Chemistry at Keele

Undergraduate Chemistry and Medicinal Chemistry Degree Programmes
Introduction

Keele University has a strong reputation for innovative teaching and degree programmes, and this is at the heart of our Chemistry and Medicinal Chemistry degree programmes. Our modules focus on key chemical knowledge, placed in the 21st century context whilst developing a range of subject specific and transferrable skills. You have the opportunity to study elective modules in subjects that interest you during our MChem and BSc Single Honours Chemistry programmes, or study two subjects through Dual Honours and Major/Minor Chemistry and Medicinal Chemistry routes. You can participate in the Distinctive Keele Curriculum to broaden your skills and there are many additional options available to you at Keele to help you stand out from the crowd when looking for a job. You may choose to do study abroad in second year, learn a language, or find a vacation placement during the summer, either in industry or undertaking research. Keele offers many opportunities to work with local schools, inspiring the next generation of scientists through on-campus activities and teaching placements, or helping out with various activities as a Student Ambassador. During semester time, many students volunteer through the Students’ Union, helping with local community initiatives, or participate in a wide range of societies and sports teams on campus.

This booklet gives you more information on these options, and on the range of excellent facilities and opportunities that Chemistry and Medicinal Chemistry at Keele University has to offer. If you have any further questions, please do not hesitate to get in touch.

Best wishes.
The staff of Chemistry at Keele

Tel: 01782 733033
Email: chemistry@keele.ac.uk Website: www.keele.ac.uk/chemistry
Key Course Features:

• Outstanding student satisfaction (source: National Student Survey);

• Excellent laboratory and teaching facilities, including exceptional access to analytical instrumentation;

• Friendly and approachable teaching staff;

• Spend a semester or a whole year studying abroad.

Why Study Chemistry?
Chemistry is the science behind many of the modern inventions that we have come to rely on. Chemists work to discover new drugs, invent novel materials to improve energy production, develop cleaner technologies and play a key role in many more innovative areas. The cutting edge of chemistry is an exciting and dynamic place to build a career. Within the UK, the chemical and pharmaceutical industry is one of the largest manufacturing sectors and offers a diversity of job opportunities both at home and around the world.

Why Study Medicinal Chemistry?
The search for new drugs to treat a wide range of human illnesses such as heart disease and cancer remains a great challenge to the pharmaceutical and biotechnology industries. The Medicinal Chemistry Course at Keele provides students with an understanding of the complex biological and chemical problems that are involved in the design and synthesis of novel therapeutic agents. The course draws on basic chemical principles to solve problems at the interfaces of chemistry, biochemistry, molecular biology and pharmacology.
Course Information

Our degree programmes offer students the chance to build up excellent subject knowledge, and develop their skills through high quality teaching and innovative assessment. Our courses place heavy emphasis on professional skills including oral and written communication skills, practical and analytical laboratory skills, problem solving and other Graduate Attributes. We believe that 21st century Chemistry graduates must have an extensive portfolio of skills, both subject-specific and transferrable in order to be competitive in finding a career. All of our students will undertake an independent research project in their final year under the guidance of an academic member of staff.

MChem Chemistry
This is a four year programme for those aiming to establish a career in chemistry. In addition to selecting from a range of chemistry modules, the highlight of the final year is a major research project.

BSc Chemistry
Our Single Honours BSc programme allows you to select electives alongside core and optional chemistry modules.

BSc Chemistry with International Year
This four-year programme, based on BSc Chemistry includes a year at one of our international partner institutions, studying a mix of chemistry modules and those of relevance to your future plans.

In addition to our MChem and BSc Single Honours Chemistry programmes, the unique Dual Honours system at Keele allows students to combine Chemistry with a diverse range of other subjects in first and second year and potentially third year. Dual Honours is a fantastic opportunity to study two subjects, including many combinations that are not available anywhere else.

BSc Major/Minor (Chemistry or Medicinal Chemistry)
You will study two subjects in first and second year, and then specialise in Chemistry or Medicinal Chemistry in the third year as your Major subject.

BSc Dual Honours (Chemistry or Medicinal Chemistry)
You will study two subjects in equal amounts, over all three years. Popular combinations include Physics, Biochemistry, Forensic Science and Neuroscience.

