COLLEGE OF MEDICINE AND HEALTH SIENCES

BIOCHEMISTRY I

MODULE DEVELOPERS

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Welcome Message

Welcome to the module of **Biochemistry I MD1156.**

This module is intended for the student interested in understanding the basic biological subject in the study of fundamental units within organisms: cell and molecules. Biochemistry combines an introduction to the structures of macromolecules and a biochemical approach to cellular functions and how they relate to normal functions and diseases.

Biochemistry is a dynamic field with a broad range of subjects applicable such as medical, pharmaceutical and biotechnology areas. In addition, this module will also provide numerous opportunities to develop a wide range of transferable skills that are intensely required after studies by potential employers, both within the bioscience sector and beyond.

Biochemistry is composed of theory lessons, exercises sessions and practical classes.
Theory lessons will consist of self-directed learning, group discussion and face to face teaching.
Exercises' sessions allow the students to ask questions about the theory as well as about the practical classes. They must help them to integrate the various components of the module.
Practical classes were conceived to explain to students how they can proceed with experiments with the help of various instruments and techniques (microscopy, drawing); to initiate them with observation and experimentation.

If you have any questions concerning the module, please ask them on the online forum, during face to face sessions or practical works. Prepare your questions before going to class. If it is not possible, and only in this case, you can contact the teaching team by e-mail to fix an appointment (see the section of contacts).

COURSE INSTRUCTORS

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Course overview

Brief description of aims

The aim of this module is to enable students to explain the complete understanding at the molecular level of all the chemical processes associated with living cells. This is basically realised by isolating molecules and understanding their structure and their function.
In addition, this module of biochemistry is intended to enable students to describe the composition of cells and tissues, the role of biomolecules and their transformations in the structures and functions of cells, tissues, organs, systems, and the human organism as a whole in both health and disease .
Examples explaining taught concepts will be specifically selected to introduce the student to human biochemistry.

Learning Outcomes

At the end of the course, you will be able to:

i. Describe the basic concepts of Biochemistry
ii. To describe the general properties of molecules composing the living species.
iii. Describe the role of biomolecules and their transformations in the structure and function of cells, tissues, organs, systems, and the human organism as a whole
iv. Describe and evaluate approaches to the understanding of the normal biochemical processes as the basis of health
v. Relate the link between basic biochemical principles and medical applications
vi. Use current biochemical and molecular techniques to plan and carry out experiments.

Allocation of study hours

Total student hours: 150	Student hours
Lectures Assignments – preparation and writing Examination – revision and attendance	72
Practical classes/laboratory	18
Self-directed study	40

Learning and Teaching Strategy

Teaching and learning will be done through blended learning (face to face and online learning). Simulation Videos, Tutorials, practicals, will be available on the Learning Management System (LMS) with the purpose to create an active learning environment that interests, challenges and motivates students Laboratory classes will be provided to support the lecture materials and to practice the application of analytical skills to biological problems. The materials to be covered in the practical classes will be assessed by group reports within eight days following the session. More focus will be on collaborative learning which will require students to work in teams of four for every assignment.

Assessment Strategy

Students' performance will be evaluated through formative and summative assessments. Formative assessments will comprise collaborative assignments, written reports (essays) with oral presentations of the tutorials per group and direct assessment during practicals and two continuous assessment tests. The Summative assessment will consist of a written exam organized at the end of the trimester/semester during the period of examinations. The written exam (multiple choice and short answer questions) will cover the theory aspects as well some aspects developed during laboratory work sessions.
The allocation of marks is +1 for each correct response and 0 for an wrong response in multiple choice questions.

Attendance at all assessments is compulsory. In case of unauthorized absence unjustified by a valid medical certificate, the penalty will be 0 point to the concerned assessment.

Assessment Pattern

Component	**Weighting (%)**	**Number**	**Learning objectives covered**
In-course assessment:			
Continuous assessment Test (CAT) : written test (1h30)	30%	2	i-v
Collaborative assignment	15%	Minimum 4	i-v
Laboratory report book	10%	For each laboratory experiment	vi
Final Examination (3h)	50%		i-vi

Strategy for feedback and student support during module

Feedback and support will be provided through online messaging, live chat support, group discussions and tutor comments during presentations. It will also be done by using an in course online satisfactory survey.

