

Chemistry

www.york.ac.uk/chemistry

Programmes	UCAS code
BSc degree programmes (3 year)	
Chemistry	F100 BSc/Chem
Chemistry, Management and Industry	F190 BSc/ChemMI
Chemistry, Resources and the Environment	F142 BSc/ChemRE
Chemistry, Biological and Medicinal Chemistry	F152 BSc/ChemBM
MChem degree programmes (4 year with a year in York/industry)	
Chemistry	F102 MChem/Ch
Chemistry, Management and Industry	F192 MChem/MI
Chemistry, Resources and the Environment	F144 MChem/RE
Chemistry, Biological and Medicinal Chemistry	F154 MChem/BM
MChem degree programmes (4 year with a year abroad)	
Chemistry	F101 MChem/ChEu
Chemistry, Management and Industry	F191 MChem/MI Eu
Chemistry, Resources and the Environment	F143 MChem/REEu
Chemistry, Biological and Medicinal Chemistry	F153 MChem/BMEu

Key facts

ADMISSIONS TUTOR

Dr Andrew Parsons

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Email: chem-ugrad@york.ac.uk

2010 Applications	1,274
2010 Admissions	200

Typical offers

MATURE STUDENTS

Mature students are welcomed and considered individually

A LEVELS

AAA/ABB

IB DIPLOMA PROGRAMME

36/32 points including HL 6 in essential subjects

SCOTTISH QUALIFICATIONS

AAAAA/AABBB at Higher and AA/AB at Advanced Higher level

BTEC

DDM or DDD in National Diploma

ADVANCED DIPLOMA

Acceptable for entry. Check our website for key detail and acceptable subjects

OTHER QUALIFICATIONS

For details of other acceptable qualifications go to www.york.ac.uk/chemistry/undergraduate/entryrequirements

Essential subjects

Chemistry

Another science subject or Mathematics is preferred

GCSE grade B or equivalent in the relevant language for applicants intending to spend the final year of the MChem at a university in Belgium, France, Germany, Italy or Spain

English as a foreign language

IELTS 6.5

“We want you to get a sense for the real excitement and the enthusiasm that we at York all share for Chemistry and its teaching”
Head of Department



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Studying Chemistry

Chemistry is all around us. To study Chemistry is to discover how it is relevant to every aspect of our lives, from an understanding of how pharmaceuticals interact with our bodies to how we affect the environment and how modern materials such as plastics and semiconductors are prepared. The potential applications of chemistry are endless.

Chemistry is often referred to as the 'central science', as it covers topics as diverse as quantum mechanics and the study of atomic particles, and the molecular nature of biological systems and the Human Genome Project. Learning about the fundamental basis of chemistry – the analysis of molecules, their structures and shapes and how they react – is vital if we are to meet the needs of our society. Chemists really can make a difference in the world!

Our degree programmes are designed to give you a thorough grounding in all aspects of modern chemistry and a qualification from the University of York is highly regarded by employers. Major employers of chemists include pharmaceutical companies, agrochemical companies, oil companies and

the makers of detergents, paints, cosmetics and explosives.

Chemistry at York

The Department of Chemistry at York offers both top quality teaching and an international research reputation in a modern welcoming department.

The Department provides students with:

- a supervisor who oversees academic progress and personal welfare
- a teaching programme which ensures a highly supportive learning environment
- lectures supported by small group tutorials and workshops
- state-of-the-art research facilities (during the last ten years over £18 million has been invested in our buildings and equipment and over the last three years £31.9 million was awarded to the Department in research grants). The research facilities include a new purpose-built £3.5 million NMR centre (accommodating six high-field NMR spectrometers) and a £9 million dedicated research wing,


housing modern synthetic and analytical research laboratories including a centre of excellence for mass spectrometry. New research and teaching laboratories are currently at the planning stage

- a wide choice of chemistry-related option modules
- an excellent record of industrial placements (typically over 30 per year)
- a flexible programme structure
- a range of industrial and departmental sponsorships.

