University of the West of England
BRISTOL

CORPORATE AND ACADEMIC SERVICES

MODULE SPECIFICATION

Part 1: Basic Data						
Module Title	Cell Biochemistry and Genetics (Premedical Sciences)					
Module Code	USSK64-30-1		Level	1	Version	1
Owning Faculty	Health and Applied Sciences		Field	Applied Sciences		
Contributes towards	Premedical Sciences Cert HE					
UWE Credit Rating	30	ECTS Credit Rating		Module Type	Standard	
Pre-requisites	None		Co- requisites	None		
Excluded Combinations	None		Module Entry requirements	N/A		
Valid From	September 2014		Valid to	September 2020		

CAP Approval Date	28/03/2014

Part 2: Learning and Teaching	
Learning Outcomes	On successful completion of this module students will be able to: • Compare the ultrastructure and function of prokaryotic and eukaryotic cells and their organelles, describe the structure of biological membranes and explain key concepts in membrane transport. (A1, B3) • Describe the key features and properties of amino acids, proteins, lipids and carbohydrates and decribe how they are metabolised and how the pathways involved inter-relate. (A1, B3) • Describe key techniques in biochemistry and relate them to to the type of information obtained while demonstrating key skills of data collection and analysis of experimental results. (B1) • Describe how the energy from metabolism is channelled into ATP synthesis. (A1, B3) • Describe current understanding of some topical issues in biochemistry in a medical context. (A1, B3) • Explain the genetic basis of life and how phenotypic traits are inherited. (A1, B3) • Describe and understand the mathematical laws governing genetic inheritance. (A1, B3) • Relate DNA and RNA structure and topology to function and understand gene organisation and expression in both eukaryotes and prokaryotes. (A1, B3) • Explain how genes can be mutated and how this can result in genetically

	linked medical conditions. (A1, B3) • Describe and understand single and multi-gene determined traits, quantitative gene loci, gene linkage and dominant and recessive mutations in a medical context. (A1, B3) • Undertake basic genetic analysis through interpreting experimental data. (B1) • Describe and understand the molecular biology inherent to DNA replication, RNA transcription and translation and how this is regulated in both eukaryotes and prokaryotes. (A1, B3) • Gain practical experience of typical biochemical and genetic phenomena and understand and implement good laboratory practice and written presentation skills. (B1) • Integrate genetic concepts with biochemical outcomes for the cell (B2) All learning outcomes will be assessed under the module components and elements therein as indicated.
Syllabus Outline	• Structure and function of prokaryotic and eukaryotic cells. Generalised bacterial cell, cell wall, flagella, fimbriae and pili. The generalised eukaryotic cell, the nucleus, endoplasmic reticulum, the golgi complex, lyosomes, the mitochondrion, centrioles, cilia and flagella, cell junctions. • Structure and function of cell membranes. Chemical composition, fluid mosaic model, transport across membranes, diffusion, carrier proteins, channels, active transport. • Amino acids and proteins. Classification, stereochemistry and ionic properties of amino acids. Isoelectric points. Primary and secondary structure of proteins including α-helices, ß-pleated sheets, random coil form. Tertiary and quaternary structure. • Carbohydrates. Monosaccharides. Glycosidic bonds. Structures of some storage and structural polysaccharides. • Lipids. Fatty acids, glycerol, sterols as components of lipid structure. Phospholipids and their role in membrane structure. • Cell Biology and biochemistry techniques. Light microscopy, confocal microscopy, the transmission electron microscope (TEM), the scanning electron microscope (SEM). Fractionation of cells and their contents, simple buffer systems, simple protein purification, enzyme assay. • Introduction to enzymology. Enzymes as biological catalysts. Temperature and rate of reaction, Enzymes and enzyme cofactors, specificity. Determination and significance of Km and Vmax, specific activity. • A Metabolic Overview. General metabolic strategy. An overview of catabolic and anabolic pathways. The metabolic roles of ATP, NADH, NADPH and FADH2. • ATP Synthesis. The electron transport process. Proton gradients and chemiosmotic coupling. The mechanism of action of F1F0 ATPases. Proton gradients in transport and thermogenesis. Substrate level phosphorylation. • Carbohydrate Metabolism. Aerobic and anaerobic glycolysis. The oxidative decarboxylation of pyruvate. The tricarboxylic acid cycle and associated anaplerotic reactions. The pentose phosphate pathway. Glycogenolysis and glycogen synthesis. • Lipid Metabolism. The classification of lipids. The β oxidation pathway. Triglyceride synthesis. Ketone body production and ketosis. • Amino acid and Nitrogen Metabolism. Amino acid deamination by oxidation, dehydration and transamination. The routes of gluconeogenesis. • Inheriting genes. What Mendel discovered and how molecular genetics relates to Mendelian concepts. Variation upon a Mendelian theme. The phenomenon of gene linkage and gene mapping. Gene inheritance patterns in humans and population genetics. • Studying genes and relating genetics to molecular biology. Genetics in a medical context. The genetic material and genomes. The human genome project. Decoding the messages within genes. DNA replication. Gene expression - transcription, RNA processing/editing and translation. Altering genes – mutation and chromosome recombination.
Contact Hours	Students undertaking this 30 credit module can expect 78h of scheduled learning contact time with teaching staff, spread over the academic year. This contact time will

