## 1. Admissions/ Management Information

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| **Title of the new programme – including any year abroad/ in industry variants See guidance on programme titles in Appendix V:** | | | |
| Chemistry, Green Principles and Sustainable Technology | | | |
| **Level of qualification** | | | |
| Please select: | Level 6 | | |
| **Please indicate if the programme is offered with any year abroad / in industry variants** | | **Year in Industry Please select** | No |
| | | **Year AbroadPlease select Y/N** | No |
| **This document applies to students who commenced the programme(s) in:** | | 2017-18 | |

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| **Awarding institution** | | **Teaching institution** | |
| University of York | | University of York | |
| **Department(s): Where more than one department is involved, indicate the lead department** | | **Board of Studies** | |
| Lead Department | Chemistry | Chemistry | |
| Other contributing | | | |

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| **Interim awards available Interim awards available on undergraduate programmes (subject to programme regulations) will normally be: Certificate of Higher Education (Level 4/Certificate),** |
| Certificate of Higher Education (Level 4/Certificate), Diploma of Higher Education (Level 5/Intermediate), Ordinary Degree. |

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| **UCAS code** | **Route code(existing programmes only)** |
| F190 | |

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| **Admissions criteria** |
| A-level in Chemistry or equivalent |

**Length and status of the programme(s) and mode(s) of study**

| Programme | Length (years) | Status (full-time/part-time) Please select | Start dates/months (if applicable – for programmes that have multiple intakes or start dates that differ from the usual academic year) | Mode | | |
|---|---|---|---|---|---|---|
| | | | | Face-to-face, campus-based | Distance learning | Other |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| BSc | 3 | Full-time | n/a | Please select Y/N | Yes | Please select Y/N | No | |

**Language(s) of study**

English

**Language(s) of assessment**

English

## 2. Programme accreditation by Professional, Statutory or Regulatory Bodies (PSRB)

**2.a. Is the programme recognised or accredited by a PSRB**

| Please Select Y/N: | Yes | if No move to section 3 |
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**2.b. Please provide details of any approval / accreditation event needed, including: timescales, the nature of the event, central support / information required:**

All existing programmes are accredited by the Royal Society of Chemistry (PSRB) and future design and development need to be considered within this accreditation framework (http://www.rsc.org/Education/courses-and-careers/accredited-courses/). Full accreditation for the new courses was obtained from the RSC in April 2017.

| **2.c. Does/ will approval or recognition require exceptions to University rules/practices?Please select Y/N** | No | if Yes, provide details |
|---|---|---|

N/A

**2.d. Any additional information (e.g. student attainment required to achieve accreditation) that are required by the PSRB should be recorded here**

N/A

## 3. Additional Professional or Vocational Standards

**Are there any additional requirements of accrediting bodies or PSRB or pre-requisite professional experience needed to study this programme?**

| Please Select Y/N: | No | if Yes, provide details |
|---|---|---|

N/A

## 4. Programme Leader

**4.a. Please name the programme leader for the year to which the programme design applies and any key members of staff responsible for designing, maintaining and overseeing the**

Nigel Lowe

**4.b. How are wider stakeholders such as professional bodies and employers involved in the design of the programme and in ongoing reflection on its effectiveness?**

The programme is monitored through initial accreditation and re-accreditation on a 5-year cycle through the Royal Society of Chemistry. Employer overview is achieved through the Department's External Advisory Group comprising academic and sector employer representatives. Advice from External Examiners has been solicited during preparation for approval.

## 5. Purpose and learning outcomes of the programme

**5.a. Statement of purpose for applicants to the programme**

Our degree has been carefully constructed to train the next generation of chemists, and will take students on a journey of exploration deep into the subject and up to the forefront of cutting-edge chemical research. In particular, we focus on showing applications of the fundamental chemistry, and providing practical training in a state-of-the-art facility. We undertake to develop the full range of skills, from communication and team-working to scientific literacy and problem solving, in a clear chemistry context. In this way, students will be ideally prepared for whatever comes next – be it a MSc/PhD position, research work in industry, a career in teaching, or other high-quality graduate-level work. This is reflected in our strong final destination statistics. The course is delivered with a strong focus on small group teaching and allows flexible choice between bachelors and masters programmes with the opportunity to specialise into three separate 'Chemistry with' courses in addition to Chemistry itself. 'Chemistry with' courses are defined by a distinct pathway through our specialised (rather than core) modules; all these specialised modules are optional modules on the generic Chemistry courses and the flexibility students have to switch between our named and generic courses (up to the end of Year 2, and provisional on achieving the 55% threshold required to access Year 3 MChem) means that any student can choose any specialised module provided they concomitantly change their course. The BSc 'Chemistry, Green Principles and Sustainable Technology' describes a 3-year course with defined, cognate specialised topics in Year 2 (20 credits) and Year 3 (20 credits) and a research project (40 credits) related to Green Principles and Sustainable Processes. The 3-year BSc, with its more even balance of chemistry-specific content and general training in transferable skills, is the natural choice to launch careers in a wide range of graduate professions including chemistry; the 4-year MChem qualification takes students to the research frontier of modern, interdisciplinary chemistry, and it is thought to be the natural choice for those anticipating an academic or commercial career in the subject.

**5.b.Programme Learning OutcomesPlease provide six to eight statements of what a graduate of the programme can be expected to do.**

| PLO | On successful completion of the programme, graduates will be able to: |
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| 1 | demonstrate learning and problem solving skills through the acquisition and application of a broad range of fundamental chemical principles and knowledge. |
| 2 | apply fundamental chemical principles and knowledge to the in-depth study of chemical science specialisms, relating to green chemistry principles and sustainable technology, and the solution of problems therein. |
| 3 | design and safely conduct chemical experiments through an effective risk assessment. Accurately document and record experiments to enable the effective synthesis of chemical compounds and analysis of physical measurements, of both a quantitative and qualitative nature. |
| 4 | interpret experimental data by using mathematical skills, chemical knowledge, information technology and scientific conventions. |
| 5 | effectively articulate scientific principles, experimental results and research findings in a way that is accessible to a variety of audiences through written, oral and other formats. |
| 6 | independently, or as part of a group, plan, design and conduct an open-ended investigative research project in an area related to green chemistry principles and sustainable technology to consolidate and extend knowledge and understanding of chemistry. |

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| **7** | demonstrate employability skills such as teamworking, commercial awareness, self-management and creativity and be equipped to work in a professional manner in their future careers in a range of areas including chemistry, green chemistry and sustainable technology. |
| **8** | |

**5.c. Programme Learning Outcome for year in industry (where applicable)For programmes which lead to the title 'with a Year in Industry' – typically involving an additional year – please**

N/A

**5.d. Programme Learning Outcome for year abroad programmes (where applicable)For programmes which lead to the title 'with a Year Abroad' – typically involving an additional year –**

N/A

**5.e. Explanation of the choice of Programme Learning OutcomesPlease explain your rationale for choosing these PLOs in a statement that can be used for students (such as in a student**

i) Why the PLOs are considered ambitious or stretching?

