

CH161-30 Introduction to Organic Chemistry

20/21

Department

Chemistry

Level

Undergraduate Level 1

Module leader

Russ Kitson

Credit value

30

Module duration

20 weeks

Assessment

20% coursework, 80% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

N/A

Module aims

The aim of this module is to provide students with a basic understanding of organic chemistry. As such it provides a fundamental look at organic chemical bonding, structure, reactivity, mechanism and synthesis of simple functional groups. Later parts of the module apply an understanding of organic chemistry to the synthesis and the chemistry of functional groups containing the carbonyl functional group and to two further areas: the structure, properties and reactivity of molecules of biological importance and of organic macromolecules including synthetic polymers. The content of this module will be assumed in ALL subsequent Chemistry modules. It provides all entering first years with a common foundational knowledge of organic chemistry.

This will be achieved by a range of teaching methods, primarily lectures and tutorials, but also student centered learning:-including directed reading, problems classes and workshops, set exercises, and computational exercises

The 30 CATS variant will include 6 CATS of skills-based assessed work, part of 18 CATS of skills-

based content across the three Year 1 theory modules. An example of this overall content would be maths, coding, general IT, specific chemistry software and career development skills.

Provide skills development for a range of transferrable and chemistry-specific skills to support their studies and careers e.g. being able to use a range of generic software, chemical software, plus access relevant databases.

For the Maths skills component, this provides the mathematical learning support for the Year 1 modules and more advanced modules in Years 2/3/4, enabling students to solve problems in the main branches of chemistry. The mathematical skills taught allow students to understand the concepts behind much of chemistry and allow the processing of their own data.

The majority of the module content is drawn from components of A-level syllabuses. As such, most students will already be familiar with some aspects of the module syllabus, but the pattern of familiarity will be heterogeneous across the class. The primary aim of the module is to equip all students with the necessary mathematical skills to succeed in their chemistry degree at Warwick. The module is structured to allow individual students to concentrate their time on those bits of the module with which they are unfamiliar.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

1. Drawing of organic structures. Orbitals, sigma and pi bonding, shape, hybridisation, stereochemistry, isomerism, conformation.
2. Cation/anion stability, resonance, delocalisation, aromaticity, acidity, basicity, pKa
3. Mechanism and curly arrows, electrophiles, nucleophiles, radicals
4. Radical stability, mechanism
5. Acidity, free energy diagrams, reaction profiles
6. Substitution mechanisms, SN1, SN2
7. Addition reactions
8. Elimination reactions and chemistry of alkenes and alkynes
9. Chemistry of alcohols, ethers, amines, oxidation and reduction
10. Aromatic electrophilic substitution
11. Carbonyl chemistry, addition, substitution
12. Hydrolysis reactions
13. Grignard, alkyl lithium, conjugate additions
14. Carbonyl enolate chemistry
15. Claisen condensations, aldol condensation, Mannich reactions
16. 1,3-Dicarbonyl compounds and reactions
17. Biomolecules, aminoacids, peptides, proteins
18. Biomolecules, DNA, RNA
19. Lipids, fatty acid synthesis, detergents
20. Macromolecules, synthetic polymers, addition polymerisation, condensation polymerisation

An example collective skills syllabus may include elements from the following:

1. Maths

Perform routine algebraic manipulations.

Manipulation of units and dimensions.

Solve simple equations.

Understand the basis of differential calculus, be able to differentiate and, find maxima and minima.

Integrate functions and solve simple differential equations.

Determine the limits of simple functions.

Manipulate logarithmic and exponential functions.

Introduction to error propagation.

Perform routine trigonometric manipulations.

Expand simple series.

Manipulate complex numbers, vectors, and matrices.

