Name	Charlotte Williams
Home Institution	Oxford University, Oxford Chemistry
Email Address	Charlotte.williams@chem.ox.ac.uk
Name(s) of course(s) examined *e.g. Tripos Part/ MPhil*	Chemistry (Natural Sciences) Part III
Level (*Delete as appropriate*)	Undergraduate
Year of Appointment	3 rd

	Yes	No	N/A
1. Are the academic standards set for the award appropriate for the qualification, and comparable with similar programmes in other UK institutions?	x		
2. Are you satisfied that you received sufficient programme materials (handbooks, regulations, marking and classing criteria) in a timely manner?	x		
3. Are you satisfied that you were consulted adequately on draft examination papers, and that your comments and suggestions were taken into consideration?	x		
4. Are you satisfied that the assessment was pitched at the appropriate level?	x		
5. Was the general standard and consistency of marking appropriate?	x		
6. Do the assessment processes measure student achievement rigorously and fairly against the intended outcomes of the programme?	x		
7. Are you satisfied that issues raised on your previous report form have been properly considered and, where applicable, acted upon?	x		
8. Did you receive a written response from the Department to your previous report form?		x	

If you replied No to any of the questions above, please expand here:
There is no need for any response.

Do you have any concerns about the course, including standards and quality?

The part III year of the course is excellent. This year covers the detailed specialism in advanced chemistry and includes a research project. It manages to be both very demanding and very important to ensure that graduates are taught the most recent specialist aspects of Chemistry and are able to learn the skills, methods and techniques of contextualised research through an original research project. Overall, the standards and quality are outstanding.

Are you satisfied that the procedures associated with the assessment are efficient (e.g. timeframes, draft papers, questions, design and conduct of exam, meetings, vivas)?

The administrative procedures were excellent. Exam papers were sent in good time and the process of both receiving papers, making comments and receiving corrections was very efficient. I made a series of suggestions regarding the Inorganic Chemistry and Materials Chemistry aspects of the course which were responded to properly, appropriately and in a timely manner by the lecturers and examiners.
The process for the external examiners 'visit' to Cambridge was very well managed, with all the relevant documents either being accessible during the visit or easy to find via a weblink. The time-frames for examining the documentation (exam scripts, mark sheets, project reports and mark sheets) were sufficient to allow for proper scrutiny, benchmarking and reading. The department also provided a thorough guide to the part III process. The lead departmental examiner for part III was easily available for questioning, provided clear inductions to the process, understood all aspects of the questions, providing detailed and clear answers to any queries. It is quite clear that the broader team of project supervisors, lecturers and examiners within Cambridge Chemistry are professional and have worked hard to deliver a strong part III education.

Do you have any comments on marking and classing (e.g. range of marks, action around borderline marks, penalties, moderation, double marking, reconciliation of marks)?

Overall the part III educational quality and standards in both attainment and assessment are extremely high. The students are outstanding and it shows in both their written examinations and their part III research projects. The projects span a breadth and depth of chemistry which is impressive and very interesting. The students are capable of learning new techniques, methods and theories and implementing original research in the project. I have only minor aspects for the school to consider:
The marking arrangements for part III projects might need some minor adjustment by the department. I feel the range of marks is rather narrow and that this may be attributed to the 'banding' used for supervisor grades. A second aspect to consider might be the relative weighting of supervisor vs two independent assessor grades. Additionally, all markers need to be careful to provide clear rationale for marking and to explain any deviation in first/second marking. The part III theses are an important aspect of chemical education and the student's degree so it is very helpful to have detailed comments to justify marks. That said, the grades for the projects that I 'spot-checked' seemed very appropriate, well balanced against both the cohort in Cambridge and against other institutions where I've worked and examined externally. My major concern is for students at the upper and lower ends of the field.
The exam marking was, in general, very good and clear rationale for marks was provided in the cribs and was evidently being applied to the exam scripts. Given the importance of rigorous marking of papers, particularly at grade boundaries, and the number of different makers being used for some papers, careful checking of scripts had been implemented.
The exam board made recommendations regarding the grade boundaries and after very careful and detailed scrutiny of candidates at those borderlines, the external examiners were content to accept the recommendations and the placement of the boundaries.