Recent departmental achievements include:

- Consistently high scores in the National Student Survey which place the Department among the top UK Chemistry departments for student satisfaction.
- We are the only department in the country to have three members of staff recognised for 'excellence of teaching' by the Royal Society of Chemistry.
- We are the first and only department in the UK to win the Athena Swan Gold award for our commitment to women in science.
- In the most recent Research Assessment Exercise we were placed equal third amongst UK Chemistry departments for research, with three-quarters of the Department's research work rated as 'world-leading' or 'internationally excellent'.

"The Department of Chemistry at York has always stood out in national league tables, and with good reason. The course gives you a comprehensive grounding in modern-day chemistry as well as the practical training you need to handle state-of-the-art equipment both in and out of labs. The quality of teaching here is first-rate, and I particularly appreciate the friendly support we get from staff throughout the Department. My time here has been immensely enjoyable, and I'd definitely recommend it to anyone looking for a distinguished degree in Chemistry."



Genevieve, MChem Chemistry, 3rd year

Our programmes

We offer a choice of three-year BSc and four-year MChem degree programmes in Chemistry, including modules specialising in management and industry, resources and the environment, and biological and medicinal chemistry. The MChem programmes give you the opportunity to gain experience in industry, to study for a year at an overseas university or to carry out an extended research project at York.

Since its inception in 2005, the Department has always been in the top ten of the UK Chemistry departments in the National Student Survey

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Our programmes are based on a modular system with a wide range of flexibility and choice, while ensuring you graduate as a fully qualified Chemist. All of our degree programmes are recognised/accredited by the Royal Society of Chemistry. The structure of the programme is such that decision making is left as late as possible to give you ample opportunity to consider your choices for the future.

In making the choice between BSc and MChem, you need to consider how useful the additional MChem year will be in preparing you for your likely career, and whether it provides experiences and challenges that will be interesting and worthwhile. Students who take the MChem programmes are generally aiming for a scientific career, whereas students taking the BSc programmes may be interested in a variety of possibilities, for example teaching. The choice between MChem and BSc can be left until the end of Year 2.

Our programmes are designed to allow you to specialise in the following areas.

Chemistry

This is a mainstream Chemistry programme, enabling you to learn about all aspects of modern chemistry, but also giving you the opportunity to specialise in areas of your choice through option modules. The modules cover a wide range of topics, eg Catalysis – From Fundamentals to Catalytic Converters, Analytical and Forensic Chemistry, Reactivity – Pathways and Intermediates, and The Material World – Advanced Nanomaterials. In the Analytical and Forensic Chemistry option you will be able to learn how modern spectroscopic and chromatographic techniques can be developed to determine the composition of complex biological mixtures. In contrast the Reactivity – Pathways and Intermediates option describes how molecules, which only exist for a fraction of a second, may be characterised. The Material World – Advanced Nanomaterials option explores the latest advances in materials technology such as liquid crystals, biopolymers and nanomaterials.

Chemistry, Management and Industry

Using the knowledge gained from the core Chemistry modules, this programme will enable you to learn about chemistry in a commercial context, eg modules in Managerial Economics, Management and Industry and Clean Technology – Industrial Strategy and Planning, which are taught in a chemistry context. Clean Technology explores the effect of legislation, economic pressure and public concern in driving the move towards cleaner manufacturing processes. The emphasis is on sources of renewable energy, the improvement of existing technology and the life-cycle analysis of products. Also included are site visits, planned to highlight particular themes of importance in the programme.

Chemistry, Resources and the Environment

This programme builds on your core Chemistry modules to give you the opportunity to learn about the chemical basis of the environment and how we impact upon it, eg modules in Dynamic Earth – Biogeochemistry and Paleoclimate, and Atmospheric Chemistry and Climate, which provide the background, at a chemical level, for many of the critical environmental issues we face. This includes studying the chemical composition of the atmosphere and the impact of potential climate change. Some lecture programmes include fieldwork.

