

Programme Specification: Undergraduate

For students starting in Academic Year 2017/2018

1. Course Summary

Names of programme(s) and award title(s)	BSc (Hons) Chemistry BSc (Hons) Chemistry with International Year (see Annex A for details)
Award type	Dual Honours/Major/Minor <i>NB: all students who study a science Principal subject are candidates for the degree of Bachelor of Science (with Honours) (BSc Hons) irrespective of their second Principal subject.</i>
Mode of study	Full time
Framework of Higher Education Qualification (FHEQ) level of final award	Level 6
Duration	3 years 4 years with International Year
Location of study	Keele University – main campus
Accreditation (if applicable)	BSc Chemistry Major Route is accredited by the Royal Society of Chemistry – for further details see section 12
Regulator	Higher Education Funding Council for England (HEFCE)
Tuition Fees	<p>UK/EU students: Fee for 2017/18 is £9,250*</p> <p>International students: Fee for 2017/18 is £14,150** <i>(if combined with a non-laboratory-based Principal Subject)</i> <i>or</i> £15,250** <i>(if combined with a laboratory-based Principal Subject)</i></p> <p>The fee for the international year abroad is calculated at 15% of the standard year fee</p>
Additional Costs	Refer to section 18

* These fees are regulated by Government. We reserve the right to increase fees in subsequent years of study in response to changes in government policy and/or changes to the law. If permitted by such change in policy or law, we may increase your fees by an inflationary amount or such other measure as required by government policy or the law. Please refer to the accompanying Student Terms & Conditions. Further information on fees can be found at <http://www.keele.ac.uk/studentfunding/tuitionfees/>

** We reserve the right to increase fees in subsequent years of study by an inflationary amount. Please refer to the accompanying Student Terms & Conditions for full details. Further information on fees can be found at <http://www.keele.ac.uk/studentfunding/tuitionfees/>

How this information might change: Please read the important information at <http://www.keele.ac.uk/student-agreement/>. This explains how and why we may need to make changes to the information provided in this document and to help you understand how we will communicate with you if this happens.

2. What is a Dual Honours programme?

Dual Honours degrees are degrees that are taken in two different subjects, resulting in an *X and Y* degree title, for example *Chemistry and Mathematics*. If you are taking a Dual Honours programme, these will be the two subjects you applied for. These are referred to as your Principal Subjects.

In a Dual Honours degree, you must take at least 120 credits in each Principal Subject, accrued over all three levels of study, with at least 30 credits in Year 1 (Level 4) and at least 45 credits in each of Years 2 and 3 (Levels 5 and 6) in each of two Principal Subjects. For Chemistry the requirement is 60 credits in each year of study. The remaining available credits can be filled with modules from these subjects or other subjects entirely.

What is a Major/Minor programme?

Major/Minor degrees are degrees that are taken in two different subjects, much like a Dual Honours degree, except that you will specialise in the Major subject. In a Major/Minor degree you will need at least 225 credits in your Major subject over your three years of study with at least two modules (30 credits) taken each year in your Major Subject, although some Principal Subjects will require you to take more than this and this will be stated in the relevant programme specification. You will also need 90 credits in your Minor subject with a minimum of 30 credits (two modules) taken in Year 1 (Level 4) and 45 credits (three modules) taken in Year 2 (Level 5).

There are two available three-year routes within the Dual Honours Chemistry framework at Keele University. These routes are distinguished by the number of credits taken in Chemistry (with 15 credits representing a single module):

Note: For clarity, this document refers to each level of study by its FHEQ level. Year 1 corresponds to Level 4, Year 2 to Level 5, and Year 3 to Level 6.

Year	Dual Honours	Dual Honours (Major)
1	60 credits (Chemistry)	60 credits (Chemistry)
	60 credits (combining subject X)	60 credits (combining subject X)
2	60 credits (Chemistry)	60 credits (Chemistry)
	60 credits (combining subject X)	60 credits (combining subject X)
3	60 credits (Chemistry)	105-120 credits (Chemistry)
	60 credits (combining subject X)	0-15 credits (Elective)
Total	360	360
Degree	BSc Chemistry AND X	BSc Chemistry WITH X

There is a wide choice of combining subjects which can be taken with Chemistry in Year 1 and 2 and further details of these are available at: <http://www.keele.ac.uk/ugcourses/chemistry/>

Details of electives available are available at: <http://www.keele.ac.uk/electives/>

Dual Honours Chemistry (Minor): It is possible to take BSc X WITH Chemistry programmes, in which case you would conclude your Chemistry studies at the end of Year 2) and study predominantly, or exclusively, your combining subject X in Year 3. Students who elect to follow the Minor route in Chemistry must take **at least 45 Level 5 credits from the core Dual Honours Year 2/Level 5 Chemistry modules and should consult the**

Programme Director to discuss their Year 2 Module Diet. The Programme Specification for combining subject X should also be consulted for students pursuing a major route in X.

Students taking the Minor Route in Chemistry might not necessarily be able to demonstrate that they have achieved all the Programme's learning outcomes.

3. Overview of the Programme

Chemistry is the central science, disciplined in experimental approach, highly creative in thinking, and life-enhancing in impact. The contribution of chemistry to our modern world ranges from advanced materials in gadgets, and high-tech materials used on the International Space Station, to life-saving drugs that are essential to modern medicine. The wide diversity of chemistry is reflected in teaching and research at Keele University. Our BSc Dual Honours and Major-Minor routes are perfect if you wish to combine Chemistry with a second subject.

In first and second year, lectures cover core material for study, introducing you to concepts that are developed in workshops and laboratory classes. Assessment is through a combination of exams and coursework including reports, presentations, and laboratory diaries. You will receive comprehensive feedback on assessed work in a variety of formats including written, audio, and face-to-face methods.

In third year, lectures and seminars cover research-focused material. Assessment includes exams and coursework designed to further develop information retrieval and critical thinking skills. Project work is in the format of a research project module and/or a dissertation module. Research project work is assessed through the evaluation of the laboratory diary, an oral examination and writing of a scientific paper, whereas the dissertation module focuses on the writing of a peer-reviewed literature dissertation and the presentation of these findings. You have access throughout your degree to excellent laboratory facilities that are exceptionally well equipped with computational facilities and chemical instrumentation, much of which is research grade. The structure of the programme is designed to enable you to enhance your employability through the development of problem-solving, presentational and communication skills as well as developing your research skills and your capacity to learn independently. If you take advantage of the full range of opportunities the programme offers, you will have acquired the knowledge and skills to present yourself with confidence in pursuit of your chosen career in a competitive world.