Students may change between Chemistry and Medicinal Chemistry; and our MChem, Single, Major/Minor and Dual Honours options at the start of the second year.

Our BSc Chemistry Single Honours and major route Chemistry and Medicinal Chemistry courses are accredited by the Royal Society of Chemistry. Graduates are eligible for admission to Associate Member of the RSC (AMRSC).
Overview

Our Master in Chemistry, MChem course is a four-year degree programme that offers excellent training for a career in Chemistry. Our BSc Chemistry course is a three-year degree programme that offers outstanding grounding in Chemistry.

You will study Chemistry and Medicinal Chemistry modules throughout your degree and can compliment them by selecting modules from our exciting range of electives in 1st and 2nd year. Our 1st year modules are designed to focus our students on the fundamental aspects of Chemistry and necessary laboratory and analytical skills in preparation for advanced study. Choice of two electives allows you the chance to broaden your interest. Our 2nd year chemistry modules build on knowledge and skills gained in first year and place theory alongside relevant modern applications of Chemistry. Students have the choice of an elective module to continue developing a breadth of skills. In 3rd year, a choice of modules is offered to both BSc and MChem students, allowing you to specialise in areas that interest you.

BSc students will undertake a 30 credit research project in 3rd year and select 6 other modules. MChem students will undertake a 15 credit research project, and select 7 other modules including synoptic topics in chemistry. The final year of our MChem is designed to allow you to specialise in areas of chemistry that interest you whilst retaining the necessary breadth of knowledge needed for your future career. You will study two taught modules to further develop and expand your subject knowledge. You will also undertake a research training module followed by a significant independent research project. The research project is often described as the highlight of our graduates’ degrees.

Modules currently on offer

<table>
<thead>
<tr>
<th>Modules</th>
<th>Autumn Semester</th>
<th>Spring Semester</th>
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<tbody>
<tr>
<td></td>
<td>2 Elective Modules</td>
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<tr>
<td></td>
<td>Elective Module to be taken in either semester</td>
<td></td>
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<tr>
<td></td>
<td>MChem students select 7 modules and take a 15 credit Research Project</td>
<td>BSc students select 6 modules and take a 30 credit Research Project</td>
</tr>
<tr>
<td>4th Year Modules</td>
<td>MChem Research Training*, Applied Chemistry Topics (30 credit)*</td>
<td>Research Chemistry Topics*</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>60 credit Research Project*</td>
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Modules may be subject to change. * MChem Only
BSc Single Honours Chemistry with International Year

Overview
Our BSc Chemistry with International year programme allows students to study at one of our overseas partner institutions in their 3rd year of study before returning to complete their final year at Keele. Admission to this programme is at the end of the 1st year, subject to meeting academic requirements and further application to our Study Abroad Programme.

You will complete the 1st and 2nd year at Keele before spending a year at one of our international partner institutions to study a range of Chemistry modules including a placement or research project. You will return to Keele for your final year, taking six 3rd year modules and a 30-credit research project.

Studying abroad for a year allows you to expand your horizons and experience a new culture. Half of your time in your international year will be spent undertaking a placement. This might be carrying out an independent research project, working in industry or working in a school. The other modules that you will pick will compliment the Keele Chemistry programme and include the option to select electives, further broadening your experience.

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<tr>
<td>1st Year</td>
<td>Chemical Concepts and Structure</td>
<td>Chemical Properties and Reactions, Practical &amp; Professional Chemistry Skills 1, Sustainable Chemistry, Mathematical Tools &amp; Concepts in Chemistry</td>
</tr>
<tr>
<td></td>
<td>Practical and Professional Chemistry Skills I</td>
<td></td>
</tr>
<tr>
<td>2 Elective Modules</td>
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<tr>
<td></td>
<td></td>
<td>Elective Module may be taken in either semester</td>
</tr>
<tr>
<td>International Year</td>
<td>Modules to be chosen in consultation with our Study Abroad Tutor, to include 25% chemistry, 25% electives and 50% research or placement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 credit Research Project</td>
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</table>

Modules may be subject to change.
“Since graduating from Keele, I have started a PhD at the University of St Andrews. My research is on solid-state NMR and using the knowledge from my third year project at Keele has helped me understand more about the materials I study and what implications they have for future applications. The fantastic help and support from lecturers within the Chemistry department at Keele University has given me the confidence and the ability to undertake a PhD.”

