Programme Information & PLOs

This document forms part of the Programme Design Document and is for use in the roll-out of the York Pedagogy to design and capture new programme statement of purpose (for applicants to the programme), programme learning outcomes, programme map and enhancement plan. Please provide information required on all three tabs of this document.

Title of the new programme – including any year abroad/ in industry variants

MSci & BSc Natural Sciences specialising in Chemistry

Level of qualification

Please select:	Level 7

Please indicate if the programme is offered with any year abroad / in industry variants	**Year in Industry** Please select Y/N	Yes
	Year Abroad Please select Y/N	Yes

Department(s):
Where more than one department is involved, indicate the lead department

Lead Department	Natural Sciences
Other contributing Departments:	Archaeology, Biology, Chemistry, Environment, Mathematics, Physics

Programme leadership and programme team

Please name the programme leader and any key members of staff responsible for designing, maintaining and overseeing the programme.

Jason Levesley (Ch. BoS), Roddy Vann (Prog. Director), Camilla Speller (Arch), Bryce Beukers-Stewart (Env), Gareth Evans (Bio), Andy Parsons & Glenn Hurst (Chem), Eric Dykeman (Maths), Laurence Wilson (Phys)

Particular information that the UTC working group should be aware of when considering the programme documentation (e.g. challenges faced, status of the implementation of the pedagogy, need to incorporate PSRB or employer expectations)

With few exceptions the modules which make up any of the Nat Sci programmes are drawn from the corresponding contributing single subject degree programmes. Local pedagogical practices and modes of assessment are honoured in Nat Sci unless there is evidence that such practices would not be pedagogically sound. Therefore, given the nature of the Nat Sci programmes parts of this document draw liberally from, or make reference to, the corresponding documentation from the contributing departments. This documentation should therefore be considered in parallel with the corresponding proforma for the single subject degree programmes of the contributing departments.

Who has been involved in producing the programme map and enhancement plan? (please include confirmation of the extent to which colleagues from the programme team /BoS have been involved; whether student views have yet been incorporated, and also any external input, such as employer liaison board)

The people listed in 14 item have primarily being responsible for the programme map and enhancement plan. At all stages the BoS has had free access to and being invited to comment on the documentation. Student input has been fed into the YP process in a focus group, through the SSLC and via the BoS.

Purpose and learning outcomes of the programme

Statement of purpose for applicants to the programme

Please express succinctly the overall aims of the programme as an applicant facing statement for a prospectus or website. This should clarify to a prospective student why they should choose this programme, what it will provide to them and what benefits they will gain from completing it.

All Natural Science programmes at the University of York aim to produce leaders in science, technology and industry who will have the interdisciplinary knowledge and skills to succeed in complex research and business environments. You will learn how science is conducted in different disciplines, how to operate within different methodological communities, and how to apply techniques and ideas across multiple disciplines.

As a Natural Science student specialising in Chemistry you will spend the vast majority of your time studying in the Department of Chemistry where you will be trained to become a highly skilled chemist. Your degree programme has been constructed to take students on a journey of exploration deep into the subject and up to the forefront of cutting-edge chemical research whilst building an awareness of the links that exist between Chemistry and other scientific disciplines. This will give you a perspective beyond the boundaries of a more traditional degree in Chemistry. You will be provided with practical training in a state-of-the-art facility and develop a range of skills, from communication and team-working to scientific literacy and problem solving, in a clear chemistry context. The course is delivered with a strong focus on small group teaching to further facilitate your understanding of subject matter.

A four-year M.Sci degree will take you to the research frontier of modern, interdisciplinary chemistry, which is ideally suited for those who are interested in pursuing an academic or commercial career related to Chemistry. Alternatively, the three-year BSc degree, offers a more even balance of Chemistry-specific content and general training in transferable skills. Either way, you will experience a first class education in Chemistry, taught in modern facilities, all underpinned by your early exposure to different scientific disciplines.

Programme Learning Outcomes

Please provide six to eight statements of what a graduate of the programme can be expected to do.

Taken together, these outcomes should capture the distinctive features of the programme. They should also be outcomes for which progressive achievement through the course of the programme can be articulated, and which will therefore be reflected in the design of the whole programme.

PLO	On successful completion of the programme, graduates will be able to:
1 BSc	demonstrate learning and problem solving skills through the acquisition and application of a broad range of fundamental chemical principles and knowledge as appropriate to the interdisciplinary ethos of a Natural Scientist.
1 MSci	demonstrate learning and problem solving skills through the acquisition and application of a broad range of fundamental and advanced chemical principles and knowledge as appropriate to the interdisciplinary ethos of a Natural Scientist
2 BSc	apply fundamental chemical principles and knowledge as appropriate to the interdisciplinary ethos of a Natural Scientist, to the in-depth study of chemical science specialisms and the solution of problems therein.
2 MSci	apply fundamental and advanced chemical scientific principles and knowledge with a strong emphasis on chemistry to the in-depth study of chemical science specialisms and the solution of problems at the forefront of the science and chemistry in particular.
3 BSc	design and safely conduct experiments. Accurately document and record experiments including analysis of physical measurements, of both a quantitative and qualitative nature.
3 MSci	design and safely conduct chemical experiments. Accurately document and record experiments to enable the effective synthesis of complex chemical compounds and advanced analysis of physical measurements, of both a quantitative and qualitative nature.
4 BSc	interpret experimental data by using mathematical skills, discipline based knowledge, information technology and scientific conventions.
4 MSci	interpret experimental data by using mathematical skills, advanced scientific knowledge, information technology and scientific conventions.
5 BSc	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.
5 MSci	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 BSc	independently, or as part of a group, plan, design and conduct an open-ended investigative research project to consolidate and extend knowledge and understanding of science with particular emphasis on chemistry.
6 MSci	independently plan, design and conduct an extended, open-ended investigative research project to extend knowledge and understanding at the forefront of the chemical sciences.
7 BSc	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.

7 MSci	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 consistent with the expectations of a research chemist in academic, governmental or commercial positions.
8 BSc	Use chemistry principles, themes, concepts and methodologies as appropriate to a Natural Scientist with a view to exploit the synergies between chemistry and other science based disciplines underpinned by experience and exposure to different scientific disciplines.
8 MSci	Use advanced chemistry based principles, themes, concepts and methodologies as appropriate to a Natural Scientist with a view to exploit the synergies between expert level chemistry skill sets and other science based disciplines all underpinned by experience and exposure to different scientific disciplines.

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 provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year in industry b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year in industry by alteration of the standard PLOs.

MSci only: For the Year in Industry PLO 6 is modified to independently plan, design and conduct an extended, open-ended investigative research project in an industrial environment to extend knowledge and understanding at the forefront of the chemical sciences.

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 – please provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year abroad or b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year abroad by alteration of the standard PLOs.

MSci only: For the Year Abroad PLO 6 is modified to independently plan, design and conduct an extended, open-ended investigative research project at an overseas university to extend knowledge and understanding at the forefront of the chemical sciences.

Explanation of the choice of Programme Learning Outcomes

Please explain your rationale for choosing these PLOs in a statement that can be used for students (such as in a student handbook). Please include brief reference to:

i) Why the PLOs are considered ambitious or stretching?

The PLOs describe a journey from consolidating basic chemical and related 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 projects, 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 teaching and learning of research-led teaching of interdisciplinary chemical science is integrated with laboratory skills, the development of problem solving and employability skills. This will ensure that the a student specialising in Chemistry for Natural Sciences 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 the subjects as well as an education in the subjecs. The year 4 experience in particular (PLO6) makes the MSci ideal preparation for those thinking of careers in chemical and related areas of science whether in industry or further study in academia.

iii) How the programme learning outcomes develop students' digital literacy and will make appropriate use of technology-enhanced learning (such as lecture recordings, online resources, simulations, online assessment, 'flipped classrooms' etc)?