4. Aims of the Programme

The broad aims of the programme are to:

- equip you with a breadth of chemistry knowledge,
- develop a variety of laboratory and analytical skills,
- develop enhanced problem solving, research and communication skills.

5. What you will learn

The intended learning outcomes of the programme (what students should know, understand and be able to do at the end of the programme), can be described under the following headings:

- Subject knowledge and understanding
- Subject specific skills
- Intellectual skills
- Key or transferable skills (including employability skills)

Subject knowledge and understanding

Successful students will be able to demonstrate:

- knowledge of the major aspects of chemical terminology and vocabulary

- knowledge and understanding of fundamental physicochemical principles
- knowledge of a range of inorganic and organic materials
- understanding of general synthetic pathways, including related isolation, purification and characterisation techniques
- awareness of issues within chemistry that overlap with other related disciplines
- knowledge of selected aspects of chemistry at the forefront of the discipline
- knowledge of aspects of chemical science research methods and peer-reviewed chemical science literature

Subject specific skills

Successful students will be able to:

- demonstrate skills in the safe-handling of chemical materials, considering their physical and chemical properties, including any specific hazards associated with their use
- conduct risk assessments
- conduct documented laboratory procedures in synthetic and analytical work, in relation to both inorganic and organic systems
- monitor, by observation and measurement, chemical properties, events or changes, with systematic and reliable recording and documentation thereof
- operate standard chemical instrumentation
- interpret and explain the limits of accuracy of their own experimental data in terms of significance and underlying theory

Intellectual skills

Successful students will be able to:

- demonstrate knowledge and understanding of essential chemistry-related facts, concepts, principles and theories
- apply such knowledge and understanding to the solution of qualitative and quantitative problems, mostly of a familiar nature
- recognise and analyse problems and plan strategies for their solution
- evaluate, interpret and synthesise chemical information and data
- carry out practical application of theory using computer software and models
- communicate scientific material and arguments
- use information technology (IT) to manipulate and present chemical information and data

Key or transferable skills (including employability skills)

Successful students will be able to:

- communicate information, ideas, problems and solutions to both specialist and non-specialist audiences orally and in writing
- demonstrate problem-solving skills, relating to qualitative and quantitative information
- demonstrate numeracy and mathematical skills, including such aspects as error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation
- retrieve and cite information, in relation to primary and secondary information sources, including retrieval of information through online computer searches

- demonstrate skills in the use of information technology for presenting information and data
- interact with other people and engage in team working, time management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working
- show development of skills and awareness necessary to seek out opportunities to undertake appropriate further training of a professional nature

Keele Graduate attributes

Engagement with this programme will enable you to develop your intellectual, personal and professional capabilities. At Keele, we call these our ten Graduate Attributes and they include independent thinking, synthesizing information, creative problem solving, communicating clearly, and appreciating the social, environmental and global implications of your studies and activities. Our educational programme and learning environment is designed to help you to become a well-rounded graduate who is capable of making a positive and valued contribution in a complex and rapidly changing world, whichever spheres of life you engage in after your studies are completed.

Further information about the Keele Graduate Attributes can be found here: <http://www.keele.ac.uk/journey/>

6. How is the Programme taught?

Learning and teaching methods used on the programme vary according to the subject matter and level of the module. They include the following:

- Lectures, lecture breaks and self-tests
- Interactive personal response systems
- Screencasts
- Recorded lectures
- Tablet PCs
- Demonstrations
- Detailed personalised and generic written and face-to-face feedback
- Electronic submission and return of marked coursework (with feedback)
- Audio feedback
- Screencast feedback
- Pre-laboratory and post-laboratory exercises
- Laboratory classes
- Research projects
- Problem classes and workshops
- Problem-based and context-based activities
- IT instruction (spread sheets, word-processing, chemical structure drawing, databases, textbook resources, information retrieval and literature searching)
- Group work
- Self and peer-assessment for learning
- Information literacy activities
- Computer-aided learning (simulations and animations, online activities and exercises)
- Case studies
- Chemical Sciences Seminar Series
- Use of e-learning/the Keele Learning Environment (KLE)

Apart from these formal activities, students are also provided with regular opportunities to talk through particular areas of difficulty, and any special learning needs they may have, with their Personal Tutors or module lecturers on a one-to-one basis.

These learning and teaching methods enable students to achieve the learning outcomes of the programme in a variety of ways.

7. Teaching Staff

A dynamic group of staff with a broad range of expertise teach on the programme and bring a wealth of experience acquired through fundamental and applied research across a diverse range of areas. A number of staff members are internationally recognised leaders in their field and manage substantial research groups comprising postgraduate research students and postdoctoral researchers, some of whom contribute to the teaching on the programme. Reflecting the diverse range of research expertise, some staff members also contribute to the Forensic Science, and Applied Environmental Science programmes at Keele. Many teaching staff hold, or are working towards an accredited Higher Education Teaching qualification and many are Fellows of the Higher Education Academy (FHEA), the professional body for teachers in Higher Education. A number of the teaching staff have established a national reputation for excellence in teaching and learning and have been recognised for their innovation in teaching through university and national teaching excellence awards, and the attraction of funding for teaching innovation projects.

The University will attempt to minimise changes to our core teaching teams, however, delivery of the programme depends on having a sufficient number of staff with the relevant expertise to ensure that the programme is taught to the appropriate academic standard.

Staff turnover, for example where key members of staff leave, fall ill or go on research leave, may result in changes to the programme's content. The University will endeavour to ensure that any impact on students is limited if such changes occur.

8. What is the Structure of the Programme?

The academic year runs from September to June and is divided into two semesters. The number of weeks of teaching will vary from course to course, but you can generally expect to attend scheduled teaching sessions between the end of September and mid-December, and from mid-January to the end of April.

Our degree courses are organised into modules. Each module is usually a self-contained unit of study and each is usually assessed separately with the award of credits on the basis of 1 credit = 10 hours of student effort. An outline of the structure of the programme is provided in the tables below.

