), a progress test (20%) and a presentation (10%). Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at

least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Biology of Disease

Module code: 5LMS0022

Semester: B

Credits: 15

Module Aims:

Understand the biology of the major diseases that affect human populations of the developed world and the influence of genetic and environmental factors that contribute to the development of disease.

Intended Learning Outcomes:

Successful students will typically: 1. Comprehend the alterations in biological processes that occur in the transition between good health and disease 2. Explain the pathology of selected major diseases at cellular, tissue and organ systems levels 3. Assess the role of the genetic and environmental factors that affect the incidence of selected disorders 4. Identify tissue types and the main organs of the human body 5. Interpret the evidence for a range of key pathological processes 6. Present both an oral and a written analysis of aspects of individual disease pathologies

Module Content:

This module will examine the major non communicable disease affecting western human populations in the 21st century. This will include cardiovascular and respiratory disease, cancer, diabetes and degenerative disorders. Students will study the pathophysiology of the disease at both the cellular, tissue and systems levels. The contribution of genetics and environment to the incidence of the disease will also be explored. Selected examples of current topical diseases will be chosen, including those affecting physiological, cellular and biochemical systems and the influence of both internal and external factors discussed. Material will be presented in lectures and in directed learning packages. Concepts will be discussed in workshop sessions. Practical sessions will be used to develop laboratory skills and help students apply their knowledge to understanding changes due to disease at the cellular, tissue and organ levels. Assignments will be used to test knowledge and its application.

Pre and Co requisites:

none

Assessment:

Coursework 50%, Exam 50%, Practical 0% (the module has a total of 2 practical session; but they are not assessed towards the final module grade)

Coursework assessment will consist of a group poster presentation (25%); and an individual synopsis (25%) where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%

Exam	Coursework	Practical
50%	50%	0%

Module name: Cell and Molecular Biology

Module code: 5LMS0092

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to develop an understanding of how molecules, particularly proteins, function to influence the behaviour of cells in a multicellular organism.

Intended Learning Outcomes:

1. Develop an understanding of the relationship between protein structure and function. 2. Appreciate how proteins affect cell behaviour. 3. Gain understanding of the major signalling pathways which underlie how cells communicate with each other and which affect cellular behaviour. 4. Understand the relationship between cell shape and cell function. 5. Understand the cellular and molecular regulation of cell division and cell cycle regulation. 6. Perform experiments in the field of molecular biology and interpret a range of experimental data. 7. Seek and communicate information within the context of molecular biology. 8. Apply technology in the use of computers and laboratory equipment

Module Content:

Functions of proteins in the cell. Relationship between protein structure and function. Protein structure and disease. Introduction to protein transport. Techniques for protein purification and characterisation: liquid column chromatography, electrophoresis, mass spectrometry. Proteomics. Signal transduction pathways in eukaryotic cells (including G-protein coupled pathways, pathways involving receptor tyrosine kinases, cytokine-activated pathways, cell death pathways) and how they affect cell proliferation, differentiation, motility and viability. Cell division and cell cycle regulation. Functional units of the cellular cytoskeleton and their dynamic organisation.

Pre and Co requisites:

None.

Assessment:

An overall average module grade of at least 40 % must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35 %. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Cytology & Histopathology

Module code: 5LMS0006

Semester: B

Credits: 15

Module Aims:

Understand the fundamental pathological processes that determine disease and comprehend the differences between healthy and diseased states explain how cellular pathology services support the investigation and treatment of disease explain the principles, practice, quality assurance and application of commonly employed methods and techniques used across cellular pathology

Intended Learning Outcomes:

Successful students will typically: describe and explain how common human disease processes have an effect at the functional, cellular, tissue, organ and system levels of organisation and explain their clinical presentation. comprehend the principles, practice, quality assurance and application of methods for retrieval, preservation, preparation and analysis of cells, tissues and organs for cellular pathology testing. understand preparation, staining and analysis of biological samples for cellular pathology testing and explain their rationale of explain the rationale of histochemistry, immunocytochemistry and special stains. understand the roles and responsibilities of healthcare professionals in the health service and in the cellular pathology services. Successful students will typically: demonstrate a range of key pathological processes through the use of laboratory experiments using safe and precise technical skills prepare, stain and investigate biological specimens for cellular pathology investigation and identify the normal and abnormal macroscopic, cellular and sub-cellular appearance and morphological changes in a range commonly investigated tissues appreciate the legal and ethical boundaries of cellular pathology manipulate, analyse and present clinical data appropriately and demonstrate a logical and systematic approach to problem solving.