Students develop effective communication and related skills through regular application of digital literacy skills. In Year 2, 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). Students have the opportunity to use specialist software and databases used to visualise proteins and calculate properties of small molecules. Year 3 focuses on scientific report-writing and develops the ability to write in a way consistent with research publications with effective use of search tools and databases to access reserach literature. 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. In Year 4, distance (blended) learning is supported by technology-enhanced learning tools. Participating departments encourage the use of lecture recording, which has very high uptake, and all modules are supported by material on the VLE including screencasts, external links and quizzes, with pockets of use of 'clicker' technology.

iv) How the PLOs support and enhance the students' employability (for example, opportunities for students to apply their learning in a real world setting)?
The programme's employability objectives should be informed by the University's Employability Strategy:

http://www.york.ac.uk/about/departments/support-and-admin/careers/staff/

All the Nat. Sci. programmes have been designed with employability in mind. This is not only as a factor of the design of the programmes themselves, which have had engagement with the University's employability strategy as a given since the early design phases of the programme. But also as a factor of the embedded skills that the contributing departments have built into their modules. Modules which form the bulk of the teaching on this degree programme. Many of the skills listed in the PLOs are generic and will equip the student with a highly transferrable skill set. As an example: PLOs 4 & 5 revolve around such transferrable skills as programming, communication skills and data analysis techniques which are applicable beyond the problems addressed in the programme.

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

Students who need support will generally self identify at admission or early in the Stage 1 and standard University protocols will then be followed. If this isn't the case and a student is identified as needing extra support later in the programme then the student will discuss the matter with their personal supervisor who will advise in accordance with University guidance. Students are assigned a supervisor in one of the contributing departments and have access to a subject facilitator in both contributing departments. The student can approach their supervisor for advice in accordance with University guidelines and seek more specialist advice on a particular discipline from the subject facilitator. Module level issues are handled with the department to which the module belongs and a student can avail themselves off all feedback and quality control mechanisms that the department offers.

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

The programme has a research-led teaching philosophy. Although most of the core material in Years 1 and 2 is building foundation knowledge, in Year 3 material aligns with the research specialisms in the contributing departments. Furthermore, the option module structure has been specifically designed to reflect the research expertise in the Chemistry with courses on environmental, analytical and medicinal chemistry as well as options on mechanistic chemistry and advanced spectroscopy.

Stage-level progression

Please complete the table below, to summarise students' progressive development towards the achievement of PLOs, in terms of the characteristics that you expect students to demonstrate at the end of each year. This summary may be particularly helpful to students and the programme team where there is a high proportion of option modules.

Note: it is not expected that a position statement is written for each PLO, but this can be done if preferred (please add information in the 'individual statement' boxes). For a statement that applies across all PLOs in the stage fill in the 'Global statement' box.

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

Stage 1

On progression from the first year (Stage 1), students will be able to:	*Developed core learning stratergies for each of the disciplines studied in Stage 1. Have been introduced to and worked with the core concepts that underpin all three disciplines. Be familiar with the foundational material and practices of each of the disciplines.*

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:	*The more focussed Stage 2 will have further developed the knowledge base of the student, giving them more sophisticated tools with which to addess more demanding problems in their two chosen disciplines. Technical facility will be improved by exposure to more advacned concepts.*

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:	*A stage 3 student will now be a fully fledged specialist and will have satisfied all the PLOs for the BSc programme. They will be equipped to progress onto a more research focussed final stage.*

PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
Individual statements							

Programme Structure

Module Structure and Summative Assessment Map

Please complete the summary table below which shows the module structure and the pattern of summative assessment through the programme.

'Option modue' can be used in place of a specific named option. If the programme requires students to select option modules from specific lists these lists should be provided in the next section.

From the drop-down select 'S' to indicate the start of the module, 'A' to indicate the timing of each distinct summative assessment point (eg. essay submission/ exam), and 'E' to indicate the end of the module (if the end of the module coincides with the summative assessment select 'EA') . It is not expected that each summative task will be listed where an overall module might be assessed cumulatively (for example weekly problem sheets).

If summative assessment by exams will be scheduled in the summer Common Assessment period (weeks 5-7) a single 'A' can be used within the shaded cells as it is understood that you will not know in which week of the CAP the examination will take place.

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
20	MAT00007C	Maths for Sciences I	S									E	A																			
20	MAT00008C	Maths for Sciences II												S												E	A	A	A			
20	CHE00010C	Chemistry for Natural Sciences I	S					A		A	A		EA																			
20	CHE00012C	Chemistry for Natural Sciences II												S			A	A	A							EA	A	A	A			
20	PHY00022C	Introduction to Thermal & Quantum Physics		S									A									E					A	A	A			
20	PHY00020C	Electromagnetism , Waves & Optics												S												E	A	A	A			
10	PHY00026C	Introduction to Quantum Physics																														
10	BIO00007C	Genetics	S									EA																				
10	BIO00009C	Genetics & Evolution											S														EA	A	A			
20	BIO00004C	Molecular Biology & Biochemistry	S										A														EA	A	A			
20	ARC00006C	Introduction to Archaeological Science												S							E		A									

20	ENV00002C	Ecological Principles for the Environment	S							A								A				E					A	A	A			
Stage 2																																
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**
10	MAT00041I	Linear Algebra for	S																			E	A				A	A	A			
10	MAT00030I	Vector Calculus	S										EA																			
10	MAT00024I	Functions of a Complex Variable											S									E				A	A	A			
30	MAT00036I	Applied Maths Option I	S										A													E	A	A	A		
30	MAT00037I	Applied Maths Option II	S										A													E	A	A	A		
20	PHY00002I	Electromagnetism & Optics												S												E	A	A	A		
20	PHY00039I	Thermodynamics & Quantum Physics																														
10	PHY00033I	Thermodynamics	S										EA																			
10	PHY00036I	Quantum & Atomic Physics II	S										EA																			
10	PHY00020I	Experimental Laboratory I	S									A										EA										
10	PHY00037I	Particle & Nuclear Physics (option)																														
10	PHY00040I	Solid State Physics I (option)																														
10	PHY00035I	Maths II for Nat Sci	S										EA																			
20	CHE00014I	Chem for Nat Sci 3	S						A			A	EA																			
20	CHE00015I	Chem for Nat Sci 4												S						A			A	A			EA	A	A			
20	CHE00025I	Chem for Nat Sci 5												S													EA	A	A			
20	BIO00051I	Molecular Biology, Biotechnology & Bioinformatics	S																								EA					
20	BIO00011I	Cell Biology	S																								EA					
20	BIO00054I	Biochemical Reactions and Interactions	S														A										EA					
20	ARC00018I, ARC00050I, ARC00055I, ARC00020I	World Archaeology I (Option list D)		S							E		A																			
20	ARC00005I, ARC00028I, ARC00004I	Practical Skills (Option list E)												S								EA										
20	ARC00009I, ARC00029I, ARC00013I	Team Project (Option list E)																					S			E			A			

20	ENV00019I	Environmental Geochemistry	S									A										E					A	A	A			
20	ENV00013I	Energy & the Environment	S												A							E					A	A	A			
10	ENV00002I	Climate Change											S								A	E										
10	ENV00016I	Environment Systems Project	S				A					EA																				
Stage 3																																
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**
10	CHE00022H	*Chemistry for Natural Sciences 8*																														
20		Option List A											S												A			EA				
10	CHE00023H	Chemistry for Natural Sciences 11: Electronic states and statistical thermodynamics																														
20	CHE00002H	Core 8: Advanced Core Chemistry II	S													A												EA				
20	CHE00003H	Core 9: Advanced Core Chemistry III	S																									EA				
20	CHE00005H	Advanced Practical Research Training	S					A			A	A	A										A								E	
10		Option List B											S							A								EA				
10		Option List C											S											A				EA				
40	CHE00021H	BSc Research Project	S																									EA				
Stage 4																																
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**
90	CHE00013M/15M/28M	Chemistry for Natural Sciences 14: MChem Advanced Research Project	S																					A				EA				
10	CHE00011M	Chemistry for Natural Sciences 15: Literature Review	S																					EA								
20	[new]	Chemistry for Natural Sciences 16: Advanced Chemistry	S																									EA				

Optional module lists

If 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 left to reveal ten further hidden rows.