Do you have any comments on the student experience of the course and/or their experience of the assessment process?

The external examiners were able to meet with the students and to hear of their experiences. The students gave a very articulate and clear account of their experiences and in the main they had thoroughly enjoyed the course. There were a lot of positive reflections on the quality of the teaching, laboratory training, part III projects and also on the enjoyment the students had in the degree – this was excellent.

Do you have any comments on University policies (e.g. the role of the external examiner, policies around plagiarism, script annotation)?

None

Please describe here any recommendations for improvement.

I have two main recommendations:

1) The marking scheme for the part III research projects could be reconsidered to ensure a stronger emphasis is given to independent marker over supervisor grade and to ensure a breadth of marks are awarded. I would also recommend that research mark pro-forma sheets are modified to ensure that markers substantiate in greater detail their decisions/assessments.
2) The department may be advised to carry out a detailed analysis of gender and achievement data. There may be a need to consider policies, assessment methods and teaching practise to ensure fairness and expected progress for all students in terms of grades/attainment.

Please highlight any good practice you encountered.

The exam questions are well constructed and very demanding but they do appear, in the main, to be able to differentiate the students and to be fair. This is an extremely difficult balance to achieve and yet the part III papers were good demonstrations of how to balance these subtle criteria. The mark schemes presented to external examiners were also, in the main, excellent, with clear evidence of how marks would be awarded. Questions appear to be very well designed, leading the student through from concepts which should be familiar to completely new problem solving and encouraging independent analysis/evaluation. The mark schemes help the students understand how much time should be devoted to particular questions and how they are weighted. The topics being covered and taught to students in part III are very interesting and appropriate as specialist lecture courses. For Inorganic Chemistry these span Main Group Chemistry, Organometallic Chemistry, Inorganic Materials, Polymers, Magnetism, Electrochemistry, Bio-inorganic Chemistry and Supramolecular Chemistry, to name a few. It's also a great strength that the department is well ahead of old-fashioned stereotypes of IOP in the teaching of Chemistry. This is a major advantage for the students and ensures that they are educated to solve real problems and think broadly about chemistry.

The breadth and depth of research projects being undertaken by students supervised in the Inorganic and Materials sections are very impressive. Projects also capitalize on the Natural Sciences degree and show-case the outstanding undergraduate students at Cambridge and their many skills. It was really impressive to see the level of analysis, in depth research evaluation and independent evaluation of the literature. Further, research outputs were well described and clearly presented by many students.

The range of topics being covered in research projects is contemporary and spans major societal challenges. This is important as students will graduate having conducted exciting, important and highly relevant research projects. It's also clear that supervisors are highly committed to providing an excellent student experience and that every effort has been made to train students in the skills, methods and techniques of chemistry research.

Have you seen any evidence of grade inflation?

No and it was very useful to be provided with such clear data on grade histograms over more than a decade.

If this is your final year as external examiner? If so, have you seen improvements over your tenure? Has the Department acted on your advice?

No

Do you have any other comments? No

Name	Prof. Nicholas Paul Lockyer			
Home Institution	University of Manchester			
Email Address	Nick.Lockyer@manchester.ac.uk			
Name(s) of course(s) examined *e.g. Tripos Part/ MPhil/ MRes*	Natural Sciences Tripos Part 2 Chemistry; Part 3 Chemistry			
Academic year of examination	2023			
Level (*Delete as appropriate*)	Undergraduate		~~Postgraduate~~	
Year of Appointment	2nd			

	Yes	No	N/A
1. Are the academic standards set for the award appropriate for the qualification, and comparable with similar programmes in other UK institutions?	X		
2. Are you satisfied that you received sufficient programme materials (handbooks, regulations, marking and classing criteria) in a timely manner?	X		
3. Are you satisfied that you were consulted adequately on draft examination papers, and that your comments and suggestions were taken into consideration?	X		
4. Are you satisfied that the assessment was pitched at the appropriate level?	X		
5. Was the general standard and consistency of marking appropriate?	X		
6. Do the assessment processes measure student achievement rigorously and fairly against the intended outcomes of the programme?	X		
7. Are you satisfied that issues raised on your previous report form have been properly considered and, where applicable, acted upon?	X		
8. Did you receive a written response from the Department to your previous report form?		X	

If you replied No to any of the questions above, please expand here:

No written response to my previous report was received. However, in response to discussions with the Department on the subject of gender attainment gap, several emails were exchanged.

