



# UNIVERSITY OF LINCOLN

## Programme Specification

Title:

### Chemistry with Mathematics

Final Award: **Master of Chemistry (MChem)**

With Exit Awards at:

**Certificate of Higher Education (CertHE)**

**Diploma of Higher Education (DipHE)**

**Bachelor of Science with Honours (BSc (Hons))**

**Master of Chemistry (MChem)**

To be delivered from: 1 Sep 2017

<b>Level</b>	<b>Date</b>
Level 1 or Certificate of Higher Education (CertHE)	2021-22
Level 2 or Diploma of Higher Education (DipHE)	2022-23
Level 3 or Bachelor of Science with Honours (BSc (Hons))	2023-24
Level 4 or Master of Chemistry (MChem)	2024-25

## Table Of Contents

<b>1. Introduction</b>	3
<b>2. Basic Programme Data</b>	4
<b>3. Programme Description</b>	5
3.1 Overview	5
3.2 Aims and Objectives	5
3.3 Variations to Standard Regulations and Guidance	6
<b>4. Programme Outcomes</b>	7
4.1 Knowledge and Understanding	7
4.2 Subject Specific Intellectual Skills	7
4.3 Subject Specific Practical Skills	7
4.4 Transferable Skills and Attributes	8
<b>5. Learning, Teaching and Assessment Strategies</b>	9
5.1. Learning and Teaching Strategy	9
5.2. Assessment Strategy	13
<b>6. Programme Structure</b>	15
<b>Appendix I - Curriculum Map</b>	17
<b>Appendix II - Assessment Map</b>	23
<b>Appendix III - Benchmark Analysis</b>	32
<b>Appendix IV - Benchmark Statements(s)</b>	36

## **1. Introduction**

This document describes one of the University of Lincoln's programmes using the protocols required by the UK National Qualifications Framework as defined in the publication *QAA guidelines for preparing programme specifications*.

This programme operates under the policy and regulatory frameworks of the University of Lincoln.

## 2. Basic Programme Data

<b>Final Award:</b>	Master of Chemistry (MChem)
<b>Programme Title:</b>	Chemistry with Mathematics
<b>Exit Awards and Titles</b>	Certificate of Higher Education (CertHE) Diploma of Higher Education (DipHE) Bachelor of Science with Honours (BSc (Hons)) Master of Chemistry (MChem)
<b>Subject(s)</b>	Chemistry
<b>Mode(s) of delivery</b>	Full Time Part Time
<b>Is there a Placement or Exchange?</b>	Yes
<b>UCAS code</b>	F1GC
<b>Awarding Body</b>	University of Lincoln
<b>Campus(es)</b>	Lincoln Campus
<b>School(s)</b>	School of Chemistry
<b>Programme Leader</b>	Tasnim Munshi (TMunshi)
<b>Relevant Subject Benchmark Statements</b>	
<b>Professional, Statutory or Regulatory Body Accreditation</b>	
<b>Programme Start Date</b>	2019-20

## 3. Programme Description

### 3.1 Overview

The chemistry with mathematics programme will allow students to gain a solid foundation in chemistry and integrating the mathematics as a pathway within the programme. Many aspects of chemistry, requires a good understanding of mathematical methods and this programme provides students with the opportunity to examine the relationship between chemistry and mathematics and the important roles of both disciplines in different contexts.

The chemistry curriculum on this programme has been devised to integrate the main sub-disciplines of chemistry effectively, relating physical chemistry concepts to aspects of organic and inorganic chemistry, and to the methods used for analyzing substances. In these programmes, a comprehensive knowledge of chemistry is augmented with subject-specific and generic skills (particularly in practical chemistry) to develop a strong understanding of how to apply chemistry to problems with direct impact on society. In this way, the chemistry education at Lincoln is designed to produce highly employable graduates with a strong background in academic chemistry, a well-developed awareness of specific topics at the cutting-edge of the chemical sciences and, an in-depth experience of the application of chemistry in contexts relevant to society and industry.

### 3.2 Aims and Objectives

General Aims:

- To provide a stimulating and supportive learning environment that inspires students in the study of chemistry and instills within them an enthusiasm for study of the chemical sciences;
- To enable the development of a broad appreciation of the importance of chemistry in a variety of application contexts: academic, industrial, economic, environmental and social and its role in establishing a sustainable society;
- To develop a range of skills relating to professional practice in chemistry that are relevant both to chemistry and other graduate-level employment
- To enable the development of a broad appreciation of the importance of chemistry and mathematics

Main aims

- To provide students with a broad appreciation of key chemical and mathematical concepts and the interrelationship between traditional discipline areas in chemistry;
- To develop a skill set that enables the implementation of sound professional practice in chemistry that ensures safe operation in chemical laboratory environments based on effective risk assessment;
- To provide students with a range of experiences that enable the effective application of defined methodologies to appropriate standards;
- To provide students with knowledge of the application of chemistry in key sectors including an awareness of the importance of regulatory compliance;
- To instill a broad range of knowledge and skills required for graduate-level employment or as a base for advanced level study in chemistry and the chemical sciences.
- To provide students with an education and learning experience that will equip them with the knowledge of fundamental areas of mathematics and chemistry.
- To extend understanding of chemical concepts and develop an in-depth appreciation of specialized areas in chemistry through engagement with advanced materials;
- To develop an ability to design scientific investigations, independently execute suitable experimentation and critically evaluate study outcomes;
- to provide a stimulating and supportive learning environment that inspires students in the study of

chemistry and mathematical concepts;

- To develop capabilities to analyse unfamiliar problems and adapt defined methodologies to devise effective solutions;
- To develop an awareness of advances at the forefront of chemistry and instill an ability for critical assessment of research in the chemical sciences;
- To prepare students for professional chemistry careers or doctoral research employment through knowledge of advanced practices.