Module content

Unit 1 : The Cell
Cell structure and types
Sub cellular structures and their functions
The Cytoskeleton
Cell division (Mitosis, Meiosis)
Cell regulation and disorders
Types of Cellular Junction
Extracellular Matrix
Unit 2: Biomolecules
Basic cell Chemistry: Atoms, chemical bonds and molecules and water
Carbohydrates
Lipids
Proteins
Nucleic acids
Unit 3 : Biological membranes
Components and structure of plasma membrane
Membrane transport mechanism
Unit 4 : Molecular Biology
DNA replication
Transcription
Translation
Control of Gene expression

Module Teaching-Learning-Assessment Schedule

The following table shows the timeline, the topics, the notional hours required for completing the theory and practical part of the module.
The theory time includes face to face teaching, assignments and self-directed study while practical time includes laboratory sessions.

Timeline	Theory	Time	Practical	Time
Week 1	Cell types and structures	4h	Safety laboratory measures Write a lab report	2h
	Sub cellular structures and their functions	4h		
Week 2	The Cytoskeleton	4h	Microscopic measurements	2h
Week 3	Types of Cellular Junction	4h	Cell Counting and viability	2h
	Extracellular Matrix	4h		
Week 4	Cell division (Mitosis, Meiosis)	4h	Mitosis in onion roots	2h
	Cell regulation and disorders	4h		
	Continuous Assessment 1 (1h30)			
Week 5	Basic cell Chemistry	4h	Test for reducing sugar	2h
	Carbohydrates	4h		
Week 6	Lipids	4h	Determination of Total Protein	2h
	Proteins	4h		
Week 7	Nucleic acids	4h	Laboratory report review 1	2h
	Continuous Assessment 2 (1h30)			
Week 8	Components and structure of plasma membrane	4h	Osmosis and cellular permeability	2h
	Membrane transport mechanism	4h		
Week 9	DNA structure and Genome organization	4h	DNA extraction from living things	2h
	DNA replication	4h		
Week 10	Transcription	4h	Qualitative analysis of proteins	2h
	Translation	4h		
Week 11	Control of Gene expression	4h	Laboratory report review 2	2h
Week 12	Revision			
Week 13	FINAL EXAM (3h)			
Total hours		80 h		22 h

Remaining 42 h are dedicated to self-directed learning

Abbreviations:

A:	Adenine
AA:	Amino Acids
ATP:	Adenosine triphosphate
ATPase:	Adenosine triphosphatase
C:	Cytosine
CAM:	Cell adhesion molecules
cAMP:	Cyclic adenosine monophosphate
CAP:	catabolite activator protein
DNA:	Deoxyribonucleic acid
ECM:	Extra cellular Matrix
EF-G :	elongation factor G,
EF-Tu :	Elongation Factor Tu
FtsZ:	Filamenting temperature-sensitive mutant Z
G:	Guanine
GAGs:	Glycosaminoglycans
GTP :	Guanosine-5'-triphosphate
IFs	Initiation factors
Lac:	lactose
MCQ :	Multiple question choice
miRNA :	microRNA
mRNA:	messenger RNA
RF1:	release factor 1
RF2:	release factor 2
RF3:	release factor 3
RNA:	Ribonucleic acid
RNAi:	RNA interference
rRNA :	ribosomal RNA
T:	Thymine
TF:	Transcription factors
tRNA :	transfer RNA
Trp :	tryptophane
U:	Uracil

Key:	
	Teacher-led activity
	Student activity – in class
	Student activity – out of class
	Laboratory practical

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4. Nelson, D.L and Cox, M.M. (2008). *Lehninger Principles of Biochemistry*, 5th edn. W. H. Freeman and Company: New York.

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7. OpenStax (2018) .*Concepts of Biology*. **OpenStax CNX.** http://cnx.org/contents/b3c1e1d2-839c-42b0-a314-e119a8aafbdd@14.1.