Option List A	Option List B	Option List C	Option List D	Option List E	Option List F	Option List G	Option List H
Reaction Intermediates & Mechanisms	Synthesis - from Nature to the Lab	Analytical & Forensic Chemistry	World Archaeology I & II: Mummification	Practical Skills and Team project: Biomolecular Archaeology			
Catalysis with Green Technologies	Chemical Biology & Molecular Interactions	Bioinspired Chemistry	World Archaeology I & II: Conflict	Practical Skills and Team project: Animal Bones			
Atmospheric Chemistry	Chemical Theory & Computation	Lasers in Chemistry	World Archaeology I & II: The Archaeology of South America	Practical Skills and Team project: Human Bones			
Chemistry & Disease			World Archaeology I & II: The Emergence of Mediterranean civilisations	Practical Skills and Team Project: Environmental Archaeology			
			new modules will be added as they are developed	Practical Skills and Team project: Experimental Archaeology			
				new modules will be added as they are developed			

Please note: you need to complete information on all three tabs of this sheet before submitting to the UTC Strategy Working Group.

You are required to submit this information for all undergraduate programme by the 31 July 2016.

Programme Map: Module Contribution to Programme Learning Outcomes

Please complete the summary table below which shows how individual modules contribute to the achievement of programme learning outcomes.

Core modules should be mapped individually. If the programme offers multiple options that contribute to exactly the same PLOs you can group these, providing a statement that articulates how all of these contribute to the achievement of the programme learning outcomes. All modules, both core and optional, should be accounted for in the map.

The table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:
· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;
· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

Note: it is not expected that every module contributes directly to all PLOs, but every module should advance some of them.

(Add additional rows as required)

Stage	Module		MSci Programme Learning Outcomes							
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8

			demonstrate learning and problem solving skills through the acquisition and application of a broad range of fundamental and advanced chemical principles and knowledge as appropriate to the interdisciplinary ethos of a Natural Scientist	apply fundamental and advanced chemical scientific principles and knowledge with a strong emphasis on chemistry to the in-depth study of chemical science specialisms and the solution of problems at the forefront of the subject science and chemistry in particular.	design and safely conduct chemical experiments through an effective risk assessment. Accurately document and record experiments to enable the effective synthesis of complex chemical compounds and advanced analysis of physical measurements, of both a quantitative and qualitative nature.	interpret experimental data by using mathematical skills, advanced chemical knowledge, information technology and scientific conventions.	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.	independently plan, design and conduct an extended, open-ended investigative research project to extend knowledge and understanding at the forefront of the chemical sciences.	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 consistent with the expectations of a research chemist in academic, governmental or commercial positions.	Use advanced chemistry based principles, themes, concepts and methodologies as appropriate to a Natural Scientist with a view to exploit the synergies between expert level chemistry skill sets and other science based disciplines all underpinned by experience and exposure to different scientific disciplines.
			BSc Programme Learning Outcomes						
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
			demonstrate learning and problem solving skills through the acquisition and application of a broad range of fundamental chemical principles and knowledge as appropriate to the interdisciplinary ethos of a Natural Scientist.	apply fundamental chemical principles and knowledge as appropriate to the interdisciplinary ethos of a Natural Scientist, to the in-depth study of chemical science specialisms and the solution of problems therein.	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 including analysis of physical measurements, of both a quantitative and qualitative nature.	interpret experimental data by using mathematical skills, chemical discipline based knowledge, information technology and scientific conventions.	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.	independently, or as part of a group, plan, design and conduct an open-ended investigative research project to consolidate and extend knowledge and understanding of science with particular emphasis on chemistry.	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.	Use chemistry principles, themes, concepts and methodologies as appropriate to a Natural Scientist with a view to exploit the synergies between chemistry and other science based disciplines underpinned by experience and exposure to different scientific disciplines.

Stage 1	Maths for Sciences I	Progress towards PLO	competently use relevant standard mathematical methods	adapt the standard tools to problems slightly outside the standard format			present clear and concise solutions to exercises				
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination			exercises, with the support of seminars and formative feedback through marked work				
Stage 1	Maths for Sciences II	Progress towards PLO	competently use relevant standard mathematical methods	adapt the standard tools to problems slightly outside the standard format			present clear and concise solutions to exercises				
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination			exercises, with the support of seminars and formative feedback through marked work				
Stage 1	Chemistry for Natural Sciences I	Progress towards PLO	Developing an understanding of core chemical principles of atomic structure, thermodynamics, periodicity, acids & bases, separations science & mass spectrometry and reactivity.	Developing an understanding of core chemical principles of atomic structure, thermodynamics, periodicity, acids & bases, separations science & mass spectrometry and reactivity.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design and commnunication of results.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design and commnunication of results.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design and commnunication of results.			Developing an understanding of core chemical principles of atomic structure, thermodynamics, periodicity, acids & bases, separations science & mass spectrometry and reactivity.	

		By working on (and if applicable, assessed through)	Examination and assessed workshop	Examination and assessed workshop	Lab report	Lab report	Lab report			Examination and assessed workshop	
Stage 1	Chemistry for Natural Sciences II	Progress towards PLO	Developing an understanding of core chemical principles of kinetics, thermodynamics, spectroscopy, transition metals and reactivity.	Developing an understanding of core chemical principles of kinetics, thermodynamics, spectroscopy, transition metals and reactivity.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design and commnunication of results.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design and commnunication of results.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design and commnunication of results.			Developing an understanding of core chemical principles of kinetics, thermodynamics, spectroscopy, transition metals and reactivity.	
		By working on (and if applicable, assessed through)	Examination and assessed workshop	Examination and assessed workshop	Lab report	Lab report	Lab report			Examination and assessed workshop	
Stage 1	Introduction to Thermal & Quantum Physics	Progress towards PLO	Gain an understanding of the core importance of quantum mechnics to the science of measurement.	Solve foundational numerical problems by application of relevant mathematical and physical principles							
		By working on (and if applicable, assessed through)	Engaging with teaching materials and links to other modules.	Regular independent assignments (PPQs), small-group problem solving in problem classes, tailored small-group sessions (tutorials), formal examination.							

Stage 1	Electromagnetism, Waves & Optics	Progress towards PLO	Apply problem solving techniques and apply them to weekly problems in an independent way.	Understand that wave mechanics can be used to understand parts of other larger problems beyond those taught explicitly in the course.							
		By working on (and if applicable, assessed through)	Regular independent assignments (PPQs), small-group problem solving in problem classes, examples given in lectures, tailored small-group sessions (tutorials) formal examination.	Engaging with teaching materials.							
Stage 1	Introduction to Quantum Physics	Progress towards PLO	Gain an understanding of the core importance of quantum mechnics to the science of measurement.	Solve foundational numerical problems by application of relevant mathematical and physical principles							
		By working on (and if applicable, assessed through)	Engaging with teaching materials and links to other modules.	Regular independent assignments (PPQs), small-group problem solving in problem classes, tailored small-group sessions (tutorials), formal examination.							

Stage 1	Genetics	Progress towards PLO	Problem solving exercises to develop understanding of genetics. Students can work individually or in groups.	By engaging with core prinicipals of classical and molecular genetics that will be built upon in future modules and Stages.	Gain experience of core techniques such as gel electrophoresis and microscopy						
		By working on (and if applicable, assessed through)	By multiple pen + paper workshop sessions spread throughout the term. 1 hour closed exam	Lectures, pre-recorded material on the VLE, worksheets and set reading. 1 hour closed exam	Three x 3 hr practicals						
Stage 1	Genetics & Evolution	Progress towards PLO	By practising the principles of genetic analysis, and evolutionary and population genetics in problem solving exercises.	Learning and developing an understanding about the principles of genetic analysis, the evolution of genes and genomes, and an introduction to evolutionary and population genetics		Practising the principles of genetic analysis in experimental design and hypothesis testing					
		By working on (and if applicable, assessed through)	Participating in problem solving workshops and practiciing the skills required by a Geneticist in lateral thinking and problem solving. 1 hour closed exam	Listening and engaging with lectures and reading slected chapters in textbooks. Completing a number of VLE based exercises and quizzes that test and direct student learning.. 1 hour closed exam		Practising teachniques and approaches in genetic analysis in problem solving sessions					

