

**PHAR S8020: Fundamentals of Molecular Biology  
and Biotechnology**

Module Details	
Module Code:	PHAR S8020
Full Title:	Fundamentals of Molecular Biology and Biotechnology <b>APPROVED</b>
Valid From::	Semester 1 - 2020/21 ( September 2020 )
Language of Instruction:	English
Duration:	1 Semester
Credits::	7.5
Module Owner::	<ul style="list-style-type: none"><li>• Arjan van Rossum</li><li>• Enda Clinton</li></ul>
Departments:	Life and Health Sciences
Module Description:	This module will present the basic chemistry, biochemistry and molecular biology underlying cell biology. It will provide the students with a fundamental knowledge of the structure and function of the cell and the process of cell division. Students will learn the processes that drive gene expression and how this process can be manipulated in controlled ways to produce biopharmaceutical products.

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	Module Learning Outcome Description
MLO1	Examine the basic structures and biologically relevant properties of the common groups of biomolecules.
MLO2	Synthesise the structure of the cell and the function of various cellular organelles.
MLO3	Evaluate and describe the processes involved in the central dogma of molecular biology and their application in recombinant DNA technology.
MLO4	Examine the merits of different expression systems for the production of recombinant proteins.
MLO5	Apply practical competencies in relevant molecular techniques.
Pre-requisite learning	
<b>Module Recommendations</b> <i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i>	
No recommendations listed	

Module Indicative Content
<b>Basics of biochemistry</b> Structure of atom, chemical bonding, Acids, bases, pH, functional groups, carbohydrates, proteins, lipids, Structure and function of nucleic acids.
<b>Introduction to cell structure and the cell cycle.</b> Ultrastructure of the cell and function of individual organelles. DNA replication, transcription and mRNA translation will be reviewed in detail including an overview of post translational modifications.
<b>Proteins</b> Functions of proteins in cells (structure and support; protection; movement; catalysts; hormones; transport). Classification of proteins (fibrous, globular, simple, conjugated). Amino acids (essential and non-essential) and protein structure (primary, secondary, tertiary, quaternary).
<b>Recombinant DNA technology</b> A detailed overview in the use of plasmids to transfer genetic material and the use of restriction enzymes, ligation and cell transformation in the manipulation of plasmid composition. An description of the process involved in creating a transgenic cell line.
<b>Production of recombinant proteins</b> Production of recombinant proteins using bacterial, yeast, insect cells and mammalian cells. An examination of the characteristics associated with the use of various production cell lines.
<b>Practical lab sessions</b> Practical lab sessions will be completed to allow students to become familiarised with the use of pipettes, the accurate preparation of solutions, the identification of key cellular structures in the cell and the use of recombinant DNA technology in the lab.

Module Assessment	
Assessment Breakdown	%
Course Work	30.00%
Practical	20.00%
Final Examination	50.00%
Module Special Regulation	

## Assessments

Part Time On Campus			
Course Work			
<b>Assessment Type</b>	Short Answer Questions	<b>% of Total Mark</b>	20
<b>Marks Out Of</b>	0	<b>Pass Mark</b>	0
<b>Timing</b>	Week 9	<b>Learning Outcome</b>	1,2,3,4
<b>Duration in minutes</b>	0		
<b>Assessment Description</b> A multiple choice / short answer / sketch / fill in the blanks exam will be performed to examine the knowledge and understanding the students have gained from weeks 4-9.			
<b>Assessment Type</b>	Short Answer Questions	<b>% of Total Mark</b>	10
<b>Marks Out Of</b>	0	<b>Pass Mark</b>	0
<b>Timing</b>	Week 4	<b>Learning Outcome</b>	1,2
<b>Duration in minutes</b>	0		
<b>Assessment Description</b> A multiple choice / short answer / sketch / fill in the blanks exam will be performed to examine the knowledge and understanding the students have gained from weeks 1-3.			
No Project			
Practical			
<b>Assessment Type</b>	Practical/Skills Evaluation	<b>% of Total Mark</b>	20
<b>Marks Out Of</b>	0	<b>Pass Mark</b>	0
<b>Timing</b>	End-of-Semester	<b>Learning Outcome</b>	1,2,3,4,5
<b>Duration in minutes</b>	0		
<b>Assessment Description</b> Students will participate in laboratory-based practical sessions in which will be performed in interactive group settings with summative practical laboratory reports and/or the lab manual will be submitted/reviewed during the module for grading. Further details are presented in the indicative content section of this document.			
Final Examination			
<b>Assessment Type</b>	Formal Exam	<b>% of Total Mark</b>	50
<b>Marks Out Of</b>	0	<b>Pass Mark</b>	0
<b>Timing</b>	End-of-Semester	<b>Learning Outcome</b>	1,2,3,4
<b>Duration in minutes</b>	0		
<b>Assessment Description</b> End-of-Semester Final Examination			
Reassessment Requirement			
<b>A repeat examination</b> <i>Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.</i>			

## Module Workload

This module has no Full Time On Campus workload.

### Workload: Part Time On Campus

<i>Workload Type</i>	<i>Contact Type</i>	<i>Workload Description</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>	<i>Hours</i>
Lecture	Contact	2 x 1 hour interactive lectures per week.	Every Week	2.00	2
Independent Study	Non Contact	Independent study of lecture-related material	Every Week	5.00	5
Directed Reading	Non Contact	No Description	Every Week	3.00	3
Practical	Contact	2 x 4 hour lab practical at the end of the semester	Once per semester	0.53	8
Independent Study	Non Contact	Preparation for practical & reporting results	Once per semester	0.80	12
				Total Weekly Learner Workload	11.33
				Total Weekly Contact Hours	2.53

Module Resources
<i>Supplementary Book Resources</i>
<p>Nelson, D and Cox, M. (2017), Lehninger Principles of Biochemistry, 7th Ed.. Freeman, [ISBN: 9781464187971].</p> <p>Lodish et al. Molecular Cell Biology, 5th Ed.. Freeman, [ISBN: 9781464183393].</p> <p>David P. Clark and Nanette J. Pazdernik. (2011), Biotechnology : Academic Cell Update Edition, Elsevier Science &amp; Technology Books, ProQuest EBook Central - Dkit Library, [ISBN: 9780123850645].</p>
<i>This module does not have any article/paper resources</i>
<i>Other Resources</i>
<p>Website, Khan Academy Biology. (2020), Khan Academy Biology, <a href="http://www.khanacademy.org">http://www.khanacademy.org</a></p>