Module Content:

This module has been designed to provide students with an understanding of cytology and histopathology. Topics covered will include: Cell death and cell injury. Overview of benign pathological processes (e.g. inflammation, embolism, infarction, ischemia, fibrosis, oedema, etc.), with reference to their pathogenesis, clinical presentation and investigation. Macroscopic and microscopic appearance of commonly investigated human tissues Macroscopic, cellular and sub-cellular changes resulting from pathological conditions Common methods for the collection, receipt and processing of human tissues and biological samples for cellular pathology. Implications for sample integrity and clinical validity. Special stains, immunohistochemistry, immunocytochemistry and molecular methods used in cellular pathology. Quality control. Regulations and guidelines relating to the use, storage and disposal of human tissues Appreciation of the roles and responsibilities of healthcare professionals in the health service and in the cellular pathology services. Case studies demonstrating the relationship between the pathophysiological process and the morphological changes within tissues. The module will be delivered via a mixture of learning experiences including lectures, workshops, laboratory classes and assignments.

Pre and Co requisites:

none

Assessment:

Coursework Weighting: 50% Exam Weighting: 50% Assessment comprises, image analysis (20%) written assignment (30%) Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Applied and Integrated Biomedical Science

Module code: 6LMS0141

Semester: B

Credits: 15

Module Aims:

Apply a detailed knowledge of subject specialities to the evaluation of problems that cross the laboratory disciplines and to appreciate the need for an integrative approach when investigating diseases.

Intended Learning Outcomes:

Successful students will typically: critically discuss disease examples showing how multiple laboratory disciplines are involved in patient care. critically discuss ethical issues which impact on the advances of biomedical science. explain why quality parameters are important in interpretation of clinical data. Successful students will typically: design and perform laboratory investigations of disease involving procedures from different subject specialties. undertake reflective practice to solve problems encountered in clinical diagnosis. interpret clinical information and data to conclude pathology-based case studies. use effective and professional written and oral communication.

Module Content:

The module consists of a set of laboratory sessions, computer-based exercises and case studies that will encourage students to integrate their knowledge across subject specialities. Scenarios will be provided that involve a range of patient presentations and students will be required to assess which laboratory investigations should be carried out. Alternatively, laboratory findings will be provided to illustrate the multidisciplinary nature of patient diagnosis and students will be required to analyse and report on these. In all cases students will be required to reflect and report on these results and they will be required to comment on issues relating to data quality and identify quality assurance processes to ensure accurate diagnoses. There will be a continued emphasis on good professional conduct, ethical issues in biomedical science and application of scientific knowledge and skills. Lectures will be provided to support the practical work. These will include information on methodologies that have not been previously encountered, experimental design and data analysis. In addition some online material will be provided.

Pre and Co requisites:

none

Assessment:

Coursework Weighting: 100% Coursework will include: A case study-based assignment that includes a group presentation viva (40%) and an individual viva (60%). The module has an attendance requirement of at least 75% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
0%	100%	0%

Module name: Cell Differentiation and Development

Module code: 6LMS0033

Semester: A

Credits: 30

Module Aims:

Develop a systematic understanding and knowledge of the organisation and expression of genetic material in cells develop an understanding of the principles involved in cellular communication, differentiation and development.

Intended Learning Outcomes:

Successful students will typically: critically discuss the application of genetic, biochemical and molecular techniques to the study of gene structure and function and cellular development understand the biochemical and molecular biological mechanisms that underpin cellular communication, differentiation and development critically discuss the use of model organisms in studying differentiation and development apply this knowledge to the understanding of human disease Successful students will typically: interpret and communicate relevant molecular biological and biochemical data apply bioinformatics to the analysis of molecular biological data analyse gene expression during cell development.

