

Module Specification

Module Title Module Code
Credit Value Level Mode of Delivery Semester A

Pre-requisite modules	Co-requisite modules	Overlapping modules
Membrane Biochemistry		

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).

The module will explore detailed study of structure and function of a selection of membrane proteins. Examples will illustrate different mechanisms by which proteins achieve vectorial excitation energy and electron transfer, ion transport and the generation of electrochemical gradients, the coupling of electrochemical gradients to ATP synthesis and transmembrane signalling. Electron transfer through proteins (e.g. cytochrome c). Structure and function of redox centres and the proteins that contain them. Membrane proteins studied will include respiratory chain complexes, light-harvesting pigment-proteins, photosynthetic reaction centres, bacteriorhodopsin, rhodopsin, ATP synthase, lactose permease.

2) Module Aims

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

This course is designed to provide you with detailed up-to-date knowledge of the structure and functions of membrane proteins and techniques essential for their studies. The course aims to give an understanding of the membrane protein classification, structure and various functions. Structure-function relationship in all classes of membrane proteins will be highlighted throughout the course. Students will learn the key principles of modulation of the structure and properties of various co-factors by the protein structure. Students will learn the standard molecular graphics software for visualisation and studies of protein structure. The coursework assessment exercises will help students to write the answers to exam questions and acquire the skills of writing scientific essays.

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:	
A 1	Understand the variety of functions of membrane proteins in the membranes of cells and cellular organelles
A 2	Learn the key role of membrane proteins in the energy transformation events of the cell
A 3	Understand the principles of structure function relationship in the membrane proteins
A 4	Identify the key types of aminoacids involved in co-factor binding

A5	Use molecular graphics software to analyse and present the structure of membrane proteins
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Disciplinary skills - able to:	
B1	Understand how we can learn about the structure and functions of membrane proteins
B2	Gain a critical understanding of the advantages and limitations of different techniques

Attributes:	
C1	Analyse protein structures using the molecular graphics software
C2	The coursework reports and revision exercises will develop students skills in the clear, succinct presentation of concepts

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.

The Photosynthetic Membrane: Molecular Mechanisms and Biophysics of Light Harvesting.
Alexander Ruban
Wiley, 2012, ISBN: 978-1-1199-6053-9.

Molecular Mechanisms of Photosynthesis. Blankenship, Robert E
Blackwell Science, 2001, ISBN: 0632043210

Bioenergetics, 3rd Edition, David Nicholls and Stuart J Ferguson
Academic Press, 2002 , ISBN 0125181213

Membrane Structural Biology (with biochemical and biophysical foundations)
Mary Luckey, Cambridge University Press, 2008, ISBN 9780521856553

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
Practical Classes	Scheduled	8
Total		30

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	30	20
Placement	0	0
Independent Study	120	80
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 including essay	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