### **3.3 Variations to Standard Regulations and Guidance**

none

## 4. Programme Outcomes

Programme-level learning outcomes are identified below.

Refer to *Appendix I – Curriculum Map* for details of how outcomes are deployed across the programme.

### 4.1 Knowledge and Understanding

On successful completion of this programme a student will have knowledge and understanding of:

- 1 Chemical terminology, nomenclature, conventions and units
- 2 Fundamental physicochemical principles
- 3 Molecular and bulk properties of a range of inorganic, organic and bio-molecular materials
- 4 The synthesis of inorganic, organic and bio-molecular compounds including related isolation, purification and characterisation techniques
- 5 Principles and procedures used in chemical analysis for characterisation and quantitation
- 6 Industrial, economic, social and environmental contexts that demonstrate the importance of chemistry and the interface with other disciplines in tackling future challenges in these contexts
- 7 Advanced topics in chemistry
- 8 Research methodology and specialist knowledge within the chemistry/mathematics research field
- 9 Methods of mathematics and limits of their applicability
- 10 Key theorems in the analysis of a range of mathematical problems

### 4.2 Subject Specific Intellectual Skills

On successful completion of this programme a student will be able to:

- 11 Recognise and analyse problems and plan strategies for their solution
- 12 Evaluate, interpret and synthesise chemical information and data from a variety of sources
- 13 Use models, computational chemistry and data-processing relating to chemical information and data
- 14 Communicate scientific material and arguments in a variety of forms
- 15 Adapt and apply methodology to the solution of unfamiliar problems
- 16 Assimilate, evaluate and present research results objectively
- 17 Undertake a research project the outcome of which is of a quality that is potentially publishable
- 18 Demonstrate knowledge and understanding of essential facts, concepts, principles and theories
- 19 Solve qualitative and quantitative problems

### 4.3 Subject Specific Practical Skills

On successful completion of this programme a student will be able to:

- 20 Monitor, record and document observations and measurements of chemical properties, events or changes
- 21 Operate standard chemical instrumentation
- 22 Interpret and explain the limits of accuracy of experimental data in terms of significance and underlying theory
- 23 Plan, design and execute experiments taking into account the results from previous experimental work
- 24 Work independently and be self-critical in the evaluation of risks, experimental procedures and outcomes
- 25 Recognise the professional, moral and ethical standards required for experimental work
- 26 Handle chemical materials safely, taking into account their physical and chemical properties including any specific hazards associated with their use and conduct risk assessments
- 27 Carry out documented laboratory procedures and standard operating procedures involved in synthetic and analytical work, in relation to both inorganic and organic systems

#### **4.4 Transferable Skills and Attributes**

On successful completion of this programme a student will be able to:

- 28 Apply numeracy and mathematics, including error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation
- 29 Use information retrieval, in relation to primary and secondary information sources, including online computer searches
- 30 Use a range of IT hardware and software for a variety of chemistry-specific and generic applications
- 31 Interact with other people and work as a member of a team, recognising and respecting the views, opinions and roles of other members of the team
- 32 Demonstrate time management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working
- 33 Communicate and interact with professionals from other disciplines
- 34 Exercise initiative and personal responsibility
- 35 Demonstrate independent learning ability required for continuing professional development
- 36 Make decisions in complex and unpredictable situations
- 37 Communicate chemistry to a variety of audiences using a range of formats including written and oral
- 38 Solve qualitative and quantitative problems demonstrating self-direction and originality

For details of each module contributing to the programme, please consult the module specification document.



## 5. Learning, Teaching and Assessment Strategies

### 5.1. Learning and Teaching Strategy

#### An Integrated Curriculum

We have chosen to interpret the presentation of the breadth of chemistry using an integrated approach that retains a clear delineation of traditional sub-disciplines. The teaching and learning strategy adopted within MChem Chemistry derives from the programme outcomes and is based upon an integration of the curriculum through five main components: Core and Extension Chemistry modules, Practical modules, Professional Practice modules and Project modules.

#### Core and Extension Modules

- The theoretical concepts of the main disciplines of chemistry (inorganic, organic and physical) are taught together in Core Chemistry modules based on a 'spine' of physical chemistry concepts. The physical chemistry key themes of: systems at equilibrium, systems under change, and the structure and bonding of systems are developed at each stage. The themes are contextualized with relevant organic and inorganic conceptual topics and these are exemplified to, respectively, build an organic chemistry reaction toolkit and, assemble a comprehensive survey of the chemistry of the elements. Together these modules provide the depth and breadth of core chemistry required for study of chemistry at this level.
- Selected aspects of advanced (pure) chemistry are presented through Extension Chemistry modules facilitating focus on key topics that are potentially of less relevance in applied areas. In this way, the core chemistry can be effectively integrated with combined programmes (e.g. Forensic Chemistry).
- At level 4, Advanced Topics in Chemistry add depth to the programmes and facilitate student specialization in selected areas of chemistry. The array of (optional) short courses presented reflect the research themes of the School and facilitate the participation of external academic and industry speakers in the programmes, broadening the exposure of students to professionals in their field.
- The 'Core Chemistry' and 'Extension Chemistry' modules use lectures as the primary vehicle to deliver content. Student development is facilitated by interactive enquiry-based tasks and, in this context, emphasis is placed upon application of knowledge to solve problems. Seminars are used to support problem solving activities and provide opportunity for students to experience different learning techniques such as peer tutoring and collaborative learning. On moving from level 1 to 3, a systematic progression is established with both increasing subject depth and in the challenge from problems requiring adaptation of methods and extended strategies for their solution.