Module Content:

This module will provide an advanced understanding of the biochemical/molecular basis of cellular differentiation and development. Genetic, molecular and biochemical techniques of investigation will be considered in relation to studying gene regulation and discovering new genes, proteins & signalling pathways involved in aspects of development. Mechanisms of gene expression and control will be considered. Differentiation and development in microbial cells (e.g. *B. subtilis* and yeast) is considered including extrapolations from yeasts to understanding aspects of human cell molecular biology. *C. elegans* as a model for microbial pathogenesis (innate immunity) will be covered. Differentiation & development in multicellular organisms will be covered including a discussion of the role of stem cells, body plans (dorsal/ventral; anterior/posterior; left/right axis formation) cell fate determination, cell polarity mechanisms and cell-cell communication. The major ligand receptor systems involved in development will be considered including a discussion of their role in embryology and human disease. The module will be delivered via lectures and workshops supported by case studies and problem based learning.

Pre and Co requisites:

Metabolic Biochemistry , Regulatory Biochemistry and Molecular Cell Biology

Assessment:

Coursework 50% Weighting: 50% Exam 50% Weighting: 50% Practical % Weighting: Coursework: 25% for an in-course test and 25% for an assignment that is based on a practical, case-study or problem based learning exercise. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%

Exam	Coursework	Practical
50%	50%	0%

Module name: Clinical Microbiology

Module code: 6LMS0005

Semester: A

Credits: 15

Module Aims:

apply their knowledge of microbiology to the study of microbial diseases; their diagnoses; treatment and control.

Intended Learning Outcomes:

Successful students will typically: compare and contrast the mechanisms of infection of a range of different bacterial, viral, fungal and parasitic pathogens. critically evaluate the tests used for identification of a range of different bacterial and viral pathogens. explain the issues associated with the laboratory investigation of parasitic and fungal diseases. assess the problems associated antibiotic resistance and its spread within microbial populations. Successful students will typically: identify microbial pathogens to species level and to individual strains where appropriate. discuss the problems associated with laboratory diagnosis of infectious diseases.

Module Content:

The aim of the module is to provide a more detailed and applied understanding of the problems associated with microbial diseases, their diagnoses and their control. The key areas covered will be: Bacterial pathogenicity: infections, disease and virulence factors; colonisation and invasion of host surfaces, evasion of the immune system; the mechanism of action of toxins and enzymes in the disease process; and the regulation of virulence. Students will have a detailed understanding of the pathogenicity of a range of bacteria that infect different sites on the body and the differences between how they survive inside a host and cause diseases. Viral pathogenicity: mechanisms of infection and virulence of a number of key infectious viruses. Prions will also be covered. Fungal and parasite pathogenicity: mechanisms of infection and virulence of a number of key infectious viruses. Design of diagnostic tests for pathogens including a comparison of traditional, seriological and molecular techniques such as PCR and MS MALDI-TOF. Issues regarding emerging infectious diseases, viable but nonculturable organisms (VBNC) and any current microbial problems (eg SARS or bird flu). Antibiotic susceptibility and resistance: the mechanisms of spread of antibiotic resistance and the problems associated with hospital and community-acquired antibiotic-resistant infections. Future antibiotic targets. The outcomes will be achieved by a combination of lectures, workshops, computer based exercises and directed study. Assessment of coursework will be of a portfolio of three tasks, based around the lecture material and will include a diagnostic case-study

Pre and Co requisites:

Microbiology of Disease 5LMS0005

Assessment:

Coursework 1, 100% Portfolio on antimicrobial resistance and microbial pathogenesis: o Scientific poster 50% o Individual oral presentation 25% — [Practical] o Piece of scientific writing (up 500 words) 25% Where a module is assessed by practical, coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination, practical or coursework) being below 35%. There is an attendance requirement of at least 75% of all teaching sessions specified in the module. Failure to attend the required proportion of classes together with failure of the module assessment at the first attempt will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
	100%	

Module name: Molecular Medicine

Module code: 6LMS0032

Semester: A

Credits: 15

Module Aims:

Build on their studies at Level 5 to apply the disciplines of biochemistry and molecular biology to selected disease states and therapeutic technologies.