Scott Sneddon, BSc Chemistry With Biochemistry

“My undergraduate degree at Keele prepared me for challenges and problems in chemistry and has allowed me to develop as a chemist, developing my passion for science.”

Ashleigh Ringrose, BSc Chemistry with Music

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BSc Chemistry Dual & Major/Minor

**Overview**

The Dual Honours and Major/Minor courses operate within the traditional Keele Dual Honours framework. Students study two subjects in first and second year, and have the option to study two subjects equally throughout the three years through Dual Honours. The Major/Minor programme allows students to specialise in Chemistry in the final year of the three year course, giving students the opportunity to study a wide breadth of Chemistry and to increase their research and analytical skills.

A wide range of subject combinations are available and Dual Honours/Major Route allows you broader career options at the end of your degree. This is an exciting way to study and allows you to select the combination of subjects that you want to study.

Major route students have the option to pick an elective in their 3rd year which may be a module from their 2nd subject.

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<td>1st Year Modules</td>
<td>Chemical Concepts &amp; Structure, Practical &amp; Professional Chemistry Skills 1</td>
<td>Chemical Properties and Reactions, Practical &amp; Professional Chemistry Skills 2</td>
</tr>
<tr>
<td></td>
<td>4 Modules in 2nd Subject</td>
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</tr>
<tr>
<td>2nd Year Modules</td>
<td>Organic Synthesis and Chirality, Spectroscopic and Analytical Chemistry</td>
<td>Structural Inorganic Chemistry, Medicinal and Biological Chemistry I</td>
</tr>
<tr>
<td></td>
<td>4 Modules in 2nd Subject</td>
<td></td>
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<tr>
<td></td>
<td>Dual Honours select 3 modules, carry out a 15 credit Research Project and study 4 modules in their 2nd subject.</td>
<td>Major Route select 6 modules and carry out a 30 credit Research Project.</td>
</tr>
<tr>
<td>Modules may be subject to change.</td>
<td>* Major Route Only</td>
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</tbody>
</table>
“I studied Medicinal Chemistry and Philosophy and studied for a semester at Macquarie University, Sydney, Australia as part of Keele’s study abroad programme. Macquarie University, like Keele, offered a warm friendly atmosphere and Australia is such an incredible place. You will always find new things to explore and amazing friends from around the world to share these awesome experiences with.”

Dayne Forrest, Medicinal Chemistry with Philosophy

BSc Medicinal Chemistry

Overview

Medicinal Chemistry focuses on drug discovery and the interaction of drugs with the human body. It is ideal if you are considering a career in the pharmaceutical industry or are particularly fascinated by the chemistry that underpins how drugs function. Both Dual Honours and Major/Minor options are available. Our 1st year is excellent preparation for advanced study in either Chemistry or Medicinal Chemistry and after gaining knowledge in the fundamentals of chemistry, students undertake Medicinal Chemistry specific modules from 2nd year onwards. Dual Honours allows Medicinal Chemists to study two subjects equally throughout their degree while our Major/Minor programme allows students to specialise in Medicinal Chemistry in the final year of the three year course, giving students the opportunity to study Medicinal Chemistry in greater depth. A wide range of Medicinal Chemistry research projects are on offer to 3rd years, including drug discovery, synthesis and analytical chemistry. Major route students have the option to pick an elective in their 3rd year which may be a module from their 2nd subject.

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</tr>
<tr>
<td>2nd Year Modules</td>
<td>Organic Synthesis &amp; Chirality, Spectroscopy &amp; Analytical Chemistry</td>
<td>Structural Inorganic Chemistry, Medicinal &amp; Biological Chemistry 1</td>
</tr>
<tr>
<td>3rd Year Modules</td>
<td>Chemical Kinetics, Photochemistry &amp; Inorganic Reaction Mechanism, Advanced Organic Chemistry, Medicinal &amp; Biological Chemistry 2</td>
<td>Topics in Biological &amp; Medicinal Chemistry, Advanced Chemical Analysis*, Radicals, Phases &amp; Supramolecular Chemistry*, Biochemistry &amp; the Therapy of Disease*</td>
</tr>
</tbody>
</table>

Dual Honours select 3 modules, carry out a 15 credit Research Project and study 4 modules in their 2nd subject.