It is possible to transfer onto the following courses from BSc Medicinal Chemistry Dual Honours or Major/Minor. Please consult the relevant programme specification for full details of these programmes.

Degree Title	Duration	Transfer Deadline
BSc Chemistry (Single Honours)	3 years	Transfer by week 1 of semester 1 of year 2
BSc Chemistry with International Year (Single Honours)	4 years	Transfer by week 1 of semester 1 of year 2
BSc Medicinal Chemistry (Dual/Major)	3 years	Transfer by week 1 of semester 2 of year 2
MChem Chemistry	4 years	Transfer by week 1 of semester 1 of year 3

There are three types of module delivered as part of this programme. They are:

- Compulsory core module – a module that you are required to study on this course;
- Optional core module – these allow you some limited choice of what to study from a list of modules;
- Programme approved elective module – subject-related modules that count towards the number of subject credits required by your degree.

Year 1 (Level 4)

There are four compulsory core 15-credit modules taken by all chemistry students at Level 4, with approximately 12 hours per week timetabled contact time including 5 hours of laboratory. You will select two electives and take two additional compulsory core modules, with approximately 4 hours per week timetabled contact time.

Whilst laying the foundations of the principles and vocabulary of Chemistry, you will be challenged to question knowledge and the nature of knowledge when you start to encounter problems that have more than one answer or interpretation. You will be exposed to experimental evidence from a variety of sources and start to learn how such evidence supports, undermines or otherwise, the theoretical models and ideas upon which the subject of Chemistry is built. The practical classes emphasise development of core practical skills through hands-on experience of key techniques and procedures, as well as skills in laboratory safety, maintaining a laboratory diary, observation, information retrieval, IT skills, scientific writing and reporting in a variety of formats.

Compulsory Core modules	Credits	Elective modules	Credits
Chemical Concepts & Structure	15	None	
Practical & Professional Chemistry Skills I	15		
Practical & Professional Chemistry Skills II	15		
Chemical Properties & Reactions	15		

Year 2 (Level 5)

In Year 2 the knowledge and skills acquired in Year 1 are developed with an increasing emphasis on the need to integrate knowledge and critically evaluate experimental evidence in solving theoretical and practical problems. In practical classes new practical skills are developed and an increasing emphasis is placed on critical evaluation of experimental design and the analysis of complex data from multiple sources, including computational theoretical calculations and the scientific peer-reviewed literature. Sophisticated analytical techniques are introduced and applied to the investigation of a variety of problems, whilst communication skills are developed to include skills in oral presentation. Skills in searching, using and referencing the peer-reviewed scientific literature are developed through timetabled training sessions in the use of online chemical and literature databases.

Compulsory Core modules	Credits	Elective modules	Credits
Organic Synthesis & Chirality	15	None	
Physical & Inorganic Chemistry	15		
Spectroscopy & Analytical Chemistry	15		
Structural Inorganic Chemistry	15		

Year 3 (Level 6) – Dual Honours

In Year 3, increasingly sophisticated theories and ideas are introduced which require you to draw upon, integrate and extend the fundamental chemical principles introduced during Years 1 and 2. Choice of modules is available to allow you to pursue your specific interests, as well as choice within Topics in Chemistry. Course work is designed to allow you to develop a range of subject specific skills, focusing on engaging with scientific literature and experimental data sets, and working towards the Graduate Attributes through presentation, interviews and various written reports. You will also carry out a 15-credit Dissertation or Project (selected from a wide variety of research projects on offer) which places increased emphasis on your ability to work independently and critically evaluate practical investigations and the peer-reviewed scientific literature.

Dual Honours

Compulsory Core modules	Credits	Optional Core Modules	Credits
Topics in Chemistry	15	Group 1: Chemistry/Medicinal Chemistry Research Project	15
		Chemistry/Medicinal Chemistry Dissertation	15
		Group 2: Advanced Organic Chemistry	15
		Kinetics, Photochemistry & Inorganic	15

		reaction Mechanisms	
		Inorganic, Physical & Solid State Chemistry	15
		Materials Chemistry & Catalysis	15

Students must select one module from Optional Core Group 1 and two modules from Optional Core Group 2, to a total of 60 credits in Chemistry.

Major route

Compulsory Core modules	Credits	Programme Approved Elective modules	Credits
Chemistry/Medicinal Chemistry Research Project	15	Materials Chemistry & Catalysis	15
Chemistry/Medicinal Chemistry Dissertation	15		
Advanced Organic Chemistry	15		
Kinetics, Photochemistry & Inorganic reaction Mechanisms	15		
Inorganic, Physical & Solid State Chemistry	15		
Advanced Chemical Analysis	15		
Topics in Chemistry	15		

Students may select an alternative level 6 elective module in lieu of Materials Chemistry & Catalysis for a minimum of 105 credits in Chemistry.

For further information on the content of modules currently offered please visit:

www.keele.ac.uk/recordsandexams/az

Learning Outcomes

A table mapping the programme learning outcomes onto modules and specific assessments can be found at the end of this document in Annex B.

9. Final and intermediate awards

Credits required for each level of academic award are as follows:

Honours Degree	360 credits	<p>You will require at least 120 credits at levels 4, 5 and 6.</p> <p>The number of Chemistry credits you require depends on whether Chemistry is taken as a Dual, Major or Minor subject.</p> <p>Dual Honours: You will require a total of 360 credits in both Chemistry and your other Principal subject, with a total 120 credits, including 60 credits in Chemistry, in each year of study.</p> <p>Major route: You will require at least 225 credits in Chemistry and at least 90 credits in your other Minor subject over the course of the degree. Students taking Chemistry as a Major subject must obtain 60 credits in Chemistry in each of years 1 and 2 (levels 4 and 5) and at least 105 credits in year 3 (level 6).</p> <p>Minor route: You will require at least 90 credits in Chemistry and at least 225 credits in your other Major subject over the course of the degree. Students taking Chemistry as a Minor</p>
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		subject must obtain at least 30 credits in Chemistry in Year 1 (level 4) and 45 credits in Chemistry in Year 2 (level 5).
Diploma in Higher Education	240 credits	You will require at least 120 credits at level 4 or higher and at least 120 credits at level 5 or higher
Certificate in Higher Education	120 credits	You will require at least 120 credits at level 4 or higher

Chemistry with International Year: in addition to the above students must pass a module covering the international year in order to graduate with a named degree in Chemistry with International Year. Students who do not complete, or fail the international year, will be transferred to the three-year Chemistry programme.