The PLOs describe a journey from consolidating basic chemical principles at the start of the course through to contributing to cutting-edge research in core and interdisciplinary chemistry at the end. The range of formative learning experiences in lecture, laboratory, workshop and tutorial, allied to independent work in individual and group settings, provide a structured training to meet the aspiration of the PLOs. The summative assessment points, including formal examinations, assessed presentations and extended research project, allow the achievement of the knowledge, skills and attributes of the PLOs to be demonstrated.

ii) The ways in which these outcomes are distinctive or particularly advantageous to the student:

The outcomes are advantageous as they ensure that the research-led teaching of chemical science is integrated with the development of laboratory, problem solving and employability skills. This will ensure that the York Chemist has all the technical and employability skills needed in his/her future career regardless of whether this career lies inside or outside the chemical sciences. The PLOs remind students that the course provides an education through chemistry as well as an education in chemistry. The Year 3 project work (PLO6) gives the BSc some element of preparation for research careers in chemistry, though not as extensively as the 4-year MChem, and demonstrates other skills with relevance to a range of future emplyment.

iii) How the programme learning outcomes develop students' digital literacy and use technology-enhanced learning to achieve the discipline and pedagogic goals which support active student learning through

Chemistry students develop effective communication and related skills through regular application of digital literacy skills. In Year 1, students will give an oral presentation and prepare a team poster on a practical project involving presentation software and specialist molecular drawing packages including the use of molecular graphics with the Protein Data Bank (PDB). They also carry out a public communication of science exercise, producing a popular science article or YouTube video aimed at explaining an application of polymer science. Some student videos have had thousands of views globally and been highlighted by international chemistry magazines. In Year 2, communication skills are enhanced by the smartphone video recording and sharing of group presentations and feedback thereon. Students will use specialist software and databases used to visualise proteins and to calculate properties of small molecules. Year 3 focuses on scientific literacy, and develops the ability to write scientific reports with effective use of search tools and databases to access reserach literature culminating in the BSc project report. Computational approaches continue to include applications of quantum chemistry. Data manipulation and analysis in laboratory work frequently involve the use of scientific software, with appropriate training. The Department makes near comprehensive use of lecture recording, and all modules are supported by material on the VLE including screencasts, external links and quizzes, with pockets of use of 'flipping' and 'clicker' technology. The VLE is exploited variously for online workflow management including submission of summative assessments.

iv) How the PLOs support and enhance the students' employability (for example, opportunities for students to apply their learning in a real world setting)?
http://www.york.ac.uk/about/departments/support-and-admin/careers/staff/

At the start of Year 1, students take part in 'The Happening' – a fun, industrially-led event, in which they get to know other students as they work in teams to solve a real-world chemical problem. In Year 1, they also carry out Integrated Chemistry Team Practical Projects in which the contents of a 'typical' night out are analysed – junk food, alcohol and a 'morning-after' coffee, to determine levels of fat, protein, alcohol, sugar and caffeine. This develops research, time-management and team-working skills. In Year 2, these ideas of team-working are developed much further in the 'Group Exercises', in which they work in smaller teams in a mock industrial company to solve a real-world chemistry problem. The suite of exercises covers various aspects of the

v) Consultation with Careers

The Department has a dedicated Careers Liaison Officer who works closely with the Industrial Placement Coordinator to circulate information and opportunities to students and to deliver training through CV Writing and Interview Skill workshops. These are delivered in collaboration with staff from Careers. The new course will retain the current links to, and involvement of, Careers from the current course. For this reason, we have not consulted directly with the Careers service during the planning of the new course.

vi) How will students who need additional support for academic and transferable skills be identified and supported by the Department?

The Department has two principal mechanisms for identifying students who require additional support. Firstly, any student whose assessment results are either poor or failing are identified by the appropriate examinations officers and then written to by the Chair of the Board of Studies and counselled by their supervisors. These students will meet with the Student Welfare Officer and their supervisors and a personal learning plan developed. Secondly, the need for individual support is identified through our college teaching system where progress is monitored weekly. Student supervisors review progress at the end of term meetings and any actions identified. All new students are assigned a mentor who is studying in a higher year in the same chemistry college as them. These mentors can provide advice on a range of social issues, such as preparing for arrival at university, settling into York or finding good student houses in the second year, as well as on academic issues such as option module choices. Furthermore, there are centrally-timetabled revision classes, run by the mentors, to provide academic peer-to-peer support to the benefit of mentees and mentors. This scheme demonstrates how our chemistry college system helps to break down barriers and enables students to make personal connections across a large chemistry department.

vii) How is teaching informed and led by research in the department/ centre/ University?

The Department of Chemistry has a research-led teaching philosophy. Although most of the core material in Years 1 and 2 is common in UK Chemistry Departments, in Year 3 material aligns with the research specialisms in the Departments. Furthermore, the option module structure has been specifically designed to reflect the research expertise in the Department with courses on environmental, **sustainable,** analytical and biological/medicinal chemistry as well as options on mechanistic chemistry and advanced spectroscopy.

**5.f. Stage-level progressionPlease complete the table below, to summarise students' progressive development towards the achievement of PLOs, in terms of the characteristics that you**

**Stage 0 (if your programme has a Foundation year, use the toggles to the left to show the hidden rows)**

**Stage 1**

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| On progression from the first year (Stage 1), students will be able to: | *demonstrate an understanding of core chemical principles that will underpin studies at subsequent stages (PLO1). By working through guided activities in our laboratories, students will also have acquired key laboratory skills for the synthesis and analysis of chemical compounds (PLO3) and had experience of acquiring, recording, processing and analysing physical data (PLO4). Students will also have developed the key quantitative, mathematical and IT skills needed for further study (PLO4) through 'Skills for Chemists' and self-directed, independent learning including, for example, the use of Excel in linear regression analysis. Students will begin to acquire invesitgative (PLO6) and communication (PLO5) skills through the ICP lab-based activity, and communication skills in a range of media developed in the 'Macromolecules' self-study package. Personal skills (PLO7) are developed through small-group teaching environments, through group work in laboratories and 'Becoming a Professional Chemist' presentations and through 'The Happening' activity.* |

| PLO 1 | PLO 2 | PLO 3 | PLO 4 | PLO 5 | PLO 6 | PLO 7 | PLO 8 |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Individual statements* | | | | | | | |

| **Stage 2** | |
|---|---|
| On progression from the second year (Stage 2), students will be able to: | *demonstrate an understanding of chemical principles at an intermediate level and how they may be applied to solve unseen, complex problems that begin to challenge basic theories (PLO1). Through the teaching of 20 credits of option modules, they will gain a more detailed knowledge of aspects of chemical science specialisms with the added complexity of interdisciplinarity (PLO2). The Advanced Synthesis laboratory course will develop techniques necessary to handle sensitive and potentially hazardous materials in a controlled manner (PLO3) whilst physical chemistry practical work brings a deeper consideration of data acquisition and analysis involving the use of software in processing (including the use of Excel in non-linear regression analysis) and presentation (PLO4, PLO5) and simulation of experiments to inform experimental design in Hammett Lab (PLO6). Awareness and practice of employability skills with a view to developing future career paths (PLO7) continue to be developed through tutorial and workshop teaching and by collaboration in laboratory work. Intermediate levels of written and oral communication (PLO5) and teamworking skills (PLO7) are developed through the Year 2 Group Exercises and the focus on employability (PLO7) sharpened through Interview Skills and CV Writing workshops. Additionally, at graduation, BSc students will demonstrate an understanding of complex chemical principles, recent developments and applications in the field from a research-led perspective (PLO1). Through the study of a further 20 credits of Year 3 option modules, students will advance their knowledge of science specialisms (PLO2) engaging with the forefront through research literature and problem solving. Students will learn advanced laboratory and research techniques (PLO3) through research projects involving the design and implementation of novel experiments which require direct engagement with the primary chemistry literature (PLO6) and potentially advanced analysis of data (PLO4) from a wide range of instrumental analytical techniques. Presentation (written, oral) skills (PLO5) will have been enhanced through the reporting of BSc projects, and engagement with experimental design and the interpretation of research literature further developed (PLO6). Collaborative skills and interpersonal communication skills continue to be developed through tutorial/workshop teaching and especially BSc project work that can be independent or group-based investigative chemistry research projects or science communication projects involving local schools or public outreach events (PLO7).* |