Chemistry, Biological and Medicinal Chemistry

This is a programme about the chemistry of life. It provides the opportunity to learn about



In practical classes, students are supervised by academic staff and postgraduate students



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the chemistry of biological systems and the way this chemistry impacts on the body's ability to combat disease, and how medicines can be designed for effective treatment, eg modules in Protein Chemistry – From Protein Function to Biotechnology, Bio-inspired Chemistry and Human Health – Introduction to Medicinal Chemistry. For example, the Human Health – Introduction to Medicinal Chemistry option describes the development of chemotherapy and our understanding of the way in which drugs interact with the whole body. Techniques such as photodynamic therapy and the controlled release of drugs are covered, together with the problem of bacterial resistance and the challenges of drug synthesis. The Human Health – Advanced Medicinal Chemistry option teaches you about strategies for drug design and how molecular modelling can be used to understand the mode of action of the target molecule to which the drug must bind.

Whatever programme you decide to apply for, we emphasise three things:

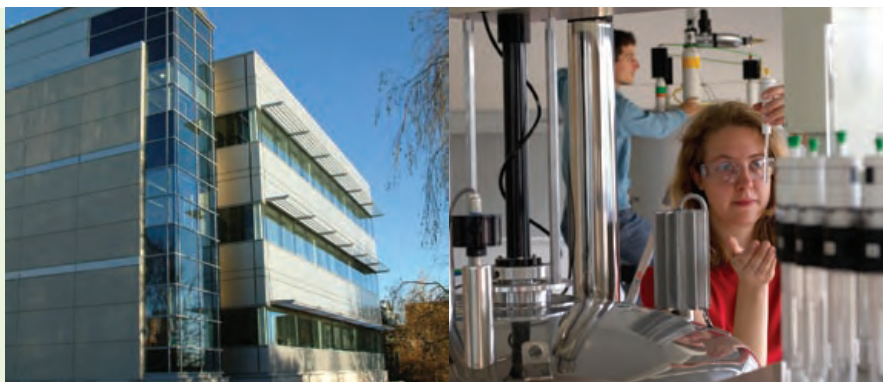
- Any decision on an area of specialisation that you make at this stage is only a provisional one.
- You will not have to make a final choice of options for a given year until the end of the previous year.
- You are in no way restricted to our recommended combinations of options.

In order to keep teaching as fresh as possible, programmes are regularly updated.

What you study

In Year 1 all students take a common set of core modules each of which integrates the major areas of Chemistry: Organic, Inorganic, Physical, Analytical, Theoretical and Biological. This programme is supplemented by practical work and a series of ancillary courses, taught by Chemistry staff, which cover related topics in Mathematics, Physics and Biology (for students who have not studied these subjects at A level or equivalent).