10. How is the Programme assessed?

The wide variety of assessment methods used within Chemistry at Keele reflects the broad range of knowledge and skills that are developed as you progress through the degree programme. Teaching staff pay particular attention to specifying clear assessment criteria and providing timely, regular and constructive feedback that helps to clarify things you did not understand and helps you to improve your performance. The following list is representative of the variety of assessment methods used within Chemistry:

- **Unseen written examinations** test students' knowledge and understanding of the subject. Examinations may consist of long or short answer questions
- **Pre-laboratory exercises** - structured exercises designed to increase students understanding of the theory and techniques required by a specific laboratory practical and may require the student to read the lab script, watch short videos of techniques, perform calculations, answer short questions and look up information
- **Laboratory reports** are structured proformas and full lab reports are formal summaries of work carried out in the laboratory and test students' understanding of the practical aspects of the programme and develop the skills necessary to enable students to present and analyse their results
- **Laboratory diaries** are a hand-written record of work carried out in laboratory sessions, maintained regularly and kept in accordance with laboratory diary checklists and guidelines provided in the laboratory script. Typically, a selection of experiments carried out in each module will be assessed at the end of the semester
- **Practical examinations** are a series of laboratory or computer based exercises designed to directly assess a student ability to perform a specific procedure or type of data analysis
- **Oral examinations** – students answer questions posed by members of staff on a specific topic such as a laboratory experiment, item of coursework, or a research project
- **IT assignments and computer-based exercises (e.g. spreadsheets exercises)** – various activities designed to assess students' ability to use software to retrieve, analyse and present scientific data in a variety of formats
- **Class tests** taken either conventionally or online via the Keele Learning Environment (KLE) assess students' subject knowledge and their ability to apply it in a more structured and focused way
- **Information retrieval exercises** require students to locate and analyse information of different types from the internet, various databases, scientific publications and textbooks. The information is then presented in a prescribed written format
- **Research projects and reports** test student's knowledge of different research methodologies and the limits and provisional nature of knowledge. They also enable students to demonstrate their ability to formulate research questions and to answer them using appropriate methods

- **Research proposals** require students to develop an independent research project and think through theoretical problems surrounding methodology and practical concerns relating to, for example, availability of sample, financial restrictions, and time limits. This form of assessment is key to the development of independent research skills and a portfolio of employability skills
- **Oral and poster presentations and reports** assess individual students' subject knowledge and understanding. They also test their ability to work effectively as members of a team, to communicate what they know orally and visually, and to reflect on these processes as part of their own personal development
- **Video/screencast presentations** require students to produce a short video or screencast on a given topic and assess students' knowledge and understanding, and ability to communicate what they know orally and visually, and to reflect on these processes as part of their own personal development

Marks are awarded for summative assessments designed to assess your achievement of learning outcomes. You will also be assessed formatively to enable you to monitor your own progress and to assist staff in identifying and addressing any specific learning needs. Feedback, including guidance on how you can improve the quality of your work, is also provided on all summative assessments within three working weeks of submission, unless there are compelling circumstances that make this impossible, and more informally in the course of tutorial and seminar discussions.

11. Contact Time and Expected Workload

This contact time measure is intended to provide you with an indication of the type of activity you are likely to undertake during this programme. The data is compiled based on module choices and learning patterns of students on similar programmes in previous years. Every effort is made to ensure this data is a realistic representation of what you are likely to experience, but changes to programmes, teaching methods and assessment methods mean this data is representative and not specific.

Undergraduate courses at Keele contain an element of module choice; therefore, individual students will experience a different mix of contact time and assessment types dependent upon their own individual choice of modules. The figures below are an example of activities that a student may expect on your chosen course by year/stage of study. Contact time includes scheduled activities such as: lecture, seminar, tutorial, project supervision, demonstration, practical classes and labs, supervised time in labs/workshop, fieldwork and external visits. The figures are based on 1,200 hours of student effort each year for full-time students.

Activity	Year 1 (Level 4)	Year 2 (Level 5)	Year 3 (Level 6)
Scheduled learning and teaching activities	34%	39%	18%
Guided independent Study	66%	61%	82%
Placements	0%	0%	0%

12. Accreditation

The BSc Chemistry Major Route is accredited by the Royal Society of Chemistry.

Study abroad: Because studying abroad has potential implications for Royal Society of Chemistry accreditation of the BSc Chemistry Major Route, students wishing to Study Abroad must discuss this in advance with the School of Chemical and Physical Sciences, Chemistry and Forensic Science 'Study Abroad tutor' to identify and agree whether any guided study will be required to ensure their eligibility for Royal Society of Chemistry Accreditation.

13. Regulations

The University Regulations form the framework for learning, teaching and assessment and other aspects of the student experience. Further information about the University Regulations can be found at: <http://www.keele.ac.uk/student-agreement/>

Chemistry Regulations

Laboratory Classes

(a) Laboratory classes are compulsory and are an essential part in fulfilling the intended learning outcomes of modules of which they are part, and a requirement of Royal Society of Chemistry accreditation. Failure to attend a significant number of the laboratory classes without good cause will result in failure of the module with no reassessment being offered.

(b) Further to the provisions of regulations 1A and 1F, any student failing to attend one laboratory class and unable to provide good cause for their absence in advance, or within 5 working days of their absence, will be issued with an informal academic warning. Thereafter warnings will be issued in line with School of Chemical and Physical Sciences policy. This is to ensure students understand the need to attend laboratory classes in order to fulfil the learning outcomes and to meet the requirements of accreditation.

(c) Any student failing to follow the health and safety guidelines in the undergraduate laboratory will be asked to leave. This may include inappropriate dress, refusal to follow reasonable requests of staff, or attending under the influence of alcohol or other substances. The student will not be permitted to make up the missed session.

(d) Further to the provision of Regulation 8, any student missing one laboratory class may self-certify their absence. In the event of missing multiple laboratory classes, an EC will be required and independent evidence may be requested for substantial absence. There is no opportunity to make up missed laboratory sessions due to timetable constraints and so the following concessions will be made available to the student:

- i. the student may be given opportunity to submit assessed work based on an alternative laboratory session, in agreement with the module leader and year tutor;
- ii. with the approval of the Discipline Board of Examiners, a small element of the laboratory assessment (up to 33%) may be disregarded with the final mark for the assessment being recalculated from the remaining elements.