| PLO 1 | PLO 2 | PLO 3 | PLO 4 | PLO 5 | PLO 6 | PLO 7 | PLO 8 |
|---|---|---|---|---|---|---|---|
| *Individual statements* | | | | | | | |

| Stage 3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| (For Integrated Masters) On progression from the third year (Stage 3), students will be able to: | | | | *Global statement* | | | |
| PLO 1 | PLO 2 | PLO 3 | PLO 4 | PLO 5 | PLO 6 | PLO 7 | PLO 8 |
| *Individual statements* | | | | | | | |

**5.g. Other features of the programme**

i) Distance Learning

| | | |
|---|---|---|
| Please Select Y/N: | No | if Yes, you are required to submit to Teaching Committee:<br>Checklist for Distance Learning Programmes |

ii) Involvement of partner organisations

| | | |
|---|---|---|
| Please Select Y/N: | No | if Yes, outline the nature of their involvement (such as contributions to teaching, placement provision). Where appropriate, see also the:<br>University guidance on collaborative provision |

N/A

iii) Internationalisation/ globalisation

The Department regularly recruits a small but significant number of undergraduates from around the world. The make-up of our academic staff and especially our large international postgraduate cohort create an appropriately supportive atmosphere. The postgraduate-led 'Chemical Interactions' society runs a number of events during the year to which all staff and student members are invited and these are often run along internationally-themed lines. We regularly host Erasmus students within Chemistry modules and our Yr Abroad scheme (MChem only) places ca. 15 Year 4 students annually in partner universities around the world.

iv) Inclusivity

This refers to the protected characteristics and duties on the University outlined in the Equality Act 2010

With over 10 years of accreditation at Gold level under the Athena SWAN scheme, the Department is justifiably proud of its record in this area. In addition to a Student Welfare Officer, the Department has identified a Disability Officer, a Women's Officer, a Study Skills Officer and a Harassment Officer. Additionally, a number of staff and students have contributed articles and participated in events focusing on LGBT contrbutions to the discipline. We maintain a quiet room/prayer room for the use of staff and students. An Equality & Diversity session on inclusivity/unconscious bias is part of the Year 1 'Becoming a Professional Chemist' activity emphasising its importance to teamworking in the modern workplace. The Department participates actively in the Widening Participation initiative through targeted admission and outreach activities involving schools not traditionally supplying York with Chemistry undergraduates.

v) Summer term weeks 8-10

This period is home to our ICP laboratory-based group research projects at the end of Year 1 and to the Group Exercise and Career-focused activities of Year 2. Currently, there are no timetabled activities in this slot at the end of Year 3 prior to graduation.

## 6. Reference points and programme regulations

**6.a. Relevant Quality Assurance Agency benchmark statement(s) and other relevant external reference pointsPlease state relevant reference points consulted (e.g. Framework for Higher**

https://www.york.ac.uk/media/staffhome/learningandteaching/documents/policies/Framework%20for%20Programme%20Design%20-%20UG.pdf
http://www.qaa.ac.uk/assuring-standards-and-quality/the-quality-code/subject-benchmark-statements
http://www.qaa.ac.uk/publications/information-and-guidance/publication?PubID=2843#.VthM1fmLS70

The PLOs were designed to capture the spirit of York Pedagogy whilst retaining the scope of the national subject benchmark statements for chemistry and, for accreditation purposes, the requirements for breadth and depth of coverage specified by the Royal Society of Chemistry.

**6.b. University award regulations**

The University's award and assessment regulations apply to all programmes: any exceptions that relate to this programme are approved by University Teaching Committee and are recorded at the end of this

**6.c. Are students on the programme permitted to take elective modules?**

(See: https://www.york.ac.uk/media/staffhome/learningandteaching/documents/policies/Framework%20for%20Programme%20Design%20-%20UG.pdf)

| Please Select Y/N: | Yes |
|---|---|

## 7. Programme Structure

**7.a. Module Structure and Summative Assessment Map**

**Stage 0 (if you have modules for Stage 0, use the toggles to the left to show the hidden rows)**

**Stage 1**

| Credits | Module | | Autumn Term | | | | | | | | | | Spring Term | | | | | | | | | | Summer Term | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Code | Title | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 30 | CHE00015C | Core 1: Fundamentals of Chemistry | S | | | | | | | | A | | EA | | | | | | | | | | | | | | | | | | | |
| 30 | CHE00016C | Core 2: Chemical Properties & Analysis | | | | | | | | | | | S | | | | | A | | | | | | | | | | EA | | | | |
| 30 | CHE00017C | Core 3: Molecules & Reactions | | | | | | | | | | | S | | | | | | | | | | | A | | | | EA | | | | |
| 20 | CHE00018C | Year 1 Practical Chemistry | S | | | | | | | | | A | | | | | | | | | | A | | A | A | A | | | | A | A | EA |
| 10 | CHE00019C | Skills for Chemists | S | | | | | | | | | A | A | | | | | | | | | | | | | | | EA | | | | |
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**Stage 2**

| Credits | Module | | Autumn Term | | | | | | | | | | Spring Term | | | | | | | | | | EA | | | | | | | | | |
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| | Code | Title | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 20 | CHE00016I | Core 4a: Molecules in Action | S | | | | | | | | | | EA | | | | | | | | | | | | | | | | | | | |
| 20 | CHE00017I | Core 4b: Theory, Analysis & Mechanisms | S | | | | | | A | | | | EA | | | | | | | | | | | | | | | | | | | |