Year	Core Chemistry	Additional studies
1	<p>Topics include:</p> <ul style="list-style-type: none"> ■ Principles of Atomic Structure and Bonding ■ Modern Spectroscopic and Analytical Techniques ■ Fundamental Principles of Inorganic and Organic Chemistry ■ Mathematics and IT for Chemistry ■ Kinetics and Thermodynamic Aspects of Chemistry 	Skills programmes in chemical aspects of Mathematics, Biology and Physics for students who have not taken these topics at A level or equivalent
2	<p>Topics include:</p> <ul style="list-style-type: none"> ■ Surface Chemistry ■ Polymer Chemistry ■ Structure, Bonding and Reactivity in Transition Metal Chemistry ■ Symmetry and Its Applications in Chemistry ■ Organic Synthesis ■ Biological Chemistry 	<p>Option modules currently include:</p> <ul style="list-style-type: none"> ■ Catalysis – From Fundamentals to Catalytic Converters ■ Managerial Economics ■ Dynamic Earth – Origins and Evolution ■ Human Health – Introduction to Medicinal Chemistry ■ The Material World – An Introduction to Materials Chemistry ■ Clean Technology – Energy and the Environment ■ Protein Chemistry – Structure and Biological Function
3	<p>Topics include:</p> <ul style="list-style-type: none"> ■ The Chemistry of the Lanthanides and Actinides ■ Supramolecular Chemistry ■ Materials and Nanoparticles ■ Asymmetric Synthesis in Organic Chemistry ■ Modern Diffraction Techniques ■ Advanced NMR Spectroscopy ■ Structures of Natural Products ■ Computational Chemistry ■ Synthetic Frontiers of Inorganic Chemistry and Ligand Design 	<p>Option modules currently include:</p> <ul style="list-style-type: none"> ■ Reactivity – Pathways and Intermediates ■ The Material World – Advanced Nanomaterials ■ Management and Industry ■ Clean Technology – Industrial Strategy and Planning ■ Dynamic Earth – Biogeochemistry and Paleoclimate ■ Atmospheric Chemistry and Climate ■ Human Health – Advanced Medicinal Chemistry ■ Genes and Genetic Engineering ■ Analytical and Forensic Chemistry ■ Bioinspired Chemistry ■ Protein Chemistry – From Protein Function to Biotechnology ■ Advanced Synthesis – From Nature to the Lab <p><i>BSc</i></p> <ul style="list-style-type: none"> ■ Research project, spectroscopy and group exercises <p><i>MChem</i></p> <ul style="list-style-type: none"> ■ Advanced practical techniques, spectroscopy and group exercises
4	<p>120 credits in total for the year Research project at York, a university abroad or in industry</p>	<p>Advanced Chemistry topics currently include:</p> <ul style="list-style-type: none"> ■ Organometallics ■ Green Chemistry ■ Quantum Chemistry ■ Chemical Biology and Molecular Interactions ■ Advanced Spectroscopy ■ Natural Product Chemistry ■ Satellite Remote Sensing of the Atmosphere ■ Chemoinformatics



Approximately three-quarters of Year 2 is made up of core Chemistry modules and practical work is common to all Chemistry programmes. The remainder consists of option modules chosen by you at the end of Year 1. Option modules are self-contained although they clearly relate to core Chemistry.

In Year 3 the BSc and MChem programmes diverge. All students still take the same series of core and option modules (which are chosen at the end of Year 2). Students on the BSc programme carry out research-based work, whereas MChem students take an advanced practical project designed to further the skills needed in a research environment.

The major component for MChem students in Year 4 is a research project undertaken at York, in one of our partner institutions abroad, or as part of a year spent in industry – if you spend a year in industry, the company normally pays you a salary. Study in Year 4 in industry also involves distance-learning courses delivered via Yorkshare (the University of York's Virtual Learning Environment, VLE) on advanced chemistry topics, whereas students at our partner universities choose from the lecture courses those universities offer.

Teaching and learning

Lectures and tutorials

The principal method of teaching is through lectures, around eight per week, the size of which varies from around 180 students to as few as four or five for some option modules. Forming an important part of our programmes, weekly tutorials (in Years 1–3) develop a wide range of skills from problem solving to essay writing, or preparing a talk to give in the tutorial. Tutorials are used to reinforce topics covered in lectures, but they are also an opportunity for you to discuss aspects of the subject that interest you and ask about any problems you have encountered in your reading. Our teaching is done in the Department.

Tutorials relating to core modules are organised on a college basis. Each student and each tutor is a member of a college, and the five or six staff in your college will arrange

your tutorial programme and guide your work. One of your college tutors will also act as your personal supervisor who monitors your academic progress and is available for more personal discussions. This continuity of teaching and the small size of the groups (normally four or five students) make it easier for you to get to know your tutors, and you are welcome to seek help from them whenever you need it. Tutorials and workshops for option modules are given by teaching staff running the options – this helps you to get to know those lecturers who specialise in the areas of your particular interest.

Laboratory work

Practical chemistry complements your theoretical studies and constitutes most of the continuously assessed parts of your degree. A wide variety of experiments are carried out, from the synthesis of target compounds to a crime-scene investigation using forensic methodology. The Department has large well-equipped and recently refurbished teaching laboratories (18 additional fumehoods were installed in October 2009), offering an extensive range of modern instrumentation, including spectrometers and chromatographic apparatus to identify and analyse compounds. In practical classes, academic staff and postgraduate students supervise students.