A student who has completed a semester abroad will not normally be eligible to transfer onto the International Year option.

14. What are the typical admission requirements for the programme?

Subject	A-level	Subjects not included	International Baccalaureate	BTEC	Access to Higher Education Diploma	GCSE requirements
Chemistry (Dual Honours)	BBC A level Chemistry at grade B or above. A Pass in Science Practical will be required if applicant is taking A level Chemistry (England) ** ** Science practical only required from applicants taking reformed A level Biology, Chemistry or Physics in England.	General Studies and Critical Thinking	32 points to include Higher Level Chemistry at 6 or above	DDD You must have taken sufficient Chemistry units, please contact us for advice	Obtain Access to Higher Education Diploma with 30 Level 3 credits at Distinction and 15 Level 3 credits at Merit. You must also have taken sufficient Science credits, please contact us for advice.	Maths @ C (or 4) English Lang @ C (or 4)

Applicants who are not currently undertaking any formal study or who have been out of formal education for more than 3 years and are not qualified to A-level or BTEC standard may be offered entry to the University's Foundation Year Programme.

Applicants for whom English is not a first language must provide evidence of a recognised qualification in English language. The minimum score for entry to the Programme is Academic IELTS 6.0 or equivalent.

Please note: All non-native English speaking students are required to undertake a diagnostic English language assessment on arrival at Keele, to determine whether English language support may help them succeed with their studies. An English language module may be compulsory for some students during their first year at Keele.

Accreditation of Prior Learning (APL) is considered on a case-by-case basis and those interested should contact the Programme Director. The University's guidelines on this can be found here:

<http://www.keele.ac.uk/qa/accreditationofpriorlearning/>

15. How are students supported on the programme?

Personal Tutors: You are allocated a Personal Tutor for the duration of your studies as part of the University's Personal Tutor system and in accordance with the University Code of Practice on Personal Tutoring. The role of the Personal Tutor is to meet formally with you periodically to discuss your progress and performance and to offer support and advice. You can make arrangements to see their Personal/Subject Tutor at any time.

Year Tutors: A year tutor is allocated to your class for every year of study and is responsible for monitoring attendance, discussing academic progress and assisting with extenuating circumstances and other issues that may be affecting your performance.

Use of e-learning/the Keele Learning Environment (KLE): All modules belonging to the Chemistry programmes are supported by learning resources that are accessible to students via the KLE.

Health and Safety: All students admitted to the programme receive detailed training on health and safety in the laboratory and are provided with a Safety Handbook, Safety Glasses and a Laboratory Coat. Other personal protective equipment will be provided if required.

Students with disabilities, medical conditions or dyslexia: Students admitted to the Chemistry degree programme with disabilities or medical problems are asked to disclose their condition to Student Support and Development Services. Year tutors and module leaders are responsible for ensuring reasonable adjustments are made.

Support for Students during Semester Abroad: Our study abroad tutor will maintain regular contact with students studying abroad. This will include a minimum of monthly emails to check on your progress, bimonthly Skype conversations.

16. Learning Resources

Chemistry at Keele is based in the Lennard-Jones building, which houses excellent, well-equipped teaching and research laboratory facilities. Each module has a site within the university's virtual learning environment (the Keele Learning Environment or KLE), which hosts teaching materials (lecture notes/slides, laboratory scripts, assessments, past examination papers, on-line quizzes, videos, screencasts and audio clips) and useful links. The KLE is accessible on or off campus and is also used for online submission and return of assessments. Each module has a module guide or specification which contains details of the specific intended learning outcomes, Graduate Attributes and assessments.

17. Other learning opportunities

Study abroad (semester)

Because studying abroad has potential implications for Royal Society of Chemistry accreditation of the BSc Chemistry Major Route degree students wishing to Study Abroad must discuss this in advance with the School of

Chemical and Physical Sciences, Chemistry and Forensic Science 'Study Abroad tutor' to identify and agree whether any guided study will be required to ensure their eligibility for Royal Society of Chemistry Accreditation.

Students on the Chemistry programme have the potential opportunity to spend a semester abroad in their second year studying at one of Keele's international partner universities.

Exactly which countries are available depends on the student's choice of degree subjects. An indicative list of countries is on the website (<http://www.keele.ac.uk/studyabroad/partneruniversities/>); however this does not guarantee the availability of study in a specific country as this is subject to the University's application process for studying abroad.

No additional tuition fees are payable for a single semester studying abroad but students do have to bear the costs of travelling to and from their destination university, accommodation, food and personal costs. Depending on the destination they are studying at additional costs may include visas, study permits, residence permits, and compulsory health checks. Students should expect the total costs of studying abroad to be greater than if they study in the UK, information is made available from the Global Education Team throughout the process, as costs will vary depending on destination

Whilst students are studying abroad any Student Finance eligibility will continue, where applicable students may be eligible for specific travel or disability grants. Students studying in Erasmus+ destinations may be eligible for grants as part of this programme. Students studying outside of this programme may be eligible for income dependent bursaries at Keele.

Students travel on a comprehensive Keele University insurance plan, for which there are currently no additional charges. Some governments and/or universities require additional compulsory health coverage plans; costs for this will be advised during the application process.

Study Abroad (International Year)

A summary of the International Year, which is a potential option for students after completion of Year 2 (Level 5), is provided at Annex A.

Industrial placements

If you are interested in spending a year in industry on a placement, then our Careers Tutor will advise and support you in applying for suitable placements.

18. Additional costs

As to be expected there will be additional costs for inter-library loans and potential overdue library fines, print and graduation.

We do not anticipate any further additional costs for this undergraduate programme.

19. Quality management and enhancement

The quality and standards of learning in Chemistry are subject to a continuous process of monitoring, review and enhancement.

- The Learning and Teaching Committee of the School of Chemical and Physical Sciences is responsible for reviewing and monitoring quality management and enhancement procedures and activities across the School.
- Individual modules and the Chemistry Programme as a whole are reviewed and enhanced every year in the annual programme review which takes place at the end of the academic year and as part of the University's Curriculum Annual Review and Development (CARD) process.
- The programmes are run in accordance with the University's Quality Assurance procedures and are subject to periodic reviews under the Internal Quality Audit (IQA) process.