Major Route select 6 modules and carry out a 30 credit Research Project.

Modules may be subject to change. * Major Route Only
Course Features

Teaching
Modules are taught through a variety of lectures, problems classes and workshops and laboratory classes. Lectures are designed to draw out key concepts and are supported by a variety of innovations including screencast pre-lectures and directed reading to help students prepare for the topic of the week. Problems classes and workshops expand on the concepts and help students develop the problem solving techniques required to tackle increasingly complex scenarios. These are interactive sessions, allowing students opportunities to seek one-on-one help from lecturers. Laboratory classes are supplemented by pre-laboratory exercises designed to draw out the theoretical basis of the experiment as well as the practical techniques and data handling skills required. Laboratory experiments are based directly on real life contexts or theories discussed in lectures and help students develop skills in handling complex data as well as key chemical techniques.

Assessment and Feedback
Assessment and feedback are key parts of learning and teaching at Keele. We use a variety of assessment methods to help students develop their skills as well as test their understanding of key concepts. Assessment types include written exams, laboratory diaries, reports, poster and oral presentations. In 1st and 2nd year, practical examinations are used to assess the laboratory and analytical skills developed by our students over the course of the year. There are exams in January and May, and each module contains several elements of continuous assessment or course work. Peer and self assessment are widely used to encourage students to engage fully with the task in hand and give an opportunity to obtain more varied feedback to help in the future.

Innovation and Excellence in Teaching
Chemistry at Keele has a reputation for innovative teaching methods that further enhance the course. We have recently redeveloped our curriculum to focus on essential skills for Chemistry Graduates alongside core subject knowledge. The Distinctive Keele Curriculum allows students to identify opportunities to develop skills such as team working, time management through short courses, and provides advice and support on building CVs and deciding on future career directions. Our staff have successfully applied for many grants for projects to improve teaching and learning within Chemistry. Recent projects include investigating and improving laboratory safety through greater student engagement, working with schools and colleges to explore the transition between A-level and university, and the use of screencasts to support more interactive lectures.

Study Abroad
All students have the opportunity to study abroad at one of our partner institutions. Students wishing to spend a year abroad should consider our BSc Chemistry with International year. Other students may spend a semester of their 2nd year abroad. Popular countries include Canada, USA and Australia.

Independent Research Project
The independent research project is the highlight of the final year for many students and allows them to apply their knowledge and skills to an area of cutting-edge chemistry that appeals to them. Projects are available in our key areas of research including catalysis and sustainable materials, synthetic and medicinal chemistry, chemical ecology, analytical and photo-chemistry, and theoretical chemistry. More information on the research interests of the staff can be found on the Chemistry website: www.keele.ac.uk/chemistry

Experience and Opportunities

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The Keele Distinctive Curriculum
Keele’s distinctive educational programmes and learning environment enable graduates to thrive in whatever spheres of life they choose to enter after their degree. Keele degree programmes are focused towards the development of distinctive graduates armed with the skills to succeed in the competitive employment market. A key part of this is the Keele Distinctive Curriculum offering students the opportunity to develop personal and professional skills through activities integrated into the curriculum.

For more information on the Keele Distinctive Curriculum, please visit: www.keele.ac.uk/distinctive
Chemistry Careers Support

What Do Keele Chemistry and Medicinal Chemistry Graduates Do?

Our Graduates go on to a diverse range of careers. Many choose to undertake further study such as teacher training, a taught Masters programme at Keele or further afield, or Medicine or Dentistry courses. Inspired by their final year research projects, many Graduates choose to continue in research, achieving a research Masters or PhD degree. Many Graduates undertake Teacher Training; having experienced classroom life through one of Keele’s many opportunities to engage with schools in the local community. Other Graduates find employment in the Chemical, Pharmaceutical or Environmental industries, working as research scientists, analytical chemists or in other roles where scientific knowledge and related skills are required such as scientific instrument sales, patent law or environmental analysis. Dual Honours students may pursue other career options related to the combination of Chemistry or Medicinal Chemistry and their second subject.

