

Module Specification

Module Title Module Code
Credit Value Level Mode of Delivery Semester

Pre-requisite modules	Co-requisite modules	Overlapping modules
BIO265 Metabolic Pathways		

1) Content Description

Provide a description of the module, as it will appear in the Module Directory and on the Student Information System (approx. 70-80 words).

This module covers the action of proteins as catalysts for chemical reactions. An initial introduction will review the basic principles of catalysis, and the mechanisms by which enzymes increase the rate of a reaction. Basics of protein expression and modification will be outlined in reference to their use in determining the catalytic mechanisms of enzymes. This will be followed by a more detailed study of the kinetics underlying catalysis, relating mechanism to function through a series of mechanistic examples. This will cover examples from several different classes of enzymes, demonstrating how structure relates to function and the different strategies employed by them to achieve catalysis. Four workshop sessions will cover the use of important computer and web-based applications used to study enzymes, including bioinformatics (sequence alignment) and molecular graphics programmes.

2) Module Aims

Specify the aims of the module, i.e. the broad educational purposes for offering this module.

The aim of this module is to give an understanding of how proteins in their role as enzymes catalyse chemical reactions. The students should develop an advanced understanding of the strategies by which they accelerate a chemical reaction. They should be able to relate this to the three dimensional structure of the protein and understand the dynamic processes involved in the catalytic mechanisms of a variety of different enzymes. They should be able to use a number of common web and computer-based bioinformatic and molecular graphics tools to visualize and understand how active sites work and the ways in which important residues involved in catalysis can be identified. They should also have a basic understanding of the techniques by which proteins can be produced and modified for catalytic and structural characterisation.

3) Learning Outcomes

Identify the learning outcomes for this module, i.e. knowledge, skills and attributes to be developed through completion of this module. Outcomes should be referenced to the relevant [QAA benchmark statements](#) and the [Framework for Higher Education Qualifications in England, Wales and Northern Ireland \(2008\)](#). The [SEEC Credit Level Descriptors for Further and Higher Education 2003](#) and [Queen Mary Statement of Graduate Attributes](#) should also be used as a guiding framework for curriculum design.

Academic Content:	
A1	Understand the mechanisms by which enzymes can increase the rate of chemical reactions
A2	Be able to understand and differentiate between different catalytic mechanisms through the use of examples covered in the module
A3	Have the ability to use web and computer based tools to understand the activity and mode of action of enzymes

A4	Explain how techniques ranging from site-directed mutagenesis to spectroscopic and structural studies can be used to elucidate the mechanism of an enzyme
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Disciplinary skills - able to:	
B1	Supply core skills in the understanding of how protein structure and dynamics is linked to function. Will bring together understanding of chemical principles of reaction with thermodynamics and how enzymes can manipulate the energetic pathway of a reaction to enhance the rate of reaction
B2	Gain computer skills in critical transferable areas and learn how to combine data from a variety of sources and techniques

Attributes:	
C1	Workshop sessions will improve the students ability to use web and computer resources to conduct independent study and to extract information from the scientific databases
C2	Enhance students general scientific understanding of and knowledge of how experimental techniques are applied to answer fundamental biochemical questions

4) Reading List

Provide an indicative reading list for the module. This should include key texts and/or journals but **should not** be an exhaustive list of materials.

Alan Fersht : Structure and Mechanism in Protein Science, Freeman.

Richard B Silverman: The organic chemistry of enzyme-catalysed reactions. Academic Press.

Tim Bugg : An introduction of enzyme and coenzyme chemistry. Blackwell Science

Price and Stevens : Fundamentals of Enzymology 3rd Edition, OUP

5) Teaching and Learning Profile

Provide details of the method of delivery (lectures, seminars, fieldwork, practical classes, etc.) used to enable the achievement of learning outcomes and an indicative number of hours for each activity to give an overall picture of the workload a student taking the module would be expected to undertake. This information will form the Key Information Set for each undergraduate programme and will be used to populate the KIS widget found on the QMUL programme information pages. More information can be found [online](#) about KIS. You may also wish to refer to the [QAA guidance on contact hours](#) when completing this section.

Activity Type	KIS Category	Time Spent (in hours)
Lecture	Scheduled	22
Workshop	Scheduled	12
Total		34

Specify the total module notional study hours. This should be a total of the hours given for each activity. The notional study hours for each academic credit point is 10. A 15 credit point module therefore represents 150 notional study hours.

Activity Type	Total Time Spent (in hours)	Percentage of Time Spent
Scheduled learning and teaching	34	22.7

Placement	0	0
Independent Study	116	77.3
Total	150	100

Use the information provided in the box above to specify the total time spent and the percentage time spent in each category of teaching and learning activity.

6) Assessment Profile

Provide details of the assessment methods used to assess the achievement of learning outcomes.

Description of Assessment	Assessment Type	KIS Category	Duration/Length	Percentage Weighting	Final element of assessment	Qualifying Mark
Written Examination	Examination	Written Exam	3 Hours	80%	Yes	
Coursework	Written assignment	Coursework		20%	No	

Final element of assessment: The assessment that takes place last. **There should normally be only one element of assessment marked as final unless two assessment or submission dates occur on the same day.**

Qualifying mark: A specified minimum mark that must be obtained in one or more elements of assessment in order to pass a module. **This is in addition to, and distinct from, the requirement to achieve a pass in the module mark to pass the module.**

Reassessment

Provide details of the reassessment methods used, specifying whether reassessment is either standard reassessment or synoptic reassessment.

- Standard Reassessment
 Synoptic Reassessment

Synoptic reassessment details (if you have indicated synoptic reassessment above, please give details)		
Brief Description of Assessment	Assessment Type	Duration/Length of Examination/ Coursework
Resit Examination	Written Exam	3 Hours