Student evaluation of, and feedback on, the quality of learning on every Chemistry module takes place every year using a variety of different methods:

- The results of student evaluations of all modules are reported to module leaders and reviewed by the Programme Committee as part of the Curriculum Annual Review and Development (CARD) process.
- Findings related to the Chemistry Programmes from the annual National Student Survey (NSS), and from regular surveys of the student experience conducted by the University, are subjected to careful analysis and a planned response at programme and School level.
- Feedback received from representatives of students in all three years of the Chemistry Programme is considered and acted on at regular meetings of the Programmes Staff/Student Liaison Committee.

The University appoints senior members of academic staff from other universities to act as external examiners on all programmes. They are responsible for:

- Approving examination questions
- Confirming all marks which contribute to a student's degree
- Reviewing and giving advice on the structure and content of the programme and assessment procedures

Information about current external examiner(s) can be found here:

<http://www.keele.ac.uk/ga/externalexaminers/currentexternalexaminers/>

20. The principles of programme design

The Chemistry Programmes described in this document have been drawn up with reference to, and in accordance with the guidance set out in, the following documents:

- a. UK Quality Code for Higher Education, Quality Assurance Agency for Higher Education: <http://www.qaa.ac.uk/assuring-standards-and-quality/the-quality-code>
- b. QAA Subject Benchmark Statement: Chemistry (2014) <http://www.qaa.ac.uk/publications/information-and-guidance/publication/?PubID=2875>
- c. Royal Society of Chemistry Accreditation <http://www.rsc.org/Education/courses-and-careers/accredited-courses/bsc-accreditation.asp>
- d. Keele University Regulations and Guidance for Students and Staff: <http://www.keele.ac.uk/regulations>

21. Document Version History

Version history	Date	Notes
Date first created	October 2016	
Revision history	V2.0: 03/2017	Replacement of 30-credit project module with two 15-credit modules to simplify project administration and provide extra choice of project or dissertation [Major change: reissued]
Date approved	27/3/17	

Programme Specification

Annex A for Dual Honours Programmes

Please note: in order to be eligible to take the International Year option your other subject must also offer this option. Please refer to the information published in the course document for your other subject.

International Year Programme

Students registered for Dual Honours **Chemistry** may either be admitted for or apply to transfer during their period of study at Level 5 to the Dual Honours with international year programme in both their principal subjects, providing that they meet the progression criteria outlined in this document. Students accepted onto the International Year programme will have an extra year of study at an international partner institution after they have completed Year 2 (Level 5) at Keele.

Students who successfully complete both the second year (Level 5) and the International Year will be permitted to progress to Level 6. Students who fail to satisfy the examiners in respect of the International Year will normally revert to the Dual Honours programme without the International Year and progress to Level 6 on that basis. The failure will be recorded on the student's final transcript.

Study at Level 4, Level 5 and Level 6 will be as per the main body of this programme specification. The additional detail contained in this annex will pertain solely to students registered for 'Chemistry with International Year'.

International Year Programme Aims

In addition to the programme aims specified in the main body of the programme specification, the international year programme of study aims to provide students with:

1. Personal development as a student and a researcher with an appreciation of the international dimension of their subject
2. Experience of a different culture, academically, professionally and socially

Entry Requirements for the International Year

Students may apply to the 4-year programme during Level 5. Admission to the International Year is subject to successful application, interview and references from appropriate staff.

The criteria to be applied are:

- Academic Performance (an average of 60% across all modules at Level 5 is normally required)
- General Aptitude (to be demonstrated by application for study abroad, interview during the 2nd semester of year 2 (Level 5), and by recommendation of the student's personal tutor, 1st and 2nd year tutors and programme director)

Student Support

Students will be supported whilst on the International Year via the following methods:

- Phone or Skype conversations with Study Abroad tutors, in line with recommended Personal Tutoring meeting points.
- Support from the University's Global Education Team

Learning Outcomes

In addition to the learning outcomes specified in the main text of the Programme Specification, students who complete a Keele undergraduate programme with International Year will be able to:

- a. Describe, discuss and reflect upon the cultural and international differences and similarities of different learning environments
- b. Discuss the benefits and challenges of global citizenship and internationalisation

- c. Explain how their perspective on their academic discipline has been influenced by locating it within an international setting.

In addition, students who complete Chemistry with International Year' will be able to:

- i) Design, plan and critically evaluate a practical investigation within the chemical sciences, record relevant information accurately and systematically and be able to reflect upon the data in critical manner
- ii) Integrate, apply and develop fundamental chemical principles to describe and explain phenomena and solve problems in the context of selected topics within contemporary chemistry

Please note that students on Dual Honours programmes with International Year must meet the subject-specific learning outcomes for BOTH their principal subjects.

These learning outcomes will all be assessed by the submission of a satisfactory individual learning agreement, the successful completion of assessments at the partner institution and the submission of the reflective portfolio element of the international year module.

Course Regulations

Students registered for the 'Chemistry with International Year' are subject to the course specific regulations (if any) and the University regulations. In addition, during the International Year, the following regulations will apply:

Students undertaking the International Year must complete 120 credits, which must comprise *at least 40%* in the student's discipline areas.

This may impact on your choice of modules to study, for example you will have to choose certain modules to ensure you have the discipline specific credits required.

Students are barred from studying any Chemistry module with significant overlap to Level 6 modules to be studied on their return. Significant overlap with Level 5 modules previously studied should also be avoided.

Additional costs for the International Year

Tuition fees for students on the International Year will be charged at 15% of the annual tuition fees for that year of study, as set out in Section 1. The International Year can be included in your Student Finance allocation, to find out more about your personal eligibility see: www.gov.uk

Students will have to bear the costs of travelling to and from their destination university, accommodation, food and personal costs. Depending on the destination they are studying at additional costs may include visas, study permits, residence permits, and compulsory health checks. Students should expect the total costs of studying abroad be greater than if they study in the UK, information is made available from the Global Education Team throughout the process, as costs will vary depending on destination.

Students studying in Erasmus+ destinations may be eligible for grants as part of this programme. Students studying outside of this programme may be eligible income dependent bursaries at Keele.

Students travel on a comprehensive Keele University insurance plan, for which there are currently no additional charges. Some Governments and/or universities require additional compulsory health coverage plans; costs for this will be advised during the application process.