Intended Learning Outcomes:

Successful students will typically:

- Apply the principles of biochemistry and molecular biology to the use of gene therapy including the role of siRNAs and CRISPR, critically discuss the molecular basis of selected diseases and potential therapies, explain the potential impact of stem cells on medicine and critically discuss the impact of personalised medicine. Successful students will also typically be able to retrieve, interpret and manipulate biological data relating to the molecular biology and biochemistry of disease.

Module Content:

Genomics and personalised medicine: the use of gene editing and induced pluripotent stem cells/embryonic tissue specific stem cells for therapeutics: the use of gene re-engineering for purification and expression; antibody engineering, monoclonal and polyclonal antibodies, Fab, Fv, humanisation of mouse antibodies, recombinant phage antibody (phage display) for the production of ScFv antibodies and applications. The molecular basis of selected diseases will include diseases such as AIDS and cancer.

Pre and Co requisites:

none

Total hours: 150

Assessment:

Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%.

Exam	Coursework	Practical
50%	50%	0%

Module name: Therapeutic Pharmacology

Module code: 6LMS0152 Semester: A Credits: 30

Module Aims:

Build upon their understanding of systems physiology and pharmacology with an in depth discussion of selected systems relate the molecular basis of pathological changes in these systems to the mode of action of drugs used in their treatment comprehend the rationale for the development of novel therapies for the treatment of disorders of the systems selected for study.

Intended Learning Outcomes:

Discuss current advances for the pathological basis of diseases affecting selected body systems and their modulation by existing and novel therapeutic strategies evaluate the experimental approaches used in the study of the pathological basis of disease and the mechanism of drug action. discuss the potential of new therapeutic approaches as opposed to conventional drug treatments.

Interpret reported experiments in pharmacology evaluate the approaches used in the study of therapeutics evaluate up-to-date published findings to assess the application of a novel therapeutic agent.

Module Content:

This module focuses on the molecular and biochemical aspects of disease and how drug therapies modulate this pathology. Current advances in understanding of the basis of selected diseases will be studied in relation to existing drugs and emerging therapies. The rationale for novel approaches which may lead to the development of new chemical and biological entities will be explored.

Pre and Co requisites:

None

Assessment:

Coursework comprises a progress test (25%) and a case study assignment of up to 2500 words based on a novel therapeutic agent (25%). A pass in the coursework overall is required to pass the coursework component of the assessment. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with neither examination or coursework being below 35%.

Exam	Coursework	Practical
50%	50%	0%

Module name: Translation of Science into Medicine

Module code: 6LMS0030

Semester: A

Credits: 15

Module Aims:

Integrate and analyse how, in drug discovery, basic research translates into clinical drug development.

Intended Learning Outcomes:

Successful students will typically: critically discuss basic research techniques that are necessary to evaluate the structure activity relationship of new chemical entities for translation into clinical drug development. demonstrate their ability to draw upon advanced knowledge of pharmacokinetics, drug metabolism, preclinical safety testing to characterise modern drug discovery and apply these principles to evaluate approaches to the translation of new drugs. Successful students will typically: design, model and interpret data from pharmacological experiments demonstrate an appreciation of the ethics relevant to pre-clinical safety testing critically appraise factors leading to selection of a drug for clinical development

Module Content:

Students will study drug discovery i.e. how basic research translates into pharmaceutical clinical drug development. This will include basic research techniques that are essential for the evaluation of structure activity relationships of new chemical entities for translation into clinical drug development including drug design, drug screening (using in vitro and in vivo methods), pharmacokinetics/pharmacodynamics and biomarkers. An advanced understanding of the basic science areas of pharmacokinetics, drug efficacy screening, drug metabolism and preclinical safety testing and toxicology will be covered. Ethical issues arising from pre-clinical testing and experimental design will be addressed. The module will apply the fundamental principles to evaluate approaches to the translation of new drugs as illustrated in case studies drawn from recent history in the pharmaceutical industry. Case studies will be presented by invited speakers with industrial experience relevant to each stage of drug discovery.