Stage 1	Molecular Biology & Biochemistry	Progress towards PLO	Practising problem-solving and basic chemistry-based calculations together with hands-on practicals in enzymes kinetics and separation of macromolecules.	Gaining an understanding of detailed chemistry and molecular aspects of biology starting from basic chemical building blocks of life to macromolecules and complex biological processes such as metabolism and photosynthesis.	Exposure to several basic biochemical techniques (column chromatography, enzyme kinetics).						
		By working on (and if applicable, assessed through)	Worksheets and practical protocols. An open assessment of problems, graphs, calculations, and conclusions relating to the practical work on enzyme kinetics.	2x 1.5-hour long exams (Start of Spring term and mid-Summer term)	Lectures and practicals.						
Stage 1	Intro to Arch Sci	Progress towards PLO					by being introduced to a range of scientific techniques used in lectures (including chemistry), learning to read scientific articles in seminar workshops			students will begin to understand the role that various chemical scientific techniques play in archaeological research	

		By working on (and if applicable, assessed through)					writing a scientific journal article critique for the formative and summative assessment			by being introduced to a range of scientific techniques used in (bio) archaeology in lectures and learning to read scientific articles in seminar workshops	
Stage 1	Eco Principles for the Environment	Progress towards PLO	Develops knowledge, understanding and awareness			Practice in primary data collection				Develops awareness of the importance of interdisciplinarity	
		By working on (and if applicable, assessed through)	Lectures and practicals on ecological theories and skills (assessed by exam)			Lecturer-defined practicals: primary data are collected on ecology-based field studies				Lectures and practicals on ecological problems and how society can manage and affect these (assessed by scientific reports)	
Stage 2	Linear Algebra for Natural Sciences	Progress towards PLO	use the standard methods of basic linear algebra and matrix theory, and their theoretical justification through abstract algebra	apply basic linear algebra and matrix theory to a range of unfamiliar situations	prove standard results in abstract linear algebra		present clear and concise solutions to exercises				
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination		exercises, with the support of seminars and formative feedback through marked work				

Stage 2	Vector Calculus	Progress towards PLO	use the standard methods of multi-variable differential and integral calculus to work with functions of many variables and vector fields	apply these standard methods to problems which require a level of interpretation to set up the application			present clear and concise solutions to exercises				
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination			exercises, with the support of seminars and formative feedback through marked work				
Stage 2	Functions of a Complex Variable	Progress towards PLO	understand and use the standard methods of complex analysis for functions of one complex variable	apply complex analysis to solve problems in applied real analysis, where their use provides quick and powerful solutions	decide when certain methods from complex analysis can, or cannot, be applied and give a justification for this decision		present clear and concise solutions to exercises				
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination.		exercises, with the support of seminars and formative feedback through marked work				
Stage 2	Applied Maths Option I	Progress towards PLO	competently use relevant mathematical methods in an applied area of science	adapt mathematical tools to solve specific problems in an applied area of science			present clear and concise solutions to exercises				

		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination			exercises, with the support of seminars and formative feedback through marked work				
Stage 2	Applied Maths Option II	Progress towards PLO	competently use relevant mathematical methods in an applied area of science	adapt mathematical tools to solve specific problems in an applied area of science			present clear and concise solutions to exercises				
		By working on (and if applicable, assessed through)	lecture material and exercises, with the support of seminars and formative feedback through marked work, and assessed by examination	exercises and with formative feedback through marked work and the seminars, and assessed by examination			exercises, with the support of seminars and formative feedback through marked work				
Stage 2	Electromagnetism & Optics	Progress towards PLO	Use a range of mathematical tools and physical principles to evaluate physics problems of increasing complexity. Understand the wide-ranging applicability of electromagnetism to solving problems from a variety of other fields of physics and beyond.								

		By working on (and if applicable, assessed through)	Regular independent assignments (PPQs), small-group problem solving in problem classes, engaging with lecture material, formal examination.								
Stage 2	Thermodynamics & Quantum Physics	Progress towards PLO	Apply and adapt a range of basic tools, models, and physical principles to evaluate physics problems of increasing complexity								
		By working on (and if applicable, assessed through)	Regular independent assignments (PPQs), small-group problem solving in problem classes, engaging with lecture material, formal examination.								

Stage 2	Experimental Laboratory I	Progress towards PLO	Apply content from lectures modules to conceptually challenging practical situations, while understanding how the choice of methodology and tools governs the reliability of the scientific data collected.		Execute longer and more nuanced experimental investigations		Keep lab book to an accepted and well-defined standard capturing an accurate and comprehensive account of methodologies and results, and effectively communicate results and ideas via formal reports. This is good preparation for the more extended and independent work in Stage 3, in BSc projects (BSc students) or in advanced experimental laboratory (MSci students).				
		By working on (and if applicable, assessed through)	Engaging with the underlying theory of experiments carried out. Working in pairs on experiments with pre-defined outputs. Independently writing formal reports for assessment.		Conducting lab experiments, writing a formal report; practicals		Writing a formal scientific report, lab book record-keeping for assessment.				

Stage 2	Particle & Nuclear Physics	Progress towards PLO	Apply and adapt a range of basic tools, models, and physical principles to evaluate physics problems of increasing complexity							Appreciate and be aware of the wider applications of particle & nuclear physics as topics which underpin much of modern physics.	
		By working on (and if applicable, assessed through)	Regular independent assignments (PPQs), small-group problem solving in problem classes, engaging with lecture material, formal examination.							Engaging with teaching materials	
Stage 2	Solid State Physics I	Progress towards PLO	Apply and adapt a range of basic tools, models, and physical principles to evaluate physics problems of increasing complexity							Appreciate and be aware of the wider applications of solid state physics as a topic which underpin much of modern physics.	
		By working on (and if applicable, assessed through)	Regular independent assignments (PPQs), small-group problem solving in problem classes, engaging with lecture material, formal examination.							Engaging with teaching materials	

Stage 2	Maths II for Nat Sci	Progress towards PLO	Be able to select and apply a range of mathematical tools to evaluate suitable physics problems. Understand the foundational importance of mathematics in the study of physics and physical systems. Vector calculus component feeds very strongly into Stage 2 Electromagnetism and Optics (EMO).				present clear and concise solutions to exercises				
		By working on (and if applicable, assessed through)	Regular independent assessed assignments (PPQs), engaging with lecture material, independent suported problem-solving sessions (maths practicals), formal examination.				exercises, with the support of seminars and formative feedback through marked work				

Stage 2	Chem for Nat Sci 3	Progress towards PLO	Developing an understanding of advanced chemical principles of retrosynthetic analysis, solutions and mixtures, symmetry and group theory, organic synthesis with enolate equivalents, metal-ligand and metal-metal bonding, coordination chemistry and quantum mechanics.	Developing an understanding of advanced chemical principles of retrosynthetic analysis, solutions and mixtures, symmetry and group theory, organic synthesis with enolate equivalents, metal-ligand and metal-metal bonding, coordination chemistry and quantum mechanics.	Develop intermediate skills required for synthetic inorganic and organic chemistry including handling air and water-sensitive materials and pyrophorics. Working safely in the laboratory	Develop intermediate skills required for synthetic inorganic and organic chemistry including handling air and water-sensitive materials and pyrophorics. Working safely in the laboratory	Develop intermediate skills required for synthetic inorganic and organic chemistry including handling air and water-sensitive materials and pyrophorics. Working safely in the laboratory			Developing an understanding of advanced chemical principles of retrosynthetic analysis, solutions and mixtures, symmetry and group theory, organic synthesis with enolate equivalents, metal-ligand and metal-metal bonding, coordination chemistry and quantum mechanics.	
		By working on (and if applicable, assessed through)	Examination	Examination	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.	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.	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.			Examination	