#### Mathematics

- The primary source of material delivered to students is lectures, where mathematical concepts are introduced, theorems are stated with or without detailed proofs, and numerous examples are used to illustrate all the steps in a specific mathematical theory. At the lectures students will also be directed towards reading materials and online resources. Algorithms of solutions are explained for typical problems arising in a given mathematical discipline; moreover, students' abilities to understand unfamiliar algorithms and to devise new ones will be developed. Lectures are accompanied by tutorials, seminars and practical workshops, where students are engaged, both individually and in group study.

## Practical Chemistry Modules

- Practical skills and associated data interpretation capabilities are developed in Practical Chemistry modules linked to professional practice. Practicals are explicitly linked to core chemistry programmes and the use of brief/debrief sessions around each laboratory class helps contextualize studies. Key skills in analytical and structural methods (e.g. chromatography, NMR, mass spectrometry, X-Ray crystallography) are developed in parallel using integrated lectures and workshops that focus on the development of skills for robust experimental design and interpretation of experimental data.

- At level 4, instrumental analytical techniques are presented as (optional) short-course 'at-instrument' programmes providing students with qualification as independent users. Emphasis is placed on developing expertise in analyzing requirements, then selecting and, where appropriate, adapting analytical methods to the outcomes of a task.

- Practical skills are developed at the bench in professional laboratory settings. Strong emphasis on gaining competence in techniques and with appropriate documentation of activities inline with industry practice. Routine and regular use of industry standard equipment and software support characterization of products and generation of reports. There is progression in the nature and demand of tasks and the style of teaching moving through the programme levels. Level 1 is concerned with developing confidence in manipulation of equipment and providing training in basic skills and techniques. Level 2 introduces more complex procedures and more sophisticated interpretation is required. Skills are further developed at level 3 but students are expected to work with increasing independence. There is a transition from fully documented procedures and laboratory exercises to investigative style tasks where students are involved in experimental design, planning, preparation and execution. Extensive use is made of pre- and post-laboratory briefing sessions that link the learning experience to theoretical contexts. Student participation and increasing leadership of these meetings is expected as student autonomy and expertise increase.

- Level 4 provides opportunity to develop skills and gain experience in the independent use of advanced techniques both in analytical and synthetic procedures. This 'at-instrument' training corresponds with the training given to research students.

## Professional Practice modules

- Professional skills, employability and awareness of requirements for application of chemistry in commercial contexts are developed in Professional Practice modules. These include systematic development of transferable skills (including maths for chemistry) alongside industry briefings and training in the context of regulatory practice.

At level 4, students undertake an independent learning programme based on reflective practice to consolidate and enhance their personal and professional development. A broad range of activities can be included in this portfolio including specialist training undertaken during off-site placements.

- Professional Practice modules are delivered through a combination of lectures, seminars, IT and TBL workshops. Application will vary from structured problem solving (e.g. chemistry or maths tutorials) to mini-projects from an industry brief. The module will be linked to the RSC undergraduate skills record as a framework for auditing skills development, to the School's personal tutoring system and to the RSC's Discover Maths for Chemistry web resources.

- At level 4, the students will have the opportunity to develop and manage their own learning portfolio through experiential learning. Students will have the opportunity to direct their own learning process and will control its nature and direction through self-evaluation (reflection). They develop and follow an agreed learning plan (corresponding with directed study) and undergo on-going evaluation of chosen learning activities through a reflective blog and meetings with academic tutor(s). A blog (web log) is maintained as a progress record of the agreed learning plan and to periodically enable reflection of that progress. Academic tutor(s) review and will add commentary to the student's blog.

### Extended Projects

- Independent research and professional experience is undertaken through Research Projects. These activities build from group projects undertaken in Practical and Professional Practice but are introduced at an individual level at level 3 through the structured Research Project. This encourages students to draw together their experience and plan and execute a significant study with the support of the research teams at the University.

- At level 4, the student experience is centred on a placement – either within a research group at Lincoln or with an external hosting company/institution. This provides the opportunity for students to develop original and independent research corresponding to the standards required of industrial regulations and/or of publishable standard for the peer-reviewed academic literature.

### Management of External Placements

- In the chemical sciences, funded placements in industry are usually organized through competitive recruitment programmes operated by the hosting companies. In this context, students normally apply for placement opportunities and undergo selection processes (assessment centres, interviews etc.) in the preceding year (level 3). Students are systematically supported in preparation of applications through the extensive skills profiling and CV development work

- Confirmation of the student placement requires direct liaison with the hosting company by the School's Employer Engagement Officer and the level 4 Tutor to ensure that the proposed placement programme has suitable scope to include an investigative project and facilitate release for short course study. Positioning hosting arrangements with partner organisations forms a key activity for the School's employer engagement programme.

- Student placements are managed by a supervisory team consisting of:

- Project supervisor. In external placements, this will typically be the Industry Tutor with primary responsibility for managing and supervising the student. For on-site placements, this will be the primary academic supervisor of the project. In each case, the project supervisor will have responsibility for project oversight, technical advice in context, and student engagement and progress monitoring.

- Academic supervisor. In each placement context, an academic/personal tutor will be appointed to monitor and enhance the student experience. In on-site cases where, coincidentally, the personal tutor is also the project supervisor, the level 4 tutor will offer additional pastoral support. In addition to being the primary point of contact for external hosting organisations, the academic tutor will supervise the design and execution of the student-centred learning portfolio for the Personal and Professional Development module through regular tutorial sessions.