Pre and Co requisites:

None

Assessment:

Coursework % Weighting: 50% Exam % Weighting: 50% Practical % Weighting: Students will develop a portfolio based on lecture and case study material for the coursework component. The examination will be 2 hours. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Advance Biochemistry

Module code: 6LMS0196

Semester: AB

Credits: 30

Module Aims:

Develop an understanding of control and organisation within the cell, explain advanced aspects of biophysical techniques along with protein structure–function relationships to develop knowledge of current topics of biochemistry including biophysical technology

Intended Learning Outcomes:

understand techniques used in biochemical studies analyse and evaluate molecular mechanisms in cellular control, explain biomolecular structure and function in vitro and in vivo. apply computer and laboratory–based technology in biochemistry, interpret, evaluate and communicate results obtained from the application of biochemical and biophysical techniques. communicate information about current biochemical topics to an informed lay audience

Module Content:

The module covers advanced aspects of biomolecular structure/function, aspects of cellular regulatory mechanisms and techniques used to study those aspects. Biomolecular examples may include areas of lipid membranes and proteins, protein– ligand interactions and engineering of proteins and/or pathways, while mechanisms may cover the formation as well as the degradation of proteins. Laboratory and computer–based techniques required to investigate biomolecular systems and mechanisms will be covered in lectures and/or practical sessions.

Pre and Co requisites:

Biochemistry 5LMS0147

Assessment:

Coursework % Weighting: 50% Exam % Weighting: 50% Practical % Weighting: N.A. The exam consists of three essay questions over three hours. The coursework includes a progress test (25%) and a seminar (20%) with a written synopsis of up to 250 words (5%). A pass in the coursework overall is required to pass the coursework component of the assessment. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with neither examination or coursework being below 35%.

Exam	Coursework	Practical
50%	50%	0%

Module name: Cellular and Molecular Pathology

Module code: 6LMS0003

Semester: AB

Credits: 30

Module Aims:

Discuss pathological changes in cells and tissues at the molecular and cellular level, and relate these changes to the pathology of tumours and selected diseases. evaluate how cellular and molecular pathology contributes to the investigation, diagnosis, management and treatment of selected diseases. discuss the application and delivery of a range of core and specialised cellular and molecular methods/techniques and understand their importance in the clinical investigation of selected diseases. discuss genetic mutations and polymorphisms and their influence in development of disease

Intended Learning Outcomes:

Successful students will typically: evaluate the transmission genetics of selected diseases. explain the rationale and application of cytogenetics. explain the molecular, biochemical, cellular and physiological changes associated with selected diseases. critically discuss, and explain with examples, cellular and molecular pathology methods to support the diagnosis, management and treatment of common clinical disorders. Successful students will typically: identify pathological tissues based on changes at the morphological, biochemical and molecular level. apply cellular and molecular methods and illustrate their value/role in diagnosis, treatment and management of selected diseases/clinical outcome. demonstrate a logical and systematic approach to problem solving. manipulate, analyse and present clinical data appropriately demonstrate good communication skills, supported by the appropriate presentation of data. demonstrate critical appraisal skills in the assessment of the quality of scientific and clinical data.

Module Content:

Collection, preparation and analysis of biological specimens. Clinical application of cellular pathology methods and techniques in diagnosis, treatment and management of cancer. Pathophysiology of tumours. Carcinogenesis and metastasis. Definitions and classification. Genetic and biological basis of cancer development. Treatment and patient management. Cancer prevention and screening programmes. Pathogenesis, clinical presentation, diagnosis, treatment and management of common solid tumours and haematological malignancies. Microbes as etiological agents of cancer and selected clinical disorders; clinical presentation and diagnostic methods. Clinical genetic. Identification of genetic mutations and polymorphisms and their influence on disease processes, genetic mapping of Mendelian diseases, applications of cytogenetic. Overview of tests that assess the molecular basis of cancer and selected diseases. Molecular techniques for disease investigation, diagnosis, screening and treatment. Topics will be supported by examples from a range of molecular, cellular pathology, microbiology and haematology methods for the diagnosis, management and treatment of selected clinical conditions. The outcomes will be achieved by a combination of lectures, workshops and directed learning activities with assessments.