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| 30 | CHE00018I | Core 5: Reactivity | | | | | | | | | | | S | | | | | | | | | | A | | | | | A | | | A | E |
| 30 | CHE00019I | Core 6: Spectroscopy & Chemistry | | | | | | | | | | | S | | | | | | | | | | A | | | | | EA | | | | |
| 20 | CHE00024I | GCS: Green Chemistry and Sustainable | | | | | | | | | | | S | | | | | | | | | A | | | | | | EA | | | | |
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**Stage 3**

| Credits | Module | | Autumn Term | | | | | | | | | | Spring Term | | | | | | | | | | Summer Term | | | | | | | | | |
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| | Code | Title | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 20 | CHE00026H | Core 7: Advanced Concepts | S | | | | | | | | | | | | | | | | | | A | | | | | | | EA | | | | |
| 20 | CHE00027H | Core 8: Synthesis & Structures | S | | | | | | | | | | | | | | A | | | | | | | | | | | EA | | | | |
| 20 | CHE00028H | Core 9: Compounds & Materials | S | | | | | | | | | | | | | | | | | | | | | | | | | EA | | | | |
| 40 | CHE00033H | BSc Research Project | S | | | | | | | | | | | | | | | | | | | | EA | | | | | | | | | |
| 20 | CHE00032H | CGT: Catalysis with Green Technologies | S | | | | | | A | | | | EA | | | | | | | | | | | | | | | | | | | |
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**Stage 4**

| Credits | Module | | Autumn Term | | | | | | | | | | Spring Term | | | | | | | | | | Summer Term | | | | | | | | | |
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| | Code | Title | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
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7.b. Optional module listsIf the programme requires students to select option modules from specific lists these lists should be provided below. If you need more space, use the toggles on the

| Option List A | Option List B | Option List C | Option List D | Option List E | Option List F | Option List G | Option List H |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**7.c. Explanation of the programme and assessment designThe statements should be in a form that can be used for students (such as in a student handbook). It should make clear to**

i) Contact with staff

Students meet our internationally recognised researchers through lectures, small group tutorials/workshops and laboratory sessions. Lectures deliver information (PLO1,2) but much more with demonstrations, interactive problem solving (e.g. with access to model kits) and illustrative examples from academic and "real-world" contexts. Some staff use 'flipped' material and 'clickers' to enhance interactivity. Typical support materials used include quizzes, extra links and screen-casts on the VLE, with links to Twitter and YouTube. Small group learning through our teaching college system provides supportive teaching through a mixture of tutorials (groups of 5 students) and workshops (groups of 20-25). These sessions tackle conceptual difficulties and challenge students to construct arguments and explain ideas to each other (PLO5,7). Written pre-work helps students assess their understanding and writing skills, and develop problem solving skills (PLO1,5). Laboratory work is supported by academic and technical staff as well as postgraduates who teach, (PGWTs). Guidance is focused on developing safe working practices, good laboratory protocols, effective manipulations of equipment and instrumentation, and a deeper understanding of the skills needed to analyse data and to design investigations in preparation for research (PLO3,4,6).

ii) Students' independent study and formative work

Please outline key features of how independent study and formative work has been designed to support the progressive achievement of the programme learning outcomes. (For example, the use of online resources, which may also incorporate formative feedback; opportunities for further learning from work-based placements).

The programme has been designed with our small-group college teaching system at its core. It is our belief (and comprehensively evidenced through student evaluations) that these activities are central to student learning and skill development. The majority of students' independent work and formative assessment is associated with small group teaching (PLO1,2,5,7). Laboratory work in Year 1 focuses on developing laboratory skills. Weekly assessment is formative with occasional summative assessments being used to evaluate levels of competence. The focus of assessment will shift from rewarding attendance and report submission in favour of directly assisting the acquisition and demonstration of key laboratory skills (PLO3-7). Taught material in Year 4 is delivered as blended learning for all students whether in York, on the Year in Industry or Year Abroad programmes. This approach prepares students for career development, self-study and PDP consistent with the postgraduate level where higher learning is often divorced from formal lecture programmes (PLO7).

iii) Summative Assessment

Please outline how summative assessment within and across modules has been designed to support and evidence the progressive achievement of the programme learning outcomes. (For example, the use of different assessment methods at the 'introduction' stage compared to those used to evaluate deeper learning through the application of skills and knowledge later in the programme).

Summative assessment through exams remains key to testing PLOs 1 & 2 and builds directly on the formative assessment of work submitted in connection with supporting tutorials and workshops. Limited past papers are made available to reinforce exam preparation, and feedback and outline answers to all exams are provided to consolidate learning at the end of modules. The Department makes use of various forms of continuous assessment that reduce the burden of formal exams and allow complementary skills to be developed and assessed. Continuous assessment types include open-book and 'closed' assessed workshops (PLO1,2,4), assessed presentations and/or written assignments (PLO1,2,5), including group work (PLO1,2,7), and project-type work (PLO1,2,4,6). Practical skills are summatively assessed through measures of in-lab competence (PLO3) and related post-lab (written) assignments (PLO4,5), and project work through reports (PLO3,4,5,6) and group exercises/presentations/posters/assorted multimedia output (PLO4,5,7).

## 8. Contribution of staff

8.a. Please outline (where applicable) the contribution of Postgraduate who Teach (PGWTs) to the programme. The programme must comply with the University Policy on PGWTs (http://www.york.ac.

PGWTs are principally involved in support and delivery of laboratory teaching. They play a direct role in teaching aspects of experimental and instrumental technique to students and advising them on data collection and interpretation particularly in the area of spectroscopy. This is achieved through a combination of participation in teaching sessions, formative assessment and summative assessment based on closely defined, moderated mark schemes. PGWTs are encouraged to mentor students by making links between their own research and the activities students meet in a more didactic setting. They also play a key role in helping to maintain high H&S standards across all years and advising on aspects of experimental design for project execution in Yr 3.

8.b. If casual teaching staff and/ or staff external to the University will be involved in delivery of the programme, please outline how they will contribute and how the programme team will

N/A

## 9. Study Abroad (including Year Abroad as an additional year and replacement year)

Students on all programmes may apply to spend Stage 2 on the University-wide North America/ Asia/ Australia student exchange programme. Acceptance onto the programme is on a

https://www.york.ac.uk/staff/teaching/procedure/programmes/design/

| Please Select Y/N: | No | if No move to section 10 |
|---|---|---|

**9.a.Will the department need to agree new/ additional study abroad partnerships in order to offer this programme?**

| Please Select Y/N: | No | |
|---|---|---|

**9.b.Please briefly detail the nature of the study abroad (tick and/ or provide additional detail as appropriate):**

| i) Is it an additional/ replacement year? | replacement year | |
|---|---|---|

Additional details:

N/A

| ii) Is it compulsory/ optional element of the programme? (please select) | optional element | |
|---|---|---|

Additional details:

N/A

| iii) If it is an additional year, is it direct entry/ transfer in? (please select) | | |
|---|---|---|

Additional details:

N/A

iv) How will students taking Study Abroad be assessed?

N/A

| v) Can it be reassessed? (please select Y/N) | Yes | Explain how: |
|---|---|---|

Explain how:

N/A

vi) If a student fails the Study Abroad which programme will they transfer onto or will they leave the University?

N/A

vii) How will the programme team manage the risks associated with offering Placement Learning and Study Abroad?

N/A

## 10. Work-based learning (including years in industry)

It is strongly recommended that departments that do not already have an established work-based learning programme should contact Careers for help and advice.