## Student as Producer Principles

- The programme fully embraces the principles of Student as Producer. Problem solving is core to the teaching, learning and assessment strategy. Students will encounter a variety of problem types including those of a familiar and unfamiliar nature and open-ended problems. Problem solving is seen as an active method of learning the core chemistry material and all core chemistry modules will have a programme of seminars specifically for problem solving and the development of problem solving skills. These provide opportunity for students to work individually or in groups and for peer collaboration and tutoring. Seminars will include student-led sessions with the tutor taking more of a facilitator role. Core chemistry module examinations will assess problem solving learning outcomes. Professional practice will provide students with an opportunity of open-ended 'industry informed' real life problems. These will be worked upon in small groups and teams with both tutor and industrial support. Outputs will consist of reports and presentations to industrial panels.
- Modules at level 3 and 4 are informed by academic staff research. Lectures will include personal research activities and papers will be used as part of the teaching material for modules. Some practicals will be designed to have an investigatory approach to allow students to work as a 'researcher' while carrying out experimental work. Team work on these tasks will be encouraged along with independent work to reflect the variety of environments likely to be encountered by chemistry graduates in employment. Project based learning plays a significant role at level 3 and for the MChem also at level 4. Students will carry out independent research projects usually in the area of specialism so in this case will be in the area of chemistry and mathematics within the research groups of academic staff or, if on external placement, within industrial research teams. Students will be involved in the planning and design of the project and will present their findings using a range of formats thus providing a full experience of working as a researcher.
- Technology will be at the forefront of the student experience. Blackboard will be used to provide module information and teaching material and to engage with students through discussion groups and on-line teaching activities.
- The learning environment for chemistry is excellent. Modern, well equipped teaching laboratories are housed in the science building. A significant proportion of time is spent within the laboratory and students gain hands-on experience of a range of chemical equipment and chemical analysis instruments. Large laboratories have demonstration facilities with A/V systems so that students can be instructed without having to leave their work stations. Organisation of laboratory classes will ensure that demonstrators are available to support small groups of students. Research laboratory and equipment facilities in the new Joseph Banks Laboratories will be available for project work.
- Learning is supported by a core pack of textbooks covering inorganic, organic and physical chemistry. A range of other supporting texts and journals are available through the library. Students will have an opportunity of a library induction provided by the chemistry librarian. The library also provides a range of workshops to support learning skills and these are made available to all students.
- A number of mechanisms are used to obtain student views about their learning. Subject committees are an important forum for obtaining feedback through elected student reps however reps are encouraged to work closely with programme teams throughout the academic year to ensure that issues are resolved in a timely manner. Other mechanisms for obtaining feedback include meetings with academic tutors, student meetings with external examiners, module evaluation forms and

discussion groups.

- Employability is an integral part of the curriculum. Professional practice provides a vehicle for students to engage and experience a variety of chemical science commercial sectors. Professional practice also deals with the practical aspects of skill profiling, personal development and job applications. For the MChem Chemistry, professional practice will support students in applying for final year placements and the external placement will provide opportunities for work place experience within the programme. Summer placements both external and on-campus are also encouraged and support is provided to help students obtain suitable placements and to apply for sources of funding.

## 5.2. Assessment Strategy

A variety of assessment methods are used that enable students to demonstrate attainment of the programme learning outcomes. Methods include:

- Unseen examinations
- Laboratory and professional reports
- Problem-solving exercises
- Presentations (oral, poster, individual, group)
- Project work (individual, group)
- Literature review
- Personal development portfolios (including RSC Skills and Personal and Professional Blogs)

Assessment is a fundamental component of the teaching and learning process and is used to enable the student to confirm their achievement of learning outcomes. It is seen, therefore, as having two functions – formative and summative. Formative assessment is primarily delivered in small group seminars, laboratory or team-based settings relating to continuous assessment of problem-solving activities or practical and project work including proposals and experimental design. Formative feedback forms the basis for routine structured feedback to students. Summative assessment is derived from examinations, and written assignments and dissertations as final module assessments. Summative feedback also provides a vehicle for student feedback, either through discussion of individual pieces or as part of overall performance profiling within personal academic tutoring.

- Knowledge and understanding. Summative assessment of knowledge and understanding is achieved through traditional-style examinations that are used at each Stage of the course and are, almost exclusively, composed from unseen problems. These are taken at the end of each semester and are the main assessment vehicle for the Core and Extension Chemistry modules. At Level 1, confirmation breadth of learning is the main objective and so examinations consist mainly of short structured questions. At Level 2, greater depth of analysis and understanding is expected and so examinations include combination of short and long answer questions and introduce problem-based components. At Levels 3 and 4, the primary aim of formal examination is to assess an individual's depth of specialist knowledge and of an independent ability to adapt methods to unfamiliar problems. Examination tends therefore to focus on analysis and interpretation in problem-based contexts. Where possible, use is made of primary scientific literature, assessing abilities to engage with, and critically evaluate research level material.

- Subject specific intellectual skills. Analysis of information and problem solving is assessed through a range of methods – primarily problem-solving exercises in continuous assessment and unseen examinations. Problem-solving activities on the Core and Extension concepts are assessed continuously through a programme of seminars and tutorials and these comprise a primary vehicle for student feedback and reflection. Group work activities in Professional Practice and in Practical Chemistry mini-projects also incorporate problem-solving activities – generally focused towards

method selection and project design. By their nature, problems in these contexts are open-ended and contribute to the development and assessment of research and transferable skills.