Pre and Co requisites:

none

Assessment:

Coursework Weighting: 50% Exam Weighting: 50% Assessment for this module comprises a seminar (25%) and a progress test (25%) Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%.

Exam	Coursework	Practical
50%	50%	0%

Module name: [Clinical Biochemistry and Immunology](#)

Module code: 6LMS0094

Semester: AB

Credits: 30

Module Aims:

Discuss the biochemical principles underlying disease and develop a knowledge of the biochemical methods used in the investigation, treatment and monitoring of disease. relate biochemical markers of disease to disease pathophysiology. discuss quality management in the context of the biochemistry and immunology laboratories. discuss the immunological processes involved in autoimmune diseases, hypersensitivity, tissue typing and organ transplantation reactions and how immune-related disorders are diagnosed, treated and monitored. evaluate the scientific and clinical rationale behind the use of immunosuppressive agents.

Intended Learning Outcomes:

Successful students will typically: critically discuss the basis of biochemical methods used in investigating disease. explain the biochemical principles underlying the study of disease. relate the biochemical evidence for disease to the pathophysiology and clinical presentation of disease. critically discuss the immunological processes giving rise to clinical disorders. explain the relationship between laboratory findings and the underlying immunopathology of selected disorders. Successful students will typically: discuss the relationship between biochemical markers and disease pathophysiology. apply quality management principles to the determination and interpretation of biochemical and immunological data critically evaluate biochemical and immunological data relevant to the diagnosis of disease.

Module Content:

The aim of the module is to enable the students to relate the measurement of biochemical parameters in bodily fluids to the diagnosis, treatment and monitoring of disease. Markers reflecting the pathophysiology in selected diseases including cardiac, renal, hepatic, bone and endocrine will be considered. The importance of quality management will be addressed. Tumour markers, will also be covered. Immune-mediated disorders: mechanisms of autoimmunity with specific examples of diseases, hypersensitivity reactions (types I-IV) with examples of specific clinical disorders. Immunological markers of disease, serum immunoglobulins, cytokines and related proteins. Transplantation immunology: HLA polymorphism, HLA function, mechanisms of host versus graft disease and graft versus host disease, anti-rejection therapy. The outcomes will be achieved by lectures, workshops, practicals, problem-based learning and case studies

Pre and Co requisites:

5LMS0007 Blood Sciences and 5LMS0009 Principles of Immunology.

Assessment:

Coursework Weighting 50% Exam Weighting 50% Assessment will be by a report on a case study (25%) and an in-course test (25%). A pass in the coursework overall is required to pass the coursework component of the assessment. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Neurobiology of Disease

Module code: 6LMS0029

Semester: AB

Credits: 30

Module Aims:

Comprehend the biological processes under the control of the nervous system that are involved in adapting to the everyday environment. critically review experimental evidence on the functions of the nervous systems and mechanisms leading to dysfunction in disorders and disease

Intended Learning Outcomes:

critically discuss the molecular mechanisms underlying selected examples of adaptive processes demonstrate underpinning knowledge of the potential mechanisms responsible for dysfunction of the nervous systems develop an understanding of the experimental techniques used to study adaptive processes. demonstrate an ability to collect, report and analyse neurobiological data obtained from in vivo and in vitro studies evaluate current research into the mechanisms of dysfunction and interpret a range of data extracted from the scientific literature

Module Content:

Students will study the neurobiology of adaptations to environmental challenge at both the central nervous system level and peripheral systems. Neurophysiology investigates how a powerful armoury of experimental methods can reveal brain mechanisms involved in movement, motivation and emotion, learning and memory, feeding, sleep and wakefulness. Neuroanatomy; major neurotransmitter pathways in the brain. Neural control of movement and posture by cerebral cortex, basal ganglia and cerebellum. States of consciousness, sleep and wakefulness, motivation and affect. Neurophysiological substrates of feeding and metabolic control. Control of autonomic and endocrine function. Plasticity; learning and memory as exemplified in the hippocampus; neural network models. Areas of study will include selected examples from pain sensation and adaptive responses to chronic pain, stress biology, the biology of reward including feeding control, cognition.