**10.a. Does the programme include the opportunity to undertake work-based learning/ placements, including years in industry? All such programmes must comply with the policy on work-**
https://www.york.ac.uk/staff/teaching/procedure/programmes/design/

This should include the signing of learning agreements between the student, department and work-place

| Please Select Y/N: | No | if No move to section 11 |
|---|---|---|

i) Is it a compulsory or optional element of the programme?

| Please Select: | optional | |
|---|---|---|

ii) Briefly detail the nature of the work-based learning:

N/A

| iii) Who will be responsible for sourcing and arranging the placement: (pleas | Student | |
|---|---|---|

Additional details:

| |
|---|
| N/A |
| iv) Is the work-based learning an additional year in industry? |
| Please Select Y/N: \| No \| if No move to section 10.b. |
| v) Is it direct entry/ transfer in? (please select) \| \| |
| Additional details: |
| N/A |
| vi) What will be the criteria for the selection of locations for work-based learning? |
| N/A |
| vii) How will the department ensure a sufficient number of work-based learning opportunities? |
| N/A |
| viii) How will the department make work-based learning providers aware of their responsibilities? |
| N/A |
| ix) How will the department make students aware of their rights and responsibilities? |
| N/A |
| x) How will students taking a year in industry be assessed? |
| N/A |
| xi) Can it be reassessed? |

| Please Select Y/N: | | |
|---|---|---|

if yes, please explain how:

N/A

xii) How will the programme team manage the risks associated with offering a year in industry?

N/A

**10.b. For programmes involving other forms of work-based learning other to years in industryIt is strongly recommended that departments that do not already have an established work-based le**

All such programmes must comply with the policy on work-based learning and placements

https://www.york.ac.uk/staff/teaching/procedure/programmes/design/

This should include the signing of learning agreements between the student, department and work-place

i) What will be the criteria for the selection of locations for work-based learning?

N/A

ii) How will the department ensure a sufficient number of work-based learning opportunities?

N/A

iii) How will the department make work-based learning providers aware of their responsibilities?

N/A

iv) How will the department make students aware of their rights and responsibilities?

N/A

v) How will students undertaking work-based learning be assessed?

N/A

vi) Can it be reassessed?

| Please Select Y/N: | Yes | |
|---|---|---|

if yes, please explain how:

N/A

**10.c. Support for students on work-based learning**

i) How will students be briefed prior to, and de-briefed after, work-based learning?

N/A

ii) Who in the department will be responsible for overseeing students whilst they are undertaking work-based learning?

N/A

iii) By what means (e.g. work-based mentors, VLE, ongoing communication with the department) will students be supported when undertaking work-based learning?

N/A

iv) How will any work-based mentors be trained and utilised?

N/A

v) If mentors/ employers are to be involved in assessment how will they trained, supported and monitored?

N/A

vi) How will work-based learning be monitored and reviewed?

N/A

## Careers & Placements - 'With Placement Year' programmes

Students on all undergraduate and integrated masters programmes may apply to spend their third year on a work-based placement facilitated by Careers & Placements. Such students would return to their studies at Stage 3 in the following year, thus lengthening their programme by a year. Successful completion of the placement year and associated assessment allows this to be recognised in programme title, which is amended to include 'with Placement Year' (e.g. BA in XYZ with Placement Year'). The Placement Year also adds a Programme Learning Outcome, concerning employability. (See Careers & Placements for details).

In exceptional circumstances, UTC may approve an exemption from the 'Placement Year' initiative. This is usually granted only for compelling reasons concerning accreditation; if the Department already has a Year in Industry with criteria sufficiently generic so as to allow the same range of placements; or if the programme is less than three years in length.

| | | |
|---|---|---|
| Programme excluded from Placement Year? | No | If yes, what are the reasons for this exemption: |

## 11. Additional information

**11.a. Recognition of prior learning / credit transferWill this programme involve any exemptions from the University Policy and Procedures on Credit Transfer and the Recognition of Prior**

| | | |
|---|---|---|
| Please Select Y/N: | No | |

**11.b. Continuing Professional Development**

| | | |
|---|---|---|
| Please Select Y/N: | No | |

if yes, please explain how:

**11.c. Ethical considerationsDoes the programme give rise to any ethical issues, which might warrant wider consideration within the University? (E.g. will the programme receive**

| | | |
|---|---|---|
| Please Select Y/N: | No | if yes, please provide brief details to be referred onto the appropriate body within the University: |

if yes, please provide brief details to be referred onto the appropriate body within the University:

**11.d. Student involvement in programme developmentHow were current and/ or former students involved in the development of this proposal/ programme?**

| |
|---|
| Student representation at DTC has allowed current students to share their thoughts about the design of the new course. This consultation process is ongoing given the recent appointment of new student reps and the re-drafting of PDD documentation. Initial responses (as minuted at DTC 19/10/16) include recognition of the benefits of rationlising content into fewer modules with the potential to reduce assessment-related workload for staff and students. We have previously monitored regular discussion of the challenge posed by multiple assessment points at our Staff Student Forum in coming to a decision about moving to fewer, larger modules. (This idea was also raised through a recent External Review and by Periodic Review; York Pedagogy has provided a route to rationalisation) We have monitored module and course (NSS) feedback from students to identify and retain popular aspects of our courses. |
| **11.e. External Examiners** |
| i) Will any additional external examiners need to be appointed for the programme? |
| Please Select Y/N: No |
| ii) Does the programme team envisage any difficulties in obtaining appropriate external examiners? |
| Please Select Y/N: No |
| iii) Will any external examiners be drawn from outside academia? (please select Y/N) — No |
| Additional details: |
| N/A |
| **11.f. Transfers out of or into the programme** |
| ii) Transfers into the programme will be possible? (please select Y/N) — Yes |
| Additional details: |
| Students registered for the MChem programmes are entitled to transfer into BSc Chemistry up to the start of Year 3. |
| ii) Transfers out of the programme will be possible? (please select Y/N) — Yes |
| Additional details: |
| Students registered on the BSc programme are entitled to transfer into other named BSc programmes at any stage provided they have studied the correct options at the appropriate points. They can transfer to the MChem course (and named MChem courses with the appropriate option) upto the start of Year 3 provided they achieve the 55% threshold at the end of Yr2. |
| **12. Exceptions to University Award Regulations approved by University Teaching Committee** |
| ExceptionPlease detail any exceptions to University Award Regulations approved by UTC — **Date approved** |
| n/a |
| **Quality and Standards** |
| The University has a framework in place to ensure that the standards of its programmes are maintained, and the quality of the learning experience is enhanced.<br>More information can be obtained from the Academic Support Office:<br>http://www.york.ac.uk/about/departments/support-and-admin/academic-support/staff/#quality |
| **Date on which this programme information was updated:** |

| |
|---|
| 30/08/2019 |
| **Departmental web page:** |
| https://www.york.ac.uk/chemistry/ |
| **Please note:The information above provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and** |

## Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in

| Stage | Module | | Programme Learning Outcomes | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 |
| | | | demonstrate | apply | design and safely | interpret | effectively | independently, | demonstrate | |
| **Stage 1** | Core 1: Fundamentals of Chemistry | Progress towards | Developing an | | | Data analysis | Development of | | Developing | |
| | | By working on | Engaging with | | | Data analysis in | Preparation of | | Preparing for and | |
| **Stage 1** | Core 2: Chemical Properties & Analysis | Progress towards | Developing an | | | Data analysis | Development of | | Developing | |
| | | By working on | Engaging with | | | Data analysis in | Preparation of | | Preparing for and | |
| **Stage 1** | Core 3: Molecules & Reactions | Progress towards | Developing an | | | Data analysis | Development of | Literature | Developing | |
| | | By working on | Engaging with | | | Spectral data | Preparation of | Macromolecules | Preparing for and | |
| **Stage 1** | Practical Chemistry | Progress towards | | | Development of | Data analysis | Development of | Develop | Developing | |
| | | By working on | | | Laboratory | Data analysis | Preparing outline | Use of databases | Group | |
| **Stage 1** | Skills for Chemists | Progress towards | Key biological, | | | Learning key | Communication | Develop | Developing | |
| | | By working on | Building a | | | Mathematics for | The Happening - | Becoming a | The Happening - | |
| **Stage 2** | Core 4a: Molecules in Action | Progress towards PLO | Developing an understanding of organic, biological and physical chemistry at an intermediate level. | | Develop intermediate skills required for synthetic inorganic and organic chemistry including handling air and water-sensitive materials and pyrophorics. Working safely in the laboratory | Data analysis | Development of written and oral presentation skills. | | Developing professional modes of behaviour, with respect to sharing resources, learning and adhering to standard laboratory practice, and working well with others | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | Engaging with lectures and learning support activities on Safety, Biomolecules in Action, Retrosynthetic analysis, Organic synthesis with enolate equivalents, Solution and mixtures. Applications to unseen problems in tutorial and workshops. Formative assessment is through small-group tutorial/worksho p assignments in each topic and summative assessment through an online assessment (Safety) and a closed-book examination (January). | | Experiments within the Advanced synthesis practical. Safety lecture course and assessment highlights good working practice. Core and advanced laboratory skills are formatively assessed during the Skills exercise then summatively assessed on a weekly basis principally through in-lab assessments during the first half of term. | Analysis of data within Advanced synthesis practical, including use of specialist software (NMR processing). Introduction to multinuclear NMR and vib/rotn spectroscopy. Formative assessment through optional post-lab tasks. Summative assessment through selected assessed post-lab tasks. Formative assessment through related tutorial and workshop problem-solving activities. | Preparation of written tutorial and workshop exercises. Engagement in tutorials and workshops. Formative assessment of articulation of intermediate scientific concepts in writing and oral presentation. Summative assessment through related examination. Experiments within the Advanced synthesis practical; summative assessment of the writing of journal-style synthetic protocols and interpretation and presentation of spectroscopic data building on | | Working on practical experiments individually, in pairs, and in small groups. Implicit assessment through summative assessment through laboratory reports. | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Stage 2** | Core 4b: Theory, Analysis & Mechanisms | Progress towards PLO | Developing an understanding of inorganic, physical and analytical chemistry at an intermediate level. | | Develop intermediate skills required for synthetic inorganic and organic chemistry including handling air and water-sensitive materials and pyrophorics. Working safely in the laboratory. | Development of key mathematical skills and data analysis | Development of written and oral presentation skills. | | Developing professional modes of behaviour, with respect to sharing resources, learning and adhering to standard laboratory practice, and working well with others | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | Engaging with lectures and learning support activities on Mass Spectrometry, Quantum Mechanics, Symmetry and Group Theory, Metal-ligand Bonding & Inorganic Mechanisms, Matrices & Determinants. Applications to unseen problems in tutorial and workshops. | | Experiments within the Advanced synthesis practical. Core and advanced laboratory skills are formatively assessed during the Skills exercise then summatively assessed on a weekly basis principally through in-lab assessments during the second half of term. | Analysis of data within Advanced synthesis practical esp. spectral data inc. NMR. Formative assessment through Skills training and optional post-lab tasks. Summative assessment through selected assessed post-lab tasks. Matrices and Determinants course; formative assessment through workshops and summative assessment through final assessed workshop. | Preparation of written tutorial and workshop exercises. Engagement in tutorials and workshops. Formative assessment of articulation of intermediate scientific concepts in writing and oral presentation. Experiments within the Advanced synthesis practical; summative assessment of written descriptions of key laboratory techniques and NMR data presentation; optional formative tasks in writing of journal-style synthetic protocols and | | Working on practical experiments individually, in pairs, and in small groups. Implicit assessment through summative assessment through laboratory reports. | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Stage 2** | Core 5: Reactivity | Progress towards PLO | Developing an understanding at intermediate level of key methods for structural analysis and their physical basis, and the reactivity of organic molecules dependent on substitution patterns and complexation to metals. | | Record experimental data. Use simulation software to aid experimental design. | Data analysis | Development of written and oral presentation skills. | | Developing professional modes of behaviour, with respect to sharing resources, learning and adhering to standard laboratory practice, and working well with others. Team working and presentations in a business context. Commercial awareness and creativity in chemical solutions to real-world business exercises. | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | Engaging with lectures and learning support activities on Organometallic chemistry, Physical organic chemistry, Heteroaromatic Chemistry, Synthesis of biological molecules, Physical methods for structure determination and Electrochemistry. Applications to unseen problems in tutorial and workshops. Formative assessment is through small-group tutorial/worksho p assignments in each topic and summative assessment through an open-book assessment (Physical | | Physical organic chemistry laboratory and related Hammett Lab software simulation. Summative assessment by written report of the use of Hammett Lab simulation to model substituent effects on the rate of reaction. | Physical organic chemistry laboratory. Analysis of reaction mechanism by exploration of reaction kinetics including introduction to non-linear regression analysis. Summative assessment through lab reports. Formative assessment through related tutorial problem-solving activities. | Preparation of written tutorial and workshop exercises. Engagement in tutorials and workshops. Formative assessment of articulation of intermediate scientific concepts in writing and oral presentation. Physical organic chemistry laboratory; summatively assessed long-format laboratory reports building on report-writing of Physical practicals (Core 6). Presentation skills formatively assessed in first Group Exercise team presentation (video recorded) and summatively | | Working on practical experiments individually, in pairs, and in small groups. Implicit assessment through summative assessment through laboratory reports. Working on problems through the Group Exercise including peer assessment of teamwork in industrially-derived case studies. Teamwork, commercial awareness and creativity and communication skills summatively assessed though team minutes, executive summary and | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Stage 2** | Core 6: Spectroscopy & Chemistry | Progress towards PLO | Developing an understanding at intermediate level of key spectroscopic techniques and their orbital interpretation with applications in organic chemistry and catalysis. | | Design and perform experiments | Data analysis | Development of written and oral presentation skills. | | Developing professional modes of behaviour, with respect to sharing resources, learning and adhering to standard laboratory practice, and working well with others | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | Engaging with lectures and learning support activities on Excited states and photochemistry, Applications of NMR spectroscopy in organic chemistry, Photoelectron spectroscopy and molecular orbital theory, Vibrational spectroscopy, Catalysis, Fundamentals of Atmospheric Chemistry, and Fundamentals of Magnetic Resonance. Applications to unseen problems in tutorial and workshops. Formative assessment is through small-group tutorial/worksho | | Physical chemistry practical | Physical chemistry practical including use of specialist software (Gaussian); self-guided study package with summative assessment via calculation of optimised molecular structures and their characteristic vibrational frequencies | Preparation of written tutorial and workshop exercises. Engagement in tutorials and workshops. Formative assessment of articulation of intermediate scientific concepts in writing and oral presentation. Physical chemistry practical; summatively assessed short- and long-format laboratory reports, the latter building on formative report-writing skills session. | | Working on practical experiments individually, in pairs, and in small groups. Implicit assessment through summative assessment through laboratory reports. | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Stage 2** | Green Chemistry and Sustainable Manufacturing | Progress towards PLO | | Applying learning skills and core chemical principles to gaining a detailed knowledge of green chemical principles and sustainable technology and applications in problem solving | | Critical data analysis in the evaluation and comparison of chemical processes | Development of written, oral coomunication and problem-solving skills | | Commercial awareness and creative solutions in the sciences. Group work. | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | | Engaging with lectures and learning support activities on Principles & Metrics of Green Chemistry, Sustainable Reagents & Reactants, Sustainable Energy Sources, Sustainable Solvents, Sustainability beyond Green Chemistry. Applications to unseen problems and case studies in workshops. Formative activities include workshop assignments and case studies and summative assessment is through an assessed workshop (Principles/metrics) and a closed-book | | Chemical case studies; analysis of key metrics of Green Chemistry and financial viability; formative assessment through workshop activities and summative assessment through assessed workshop. | Learning support workshops; formative assessment through supported workshop activities with summative assessment of written work covering specialised chemical topics at an intermediate level through an assessed workshop (group poster and poster session) and examination. | | Application of green chemistry philosophy to commercial processes through formative case studies and workshop activities. Metrics including costs summatively assessed through assessed workshop (group poster and poster session). | |