- Subject specific practical skills. The range of skills developed in practical work requires a variety of assessment types. Student portfolios are used to audit the acquisition of manipulative and practical skills including at-bench evaluation and competency tests. These tests are used for on-going in-class feedback and additionally function as qualification training for independent use of instrumentation. Competence in data acquisition, recording and analysis is assessed through inspection of laboratory records and through structured report sheets contributing to student portfolios for final assessment. Familiarity with a range of formal reporting methods is assessed through formally submitted reports and these allow interrogation of abilities to contextualise laboratory studies, interpret and validate experimental results, and draw conclusions from experimental data. Formal reports form the basis for summative assessment in Practical Chemistry modules.
- Research skills are assessed through individual research projects (at Stage 3 and 4) and group work in mini-projects in Practical chemistry and Professional Practice modules. These include project planning through a portfolio of tasks, execution of the planned work that is assessed continuously by the project supervisor and through the written report, analysis and interpretation of results that are assessed by the written report and individual or group presentation.
- Presentation and written communication skills are assessed at all levels. Written skills are assessed using a range of written tasks that include laboratory reports, scientific articles, job application, literature review, dissertation, professional report. Competence is developed through feedback through the programme Levels with the expectation that students will produce written outputs corresponding with recognised professional practice. These are many-fold but include presentation, structure and quality of writing that would satisfy the criteria for publication. Oral presentations are assessed formatively in group-working and seminar contexts. These include both individual and group presentations. Summative assessment of presentation skills is through group and individual presentations. Peer assessment of presentation skills is additionally used for informal feedback.

## 6. Programme Structure

The total number of credit points required for the achievement of Certificate of Higher Education (CertHE) is 120.

The total number of credit points required for the achievement of Diploma of Higher Education (DipHE) is 240.

The total number of credit points required for the achievement of Bachelor of Science with Honours (BSc (Hons)) is 360.

The total number of credit points required for the achievement of Master of Chemistry (MChem) is 480.

### Level 1

<b>Title</b>	<b>Credit Rating</b>	<b>Core / Optional</b>
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20	15	Core
Probability and Statistics 2019-20	15	Core
Calculus 2019-20	15	Core
Practical Chemistry 1.1: Fundamental laboratory techniques 2019-20	15	Core
Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20	15	Core
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20	30	Core
Core Chemistry 1.2: Molecular Structure, Bonding and Mechanism 2019-20	15	Core

### Level 2

<b>Title</b>	<b>Credit Rating</b>	<b>Core / Optional</b>
Industrial and Financial Mathematics 2020-21	15	Core
Differential Equations 2020-21	15	Core
Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation 2020-21	15	Core
Practical Chemistry 2.2: Inorganic synthesis and structural methods 2020-21	15	Core
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21	15	Core
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21	30	Core
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21	15	Core

### Level 3

<b>Title</b>	<b>Credit Rating</b>	<b>Core / Optional</b>
Mathematics Project 2021-22	30	Core
Structured project 2021-22	30	Core
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22	15	Core
Core Chemistry 3.1: Defining Shape, Symmetry and Stereochemistry	30	Core

2021-22

Core Chemistry 3.2: Heterogeneous Systems, Surfaces and  
Nanoscience 2021-22

15

Core

**Level 4**

<b>Title</b>	<b>Credit Rating</b>	<b>Core / Optional</b>
Commercial Research Project 2022-23	60	Optional
Advanced Topics in Chemistry 2022-23	30	Core
Academic Research Project 2022-23	60	Optional
Professional and Personal Development 2022-23	30	Core



## Appendix I - Curriculum Map

This table indicates which modules assume responsibility for delivering and ordering particular programme learning outcomes.

**Key:**  Delivered and Assessed     Delivered     Assessed

### Level 1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Calculus 2019-20	<input checked="" type="checkbox"/>				<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Core Chemistry 1.2: Molecular Structure, Bonding and Mechanism 2019-20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							
Practical Chemistry 1.1: Fundamental laboratory techniques 2019-20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>							<input type="checkbox"/>
Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							
Probability and Statistics 2019-20					<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	PO13	PO14	PO15	PO16	PO17	PO18	PO19	PO20	PO21	PO22	PO23	PO24
Calculus 2019-20						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input type="checkbox"/>		
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>						
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					
Core Chemistry 1.2: Molecular Structure,						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					

Bonding and Mechanism 2019-20													
Practical Chemistry 1.1: Fundamental laboratory techniques 2019-20						✓	✓	✓		✓			
Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20		✓				✓	✓	✓	✓	✓			
Probability and Statistics 2019-20						✓	✓						

	PO25	PO26	PO27	PO28	PO29	PO30	PO31	PO32	PO33	PO34	PO35	PO36
Calculus 2019-20												
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20												
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20				✓								
Core Chemistry 1.2: Molecular Structure, Bonding and Mechanism 2019-20				✓								
Practical Chemistry 1.1: Fundamental laboratory techniques 2019-20		✓	✓	✓								
Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20		✓	✓	✓								
Probability and Statistics 2019-20												

	PO37	PO38
Calculus 2019-20		
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20	✓	✓
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20	✓	✓
Core Chemistry 1.2: Molecular Structure, Bonding and Mechanism 2019-20		✓
Practical Chemistry 1.1: Fundamental laboratory techniques 2019-20		✓
Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20	✓	✓
Probability and Statistics 2019-20		