	occur during lectures (48h), practical/tutorial sessions (24h) and during timetabled in class assessments (6h) in the form of MCQ tests.
Teaching and Learning Methods	Theoretical material within the module will be presented to the students in the form of weekly lectures throughout each of the semesters in the academic year. The learning of lecture content will be reinforced through time spent in independent learning by the directed reading of recommended texts and through the use of technology enhanced learning resources that will be provided online. A number of relevant practical sessions will be incorporated during each of the semesters and will be used to highlight important aspects of both biochemistry and genetics within an integrated biomedical and medical context. Practical sessions will both drive hands on learning and the acquisition of technical skills at both an individual and group working level. Online MCQ assessments will be used to further engage students in the development of their continual learning skills. Students undertaking this module can expect to receive 2h of lectures per week of the teaching period and would be expected to spend another 3h in independent learning while undertaking directed reading in relation to each of the lecture sessions. In addition to the lectures the students will undertake 8x2h practical classes across both semesters. For each of the practical classes the students should again expect to spend the same time in reading around the subject before and after each of these sessions. Each practical class will be followed by a 1h tutorial session. The students will also receive fortnightly 30min in class assessments that comprise online MCQs and which will test their knowledge gained during both lecture and practical sessions. **Scheduled learning** includes lectures, practical classes and in class assessment periods. **Independent learning** includes hours engaged with essential reading, assignment preparation and completion etc. These sessions constitute an average time per level as indicated in the table below. Scheduled sessions may vary slightly depending on the module choices you make.
Key Information Sets Information	Key Information Sets (KIS) are produced at programme level for all programmes that this module contributes to, which is a requirement set by HESA/HEFCE. KIS are comparable sets of standardised information about undergraduate courses allowing prospective students to compare and contrast between programmes they are interested in applying for. **Key Information Set - Module data** *Number of credits for this module* 30 Hours to be allocated / Scheduled learning and teaching study hours / Independent study hours / Placement study hours / Allocated Hours 300 / 78 / 222 / 0 / 300 The table below indicates as a percentage the total assessment of the module which constitutes a - **Written Exam**: Unseen written exam **Coursework**: Written assignment or essay, practical report and in class MCQ tests

	Please note that this is the total of various types of assessment and will not necessarily reflect the component and module weightings in the Assessment section of this module description: Total assessment of the module: Written exam assessment percentage 40% Coursework assessment percentage 60% 100%
Reading Strategy	• All students will be encouraged to make full use of the print and electronic resources available to them through membership of the University. These include a range of electronic journals and a wide variety of resources available through web sites and information gateways. The University Library's web pages provide access to subject relevant resources and services, and to the library catalogue. Many resources can be accessed remotely. Students will be presented with opportunities within the curriculum to develop their information retrieval and evaluation skills in order to identify such resources effectively. • Any **essential reading** will be indicated clearly, along with the method for accessing it, e.g. students may be expected to purchase a set text, be given or sold a print study pack or be referred to texts that are available electronically, *etc*. This guidance will be available either in the module handbook, via the module information on Blackboard or through any other vehicle deemed appropriate by the module/programme leaders. • If **further reading** is expected, this will be indicated clearly. If specific texts are listed, a clear indication will be given regarding how to access them and, if appropriate, students will be given guidance on how to identify relevant sources for themselves, e.g. through use of bibliographical databases.
Indicative Reading List	The **core text** will be the most recent edition of: • Alberts, B. et al*., Essential Cell Biology*. New York: Garland Science • Russell, P.J. *Genetics. iGenetics A Molecular Approach*. USA : Pearson Ed. Inc. Alberts, B. Johnson, A. Lewis, J. Raff, M. Roberts, K. & Walter, P. *Molecular Biology of the Cell*. New York: Garland Science. **Other reading** from the most recent editions of: • Lodish et al., *Molecular Cell Biology*, New York: W.H. Freeman and Company • Alberts, B. et al., *Molecular Biology of the Cell* New York: Garland Science • Nelson, D.M. and Cox, M.M. *Lehninger Principles of Biochemistry*. New York: WH Freeman • Berg, J.M. et al., *Biochemistry*. New York: WH Freeman • Clark, D.P. & Russell, L.D. *Molecular Biology Made Simple and Fun*. St. Louis, MO, USA: Cache River Press/Quick Publishing • , Robinson, T.R. *Genetics for Dummies*. USA: Wiley

Part 3: Assessment	
Assessment Strategy	• Summative assessment for this module will be provided using a number of approaches. The nature of the premedical sciences programme to which this module contributes requires continuous and final assessment of student learning and a measure of their acquisition of written presentation skills of analysed data. • Continuous assessment within component B will be provided by the use of frequent multiple choice question tests throughout the module

	and following blocks of learning provided in the form of lectures. These tests will be provided online, marked automatically and the results provided to the module leader. Feedback at this level will also be provided online and will be by review of the tests after they have been completed and will include the correct answers and the rationale behind these. • The ability of the students to write scientifically and analyse data will be assessed under component B in the form of a practical report and an essay based assignment. These will be marked and feedback provided in the form of written comments. • Final assessments under component A will take the form of an examination that comprises short answer and multiple choice questions.

Identify final assessment component and element		
% weighting between components A and B (Standard modules only)	**A:** **40**	**B**: **60**

First Sit	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**
1. EX1 Examination Exam Period 2 (3h) FINAL ASSESSMENT	100%
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Practical report	25%
2. Essay based assignment	25%
3. MCQ Tests	50%

Resit (further attendance at taught classes is not required)	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**
1. EX2 Examination Exam Period 3 (3h) FINAL ASSESSMENT	100%
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Practical report	50%
2. Essay based assignment	50%
If a student is permitted an **EXCEPTIONAL RETAKE** of the module the assessment will be that indicated by the Module Description at the time that retake commences.	