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| **Stage 3** | Core 7: Advanced Concepts | Progress towards PLO | Understanding high-level chemical principles across physical, theoretical and organic chemistry. | | | | Development of written and oral presentation skills | | Commercial applications of cutting-edge chemistry; creativity in research and applications | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | Engaging with lectures and learning support activities on Bioinorganic Chemistry, Electronic States of Atoms & Molecules, Statistical Thermodynamics , Applications of Quantum Chemistry, Pericyclic Reactions and Supramolecular & Nanoscale Chemistry. Applications to unseen problems in tutorial and workshops. Formative assessment is through small-group tutorial/worksho p and computer-based assignments in each topic and summative assessment | | | | Preparation of written tutorial and workshop exercises. Engagement in tutorials and workshops. Formative assessment of articulation of complex scientific concepts in writing and oral presentation. | | Application of Supramolecular chemistry to commercial activities in industrial/medici nal chemistry through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Stage 3** | Core 8: Synthesis & Structures | Progress towards PLO | Understanding high-level chemical principles across the organic-inorganic chemistry interface. | | | | Development of written and oral presentation skills | | Commercial applications of cutting-edge chemistry; creativity in research and applications | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | Engaging with lectures and learning support activities on Main Group Chemistry: Bonding & Applications, Synthetic Frontiers of Inorganic Chemistry & Ligand Design, Metal-Mediated Synthesis, Asymmetric Synthesis, Radicals in Synthesis and Advanced Separations & Mass Spectrometry. Applications to unseen problems in tutorial and workshops. Formative assessment is through small-group tutorial/worksho p assignments in each topic and summative | | | | Preparation of written tutorial and workshop exercises. Engagement in tutorials and workshops. Formative assessment of articulation of complex scientific concepts in writing and oral presentation. | | Application of Main Group chemistry to modern materials through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. | |
| **Stage 3** | Core 9: Compounds & Materials | Progress towards PLO | Understanding high-level chemical principles across physical and materials chemistry. | | | | Development of written and oral presentation skills | | Commercial applications of cutting-edge chemistry; creativity in research and applications | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | Engaging with lectures and learning support activities on Processes at Solid Surfaces, Principles of Diffraction, Electronic Properties of Materials, f-block chemistry, Materials & Nanoparticles and Electronic Spectra & Photochemistry of Transition Metals. Applications to unseen problems in tutorial and workshops. Formative assessment is through small-group tutorial/worksho p assignments in each topic and summative assessment through a closed-book | | | | Preparation of written tutorial and workshop exercises. Engagement in tutorials and workshops. Formative assessment of articulation of complex scientific concepts in writing and oral presentation. | | Application of materials and nanochemistry to commercial activities in device and advanced materials technology through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Stage 3** | BSc Research Project | Progress towards PLO | | Fundamental investigation of specific chemical principles in the area of green chemistry principles and sustainable processes; researching project-related literature topic | Design laboratory experiments and carrying out risk assessments. Documenting work through a lab book. | Experimental data interpretation and analysis | Written presentation skills | Plan, design and conduct independent (or group) open-ended investigative research project in the area of green chemistry principles and sustainable processes | Problem solving, time management and team working during research projects. Creativity in research. | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | | Research project including literature review and comprehension. Formative research/laboratory experiences are guided by the supervisor and other research group members. Formative assessment of a project report/lit review draft. Summative assessment by final project report (35%), supervisor's project execution mark (35%) and literature review (17.5%). Summative literature comprehension exam (6.25%). | Research Project. Collaboration with project supervisor and research group encourages development of increasingly independent approaches to safe working and the design and interpretation of experiments. Summatively assessed though the written report and the supervisor's project execution mark (35% of module). | Research Project. Collaboration with project supervisor and research group encourages development of skills in data analysis. Summatively assessed though the written report (35% of module). | Research project report (35% summative assessment) with prior formative draft stage. Summative assessment of essay writing through Sci Lit exam (6.25%) with formative Scientific Writing session and workshop. | Research Project. Students experience an independent project experience within a research group or as a small group working on related topics. Formative experience is provided through introductory courses (literature, safety, etc.) and through support within research groups and supervision. Summative assessment is achieved through assessment of the project by report and through the supervisor's assessment of student research skills. | Research Project. Students experience anindependent project experience within a research group or as a small group working on related topics involving engagement with planning, time management, teamwork and interpersonal communication with a range of Departmental staff and co-workers. Formative feedback available through academic supervision with summative assessment of outcomes implicitly assessed through overall productivity | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Stage 3** | Catalysis wth Green Technologies | Progress towards PLO | | Applying learning skills and core chemical principles to gaining a detailed knowledge of green chemical principles and sustainable technology and applications in problem solving | | | Development of written and problem-solving skills | | Commercial applications of cutting-edge green chemistry and sustainable technology; creativity in research and applications | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | By working on (and if applicable, assessed through) | | Engaging with lectures and learning support activities on Heterogeneous Catalysis, Homogeneous Catalysis by Transition Metal Compounds, Asymmetric Catalysis, Enzymatic Catalysis, Catalysis with Sustainable Metals and Green Catalytic Technologies. Applications to unseen problems and case studies in workshops. Formative activities include workshop assignments and summative assessment is through a MCQ assessment (Sustainable Catalysis) and a closed-book | | | Learning support workshops; formative assessment through supported workshop activities with summative assessment of written work covering complex, specialised chemical topics through an MCQ assessment and examination. | | Application of green catalytic technologies including biocatalysis to commercial activities in production technology through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. Summative assessment of aspects of commercial awareness through assessed workshop and exam. | |

## Overview of modules by stage

**Notes:**

[1] The credit level is an indication of the module's relative intellectual demand, complexity and depth of learning and of learner autonomy (Level 4/Certificate, Level 5/Intermediate, Level 6/Honours, Level 7/Masters)

[2] The credit value gives the notional workload for the module, where 1 credit corresponds to a notional workload of 10 hours (including contact hours, private study and assessment)

