



<b>Title:</b>	Metabolic Biochemistry <b>APPROVED</b>
<b>Long Title:</b>	Metabolic Biochemistry
<b>Module Code:</b>	BIOL6017
<b>Duration:</b>	1 Semester
<b>Credits:</b>	5
<b>NFQ Level:</b>	Fundamental
<b>Field of Study:</b>	Biochemistry & Cell Biology
<b>Valid From:</b>	Semester 1 - 2017/18 ( September 2017 )
<b>Module Delivered in</b>	<a href="#">9 programme(s)</a>
<b>Module Coordinator:</b>	Brigid Lucey
<b>Module Author:</b>	Fiona OHalloran
<b>Module Description:</b>	This module teaches the principles of enzyme catalysis, inhibition and regulation, leading on to a study of selected metabolic pathways and their integration and control.
<b>Learning Outcomes</b>	
<i>On successful completion of this module the learner will be able to:</i>	
LO1	Explain the principles of enzyme catalysis, inhibition and regulation.
LO2	Design and optimise assays to monitor enzyme reactions and assess reaction rates.
LO3	Outline selected metabolic pathways and describe the principles that govern their regulation
LO4	Perform laboratory experiments to demonstrate enzyme action and quantify reaction rate constants.
LO5	Write scientific reports to analyse and interpret experimental data
<b>Pre-requisite learning</b>	
<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 CIT 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>	
12751	BIOL6017
	Metabolic Biochemistry
<b>Incompatible Modules</b>	
<i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.</i>	
No incompatible modules listed	
<b>Co-requisite Modules</b>	
No Co-requisite modules listed	
<b>Requirements</b>	
<i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed. You may not enrol on this module if you have not acquired the learning specified in this section.</i>	
No requirements listed	

**Module Content & Assessment**
**Indicative Content**
**Enzymes**

Biological functions of enzymes / Energy of activation and catalysis / Classification of enzymes / Enzyme-substrate complex / Kinetics (Michaelis-Menton,  $K_m$ ,  $V_{max}$ ,  $K_i$ , Lineweaver Burk) / Temperature and pH effects / Regulation of enzyme activity / Enzyme inhibition / Units of enzyme activity / Introduction to enzyme assay design (monitoring assays, coupling reactions, fixed time assays and kinetic assays).

**Cellular energetics and ATP**

Biological redox reactions, reduction potential/energy coupling reactions, ATP hydrolysis.

**Carbohydrate metabolism**

Overview of relevant metabolic pathways (glycolysis, citric acid cycle, electron transport chain) / substrate level and oxidative phosphorylation / metabolic regulation and control points.

**Gluconeogenesis**

Overview of metabolic pathway / Cori cycle / metabolic control points / hormonal regulation

**Lipid metabolism**

Overview of Fatty acid metabolism / beta oxidation / metabolic regulation.

**Urea cycle**

Amino acid metabolism / Ammonia formation / overview of the urea cycle / metabolic regulation.

**Practical skills**

Methods for quantitation of biomolecules / determination of  $K_m$  and  $V_{max}$  using fixed time and continuous monitoring methods / effect of temperature, pH and reactant concentrations on enzyme reaction rates / estimation of precision and accuracy of experimental results.

**Assessment Breakdown**

%

Course Work

100.00%

**Course Work**

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Multiple Choice Questions	Theory-based assessment of lecture material	1,2	25.0	Week 7
Short Answer Questions	Theory-based assessment of lecture material	2,3	35.0	Week 13
Written Report	Themed lab reports and data handling	4,5	20.0	Every Second Week
Practical/Skills Evaluation	Laboratory exam	4,5	20.0	Week 12

No End of Module Formal Examination

**Reassessment Requirement**
**Repeat examination**

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.

The institute reserves the right to alter the nature and timings of assessment

**Module Workload**

<b>Workload: Full Time</b>				
<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	class-based instruction	2.0	Every Week	2.00
Lab	practical laboratory instruction	2.0	Every Week	2.00
Independent & Directed Learning (Non-contact)	study of lecture notes	2.0	Every Week	2.00
Independent & Directed Learning (Non-contact)	report preparation, data handling exercises	1.0	Every Week	1.00
			Total Hours	7.00
			Total Weekly Learner Workload	7.00
			Total Weekly Contact Hours	4.00

**This module has no Part Time workload.**

## Module Resources

### Recommended Book Resources

- Nelson, D.L. & Cox, M. M. 2017, *Lehninger principles of biochemistry*, 7th Ed., Freeman and Sapling [ISBN: 9781464126116]

### Supplementary Book Resources

- Berg, J.M., Tymoczko, J.L., Gatto, G.J. & Stryer, L. 2015, *Biochemistry*, 8th Ed., W.H. Freeman [ISBN: 9781464126109]
- Moorthy, K. 2007, *Fundamentals of Biochemical Calculations*, 2nd Ed., CRC Press [ISBN: 1420053574]
- Dwivedi, Neeraja, Dwivedi, Prakash 2009, *Comprehensive Biochemistry, Ebook*, Pragati Prakashan [ISBN: 9789350434536]

*This module does not have any article/paper resources*

### Other Resources

- Website: *Interactive Concepts in Biochemisrty*, Wiley  
<http://http://www.wiley.com/legacy/coll ege/boyer/0470003790/animations/animatio ns.htm>
- Website: Kevin Ahern and Indira Rajagopal*Biochemistry Free & Easy*  
<http://http://biochem.science.oregonsta te.edu/files/biochem/ahern/BiochemistryFreeandEasy3.pdf>

**Module Delivered in**

<b>Programme Code</b>	<b>Programme</b>	<b>Semester</b>	<b>Delivery</b>
CR_SAGBI_8	<a href="#"><u>Bachelor of Science (Honours) in Agri-Biosciences</u></a>	4	Mandatory
CR_SHERB_8	<a href="#"><u>Bachelor of Science (Honours) in Herbal Science</u></a>	4	Mandatory
CR_SNHSC_8	<a href="#"><u>Bachelor of Science (Honours) in Nutrition and Health Science</u></a>	4	Mandatory
CR_SPHBI_8	<a href="#"><u>Bachelor of Science (Honours) in Pharmaceutical Biotechnology</u></a>	4	Mandatory
CR_SAGBI_7	<a href="#"><u>Bachelor of Science in Agri-Biosciences</u></a>	4	Mandatory
CR_SBIBI_7	<a href="#"><u>Bachelor of Science in Applied Biosciences and Biotechnology</u></a>	4	Mandatory
CR_SFSTE_7	<a href="#"><u>Bachelor of Science in Food and Health Science</u></a>	4	Mandatory
CR_SCEBS_8	<a href="#"><u>Common Entry Biological Sciences</u></a>	4	Mandatory
CR_SBIOS_6	<a href="#"><u>Higher Certificate in Science in Applied Biosciences</u></a>	4	Mandatory