**Level 2**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21	✓	✓	✓	✓	✓	✓					✓	
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21	✓	✓	✓	✓	✓						✓	✓
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21	✓	✓	✓	✓							✓	✓
Differential Equations 2020-21									✓	✓		
Industrial and Financial Mathematics 2020-21						✓						
Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation 2020-21				✓	✓						✓	✓
Practical Chemistry 2.2: Inorganic synthesis and structural methods 2020-21	✓	✓		✓							✓	✓

	PO13	PO14	PO15	PO16	PO17	PO18	PO19	PO20	PO21	PO22	PO23	PO24
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21		✓				✓						
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21	✓	✓				✓	✓					
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21						✓	✓					
Differential Equations 2020-21	✓						✓					
Industrial and Financial Mathematics 2020-21		✓										
Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation 2020-21		✓						✓	✓	✓		
Practical Chemistry 2.2: Inorganic synthesis		✓					✓	✓	✓	✓		

and structural methods 2020-21

	PO25	PO26	PO27	PO28	PO29	PO30	PO31	PO32	PO33	PO34	PO35	PO36
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21												
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21				✓								
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21				✓								
Differential Equations 2020-21												
Industrial and Financial Mathematics 2020-21												
Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation 2020-21		✓	✓	✓								
Practical Chemistry 2.2: Inorganic synthesis and structural methods 2020-21			✓	✓								

	PO37	PO38
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21		✓
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21	✓	✓
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21		✓
Differential Equations 2020-21		
Industrial and Financial Mathematics 2020-21	✓	
Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation 2020-21		✓
Practical Chemistry 2.2: Inorganic synthesis and structural methods 2020-21	✓	✓

### Level 3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Core Chemistry 3.1: Defining Shape,	✓	✓	✓	✓	✓						✓	✓

Symmetry and Stereochemistry 2021-22													
Core Chemistry 3.2: Heterogeneous Systems, Surfaces and Nanoscience 2021-22	✓	✓	✓	✓	✓							✓	✓
Mathematics Project 2021-22									✓	✓			
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22	✓	✓	✓	✓	✓	✓						✓	✓
Structured project 2021-22	✓					✓	✓					✓	✓

	PO13	PO14	PO15	PO16	PO17	PO18	PO19	PO20	PO21	PO22	PO23	PO24
Core Chemistry 3.1: Defining Shape, Symmetry and Stereochemistry 2021-22	✓	✓				✓	✓					
Core Chemistry 3.2: Heterogeneous Systems, Surfaces and Nanoscience 2021-22	✓	✓				✓	✓					
Mathematics Project 2021-22	✓	✓				✓	✓			✓		
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22	✓	✓				✓	✓	✓	✓	✓		
Structured project 2021-22	✓	✓						✓	✓	✓		

	PO25	PO26	PO27	PO28	PO29	PO30	PO31	PO32	PO33	PO34	PO35	PO36
Core Chemistry 3.1: Defining Shape, Symmetry and Stereochemistry 2021-22				✓								
Core Chemistry 3.2: Heterogeneous Systems, Surfaces and Nanoscience 2021-22				✓	✓	✓						
Mathematics Project 2021-22												
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22			✓	✓		✓	✓					
Structured project 2021-22	✓			✓	✓			✓				

	PO37	PO38
Core Chemistry 3.1: Defining Shape, Symmetry and Stereochemistry 2021-22	✓	✓
Core Chemistry 3.2: Heterogeneous Systems, Surfaces and Nanoscience 2021-22		✓
Mathematics Project 2021-22		
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22	✓	

Structured project 2021-22

✓

**Level 4**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Academic Research Project 2022-23	✓	✓			✓	✓	✓	✓			✓	✓
Advanced Topics in Chemistry 2022-23	✓	✓	✓				✓					
Commercial Research Project 2022-23	✓	✓			✓	✓	✓	✓			✓	✓
Professional and Personal Development 2022-23					✓	✓		✓			✓	

	PO13	PO14	PO15	PO16	PO17	PO18	PO19	PO20	PO21	PO22	PO23	PO24
Academic Research Project 2022-23	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
Advanced Topics in Chemistry 2022-23			✓			✓	✓					
Commercial Research Project 2022-23	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
Professional and Personal Development 2022-23		✓										✓

	PO25	PO26	PO27	PO28	PO29	PO30	PO31	PO32	PO33	PO34	PO35	PO36
Academic Research Project 2022-23				✓	✓	✓		✓		✓	✓	✓
Advanced Topics in Chemistry 2022-23				✓								
Commercial Research Project 2022-23				✓	✓	✓		✓		✓	✓	✓
Professional and Personal Development 2022-23						✓		✓	✓	✓	✓	✓

	PO37	PO38
Academic Research Project 2022-23	✓	✓
Advanced Topics in Chemistry 2022-23		✓
Commercial Research Project 2022-23	✓	✓
Professional and Personal Development 2022-23	✓	

## Appendix II - Assessment Map

This table indicates the spread of assessment activity across the programme. Percentages indicate assessment weighting.