Do you have any concerns about the course, including standards and quality?

No

Are you satisfied that the procedures associated with the assessment are efficient (e.g. timeframes, draft papers, questions, design and conduct of exam, meetings, vivas)? Yes. Assessment procedures were very efficient. I found using Dropbox for both Part II and Part III Examinations to be an improved method of document sharing compared to last year. Draft examination papers were again prepared to an excellent standard and almost without exception were accompanied with complete model answers and cover sheets. Communication with the Department was generally very efficient and of great help. One of the Senior Examiners was taken seriously ill at a critical time in the process which caused some delays despite his best efforts to maintain the timeframe. This suggests the Department might want to consider contingency planning for such eventualities.
Do you have any comments on marking and classing (e.g. range of marks, action around borderline marks, penalties, moderation, double marking, reconciliation of marks)? Marking and assessment policies and procedures are rigorous and robust. Where scaling of marks on a Part II paper was applied the process and mechanism was defended robustly in the Briefing to External Examiners. Borderline candidates were identified and looked at closely by Externals and appropriate action agreed with the Exam Board. The impact of the UCU Marking & Assessment Boycott appeared to be minimal thanks to efforts within the Department and did not affect any classification decisions.
Do you have any comments on the student experience of the course and/or their experience of the assessment process? The External Examiners met with eleven students (seven from Part II and four from Part III) for approximately two hours during our visit. The overwhelming view was of an excellent student experience. Teaching quality and support for Teaching & Learning was highlighted for particular praise and the Department was seen as a welcoming and inclusive environment and culture.
Do you have any comments on University policies (e.g. the role of the external examiner, policies around plagiarism, script annotation)? No
Please describe here any recommendations for improvement. I understand some changes to the policy on Part III project assessments are in-process and should come into effect next year – these are welcomed. The Department is well-aware of the gender attainment gap which continues to cause concern. I understand a Departmental working party is looking at ways to address this issue.
Please highlight any good practice you encountered. The EE Briefing notes were detailed and comprehensive and helped focus our attention on the most pertinent issues during our short visit.
Have you seen any evidence of grade inflation? No.

If this is your final year as external examiner? If so, have you seen improvements over your tenure? Has the Department acted on your advice? N/A
Do you have any other comments? No

Name	Professor Alison Hulme			
Home Institution	The University of Edinburgh			
Email Address	Alison.Hulme@ed.ac.uk			
Name(s) of course(s) examined *e.g. Tripos Part/ MPhil/ MRes*	Chemistry Part II and Part III			
Academic year of examination	2022-23			
Level (*Delete as appropriate*)	Undergraduate		~~Postgraduate~~	
Year of Appointment	1st ✓	2nd	3rd	4th

	Yes	No	N/A
1. Are the academic standards set for the award appropriate for the qualification, and comparable with similar programmes in other UK institutions?	✓		
2. Are you satisfied that you received sufficient programme materials (handbooks, regulations, marking and classing criteria) in a timely manner?	✓		
3. Are you satisfied that you were consulted adequately on draft examination papers, and that your comments and suggestions were taken into consideration?	✓		
4. Are you satisfied that the assessment was pitched at the appropriate level?	✓		
5. Was the general standard and consistency of marking appropriate?	✓		
6. Do the assessment processes measure student achievement rigorously and fairly against the intended outcomes of the programme?	✓		
7. Are you satisfied that issues raised on your previous report form have been properly considered and, where applicable, acted upon?			✓
8. Did you receive a written response from the Department to your previous report form?			✓
If you replied No to any of the questions above, please expand here:			

Do you have any concerns about the course, including standards and quality?