Annex B: Programme Learning Outcomes, Modules and Assessments

a) Subject-specific knowledge and understanding:	Knowledge of the major aspects of chemical terminology and vocabulary	Knowledge and understanding of fundamental physicochemical principles.	Knowledge of a range of inorganic and organic materials	Understanding of general synthetic pathways, including related isolation, purification and characterisation techniques	Awareness of issues within chemistry that overlap with other related disciplines.	Knowledge of selected aspects of chemistry at the forefront of the discipline.	Knowledge of aspects of chemical science research methods and peer-reviewed chemical science literature.
Principal forms of assessment for learning outcome	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Laboratory Assessment</i>	<i>Essay, Group Project, Presentation, Coursework</i>	<i>Group Project, Online Tasks, Coursework</i>	<i>Group Project, Online Tasks, Presentation, Coursework</i>
CHE-10047 Chemical Concepts and Structure	Y	Y	Y	Y			
CHE-10048 Practical and Professional Chemistry Skills 1	Y	Y	Y	Y			
CHE-10049 Practical and Professional Chemistry Skills 2	Y	Y	Y	Y			
CHE-10050 Chemical Properties and Reactions	Y	Y	Y	Y			
CHE-20001 Organic Synthesis and Chirality	Y	Y		Y			Y
CHE-20030 Spectroscopy and Analytical Chemistry	Y	Y	Y	Y			Y
CHE-20028 Physical inorganic Chemistry	Y	Y	Y	Y			
CHE-20031 Structural Inorganic Chemistry	Y	Y	Y	Y	Y	Y	Y

a) Subject-specific knowledge and understanding:	Knowledge of the major aspects of chemical terminology and vocabulary	Knowledge and understanding of fundamental physicochemical	Knowledge of a range of inorganic and organic materials	Understanding of general synthetic pathways, including related isolation, purification and	Awareness of issues within chemistry that overlap with other related disciplines.	Knowledge of selected aspects of chemistry at the forefront of the	Knowledge of aspects of chemical science research methods and peer-reviewed chemical science
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		principles.		characterisation techniques		discipline.	literature.
Principal forms of assessment for learning outcome	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Laboratory Assessment</i>	<i>Essay, Group Project, Presentation, Coursework</i>	<i>Group Project, Online Tasks, Coursework</i>	<i>Group Project, Online Tasks, Presentation, Coursework</i>
CHE-30032 Advanced Chemical Analysis			Y	Y	Y	Y	Y
CHE-30037 Topics in Chemistry		Y			Y	Y	Y
CHE-30038 Chemical Kinetics, Photochemistry and Inorganic Reaction Mechanisms	Y	Y	Y		Y	Y	Y
CHE-30039 Advanced Organic Chemistry	Y		Y	Y		Y	Y
CHE-30042 Inorganic, Physical and Solid State Chemistry	Y	Y	Y				Y
CHE-30043 Materials Chemistry and Catalysis	Y	Y	Y		Y	Y	Y
CHE-30050 Chemistry/Medicinal Chemistry Research Project						Y	Y
CHE-30051 Chemistry/Medicinal Chemistry Dissertation						Y	Y

b) Subject-specific skills:	Demonstrate skills in the safe-handling of chemical materials, taking into account their physical and chemical properties including any specific hazards associated with their use	Conduct risk assessments	Conduct documented laboratory procedures in synthetic and analytical work, in relation to both inorganic and organic systems	Monitor, by observation and measurement, chemical properties, events or changes, with systematic and reliable recording and documentation thereof	Operate standard chemical instrumentation	Interpret and explain the limits of accuracy of their own experimental data in terms of significance and underlying theory.
Principal forms of assessment for learning outcome	<i>Practical Exam, Practical Assessments, Laboratory</i>	<i>Practical Exam, Practical Assessments, Laboratory</i>	<i>Practical Exam, Practical Assessments, Laboratory</i>	<i>Practical Exam, Practical Assessments, Laboratory</i>	<i>Practical Exam, Practical Assessments, Laboratory</i>	<i>Practical Exam, Practical Assessments, Laboratory</i>

	<i>Diary</i>	<i>Diary</i>	<i>Diary</i>	<i>Diary</i>	<i>Diary</i>	<i>Diary</i>
CHE-10048 Practical and Professional Chemistry Skills 1	Y	Y	Y	Y	Y	
CHE-10049 Practical and Professional Chemistry Skills 2	Y	Y	Y	Y	Y	Y
CHE-20001 Organic Synthesis and Chirality	Y	Y	Y	Y	Y	
CHE-20030 Spectroscopy and Analytical Chemistry	Y	Y	Y	Y	Y	Y
CHE-20028 Physical inorganic Chemistry	Y	Y	Y	Y	Y	Y
CHE-20029 Radicals, Phases and Supramolecular Chemistry	Y	Y	Y	Y	Y	Y
CHE-20031 Structural Inorganic Chemistry	Y	Y	Y	Y	Y	Y
CHE-30032 Advanced Chemical Analysis			Y	Y	Y	Y
CHE-30050 Chemistry/Medicinal Chemistry Research Project	Y	Y	Y	Y	Y	Y

c) Intellectual Skills:	Demonstrate knowledge and understanding of essential chemistry-related facts, concepts, principles and theories.	Apply such knowledge and understanding to the solution of qualitative and quantitative problems, both familiar and unfamiliar.	Recognise and analyse problems and plan strategies for their solution.	Evaluate, interpret and synthesise chemical information and data.	Carry out practical application of theory using computer software and models.	Communicate scientific material and arguments.	Use information technology (IT) to manipulate and present chemical information and data.
<i>Principal forms of assessment for learning outcome</i>	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Laboratory Assessment</i>	<i>Essay, Group Project, Presentation, Coursework</i>	<i>Exam, Class Test, Coursework, Presentation, Poster, Dissertation</i>	<i>Presentation, Poster, Laboratory Report, Coursework</i>
CHE-10047 Chemical Concepts and Structure	Y	Y				Y	Y
CHE-10048 Practical and Professional Chemistry Skills 1	Y	Y				Y	Y