Pre and Co requisites:

None

Assessment:

Group seminar (5%). Individual seminar (20%). The group seminar provides feedback which can be used to inform the individual presentation. Progress test (25%). Examination: 3 hours. A pass in the coursework overall is required to pass the coursework component of the assessment. Where a module is assessed by both coursework and examination, an overall average module grade of at least 40% must be achieved in order to pass the module, with no element of assessment (examination or coursework) being below 35%. There is an attendance requirement of at least 75% of the classes specified in the module. Failure to attend the required proportion of classes together with failure of the module assessment at the first attempt will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
50%	50%	0%

Module name: Applied and Integrated Molecular Science

Module code: 6LMS0053

Semester: B

Credits: 15

Module Aims:

Apply the principles of biochemistry and molecular biology to a range of applications appropriate to industry and medicine.

Intended Learning Outcomes:

Successful students will typically: select and apply appropriate techniques for the isolation, purification and characterisation of selected proteins apply their knowledge and understanding of enzyme-catalysed reactions to industrial processes critically discuss the contribution of biochemical techniques to the diagnosis of selected diseases Successful students will typically: design experiments to answer scientific questions relating to the disciplines within molecular science evaluate data from their own experiments and those published in primary literature use effective and professional oral and written communication

Module Content:

The module will bring together theory and practice in molecular biology and biochemistry equipping students to apply an integrative approach to areas such as enzyme technology, clinical diagnostics, and protein synthesis and purification. The practical work will typically include analysis of nucleic acids, protein analysis and immunochemical techniques. Applications of bioinformatics will also be included. The students will have the opportunity to design and implement experiments to answer a scientific question. Skills in the evaluation, interpretation and communication of data will also be developed. A “case study” and problem-based learning approach will be adopted that will include the planning and implementation of experiments. This will be supported by lectures and workshops.

Pre and Co requisites:

none

Assessment:

Coursework 100% Weighting: Exam % Weighting: Practical % Weighting: Coursework will include: A substantial laboratory report showing experimental design and method development as well as the results and discussion (50%) A viva on a case study (50%) The module has an attendance requirement of at least 50% of the practical sessions. Failure to attend the required proportion of sessions will normally result in the award of an FREN (Fail, re-enrol) grade.

Exam	Coursework	Practical
0%	100%	0%

Module name: Applied and Integrated Pharmacological Science

Module code: 6LMS0027

Semester: B

Credits: 15

Module Aims:

Analyse how, in clinical drug development, basic research translates into new medicines and to appreciate the need for an integrative approach when developing and testing novel therapies.

Intended Learning Outcomes:

Successful students will typically: relate outcomes from basic research to the design and analysis of clinical trials in the development of modern medicines critically discuss ethical issues and regulatory requirements which impact upon clinical research explain why a range of scientific evidence is important in interpretation of clinical data. Successful students will typically: design pharmacological experiments and clinical studies relevant to the testing of new therapies interpret data from pharmacological experiments and clinical data to conclude drug development based case studies. critically appraise the ethical issues and constraints of regulatory requirements on clinical phases of drug development Use effective and professional written and oral communication.

Module Content:

This module focuses on the manner in which clinical research and basic research impact each other particularly in pharmaceutical development i.e. 'bench to bedside' . An advanced understanding of clinical trial design, safety testing and toxicology and pharmacogenomics will be related to the testing of medicines in human clinical trials and the area of pharmacovigilance. Ethical questions arising from clinical trials design will be addressed. The influence of regulatory requirements on the pharmaceutical industry will also be highlighted. Students will apply problem based learning approaches to interpret data from preclinical and clinical studies in case studies of drug development. They will also gain an appreciation of the factors leading to the withdrawal of a drug from the market. Role play scenarios will be provided relevant to drug discovery and development where students will engage in group work.

Pre and Co requisites:

None

Assessment:

Coursework % Weighting: 100% Exam % Weighting: Practical % Weighting: Coursework will include: A substantial report showing experimental planning and method development as well as data interpretation and discussion (50%) A viva on a case study (50%)

Exam	Coursework	Practical
0%	100%	0%

NUTRITION AND DIETETIC UNDERGRADUATE COURSES