

CH420-15 Analytical Frontiers in a Changing World

26/27

Department

Chemistry

Level

Undergraduate Level 4

Module leader

Mark Barrow

Credit value

15

Module duration

10 weeks

Assessment

20% coursework, 80% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

The module provides a focus upon advanced aspects of analytical science, building upon core concepts of analytical science covered in Year 1 and Year 2 modules. The Year 3 module “CH3H1: Analytical Science and Global Challenges” offers useful background but is not a prerequisite. The lectures will each have a theme, where they present students with a question at the beginning, which the material then addresses. Solid state nuclear magnetic resonance (NMR) will be introduced, building upon Year 2 coverage of solution phase NMR. Electron paramagnetic resonance (EPR) spectroscopy, not previously covered during the course, will be introduced and the module will cover more sophisticated experimental designs and strategies for data analysis. The lectures will be supported by case studies to link understanding of theory with real world applications. In particular, there will be a focus on how analytical science directly guides advances in sustainability, such as understanding the environmental impact of anthropogenic activities and development of future materials and sources of energy.

[Module web page](#)

Module aims

Students will learn how advances in analytical science directly guide advances in the modern world, particularly with respect to energy, health, and the environment. They will be trained in analysis and interpretation of data encompassing mass spectrometry, EPR, and solid-state NMR. They will learn how to plan experiments and analyse and interpret data

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.

The module is divided into three areas of modern analytical instrumentation:

- (1) Mass spectrometry: introductions/basics, hyphenation (coupling with complementary techniques), interpretation of data, and AI
- (2) Electron paramagnetic resonance: introduction, interpretation of data, reaction monitoring, advanced EPR techniques/applications.
- (3) Nuclear magnetic resonance: solid state NMR, vector model and pulse sequences, , relaxation, exchange, double resonance experiments, and dynamic nuclear polarisation

Learning outcomes

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

- Understand the principles and capabilities of advanced analytical techniques: mass spectrometry, electron paramagnetic resonance spectroscopy, and solid-state NMR spectroscopy.
- Understand and explain strategies for data analysis
- Discuss roles of analytical science plays towards developments in the modern world, including energy, the environment, and health care, amongst others.
- Analyse and interpret real-world analytical data

Indicative reading list

[Reading lists can be found in Talis](#)

[Specific reading list for the module](#)

Subject specific skills

Atomic and Molecular Structure
Spectroscopy and Structural Characterisation
Sustainability and Green Chemistry

Transferable skills

Critical thinking
Problem solving
Digital literacy

Study

Study time

Type	Required
Lectures	16 sessions of 1 hour (11%)
Practical classes	3 sessions of 1 hour (2%)
Other activity	1 hour (1%)
Private study	130 hours (87%)
Total	150 hours

Private study description

N/A

Other activity description

Lab tour of analytical facilities (mass spectrometry, NMR, and EPR) at Millburn House

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group D

	Weighting	Study time	Eligible for self-certification
Assessment component			
Problem sets	20%		Yes (extension)
Three, short assessments on the topics of mass spectrometry, EPR, and NMR experiments and data analysis.			

Reassessment component is the same

	Weighting	Study time	Eligible for self-certification
Assessment component			
Written examination	80%		No
• Answerbook Pink (12 page) • Students may use a calculator • Periodic Tables			
Reassessment component is the same			

Feedback on assessment

Individual feedback provided to students via Moodle/Tabula

[Past exam papers for CH420](#)

Availability

Courses

This module is Optional for:

- UCHA-F110 Undergraduate Master of Chemistry (with Industrial Placement)
 - Year 4 of F110 MChem Chemistry (with Industrial Placement)
 - Year 4 of F112 MChem Chemistry with Medicinal Chemistry with Industrial Placement
- Year 5 of UCHA-F107 Undergraduate Master of Chemistry (with Intercalated Year)
- UCHA-F109 Undergraduate Master of Chemistry (with International Placement)
 - Year 4 of F109 MChem Chemistry (with International Placement)
 - Year 4 of F111 MChem Chemistry with Medicinal Chemistry (with International Placement)
- UCHA-4M Undergraduate Master of Chemistry Variants
 - Year 4 of F105 Chemistry
 - Year 4 of F110 MChem Chemistry (with Industrial Placement)
 - Year 4 of F109 MChem Chemistry (with International Placement)
 - Year 4 of F125 MChem Chemistry with Medicinal Chemistry
- Year 5 of UCHA-F127 Undergraduate Master of Chemistry with Medicinal Chemistry (with Intercalated Year)