It is clear that the Part II and Part III courses teach a wide range of traditional and modern organic chemistry to a level that is equal to, or exceeds, that taught elsewhere. Exams remain the primary mode of assessment; the standard of questions in the exam papers for Part II and Part III is generally excellent (see later comments), and questions require students to demonstrate high-level problem solving skills. My examination of a number of scripts during the Exam Board meetings suggest that exam questions have generally been answered well.

An appropriate range of practical work is taught in the Part II course. The students we met praised its marking, particularly where markers have taken time to link the practical work to lecture courses. However, the intense blocks in which labs are undertaken are very demanding on students; the "Synthetic" lab was universally described as "very stressful" by the students which we met, with little flexibility to accommodate illness, or inadvertent error. Whilst stretching very able students is clearly a desirable outcome, I am not convinced of the need to generate artificial barriers to student progression through the labs (e.g. preventing students from multi-tasking by running experiments in parallel).

The Part III project allows students to conduct an in-depth piece of research. The opportunity to become embedded within research groups and see research as it really is, is a critical part of their scientific training at this level. The projects offered are varied and demanding, and take place within research groups across the Department. However, there are some improvements that could be made to the way projects are supported and assessed (see later suggestions) to ensure that all students have an equivalent experience in their research projects.

Are you satisfied that the procedures associated with the assessment are efficient (e.g. timeframes, draft papers, questions, design and conduct of exam, meetings, vivas)?

The timeframes for the production of draft papers, the design and conduct of exams and the meetings arranged for the External Examiners are all appropriate. However, a minor delay to the production of one set of exam papers highlighted that there isn't much of a safety net in the current system. This could be either teaching office, or academic staff backup for those coordinating exam preparation; but it should allow someone to step in and take over if circumstances require.

Preparation of the exam material for review at the time of the Exam Board meetings by the External Examiners was exemplary. However, there have been changes to how Part III projects are submitted and assessed this year, which meant we didn't get to see as many of the assessed projects as we might have liked, this is something that should be streamlined for next year now that the online submission process has bedded in.

Do you have any comments on marking and classing (e.g. range of marks, action around borderline marks, penalties, moderation, double marking, reconciliation of marks)?

Although Part II and Part III examination scripts are not double marked, there are several markers contributing to student assessment on each paper which ensures a very fair process. For the most part, the link between the suggested mark schemes (which were made available to external examiners prior to the exams) and the marking itself was clear. Where mark averages for individual questions were not in line with the desired ranges, these were either fully justified, or adjusted. Where two cohorts of

students took variants of the same paper, marks were scaled so that neither cohort was unduly advantaged/disadvantaged.

There is however, room for some refinement to the marking and reconciliation of Part III projects. In an effort to avoid overly high marks from supervisors, a simplified (letter-based) mark scale has been introduced by the Department; with letters correlated with mark descriptors. However, the use of the high or low ends of this scale are not always adequately justified in the comments made by supervisors on performance. Similarly, it was clear that only some supervisors were aware that grade boundaries on this scale could be used to give greater discrimination. The process for the assessment of project reports by other staff members (examiner and assessor) also needs further tweaking, to ensure that marks are arrived at in a fully independent manner prior to any reconciliation process. Whilst the use of more junior staff members in the project assessment process is excellent, it is imperative that proper training is provided for everyone involved in the assessment process.

The range of marks at Part II is broad, ranging from the high 90's to a few fails suggesting a very discriminating process. The degree classifications appeared fair, and the performance of students at the grade boundaries met with expectations. However, it is disturbing to see that there is a distinct gender gap in attainment of the highest grades at this level. The range of marks in Part III is smaller, no doubt due to the requirement to attain a 2i in Part II in order to gain entry to this part of the course. But there is still a significant gender gap, particularly in the project component of the course which constitutes 35% of the Part III mark.

Do you have any comments on the student experience of the course and/or their experience of the assessment process?

Overall, students from both the Part II and Part III cohorts were very articulate in expressing their appreciation of both the course content across all years and the welcoming and inclusive environment found in the Department (citing the welcoming environment in research group meetings and the active promotion of the LGBTQ+ society and the IUPAC Global Women's Breakfast as examples).