Stage 2	Chem for Nat Sci 4	Progress towards PLO	Developing an understanding of advanced chemical principles of the synthesis of biological molecules, physical organic chemistry, organometallic chemistry, electrochemistry and heteroaromatic chemistry.	Developing an understanding of advanced chemical principles of the synthesis of biological molecules, physical organic chemistry, organometallic chemistry, electrochemistry and heteroaromatic chemistry.	Design and perform experiments	Design and perform experiments	Design and perform experiments			Developing an understanding of advanced chemical principles of vibrational specroscopy, excited states and photochemistry, physical organic chemistry, organometallic chemistry, photoelectron spectroscopy and molecular orbital theory and heteroaromatic chemistry.	
		By working on (and if applicable, assessed through)	Examination	Examination	Physcial organic chemistry lab / physical chemistry labs	Physcial organic chemistry lab / physical chemistry labs	Physcial organic chemistry lab / physical chemistry labs			Examination	
Stage 2	Chem for Nat Sci 5	Progress towards PLO	Developing an understanding of fundamental chemical principles of solid state chemistry, alkenes and alkynes, catalysis, vibrational spectroscopy and excited states and photochemistry.	Developing an understanding of fundamental chemical principles of solid state chemistry, alkenes and alkynes, catalysis, vibrational spectroscopy and excited states and photochemistry.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	Development of core laboratory skills and understanding of key safety practices. Aspects of planning and experimental design.	Developing professional modes of behaviour, with respect to sharing resources, learning and adhering to standard laboratory practice, and working well with others	Developing an understanding of fundamental chemical principles of solid state chemistry, substitution and elimination and alkenes and alkynes.	

		By working on (and if applicable, assessed through)	Examination	Examination	Team project work through Integrated Chemistry Practical (ICP). A mixture of mainly formative assessments (training) and selected summative assessments (proof of competence) drive the learning of key laboratory skills. Design of an experimental investigation applying analytical chemistry techniques is guided by laboratory staff and summatively assessed at the conclusion of ICP.	Team project work through Integrated Chemistry Practical (ICP). A mixture of mainly formative assessments (training) and selected summative assessments (proof of competence) drive the learning of key laboratory skills. Design of an experimental investigation applying analytical chemistry techniques is guided by laboratory staff and summatively assessed at the conclusion of ICP.	Team project work through Integrated Chemistry Practical (ICP). A mixture of mainly formative assessments (training) and selected summative assessments (proof of competence) drive the learning of key laboratory skills. Design of an experimental investigation applying analytical chemistry techniques is guided by laboratory staff and summatively assessed at the conclusion of ICP.	Team project work through Integrated Chemistry Practical (ICP). A mixture of mainly formative assessments (training) and selected summative assessments (proof of competence) drive the learning of key laboratory skills. Design of an experimental investigation applying analytical chemistry techniques is guided by laboratory staff and summatively assessed at the conclusion of ICP.	Group experiments in the integrated chemistry practicals and by working on practical experiments individually, in pairs, and in small groups; creative approaches to research strategy; summative assessment (ICP) involves team presentations.	Examination	
Stage 2	Cell Biology [new]	Progress towards PLO	Integration of acquired understandings of cell biology principles and pathophysiologies. Logical thinking/crtitical analyses/ problem solving skills.		Design and perform experiments to investigate mechanisms underlying cell motility.			Group work in laboratory practicals and workshops to understand cell biology.			
		By working on (and if applicable, assessed through)	Lectures, workshops and practicals. Assessed through a closed assessment.		Workshops and practicals. Assessed through a closed assessment.			Workshops and practicals. Assessed through a closed assessment.			

Stage 2	Biochemical Reactions and Interactions (20c) [new]	Progress towards PLO		Evaluate key analytical and quantitative techniques used in a modern biochemistry lab by focusing on the appropriateness of the technique (s) to the biochemical question being addressed.	Design experiments applying advanced analytical and quantitative techniques to address biological questions. Analyse multi-parameter data sets generated by these techniques and interpret in the context of a research hypothesis.			Group work in problem-solving workshops to understand key concepts underlying techniques, their limitations and their applications in biochemical research.		Select an appropriate set of techniques to address a research question, then analyse and interpret the data acquired using these techniques. Gain an appreciation of the wider applicability of core biochemical and biophysical techniques in cross-disciplinary research through engagement with the published literature.	
		By working on (and if applicable, assessed through)		By applying concepts to biochemical and biophysical problems in formative workshops. Assessed by 1.5 hr closed (open note) workshop in middle of Spring term.	Design experiments to address biochemical and biophysical problems in formative workshops. Critical analysis of research articles in workshops. Assessed by 1.5 hr closed (open note) workshop in middle of Spring term.			Formative problem-solving activities in workshops and structured independent learning (engagement with 'flipped' lecture material).		By applying numerical and quantitative skills in biochemical and biophysical problem-solving activities in formative workshops with opportunities to apply R. Critical analysis of research articles in workshops. Numerical and quantitative skills assessed by summative workshop-based exam.	

Stage 2	Molecular Biology, Biotechnology & Bioinformatics 20 c [new]	Progress towards PLO	Biological problems presented in a range of workshops with different formats where students will work alone or in different sized groups.		First hand execution of practical and analysis of quantitative transcriptomics data.	Understanding methods associated with transciptomics, manipulating and interpreting this type of data using bioinformatics skills.					
		By working on (and if applicable, assessed through)	Practicals and workshops. Understanding and problem solving ability assessed in workshops. All blocks		Practicals	All workshops and or practicals which involve some of the transferable skills listed above					
Stage 2	World Arch I	Progress towards PLO					students will practise the principles of communicating complex issues to a non-specialist audience				
		By working on (and if applicable, assessed through)					by being provided with worked examples online and producing an article on a chosen case study for a popular magazine for the summative assessment				
Stage 2	Practical Skills	Progress towards PLO					Students will further build on criticality in their written work and recognise professional standards in report writing				

		By working on (and if applicable, assessed through)					by completing written critiques of professional reports in formative and summative assessment				
Stage 2	Team Project	Progress towards PLO						students will build on their knowledge of archaeological research design using specialist methodologies relevant to their chosen option	students will significantly enhance their understanding and experience of teamwork		
		By working on (and if applicable, assessed through)						by matching recording and analytical methods to research aims and objectives and writing a specialist report on a dataset for the summative assessment	by working as a team to produce a professional report for the summative assessment. Students are required to allocate and coordinate tasks, communicate effectively and keep adequate records of meetings. managing their time effectively to complete a substantial piece of collaborative work to a deadline,		
Stage 2	Environmental Geochemistry	Progress towards PLO	Develops skills in performing scientific calculations			Develops skills in data collection and handling			Develops team-working skills		

		By working on (and if applicable, assessed through)	Calculations: A range of laboratory and paper based practicals in which environmental science data is analysed to gain insight and information about various topics relevant to environmental science. Assessed by summative coursework and exam.			Lecturer-led laboratory practicals: A range of laboratory practicals and calculation methods that students may choose to apply in their 3rd / 4th year projects			Groupwork: Working in groups to carry out laboratory practicals		
Stage 2	Energy & the Environment	Progress towards PLO	Develops knowledge, understanding and awareness	Develops awareness of environmental problems and critically evaluating their solutions		Develops data handling and analysis skills	Develops skills in written comunication		Develops team-working skills	Develops awareness of the importance of interdisciplinarity	

		By working on (and if applicable, assessed through)	Gaining knowledge on technical, social and spatial dimensions of energy systems and how these interact with environmental parameters; students also gain knowledge and experience of some of the key methodologies used in managing and protecting the environment. (assessed by exam)	Undertaking problem-based tasks in groups across five practical sessions exploring EIA, SEA, carbon policy, energy futures, community engagement. Assessed by summative essay and exam.		Secondary data handling: The summative coursework essay requires analysis of country-specific energy issues and policies to determine the extent to which environmental problems influence energy policy.	Written: Preparation of argument-based summative essay		Groupwork: Working as a group on problem-based tasks across five practical sessions (EIA, SEA, carbon policy, energy futures, community engagement)	Studying energy as a socio-technical system. The summative coursework essay in particular requires understanding and expression of energy as a socio-technical system.	
Stage 2	Climate Change	Progress towards PLO	Develops knowledge, understanding and awareness	Develops awareness of environmental problems and their solutions, and provides experience in designing sustainable solutions		Develops skills in data collection and handling, and research project design		Develops awareness of environmental problems and their solutions, and provides experience in designing sustainable solutions	Practice in working as a group	Develops awareness of the importance of interdisciplinarity	