From the outset of the chemistry degree programme careers are embedded into the course. Dr Graeme Jones, our Careers and Industrial Placements tutor, offers a range of opportunities designed to help students with careers decisions. From CV building sessions with 1st year students, to interviews to discuss careers options, a great deal of support is provided whatever a student wants to do. We offer support when completing applications, practice interviews and advice on putting together a professional CV. Career Sessions are a chance for students to attend a series of talks by experts on career options such as teaching, the Chemical, Pharmaceutical and Environmental industries and undertaking a PhD.

Students are encouraged to apply for Industrial Placements during the summer, both around the Keele area and by finding opportunities nearer to home. Other summer options include applying for Undergraduate Research Placements in the summer before their final year. Students are also encouraged to make full use of the Careers Service to explore a wide range of possible careers, taking their second subjects into consideration as well as the distinctive set of skills they have developed throughout their time with us.
Our staff are friendly, approachable and enthusiastic and you join a vibrant and forward-thinking School when you become a Chemistry student at Keele. Your development as a chemist and general welfare is monitored by a Year Tutor, and all students are assigned a Personal Tutor whose role is to offer guidance on study skills, professional development and careers opportunities as well as being a friendly face as required. We have an active Student-Staff Liaison Committee which provides a forum for students to raise any concerns they have about the course and work with staff to improve the course generally. Our student Chemical Society (ChemSoc) organises a wide range of events for all members of the School including parties, an end of year ball and sporting activities such as student-staff football matches.

Facilities
The Lennard-Jones Laboratories are centrally located on the campus and within easy walking distance of all the facilities provided. Many students choose to spend most of their day in Lennard-Jones, making use of the Computer Classroom and other rooms available for student study.

We have excellent teaching laboratories with synthetic and analytical space, all of which have been built or refurbished in recent years. 1st and 2nd Year Chemistry and Medicinal Chemistry laboratory classes are held in our new Multi-user teaching laboratory complete with state-of-the-art analytical instruments for student use. Our students will use a variety of analytical instruments including UV-Visible, Infrared and NMR spectroscopy during 1st and 2nd year. They will also have access to X-ray diffraction, and various mass spectrometers and chromatography instruments in the 2nd year, and access to a wider range of equipment during their final year research projects.

Chemistry at Keele is taught by experienced and enthusiastic staff. Most staff hold or are working towards Keele’s Learning and Teaching in Higher Education qualification. Our focus on learning and teaching has been frequently recognised and we have a reputation for designing innovative assessment and teaching activities. Many staff have successfully applied for funding for Keele Teaching Innovation Projects which have included the use of tablet computers to create pre-lecture resources, improvements to laboratory safety, the use of 3-D printers to create models for discussion in class, and ways of integrating social, economic and environmental considerations into chemistry teaching.

Many staff have established research groups that investigate a range of areas including Chemical Ecology, Synthesis and Medicinal Chemistry, Catalysis and Sustainable Materials, Porous Materials, Photochemistry and Zeolites. These researchers work at the forefront of their discipline and spend time writing grants and research papers, supervising postgraduate research students and travelling to conferences and using facilities such as the UK 850 MHz Solid-State NMR Facility or Diamond, the UK’s national synchrotron science facility. Our 3rd and 4th year modules include examples of recent work carried out by staff making the curriculum exciting and cutting edge.

Staff are frequently nominated for and have been awarded Keele Teaching Excellence awards. These recognise the substantial commitment of staff members towards innovative and excellent teaching and assessment within our courses.
Further Information
If you have any questions please contact our Admissions Tutor for further information:
School of Physical and Geographical Sciences
Lennard-Jones Laboratories,
Keele University, Staffordshire, ST5 5BG

Email: chemistry@keele.ac.uk
Tel: (+44) 01782 733033
Website: www.keele.ac.uk/chemistry