c) Intellectual Skills:	Demonstrate knowledge and understanding of essential chemistry-related facts, concepts, principles and theories.	Apply such knowledge and understanding to the solution of qualitative and quantitative problems, both familiar and unfamiliar.	Recognise and analyse problems and plan strategies for their solution.	Evaluate, interpret and synthesise chemical information and data.	Carry out practical application of theory using computer software and models.	Communicate scientific material and arguments.	Use information technology (IT) to manipulate and present chemical information and data.
Principal forms of assessment for learning outcome	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Coursework</i>	<i>Exam, Class Test, Laboratory Assessment</i>	<i>Essay, Group Project, Presentation, Coursework</i>	<i>Exam, Class Test, Coursework, Presentation, Poster, Dissertation</i>	<i>Presentation, Poster, Laboratory Report, Coursework</i>
CHE-10049 Practical and Professional Chemistry Skills 2	Y	Y	Y	Y	Y	Y	Y
CHE-10050 Chemical Properties and Reactions	Y	Y				Y	Y
CHE-20001 Organic Synthesis and Chirality	Y	Y	Y	Y		Y	Y
CHE-20030 Spectroscopy and Analytical Chemistry	Y	Y	Y	Y	Y	Y	Y
CHE-20028 Physical inorganic Chemistry	Y	Y	Y	Y	Y	Y	Y
CHE-20031 Structural Inorganic Chemistry	Y	Y	Y	Y	Y	Y	Y
CHE-30032 Advanced Chemical Analysis	Y	Y	Y	Y		Y	Y
CHE-30037 Topics in Chemistry	Y	Y				Y	Y
CHE-30038 Chemical Kinetics, Photochemistry and Inorganic Reaction Mechanisms	Y	Y	Y	Y	Y	Y	Y
CHE-30039 Advanced Organic Chemistry	Y	Y	Y	Y		Y	
CHE-30042 Inorganic, Physical and Solid State Chemistry	Y	Y	Y	Y	Y	Y	Y
CHE-30043 Materials Chemistry and Catalysis	Y	Y	Y	Y		Y	Y
CHE-30050 Chemistry/Medicinal Chemistry Research Project							

c) Intellectual Skills:	Demonstrate knowledge and understanding of essential chemistry-related facts, concepts, principles and theories.	Apply such knowledge and understanding to the solution of qualitative and quantitative problems, both familiar and unfamiliar.	Recognise and analyse problems and plan strategies for their solution.	Evaluate, interpret and synthesise chemical information and data.	Carry out practical application of theory using computer software and models.	Communicate scientific material and arguments.	Use information technology (IT) to manipulate and present chemical information and data.
Principal forms of assessment for learning outcome	Exam, Class Test, Coursework	Exam, Class Test, Coursework	Exam, Class Test, Coursework	Exam, Class Test, Laboratory Assessment	Essay, Group Project, Presentation, Coursework	Exam, Class Test, Coursework, Presentation, Poster, Dissertation	Presentation, Poster, Laboratory Report, Coursework
				Y	Y	Y	Y
CHE-30051 Chemistry/Medicinal Chemistry Dissertation				Y		Y	Y

d) Key or transferable skills, including employability skills:	Communicate information, ideas, problems, and solutions to both specialist and non-specialist audiences orally and in writing.	Demonstrate problem-solving skills, relating to qualitative and quantitative information.	Demonstrate numeracy and mathematical skills, including such aspects as error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation.	Retrieve and cite information, in relation to primary and secondary information sources, including retrieval of information through online computer searches.	Demonstrate skills in the use of information technology for presenting information and data.	Interact with other people and engage in team-working, time management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working.	Show development of skills and awareness necessary to seek out opportunities to undertake appropriate further training of a professional nature;
Principal forms of assessment for learning outcome	Class Test, Exam, Coursework	Class Test, Exam, Coursework	Class Test, Exam, Coursework	Class Test, Exam, Coursework	Class Test, Exam, Coursework	Class Test, Exam, Coursework	CV
CHE-10047 Chemical Concepts and Structure	Y		Y	Y	Y		
CHE-10048 Practical and Professional Chemistry Skills 1	Y		Y	Y	Y	Y	
CHE-10049 Practical and Professional Chemistry Skills 2	Y	Y	Y	Y	Y	Y	
CHE-10050 Chemical Properties and Reactions	Y		Y	Y	Y	Y	

d) Key or transferable skills, including employability skills:	Communicate information, ideas, problems, and solutions to both specialist and non-specialist audiences orally and in writing.	Demonstrate problem-solving skills, relating to qualitative and quantitative information.	Demonstrate numeracy and mathematical skills, including such aspects as error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation.	Retrieve and cite information, in relation to primary and secondary information sources, including retrieval of information through online computer searches.	Demonstrate skills in the use of information technology for presenting information and data.	Interact with other people and engage in team-working, time management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working.	Show development of skills and awareness necessary to seek out opportunities to undertake appropriate further training of a professional nature;
Principal forms of assessment for learning outcome	<i>Class Test, Exam, Coursework</i>	<i>Class Test, Exam, Coursework</i>	<i>Class Test, Exam, Coursework</i>	<i>Class Test, Exam, Coursework</i>	<i>Class Test, Exam, Coursework</i>	<i>Class Test, Exam, Coursework</i>	<i>CV</i>
CHE-20001 Organic Synthesis and Chirality	Y	Y		Y	Y		
CHE-20030 Spectroscopy and Analytical Chemistry	Y	Y	Y	Y	Y	Y	Y
CHE-20028 Physical inorganic Chemistry	Y	Y	Y	Y	Y	Y	
CHE-20031 Structural Inorganic Chemistry	Y	Y	Y	Y	Y	Y	
CHE-30032 Advanced Chemical Analysis	Y	Y	Y			Y	
CHE-30037 Topics in Chemistry	Y	Y		Y	Y		
CHE-30038 Chemical Kinetics, Photochemistry and Inorganic Reaction Mechanisms	Y	Y	Y	Y	Y		
CHE-30039 Advanced Organic Chemistry	Y	Y		Y			
CHE-30042 Inorganic, Physical and Solid State Chemistry	Y		Y	Y	Y	Y	
CHE-30043 Materials Chemistry and Catalysis	Y	Y	Y	Y	Y	Y	
CHE-30050 Chemistry/Medicinal Chemistry Research Project	Y	Y		Y	Y	Y	
CHE-30051 Chemistry/Medicinal Chemistry Dissertation	Y	Y		Y	Y	Y	