### Level 1

	01	02	03	04	05	06	07	08	09	10	11	12
Calculus 2019-20												40
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20												
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20												30
Core Chemistry 1.2: Molecular Structure, Bonding and Mechanism 2019-20												
Practical Chemistry 1.1: Fundamental laboratory techniques 2019-20												
Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20												
Probability and Statistics 2019-20												
	13	14	15	16	17	18	19	20	21	22	23	24
Calculus 2019-20				60								
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20												
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20				70								
Core Chemistry 1.2: Molecular Structure, Bonding and Mechanism 2019-20												
Practical Chemistry 1.1: Fundamental	100											

laboratory techniques 2019-20												
Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20												
Probability and Statistics 2019-20												
	25	26	27	28	29	30	31	32	33	34	35	36
Calculus 2019-20												
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20							30					
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20												
Core Chemistry 1.2: Molecular Structure, Bonding and Mechanism 2019-20							30					
Practical Chemistry 1.1: Fundamental laboratory techniques 2019-20												
Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20				30		70						
Probability and Statistics 2019-20						40						
	37	38	39	40	41	42	43	44	45	46	47	48
Calculus 2019-20												
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20												
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20												
Core Chemistry 1.2: Molecular Structure, Bonding and Mechanism 2019-20												
Practical Chemistry 1.1: Fundamental laboratory techniques 2019-20												



Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20																		
Probability and Statistics 2019-20																		
													49	50	51	52	EP 1 (Wk 16)	EP 2 (Wks 33, 34, 35)
Calculus 2019-20																		
Chemistry Extension 1: Electronic Structure, Spectroscopy and Reactivity in p-Block Compounds 2019-20																		70
Core Chemistry 1.1: Introduction to Energy, Change and Electronic Structure 2019-20																		
Core Chemistry 1.2: Molecular Structure, Bonding and Mechanism 2019-20																		70
Practical Chemistry 1.1: Fundamental laboratory techniques 2019-20																		
Practical Chemistry 1.2: Introduction to synthetic methodologies and molecular characterisation 2019-20																		
Probability and Statistics 2019-20																		60

## Level 2

	01	02	03	04	05	06	07	08	09	10	11	12
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21												
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21												30
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21												
Differential Equations 2020-21												40

Industrial and Financial Mathematics 2020-21												
Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation 2020-21										70		
Practical Chemistry 2.2: Inorganic synthesis and structural methods 2020-21												
	13	14	15	16	17	18	19	20	21	22	23	24
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21												
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21				70								
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21												
Differential Equations 2020-21				60								
Industrial and Financial Mathematics 2020-21												
Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation 2020-21	30											
Practical Chemistry 2.2: Inorganic synthesis and structural methods 2020-21												
	25	26	27	28	29	30	31	32	33	34	35	36
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21							30					
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21												
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21							30					
Differential Equations 2020-21												
Industrial and Financial Mathematics 2020-21	70						30					

Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation 2020-21													
Practical Chemistry 2.2: Inorganic synthesis and structural methods 2020-21							70	30					
	37	38	39	40	41	42	43	44	45	46	47	48	
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21													
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21													
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21													
Differential Equations 2020-21													
Industrial and Financial Mathematics 2020-21													
Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation 2020-21													
Practical Chemistry 2.2: Inorganic synthesis and structural methods 2020-21													
							49	50	51	52	EP 1 (Wk 16)	EP 2 (Wks 33, 34, 35)	
Chemistry Extension 2: Electronic Structure, Spectroscopy and Reactivity in d- and f-Block Compounds 2020-21												70	
Core Chemistry 2.1: Stability, Structure and Mechanism in Molecular Systems 2020-21													
Core Chemistry 2.2: Chemistry of Activated Systems and Radicals 2020-21												70	
Differential Equations 2020-21													
Industrial and Financial Mathematics 2020-21													

Practical Chemistry 2.1: Organic synthesis, purification and advanced characterisation  
2020-21

Practical Chemistry 2.2: Inorganic synthesis and structural methods 2020-21

### Level 3

	01	02	03	04	05	06	07	08	09	10	11	12
Core Chemistry 3.1: Defining Shape, Symmetry and Stereochemistry 2021-22												30
Core Chemistry 3.2: Heterogeneous Systems, Surfaces and Nanoscience 2021-22												
Mathematics Project 2021-22												
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22												
Structured project 2021-22												
	13	14	15	16	17	18	19	20	21	22	23	24
Core Chemistry 3.1: Defining Shape, Symmetry and Stereochemistry 2021-22				70								
Core Chemistry 3.2: Heterogeneous Systems, Surfaces and Nanoscience 2021-22												
Mathematics Project 2021-22												
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22	70			30								
Structured project 2021-22												
	25	26	27	28	29	30	31	32	33	34	35	36
Core Chemistry 3.1: Defining Shape, Symmetry and Stereochemistry 2021-22												
Core Chemistry 3.2: Heterogeneous Systems, Surfaces and Nanoscience 2021-22							30					

Mathematics Project 2021-22									100				
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22													
Structured project 2021-22				75		25							
	37	38	39	40	41	42	43	44	45	46	47	48	
Core Chemistry 3.1: Defining Shape, Symmetry and Stereochemistry 2021-22													
Core Chemistry 3.2: Heterogeneous Systems, Surfaces and Nanoscience 2021-22													
Mathematics Project 2021-22													
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22													
Structured project 2021-22													
								49	50	51	52	EP 1 (Wk 16)	EP 2 (Wks 33, 34, 35)
Core Chemistry 3.1: Defining Shape, Symmetry and Stereochemistry 2021-22													
Core Chemistry 3.2: Heterogeneous Systems, Surfaces and Nanoscience 2021-22													70
Mathematics Project 2021-22													
Practical Chemistry 3.1: Advanced techniques in IO-chemistry 2021-22													
Structured project 2021-22													

## Level 4

	01	02	03	04	05	06	07	08	09	10	11	12	
Academic Research Project 2022-23													20
Advanced Topics in Chemistry 2022-23													50