Laboratory work carried out in Years 1 and 2 (typically eight hours each week) includes the following areas:

- modern organic and inorganic synthetic techniques
- chromatographic methods used in the separation and purification of reaction products
- spectroscopic techniques – infrared, ultraviolet, nuclear magnetic resonance and atomic absorption spectroscopy, and mass spectrometry used in chemical analysis and in the study of molecular structure
- kinetic and thermodynamic studies
- study of reaction mechanisms and intermediates.

Our practicals will also give you experience in handling and interpreting experimental data to illustrate how principles taught in lectures can be put to use.

We have developed our own online resources to support the teaching of introductory skills in practical chemistry.

Group work

Other small group teaching involves case studies and exercises that develop your ability to work as a member of a team, on activities involving planning and decision making. These also give you practice in presentation skills, both through the production of posters and through giving talks in which you justify decisions and the reasoning behind them. Such skills, which are invaluable in career terms, are reinforced throughout the programme.

Site visits

An important aspect of learning is the opportunity to see things for yourself. For much of the programme this can be done within the Department, but in the case of options relating to industrial chemistry we arrange for you to visit industrial companies, see the operations described in lectures being carried out, and talk to plant managers. Similarly, options in environmental chemistry involve visits and excursions, such as a day visit to Whitby to examine coastal exposure of Jurassic sediments.

Research projects

Research is an essential part of university life and all of our undergraduate degrees have, as a vital component, a research project or research-based work. The research project is an opportunity to do a piece of original work in a particular area of chemistry chosen by you.

For those students studying for the MChem (York) programme, the project will be undertaken in one of our research laboratories, where you will have the chance to work alongside graduate students and you will have access to the state-of-the-art instrumentation that the Department has to offer. Your project choice may be related to option modules or reflect your intended career path. MChem

students may even design their own project.

Students on the MChem abroad and MChem industry programmes also carry out research projects. Those at partner universities will conduct their work as if they were a student at their host university, though assessment of the project is carried out back at York. For students on industrial placement, the research project is largely directed by the company for which they work, typically over a period of 12 months. Around 50 companies, including all the large pharmaceutical companies in the UK, plus a number in Europe, support this popular scheme – companies seem to appreciate the extra maturity and the enhanced background in chemistry shown by Year 4 students. Inevitably, some companies offer permanent employment to graduates who have impressed them during their fourth year industrial placement.

BSc students interested in teaching as a career have the opportunity to do research-based work on developing new teaching materials.

The Department of Chemistry has its own Staff–Student Committee. There are also elected student representatives on the departmental committees responsible for each year of the course and on the Board of Studies. On these committees students put forward constructive criticisms and recommendations

Year	Examinations	Assessed coursework
1	End-of-module examinations	Laboratory work
2	End-of-module examinations	Laboratory work in core Chemistry Coursework related to options
3	End-of-module examinations	Coursework related to options <i>For BSc students:</i> Research-based work, group exercises and spectroscopy <i>For MChem students:</i> Advanced techniques practical course, group exercises and spectroscopy
4	End-of-module examinations	Research project (report and oral examination)

about their programmes, and play a part in the discussions involved in the revision of programmes.

Study abroad

The development of the European Union has seen a steady increase in the number of companies who have bases in the UK, on the Continent and even further afield. This is creating a growth in the demand for Chemistry graduates who are fluent in a second language and who have direct experience of living in another culture. Our student exchanges bring

students from other universities to York, and provide you with the opportunity to spend an academic year in Australia, Belgium, Finland, France, Germany, Italy, Singapore or Spain. Students on European exchanges receive financial support from the EU to help with extra expenses, such as travel, through the Erasmus programme.

The University has exchange schemes with some American, Canadian, Japanese, Hong Kong and Australian universities. These also provide students with the opportunity of studying abroad for a year, but applications are not required until after you have started your programme at York.

Assessment

Students are typically assessed through end-of-module examinations plus continuous assessment of practical work and/or coursework. For some modules, oral presentations are assessed, but tutorial work is not assessed for examination purposes, since tutorials are intended purely for teaching support.

Assessment in the first year does not count towards the final degree mark.