[3] Special assessment rules (requiring University Teaching Committee approval); P/F – the module marked on a pass/ fail basis (NB pass/ fail modules cannot be compensated); NC – the module cannot be compensated; NR – there is no reassessment opportunity for this module. It

[4] Independent Study Modules (ISMs) are assessed by a dissertation or substantial project report. They cannot be compensated (NC) and are subject to reassessment rules which differ from 'taught modules'. Integrated Masters programmes may designate a project in the final

**Core & option module table (add additional rows as required)**

| Stage | Core/ Option | New/ | Module title | Module code | Credit | Credit | Prerequisites, | Assessment rules[3],[4] | Timing of module | Format, contribution to module mark and |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Core | Yes | Core 1: Fundamentals of Chemi | CHE00015C | 4 | 30 | | | AuT | 85% exam SpT and 15% workshop AuT |
| 1 | Core | Yes | Core 2: Chemical Properties and | CHE00016C | 4 | 30 | Core 1 | | SpT, SuT | 85% exam SuT and 15% workshop SpT |
| 1 | Core | Yes | Core 3: Molecules and Reaction | CHE00017C | 4 | 30 | Core 1 | The assessed component of the self-study course (Macromolecules) is a short video or an article which would be impractical to reassess and will not be of value for the students. | SpT, SuT | 85% exam SuT and 15% tutorial SuT (Macromolecules) |
| 1 | Core | Yes | Skills for Chemists | CHE00019C | 4 | 10 | | A diagnostic assessment of maths skills is required (Wk2 AuT) as the students need a certain level in maths in order to cope with the Chemistry course. The pass threshold corresponds to the lowest acceptable level. The Department will provide support to failing students throughout the first term to help bring them to the required level tested through re-assessment (Wk9 AuT). The questions for the test will be drawn from a bank of questions so that the test can be repeated several times, if required. The 'no reassessment' part is assessed via presentations for which reassessment would be very impractical and of doubtful value. | Year Long | 30% exam SpT, 30% group presentation AuT, 40% exam SuT |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Core | Yes | Practical Chemistry | CHE00018C | 4 | 20 | | The module is not marked on a PASS/FAIL basis, but it contains, in addition to the credit-bearing elements, a single P/F assessment, which assesses each student's ability to work safely in the chemistry laboratory. This is crucial for the practical work which follows in subsequent years, and therefore merits a P/F assessment. For students who fail this assessment at the first opportunity, special measures will be deployed, including retraining, closer supervision and multiple opportunities to retake the assessment during the Spring and Summer terms.<br><br>The 'no reassessment' components are laboratory experiments. It is impractical to put in place reassessment of this work although it may be possible to set a reassessment of part of the laboratory write-up involving sample data sets. However, this would not in any sense correctly reflect the competence of the student to carry out practical chemistry, a component that lies at the heart of undergraduate chemistry training and which constitutes a major part of the Royal Society of Chemistry accreditation process. | Year Long | P/F skills test AuT, 45% skills tests SpT, 5% coursework SpT (lab book), 25% practicals SuT (Physical Chem.), 25% practicals SuT (ICP) |
| 2 | Core | Yes | Core 4a: Molecules in Action | CHE00016I | 5 | 20 | Chemistry Stage 1 modul | Safety Pass/Fail assessment can be repeated unlimited number of times until a Pass mark is achieved.<br>The 'no reassessment' components are laboratory practical. It is completely impractical to put in place reassessment of laboratory work although it may be possible to set a reassessment of part of the laboratory write-up involving sample data sets. However, this would not in any sense correctly reflect the competence of the student to carry out practical chemistry, a component that lies at the heart of undergraduate chemistry training and which constitutes a major part of the Royal Society of Chemistry accreditation process. | AuT | 80 %exam SpT, 20% practicals AuT |

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|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Core | Yes | Core 4b: Theory, Analysis and M | CHE00017I | 5 | 20 | Chemistry Stage 1 modul | The 'no reassessment' components are laboratory practical. It is completely impractical to put in place reassessment of laboratory work although it may be possible to set a reassessment of part of the laboratory write-up involving sample data sets. However, this would not in any sense correctly reflect the competence of the student to carry out practical chemistry, a component that lies at the heart of undergraduate chemistry training and which constitutes a major part of the Royal Society of Chemistry accreditation process. | AuT | 80% exam SpT, 12.5% practicals AuT, 7.5% workshop AuT |
| 2 | Core | Yes | Core 5: Reactivity | CHE00018I | 5 | 30 | Autumn term Chemistry s | The 'no reassessment' components are assessed by presentation (reassessment would be very impractical and of doubtful value) or are a laboratory practical. It is completely impractical to put in place reassessment of laboratory work although it may be possible to set a reassessment of part of the laboratory write-up involving sample data sets. However, this would not in any sense correctly reflect the competence of the student to carry out practical chemistry, a component that lies at the heart of undergraduate chemistry training and which constitutes a major part of the Royal Society of Chemistry accreditation process. | SpT, SuT | 70% exam SuT, 10% practicals SpT SuT, 11.67% workshop SuT, 8.33% presentation SuT |
| 2 | Core | Yes | Core 6: Spectroscopy and Chemistry | CHE00019I | 5 | 30 | Autumn term Chemistry stage 2 modules | The 'no reassessment' components are assessed by a laboratory practical. It is completely impractical to put in place reassessment of laboratory work although it may be possible to set a reassessment of part of the laboratory write-up involving sample data sets. However, this would not in any sense correctly reflect the competence of the student to carry out practical chemistry, a component that lies at the heart of undergraduate chemistry training and which constitutes a major part of the Royal Society of Chemistry accreditation process. | SpT, SuT | 55% exam SuT, 30% practicals SpT, 15% workshop SuT |
| 2 | Core | Yes | Green Chemistry and Sustainable Manufacturing (GCS) | CHE00024I | 5 | 20 | Chemistry Stage 1 Modules, or by special permission of module coordinator | The 'no reassessment' component is an assessed poster session incorporating group work and individual mark components. It is completely impractical to put in place reassessment of such an activity. Creating another poster, for instance, would not in any sense correctly reflect the competence of the student to carry out group work or respond to questions from multiple assessors in a face-to-face poster session | SpT, SuT | 80% exam SuT, 20% poster assessment SpT |
| 3 | Core | Yes | Core 7: Advanced Concepts | CHE00026H | 6 | 20 | Chemistry Stage 2 modules | | Year Long | 85% exam SuT, 15% workshops SpT |
| 3 | Core | Yes | Core 8: Synthesis & Structures | CHE00027H | 6 | 20 | Chemistry Stage 2 modules | | Year Long | 85% exam SuT, 15% workshops SpT |

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| 3 | Core | Yes | Core 9: Compounds & Materials | CHE00028H | 6 | 20 | Chemistry Stage 2 modules | | Year Long | 100% exam SuT |
| 3 | Core | Yes | Catalysis with Green Technologies (CGT) | CHE00032H | 6 | 20 | Chemistry Stage 2 modules, or by special permission of Module Coordinator | | AuT | 80% exam SpT, 20% workshop AuT |
| 3 | Core | Yes | BSc Research Project | CHE00033H | 6 | 40 | Chemistry Stage 2 modules | | Year Long | 87.5% project report/execution/lit review (45:40:15) SuT, 12.5% exam SuT |
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