Commercial Research Project 2022-23												20
Professional and Personal Development 2022-23					30							
	13	14	15	16	17	18	19	20	21	22	23	24
Academic Research Project 2022-23												
Advanced Topics in Chemistry 2022-23				50								
Commercial Research Project 2022-23											60	20
Professional and Personal Development 2022-23												
	25	26	27	28	29	30	31	32	33	34	35	36
Academic Research Project 2022-23							60	20				
Advanced Topics in Chemistry 2022-23												
Commercial Research Project 2022-23												
Professional and Personal Development 2022-23							70					
	37	38	39	40	41	42	43	44	45	46	47	48
Academic Research Project 2022-23												
Advanced Topics in Chemistry 2022-23												
Commercial Research Project 2022-23												
Professional and Personal Development 2022-23												
							49	50	51	52	EP 1 (Wk 16)	EP 2 (Wks 33, 34, 35)
Academic Research Project 2022-23												
Advanced Topics in Chemistry 2022-23												
Commercial Research Project 2022-23												

--	--	--	--	--	--	--	--

## Appendix III - Benchmark Analysis

This table maps programme learning outcomes to relevant QAA subject benchmark statements or PSRB guidelines.

### Knowledge and Understanding

	ChemHons 01	ChemHons 02	ChemHons 03	ChemHons 04	ChemHons 05	ChemHons 06	ChemHons 07	ChemHons 08	ChemMstr0 1
PO1	✓	✓			✓	✓			
PO2	✓	✓			✓	✓			
PO3	✓	✓			✓	✓			
PO4	✓	✓	✓		✓	✓	✓		
PO5	✓	✓	✓		✓	✓	✓		
PO6	✓	✓			✓	✓			
PO7									✓
PO8									✓
PO9	✓	✓			✓	✓			
PO10					✓				

  

	ChemMstr0 2	ChemMstr0 3	ChemMstr0 4	ChemMstr0 5
PO1				
PO2		✓		
PO3				
PO4		✓		
PO5				
PO6				
PO7	✓			
PO8	✓		✓	
PO9				
PO10				



**Subject Specific Intellectual Skills**

	ChemHons 01	ChemHons 02	ChemHons 03	ChemHons 04	ChemHons 05	ChemHons 06	ChemHons 07	ChemHons 08	ChemMstr0 1
PO11		✓			✓	✓			
PO12					✓				✓
PO13			✓						
PO14				✓				✓	
PO15					✓				✓
PO16						✓			✓
PO17									✓
PO18	✓	✓			✓	✓			✓
PO19	✓	✓			✓				✓

	ChemMstr0 2	ChemMstr0 3	ChemMstr0 4	ChemMstr0 5
PO11				
PO12	✓	✓		
PO13		✓		
PO14			✓	✓
PO15	✓	✓	✓	✓
PO16	✓	✓	✓	✓
PO17	✓		✓	
PO18				
PO19				

**Subject Specific Practical Skills**

	ChemHons 01	ChemHons 02	ChemHons 03	ChemHons 04	ChemHons 05	ChemHons 06	ChemHons 07	ChemHons 08	ChemMstr0 1
PO20			✓				✓		

PO21			✓				✓		
PO22			✓				✓		
PO23							✓		
PO24									
PO25									
PO26									
PO27			✓				✓		

						ChemMstr0 2	ChemMstr0 3	ChemMstr0 4	ChemMstr0 5
PO20							✓		
PO21							✓		
PO22							✓		
PO23							✓	✓	
PO24							✓	✓	
PO25							✓		
PO26							✓		
PO27							✓		

## Transferable Skills and Attributes

	ChemHons 01	ChemHons 02	ChemHons 03	ChemHons 04	ChemHons 05	ChemHons 06	ChemHons 07	ChemHons 08	ChemMstr0 1
PO28				✓				✓	
PO29				✓				✓	
PO30				✓				✓	
PO31				✓				✓	
PO32				✓				✓	
PO33				✓				✓	
PO34				✓				✓	
PO35				✓				✓	

PO36				✓				✓	
PO37				✓				✓	
PO38				✓				✓	

	ChemMstr0 2	ChemMstr0 3	ChemMstr0 4	ChemMstr0 5
PO28				✓
PO29				✓
PO30				✓
PO31				✓
PO32				✓
PO33				✓
PO34				✓
PO35				✓
PO36				✓
PO37				✓
PO38				✓

## **Appendix IV: Benchmark Benchmark Statement(s)**

**ChemHons01** - *A basic knowledge and understanding of the content covered in the programme is evident*

**ChemHons02** - *Problems of a routine nature are generally adequately solved*

**ChemHons03** - *Standard laboratory experiments are carried out safely and with reasonable success*

**ChemHons04** - *Professional skills (For example, interpersonal, time management and organisational skills) have been developed to a basic level*

**ChemHons05** - *Knowledge base covers essential aspects of subject matter dealt with in the programme and shows some evidence of enquiry beyond this. Conceptual understanding is good*

**ChemHons06** - *Problems of a familiar nature are solved in a logical manner, and solutions are generally correct or acceptable*

**ChemHons07** - *Experimental work is carried out in a reliable, safe and efficient manner, with demonstrable understanding of the significance and limitations of experimental data and observations*

**ChemHons08** - *Professional skills are sound and show no significant deficiencies*

**ChemMstr01** - *Knowledge base extends to a systematic understanding and critical awareness of current research in the subject*

**ChemMstr02** - *Problems of an unfamiliar nature are tackled with appropriate methodology and taking into account the possible absence of complete data*

**ChemMstr03** - *Experimental work is carried out independently, with some evidence of originality, and with appropriate risk assessments*

**ChemMstr04** - *A substantial research project at the forefront of the subject is completed effectively*

**ChemMstr05** - *Professional skills are developed appropriately for the workplace*