Bursaries

Some industrial companies offer sponsorships for Chemistry students at York. All BSc and MChem students, including overseas students,

"I was drawn to three things at York: the campus setting, the reputation of the Department, and the in-depth modules that the course offered in Medicinal and Biological Chemistry, which are the two areas I'm particularly interested in. The Department is a close, friendly environment and I've always felt comfortable approaching staff. I've particularly enjoyed lab work – it's always enjoyable to get hands-on experience and I'm sure the skills I've learned will be invaluable for future research projects."



Jonathan, Chemistry, Biological and Medicinal Chemistry, 2nd year

Right Weekly tutorials reinforce topics covered in lectures

Far right With around 40 research groups in the Department, your choice of topic for your final year research project is very wide



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are eligible to apply for these sponsorship schemes. The sponsorship awards provide financial support, in the region of £1,000 per annum, for one year or throughout your degree (this includes the final year of the MChem programme if it is spent either at York or at one of our partner universities abroad). Industrial sponsorship packages also typically include periods of paid industrial training during one or more summer vacations.

The Department typically offers a minimum of eight scholarships for UK-based students and up to five scholarships for overseas students (www.york.ac.uk/chemistry/undergraduate/sponsorship). All Chemistry students also receive a Teaching Package free of charge, which includes lab specs, a lab coat, a full set of laboratory equipment, a molecular model set, affiliate membership of the RSC for one year, a Chemistry data book, detailed laboratory scripts and membership of York ChemSoc for one year.

Admissions

We consider all applications on their merits and therefore the exact nature of offers can vary to match individual cases. We select applications on the basis of student potential and will take account of evidence of educational, social, health or other personal disadvantage.

Offers to applicants for the MChem programmes are the same as for BSc programmes, except that applicants wishing to be considered for the year abroad programme are generally expected to have a minimum of GCSE grade B in the appropriate language (except in Australia, Finland and Singapore).

The Department encourages applications from mature students including those who have completed a suitable Access or Foundation course; syllabuses must contain a significant portion of Science and Mathematics. Applications are considered on an individual basis.

Applications from overseas students are welcome and, in most cases, an English language qualification, typically a score of 6.5 in the IELTS test, will be required.

For applicants who are based in the UK,

Destinations of York Chemistry graduates 2007/09

Destination	%
Postgraduate (research)	29.8
Postgraduate (taught)	15.6
Other further study	1.3
Computing/IT	1.3
Education	4.4
Health work	0.4
Hospitality/sales	8.0
Industry	23.1
Law/accountancy/consultancy	2.2
Logistics/telecommunications	0.4
Media/creative	0.9
Other social and business	4.0
Public administration	3.1
Recreation/culture	1.3
Research and development	3.6
Social/community work	0.4

This chart shows the sorts of further study and kinds of employment taken up by York graduates from this department over the past three years.

For more information see: www.york.ac.uk/careers/destinations

it is our policy not to make offers without interview. The interview day is not only aimed at learning more about you, it is very much an opportunity for you to see the campus and Department and the teaching facilities we have to offer, and to meet members of staff.

If you would prefer to visit us during the summer before you submit your UCAS application, you are welcome to do so. The Department runs its popular pre-application visit days during August – for further details, please see our website.

If you have any concerns about the acceptability of subject combinations you are taking (or plan to take) then please contact the Admissions Tutor.

After you finish

Although the majority of our graduates progress to become scientists, the analytical and transferable skills that constitute part of our degrees are recognised as suitable training for a wide range of careers. We run a careers

day when we invite recent graduates to talk about their current employment.

About 40 graduates per year stay in the Department or join other universities to work for higher degrees – the majority are involved in collaborative research projects with chemical companies. The Department is also an important centre for postgraduate teacher training, returning qualified teachers to schools to ensure a good education for the next generation of Chemistry students.

Chemistry at York typically has an excellent 97% 'positive destination' rate, that is, the proportion of students who either continue their studies or go into permanent employment. Our graduates also achieve a high rate in the quality of their employment, typically with 79% entering professions in the top three occupational classes.