

Module Specification

Module Title	Physical and Quantum Chemistry	Module Code	CHE204B			
Credit Value	15	Level	5	Mode of Delivery	On Campus	Semester B

Pre-requisite modules	Co-requisite modules	Overlapping modules
		CHE204

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 considers the fundamental role of molecular symmetry in bonding and in determining molecular properties. A range of spectroscopic techniques are then considered in detail, with emphasis on developing understanding of the theoretical principles and the applications of the techniques in studying molecular structure and chemical reactivity.

2) Module Aims

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

This module aims to provide students with an understanding of the role of symmetry in molecular bonding and spectroscopy, and an understanding of how a range of spectroscopic techniques can be applied to the study of molecular structure and chemical reactivity.

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	Symmetry and group theory: <ul style="list-style-type: none">• fundamentals of molecular symmetry• applications in molecular structure and bonding;• applications in spectroscopy;
A 2	Spectroscopy: theoretical principles and illustrative applications, of selected techniques from: <ul style="list-style-type: none">• vibrational spectroscopy• electronic spectroscopy• photoelectron spectroscopy• magnetic resonance spectroscopy
A 3	Mathematical topics and skills of relevance to the aforementioned academic content, and supplementary to those covered in the CHE100 module: Linear operators. Eigenfunctions and eigenvalues. Representations. Commutation and non-commutation. The construction of operators. Integrals over operators. Dirac bracket notation. Hermitian operators

Disciplinary skills - able to:	
B1	Utilize symmetry arguments to assist in rationalizing and making predictions about the bonding in molecules, and other molecular properties.
B2	Discuss the origin of spectra, and the selection rules governing such spectra; deduce molecular properties from a detailed analysis of spectroscopic data.

Attributes:	
C1	Acquire and apply knowledge relating to the principles and practices of physical and quantum chemistry
C2	Produce analyses which are grounded in experimental evidence (e.g. structural, spectroscopic and computational)
C3	Apply existing knowledge and skills to investigate unfamiliar problems.
C4	Able to conduct calculations of intermediate complexity, in a confident and reliable manner.

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.

Atkins' Physical Chemistry, 9th ed, P. Atkins & J. de Paula, Oxford Univ Press
 P. Atkins and R. Friedman, Molecular Quantum Mechanics, Oxford Univ Press
 A. Vincent, Molecular Symmetry and Group Theory, Wiley

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 and Workshops	Scheduled	8
Guided Independent Study	Independent	120
Total		150

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	Assessment	KIS	Duration/Length	Percentage	Final	Qualifying
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of Assessment	Type	Category		Weighting	element of assessment	Mark
Coursework	Written Assignment including essay	Coursework		20%	No	
Examination	Written Exam	Written	2 Hours	80%	Yes	

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	2 Hours