		By working on (and if applicable, assessed through)	Studying the public perception, best evidence of impacts, mitigation and adaptations to climate change including recommendations for future emissions reductions in carbon.	A report recommending sustainable solutions to climate change considering the broader social, political and environmental contexts, and the ethical implications of their application by applying knowledge, theories and approaches from the module and wider degree		Student-led research projects, groups: For a scientific report, students plan, design and execute research as an individual to address climate change using modelling software		A report recommending sustainable solutions to climate change considering the broader social, political and environmental contexts, and the ethical implications of their application by applying knowledge, theories and approaches from the module and wider degree	Groupwork: Work responsibly as part of a team or as a team-leader to design and write an eye catching yet scientifically informing newspaper article on climate change	Media seminar which involves students thinking about something other than the science of climate change and how the need to sell papers affects reporting. The scientific report involves working across disciplinary boundaries. As well as considering the scientific aspects behind climate change, students also consider the social, political and economic aspects.	
Stage 2	Environment Systems Project	Progress towards PLO	Develops knowledge, understanding and awareness	Develops awareness of environmental problems and provides experience in critically evaluating sustainable solutions		Develops data handling and analysis skills		Develops skills in data collection and handling, and research project design	Devlops skills in oral and written comunication		

		By working on (and if applicable, assessed through)	Undertaking research for group project on the impacts of development on the environment (assessed in a summative verbal assessment and scientific report)	Students are asked to propose sustainable solutions to mitigating the impacts of development on the environment. Assessed in a summatively assessed scientific report.		Statistics: Analysis of field/lab data. Use of SPSS. Independent design of data analysis. Assessed in summative assessments: verbal presentation of a research plan and scientific report.		Student-led research projects, groups: Designing a field/ lab project as part of a group. Defining a research question, aim and objectives, sampling strategy, collecting data in the field/ lab, analysing the data and communicating the findings. Assessed in verbal presentation of a research plan.	Oral: Individual presentation of a research plan; Written: Individual project write-up as a scientific report on data collected in group project. Reportincludes a technical summary for a non-specialist audience (University of York Estates).		
Stage 3	Chemistry for Natural Sciences 11: Atmospheric, electronic states and statistical thermodynamics	Progress towards PLO	Understanding high-level chemical principles across physical and theoretical chemistry.				Development of written and oral presentation skills		Commercial applications of cutting-edge chemistry; creativity in research and applications		

		By working on (and if applicable, assessed through)	Engaging with lectures and learning support activities on Atmospheric Chemistry, Statistical Thermodynamics and Electronic States of Atoms & Molecules. Applications to unseen problems in tutorial and workshops. Formative assessment is through a workshop in each topic and summative assessment through a closed-book examination.				Preparation of written workshop exercises. Engagement in workshops.		Introduction to research topics through lectures and formative case studies and workshop activities.		
Stage 3	Core 8: Advanced Core Chemistry II	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		

		By working on (and if applicable, assessed through)	Engaging with lectures and learning support activities on Supramolecular & Nanoscale Chemistry, 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 assessment through an open-book assessed workshop activity (Advanced Separations & Mass Spectrometry) and a closed-book examination (Summer). The content is delivered across the whole of Year 3 and examined at the end to				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 & Nanoscale Chemistry to modern commercial 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: Advanced Core Chemistry III	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		

		By working on (and if applicable, assessed through)	Engaging with lectures and learning support activities on Applications of Quantum Chemistry, Electronic Properties of Materials, Fundamentals of Magnetic Resonance, Dynamic Electrochemistry, 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 examination (Summer). The content is delivered across the whole of Year 3 and examined at the end to reinforce the importance of synoptic learning as the teaching engages				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.		

Stage 3	Chemistry for Natural Sciences 8	Progress towards PLO	Understanding high-level chemical principles regarding spectroscopic characterisation of unknown structures.				Development of written and oral presentation skills				

		By working on (and if applicable, assessed through)	Engaging in lectures and learning support activities on integrated spectroscopy, applications of NMR in organic chemistry, physical methods for structure determination and mass spectrometry. Applications to unseen problems in tutorial and workshops. Formative assessment is through small-group tutorial/workshop assignments in each topic and summative assessment through a closed-book examination (Summer). The content is delivered across the whole of Year 3 and examined at the end to reinforce the importance of synoptic learning as the teaching engages increasingly with the interdisciplinary forefront of modern chemistry.				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.				

Stage 3	Chemistry for Natural Sciences 6: Advanced Practical Research Training	Progress towards PLO			Experimental design and implementation	Data interpretation and analysis	Written scientific project reports and posters	Design and implement a research project	Team working towards a research goal, creative solutions in research		
		By working on (and if applicable, assessed through)			Advanced experiments and miniprojects	Advanced experiments in inorganic, physical and organic chemistry. Data obtained from the miniprojects. Summative assessment through extended reports building on Stage 2 report writing.	Lab reports for four advanced experiments and the group miniproject; the latter also includes production of a research poster by the group. All are summatively assessed.	Team miniproject - groups of 3-6 students tackle an open-ended problem with scope to design their own investigation on the basis of literature and their own ideas and in collaboration with a supervisor. Students take the lead with planning, risk assessing and evolving the project. Summative assessment through individual reports (covering the whole group's work) and a group poster.	Team miniproject involving teamwork in a research setting including planning, prioritisation, sharing of workload and interpersonal communication. Outcomes are implicitly assessed through the summative assessment of overall productivity (report) and team presentation (group poster). Implicit summative assessment of creative strategy in research and presentation thereof.		
Stage 3	BSc Research Project	Progress towards PLO	Fundamental investigation of specific chemical principles; researching project-related literature topic	Fundamental investigation of specific chemical principles; 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	Problem solving, time management and team working during research projects. Creativity in research.	Fundamental investigation of specific chemical principles; researching project-related literature topic	

		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, supervisor's project execution mark, and literature review. Summative literature comprehension exam & presentation.	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, supervisor's project execution mark, and literature review. Summative literature comprehension exam & presentation.	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.	Research Project. Collaboration with project supervisor and research group encourages development of skills in data analysis. Summatively assessed though the written report.	Research project report with prior formative draft stage. Summative assessment of essay writing through Sci Lit exam 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 and execution. Implicit assessment of creativity in research strategy.	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, supervisor's project execution mark and literature review. Summative literature comprehension exam. A presentational aspect will be built in on a project day, where students will be tasked to present the findings of their research to their peers across their cohort. To enable students from different disciplines to understand their presentation, a student will need to appreciate th inter-disciplinary aspects of their subject.	

Stage 3	Reaction Intermediates & Mechanisms	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge of a chemical science specialism and applications in problem solving			Development of written and problem-solving skills		Commercial applications of cutting-edge chemistry; creativity in research and applications		

		By working on (and if applicable, assessed through)		Engaging with lectures and learning support activities on Organic Intermediates in Synthesis & Biology, Interrogation of Mechanism in Organometallic Chemistry, NMR Studies of Reaction Intermediates & Mechanism, Mechanistic Studies with EPR Spectroscopy, and Time-Resolved Spectroscopy for the Study of Fast Reactions. Applications to unseen problems and case studies in workshops. Formative assessment is through workshop assignments and summative assessment is through an open-book assessed workshop (NMR) and a closed-book examination (January).			Learning support workshops; formative assessment through supported workshop activities with summative assessment of written work covering complex, specialised chemical topics through an assessed workshop and examination.		Application of organometallic chemistry and spectroscopy to commercial production routes through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities.		

Stage 3	Catalysis wth Green Technologies	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge of a chemical science specialism 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 examination (January).			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.	