2. Probability and statistics

3. Coding

4. General IT skills

5. Specific chemistry software training

6. Career development skills

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate an understanding and awareness of different reactions in organic chemistry and why and how they take place.
- Demonstrate an understanding of the structure, shape, properties and reactivity of organic molecules including their acidity, mechanisms and reactions.
- Have a basic understanding of mechanisms and their stereochemical consequences of nucleophilic substitution, elimination, electrophilic additions/substitutions, oxidations and reduction.
- Have a basic understanding of mechanisms carbonyl and enolate chemistry.
- Understand the basic principles of macromolecules, including the structure, reactivity and properties of synthetic and natural polymers.
- Use their knowledge of general mechanism and reactivity to postulate mechanisms of organic reactions using curly arrows.
- Use their knowledge to be able to design short syntheses of organic molecules.
- Understand the roles of lipids, aminoacids, and DNA in biological chemistry and their structure, reactivity, synthesis and physical properties. Demonstrate a knowledge of fatty acid biosynthesis

Indicative reading list

Essential Text (required)

Clayden, Greeves, Warren and Wothers, Organic Chemistry, Oxford, second edition 2012

Advised text (not required)

Mechanism in Organic Chemistry, 6th Edition, Peter Sykes, Pearson Prentice Hall

For Maths skills component

Maths for Chemists, 2nd Ed., M. Cockett and G. Doggett, RSC Publishing.
Foundation Maths, 4th Ed., A. Croft and R. Davison, Pearson Prentice Hall.
Calculus with Analytical Geometry, 2nd Ed., G. F. Simmons, McGraw Hill.

Interdisciplinary

i.e. co taught with another department or with an industry perspective, bridges two or more disciplinary concepts, ideas, etc.

International

i.e. includes mobility opportunities, explores concepts and ideas in a global context, fosters a global mindset and awareness of diversity, etc.

Subject specific skills

Teamwork
Digital skills and literacy
Intercultural learning and diversity awareness

Transferable skills

Teamwork
Digital skills and literacy
Intercultural learning and diversity awareness

Study

Study time

Type	Required
Lectures	55 sessions of 1 hour (18%)
Tutorials	6 sessions of 1 hour (2%)
Other activity	7 hours (2%)
Private study	232 hours (77%)
Total	300 hours

Private study description

N/A

Other activity description

1hr Non Assessed Class Test

5 hr revision lectures/workshop
1hr Non Assessed Exit Test (Term 3)

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D1

	Weighting	Study time
Assessed	20%	
Online Examination	80%	

- Answerbook Green (8 page)
- Periodic Tables
- Students may use a calculator
- Graph paper

Feedback on assessment

Class test-annotated scripts returned (and interactive peer-marking session).\r\nCohort level examination feedback to be provided via Moodle.\r\nWritten feedback for assessed work components.\r\n

[Past exam papers for CH161](#)

Availability

Post-requisite modules

If you pass this module, you can take:

- CH3E9-15 Advanced Organic Chemistry and Laboratory
- CH270-15 Selective Organic Synthesis
- CH271-15 Mechanistic and Biological Chemistry

Courses

This module is Core for:

- UCHA-4 Undergraduate Chemistry (with Intercalated Year) Variants
 - Year 1 of F101 Chemistry (with Intercalated Year)
 - Year 1 of F122 Chemistry with Medicinal Chemistry (with Intercalated Year)
- UCHA-3 Undergraduate Chemistry 3 Year Variants
 - Year 1 of F100 Chemistry
 - Year 1 of F100 Chemistry
 - Year 1 of F121 Chemistry with Medicinal Chemistry
- UCHA-F110 Undergraduate Master of Chemistry (with Industrial Placement)
 - Year 1 of F100 Chemistry
 - Year 1 of F110 MChem Chemistry (with Industrial Placement)
 - Year 1 of F112 MChem Chemistry with Medicinal Chemistry with Industrial Placement
- Year 1 of UCHA-F107 Undergraduate Master of Chemistry (with Intercalated Year)
- UCHA-F109 Undergraduate Master of Chemistry (with International Placement)
 - Year 1 of F109 MChem Chemistry (with International Placement)
 - Year 1 of F111 MChem Chemistry with Medicinal Chemistry (with International Placement)
- UCHA-4M Undergraduate Master of Chemistry Variants
 - Year 1 of F100 Chemistry
 - Year 1 of F105 Chemistry
 - Year 1 of F110 MChem Chemistry (with Industrial Placement)
 - Year 1 of F109 MChem Chemistry (with International Placement)
 - Year 1 of F125 MChem Chemistry with Medicinal Chemistry
- Year 1 of UCHA-F127 Undergraduate Master of Chemistry with Medicinal Chemistry (with Intercalated Year)