Stage 3	Atmospheric Chemistry	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge of a chemical science specialism and applications in problem solving		Critical data analysis	Development of written and problem-solving skills		Applications of cutting-edge chemistry; creativity in research and implications for policy		
		By working on (and if applicable, assessed through)		Engaging with lectures and learning support activities on Meteorology & Physical Climate, Chemistry of Gases in the Troposphere & Stratosphere, Modelling Techniques, Measurement Techniques and Science into Health & Policy. Applications to unseen problems and case studies in workshops. Formative activities include workshop assignments and summative assessment is through a computer-based simulation workshop and report (Modelling Techniques) and a closed-book examination (January).		Report on air quality in cities; application of computer modelling; summative assessment through a computer-based simulation workshop and report (Modelling Techniques)	Learning support workshops; formative assessment through supported workshop activities with summative assessment of written work covering complex, specialised chemical topics through an assessed report based on computer modelling and examination.		Application of atmospheric research (through measurement and modelling) to policy-making through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. Summative assessment of modelling of pollution in cities on aspects of policy through assessed workshop.		

Stage 3	Chemistry & Disease	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge of a chemical science specialism and applications in problem solving		Understanding the role of computers in chemistry	Development of written and problem-solving skills		Applications of cutting-edge chemistry; creativity in research and implications for future affordable and effective treatments		

		By working on (and if applicable, assessed through)		Engaging with lectures and learning support activities on Introduction to Chemotherapy, Drug Metabolism & Delivery, Introduction to the Molecular Basis of Disease, Cancer Chemotherapy, Molecular Aspects of Complex Diseases, Modern Approaches to Drug Discovery and Metals in Medicine. Applications to unseen problems and case studies in workshops. Formative activities include workshop assignments and summative assessment is through a computer-based workshop using software to visualise active site-drug interactions and related report (Modern Approaches to Drug Discovery) and a closed-book examination (January).		Molecular graphics workshop; summative assessment through a computer-based workshop using software to visualise active site-drug interactions and related report (Modern Approaches to Drug Discovery)	Learning support workshops; formative assessment through supported workshop activities with summative assessment of written work covering complex, specialised chemical topics through an assessed report based on modelling/molecular graphics software and examination.		Application of research at the interface of biological and medicinal chemistry to current and future therapies through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. Summative assessment of modelling of molecular interactions on drug design through assessed workshop.		

Stage 3	Synthesis - From Nature to the Lab	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge at M-level of a chemical science specialism and applications in problem solving			Development of written and problem-solving skills		Applications of cutting-edge chemistry; creativity in research		

		By working on (and if applicable, assessed through)		Engaging with lectures and learning support activities on Advanced Organic Synthesis, Biosynthesis of Polyketides, Terpenes and Alkaloids, Advanced Retrosynthesis, Stereocontrolled Synthesis using Organo-Main Group Chemistry and Synthesis of Nitrogen-containing Pharmaceuticals and Natural Products. Applications to unseen problems and case studies in workshops. Formative activities include workshop assignments and a problems class and summative assessment is through an assessed workshop (Synthesis of Polyketides, Terpenes & Alkaloids) and a closed-book examination (Summer).			Learning support workshops; formative assessment through supported workshop activities and a problems class with summative assessment of written work covering leading-edge, specialised chemical topics and current research literature through an assessed workshop and examination.		Application of research at the interface of biological and synthetic chemistry to development of creative and cost-effective synthetic strategies through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. Implicit summative of assessment creativity in synthetic strategy through exam.		

Stage 3	Chemical Biology & Molecular Interactions	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge at M-level of a chemical science specialism and applications in problem solving		Understanding the role of computers and spectroscopy in biological chemistry	Development of written and problem-solving skills		Applications of cutting-edge chemistry; creativity in research		

		By working on (and if applicable, assessed through)		Engaging with lectures and learning support activities on Current Topics in Molecular and Cell Biology, Modern Methods of Probing Biological Interactions and Chemical Biology. Applications to unseen problems and case studies in workshops. Formative activities include a molecular graphics workshop and summative assessment is through an assessed activity involving a workshop and follow-up written exercise based on a selection of scientific papers (Proteins in Chemical Biology) and a closed-book examination (Summer).		Molecular graphics workshop (formative) for probing molecular interactions; data analysis/interpretation of advanced spectroscopic techniques including NMR, crystallography and calorimetry; summative assessment through examination	Learning support workshops; formative assessment through supported workshop activities including molecular graphics software with summative assessment of written work covering leading-edge, specialised chemical topics and current research literature through an assessment based on a review of scientific papers and examination.		Application of chemistry techniques to research in cellular processes and current topics in chemical biology. Creative experimental design through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. Implicit summative assessment through exam.		

Stage 3	Chemical Theory & Computation	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge at M-level of a chemical science specialism and applications in problem solving		Understanding the role of computers in chemistry	Development of written and problem-solving skills		Applications of cutting-edge theoretical and computational chemistry; creativity in research		
		By working on (and if applicable, assessed through)		Engaging with lectures and learning support activities on Solubility and Solvent Design, Computer Simulation of Molecular Systems and Quantum Chemical Calculations. Applications to unseen problems and case studies in workshops. Formative activities include computer-based workshop assignments and summative assessment is through an assessed workshop and a closed-book examination (Summer).		Computer-based simulations and quantum-chemical calculations/modelling through three formative workshop assignments and a single summatively assessed workshop.	Learning support workshops; formative assessment through supported workshop and computer-based activities with summative assessment of written work covering leading-edge, specialised chemical topics and current research literature through an assessed workshop and examination.		Application of theoretical and computational techniques to research and industrial commercial applications. Creative experimental design through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. Implicit summative assessment through exam.		

Stage 3	Analytical & Forensic Chemistry	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge at M-level of a chemical science specialism and applications in problem solving			Development of written and problem-solving skills		Applications of cutting-edge analytical chemistry; creativity in research		
		By working on (and if applicable, assessed through)		Engaging with lectures and learning support activities on Multidimensional Chromatography with Mass-Selective Detection, Forensics & the Environment, Applications to Forensic Science and New Directions in Analytical & Forensic Chemistry. Applications to unseen problems and case studies in workshops. Formative activities include workshop assignments and summative assessment is through an assessed workshop and a closed-book examination (Summer).			Learning support workshops; formative assessment through supported workshop activities and case studies with summative assessment of written work covering leading-edge, specialised chemical topics and current research literature through an assessed workshop and examination.		Application of analytical techniques to the study of biological, medical, environmental and pharmaceutical sciences. Creative experimental design through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. Implicit summative assessment through exam.		

Stage 3	Bioinspired Chemistry	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge at M-level of a chemical science specialism and applications in problem solving			Development of written and problem-solving skills		Applications of biomimetic chemistry to catalysis and materials; creativity in research		

		By working on (and if applicable, assessed through)		Engaging with lectures and learning support activities on Bioinorganic Model Complexes I & II, Biological Inspiration in Materials Science and Bioinspired Solutions for Sustainable Chemistry. Applications to unseen problems and case studies in workshops. Formative activities include workshop assignments and summative assessment is through an assessed workshop involving scientific paper comprehension (Bioinorganic Model Complexes) and a closed-book examination (Summer).			Learning support workshops; formative assessment through supported workshop activities with summative assessment of written work covering leading-edge, specialised chemical topics and current research literature through an assessed workshop based on paper comprehension and examination.		Application of biomimetic approaches to the development of green chemical production processes and novel materials. Creative experimental design through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. Implicit summative assessment through exam.		

Stage 3	Lasers in Chemistry	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge at M-level of a chemical science specialism and applications in problem solving			Development of written and problem-solving skills		Applications of lasers in chemistry/spectroscopy; creativity in research		
		By working on (and if applicable, assessed through)		Engaging with lectures and learning support activities on Introduction to Lasers, Lasers in Frequency Domain Spectroscopy and Lasers in the Time-Domain: Reaction Dynamics. Applications to unseen problems and case studies in workshops. Formative activities include workshop assignments and summative assessment is through an assessed workshop and a closed-book examination (Summer).			Learning support workshops; formative assessment through supported workshop activities with summative assessment of written work covering leading-edge, specialised chemical topics and current research literature through an assessed workshop and examination.		Application of lasers in high resolution and time-dependent spectroscopy. Creative experimental design through formative case studies and workshop activities. Introduction to research topics through lectures and formative case studies and workshop activities. Implicit summative assessment through exam.		

Stage 4	Chemistry for Natural Sciences 14: MChem Advanced Research Project	Progress towards PLO	Fundamental investigation of specific chemical principles	Fundamental investigation of specific chemical principles	Design laboratory experiments and carrying out risk assessments. Documenting work through a lab book.	Masters-level data interpretation and analysis	Oral and written presentation skills	Plan, design and conduct an independent open ended investigative research project	Problem solving, time management and team working during research projects. Creativity in research.	Fundamental investigation of specific chemical principles	

		By working on (and if applicable, assessed through)	M-level research including literature comprehension. Formative research and laboratory experiences are guided by the supervisor and other research group members. Formative assessment of a project report draft and practice presentations. Summative assessment by final project report, supervisor's project execution mark and oral presentation/exam.	M-level research including literature comprehension. Formative research and laboratory experiences are guided by the supervisor and other research group members. Formative assessment of a project report draft and practice presentations. Summative assessment by final project report, supervisor's project execution mark and oral presentation/exam.	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.	Research Project. Collaboration with project supervisor and research group encourages development of skills in data analysis. Summatively assessed though the written report.	Research project report and oral presentation	Research Project. Students experience an extended, independent project experience within a research group with the potential to produce publishable research for chemistry and related journals. Formative experience is provided through introductory courses (literature, safety, planning etc.) and through support within research groups and supervision. Summative assessment is achieved through assessment of the project by report and oral examination, and through the supervisor's assessment of student research skills.	Research Project. Students experience an extended, independent project experience within a research group 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 (report/oral) and execution. Implicit assessment of creativity in research strategy.	M-level research including literature comprehension. Formative research and laboratory experiences are guided by the supervisor and other research group members. Formative assessment of a project report draft and practice presentations. A presentational aspect will be built in on a project day, where students will be tasked to present the findings of their research to their peers across their cohort. To enable students from different disciplines to understand their presentation, a student will need to appreciate th inter-disciplinary aspects of their subject.	

Stage 4	Chemistry for Natural Sciences 15: Literature Review	Progress towards PLO		Researching a project-related literature topic		Collating, interpreting and presenting results from the chemical literature	Preparing a well-presented report using ChemDraw and related software.				
		By working on (and if applicable, assessed through)		Literature gathering, analysis and interpretation. Formative workshop on the use of search engines; commentary on draft literature review document. Summative assessment through final written literature review (2500-3000 words).		Writing a literature report; formative elements include a workshop on using the research literature and databases and commentary on a draft of the literature reivew by the project supervisor. The final literature review is summatively assessed.	Writing a literature review at a level consistent with published materials. Commentary on a draft of the literature reivew by the project supervisor before the final literature review is summatively assessed.				
Stage 4	Chemistry for Natural Sciences 16: Advanced Chemistry	Progress towards PLO		Applying learning skills and core chemical principles to gaining a detailed knowledge at M-level of a chemical science specialism and applications in problem solving					Develop approaches to lifelong & workplace learning for CPD; identifying specific learning needs		

		By working on (and if applicable, assessed through)		Advanced distance learning topics in (three from) Inorganic Chemistry; Materials Chemistry; Organic Chemistry; Physical / Analytical Chemistry. Formative assessments through online tools/quizzes. Summative assessment through closed-book exam (Summer).					Engage with distance learning packages covering interdisciplinary modern chemical research in preparation for summative examination. Distance learning materials contain formative assessment points through suitable VLE quizzes etc.		

Programme Map: Module Contribution to Programme Learning Outcomes

The information provided in this section should make clear why the students are doing the key activities of the programme, in terms of reaching the PLOs. You should use this section to provide commentary on the programme map and how current practice effectively propels student learning. Please indicate any changes that you plan to make to the programme linked to the pedagogic principles.

This section should capture reflections on the programmes and areas for development linked to the principles of the York pedagogy. Please provide an explanation of the programme and assessment design with reference to future enhancements aligned with the pedagogic principles.

Contact with staff

Please explain how the programme's design maximises the value of students' contact time with staff (which may be face-to-face, virtual, synchronous or asynchronous), including through the use of technology-enhanced learning. An example might be giving students resources for their independent study which then enables a class to be more interactive with a greater impact on learning.

You should include:

i. An explanation of how contact with staff in the future programme will be designed to propel student learning

The vast majority of the programme is made up of modules from the Department of Chemistry. Therefore the relevant statements made in that department's respective submissions apply here. Note is also made to refer to the Arch, Bio, Env, Maths & Phys YP single subject documentation due to the various splits in Stages 1 and 2.

ii. Changes to the existing programme that will be explored to affect this change; make references to the map to include module level change.

Some changes are expected due to the rollout of the YP in Biol & Chemistry. The Maths & Phys rollouts have already begun and have been incorporated into the current programme. Further changes will roll out in concert with those of the corresponding departments. All courses, this one included, are reviewed annually and feedback will be given to all contributing departments. Any further changes that may be necessary will naturally arise during this constant process of review.

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).

You should include:

i. An explanation of how students' independent study and formative work has been designed in the future programme to propel student learning?

Again, we refer to the corresponding statements in the Arch, Biol, Env, Maths & Phys enhancement plans for the reasons stated above.

ii. Changes to the existing programme to affect this change; make reference to the programme map to indicate module level change

Changes due roll out of the YP will be phased as they occur in the single subject rollouts. Reference is made to the corresponding statements in the Arch, Bio,Env, Maths & Phys enhancement plans.

Due to the nature of all our specialisation programmes and the fact that the learning and teaching in Stages 1 & 2 is spread across multiple departments, there may be bottle necks for the students in terms of assessment. Currently this is handled on a report to the BoS basis and then escalted outwards after a BoS meeting to the Departments. This is a challenge for Natural Sciences and and a definite enhancement to the programmes will be some way of monitoring and controlling these bottlenecks. Currently the YP doesn't help as its level of detail is module assessment and that we have more control over. Its the intra-module assessment. We will carry on investigating ways in which we can manage this issue effectively for our students.

One thing that we have not yet being able to do is use any NSS returns to identify issues or good practice as we have yet to have a graduating cohort. Once this data comes in then we will of course incorporate the outcomes into our annual review processes.

(c) 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).

You should include:

i. An explanation of how formative and summative assessment has been designed in the future programme to propel student learning?

As in Item 5; Nat Sci honours the pedagogical practices of our contributing departments whenever possible and this is certainly the case in summative assessment. The vast majority of the programme is built on modules from the single subject diet and the assessment modes used are judged best to assess the various learning outcomes on these modules.

ii. Changes to the existing programme to affect this change; make reference to the programme map to indicate module level change

As for item 12.

The final year project is a major component of all our degrees and is a chance for our students to show not only their skills and ability in a specialisim, but also to work in their specialism on a project that is interdisciplinary. Indeed this is seen at the most natural place to assess any PLOs which emphasise interdisciplinarity. The full process of running projects is currently under review and any changes/improvements will be incorporated into the programmes.

We need to figure out how to faithfully capture the interdisciplinarity of the programme when a lot of it isn't assessed e.g.
(a) the intentional juxtaposition of modules from different departments that cover complementary/similar topics
(b) Natural Sciences hour
The latter is especially important as its a unique feature of the Nat Sci programmes.

Support with implementing programme enhancements

Support services will be able to provide guidance on enhancing programmes for example changing assessment and feedback practice, developing students' digital literacy capabilities and technology enhanced learning, employability etc. Please indicate in the space below if you would like additional guidance to implement you enhancements and what support you would require. For more information on the types of support that is available across the University please see the website:

https://www.york.ac.uk/staff/teaching/support/

Infrastructure: we look forward to the creation of a fully-functional programme & module catalogue which will enable:

- the efficient sharing of information between departments (& the ASO) e.g. module changes
- the shared usage of information for a variety of purposes (e.g. programme specs, admissions materials, student handbooks, website, ...)
- identification of issues like assessment bottlenecks & student workload

Nat Sci would like to give a particular note of thanks to David Gent, Cecillia Lowe, Katy Mann Benn & colleagues for their support when compiling this documentation and undergoing the process of making our programmes YP compliant. Their input has been invaluable.