In discussing course content, one common theme was that students who hadn't taken Part 1B Maths found aspects of the compulsory Part II Theoretical Courses much more challenging. It was suggested by the students that the Department provides a short (2-3 weeks) additional Maths course early in Part II, with supervision support, to address this. Disappointingly, in discussing course choices several students commented that their approach was tactical (which exam questions were most suited in style and/or easiest to answer) rather than a true reflection of what they would like to study.

In discussing practical aspects of the course, students commented on the highly stressful nature of the Part II labs due to their short timeframe. They queried the learning outcomes of these labs, particularly the lack of opportunity to multi-task by running experiments in parallel, as they felt that this didn't reflect skills which would be needed in their Part III project. Students on the Part III course felt that project choice had been handled well overall, but would like greater transparency as to how the process is managed. But the levels of day-to-day supervision provided by the Part III laboratory supervisor were very variable (from a daily interaction in most instances, to one student only having seen their lab supervisor once in the first term).

Further discussion highlighted ongoing tensions between College and Departmental support:

1. Disparities in the quality of tutorial supervision provided by different Colleges (with some students forced to actively seek their own tutorial supervisors where these were either missing or inadequate). It was clear that mechanisms by which students could seek additional/alternative support through the Department were not universally known.
2. Disparities in the knowledge of different support mechanisms for students with either a short-term or chronic, illness or disability. Despite considerable effort by the Department to highlight support for students (including: bespoke email contact points; training for demonstrators, technicians and support staff to identify struggling students, etc.), a lack of connection between Colleges and the Department results in some students missing out on the correct application of course adjustments using mechanisms which are already in place, or inappropriate adjustments being suggested which place additional pressure on those who are already struggling.

Do you have any comments on University policies (e.g. the role of the external examiner, policies around plagiarism, script annotation)?

The exam script books which I reviewed were, for the most part, annotated clearly and appropriately.

We were alerted to one instance of plagiarism, for which the appropriate penalty had been decided externally to the Department and the penalty applied to the marked report.

I find it slightly unusual that the Exam Board are not alerted to any special circumstances, particularly where these might take a student's marks into the grade boundaries requiring consideration by the Exam Board. At other institutions where I have acted as External Examiner (as well as my own), the outcome of special circumstance appeals (e.g. no further action, adjustment of practical marks due to illness, etc.) are determined by a centralised process and are made known prior to the Exam Board meeting so that the student's final marks can be considered appropriately.

Please describe here any recommendations for improvement.

Question setting: I am concerned about the structure and length of a small minority of the questions – challenging problems can be set without resorting to unnecessary obfuscation. Refocus on the excellence of answers obtained rather than the ability of students to speed-read, or speed-write; limiting the absolute length of questions (e.g. to 2-pages) should help.

Annotation of scripts: in some instances it was easier to see how marks had been allocated in line with the submitted marking schemes than in others. Annotation serves many roles, including helping External Examiners see how marks have been arrived at, and also assisting should a student appeal. A reminder to staff would help.

Part II labs: should define the minimum learning outcomes required for each lab to allow more flexibility in the adjustments for students with long-term disabilities; and should explore options for multi-tasking.

Part III project supervision and support: this is variable and needs to be more tightly regulated. There should be a formal explanation of the role of the Part III laboratory/day-to-day supervisor (e.g. direction to appropriate induction or training processes, normal frequency of planning meetings, "daily" assistance provided in person/by email, help with finding relevant literature etc.). Writing it down will help to define what the minimum expectations are, and publication will clarify for project students the

support they can expect to receive. This material could be provided either online, or in person to lab/day-to-day supervisors who need to sign up to these expectations.

Part III project review: to assist students with planning for the project report and to mitigate where projects do not progress as expected, a formal mid-project review with a self-assessment provided by the student and commented on by the supervisor can provide a very helpful formative assessment process and ensures that the student engages with the project supervisor in a constructive way. It can also be a useful mechanism for identifying any additional training that the student might need in order to successfully complete the assigned project.

Part III project marking: greater clarity is needed for supervisors in how to apply the new letter-based mark scheme, and marks which are at the high or low end of the scale need to be fully justified in the accompanying feedback. The current 50:50 weighting of marks (supervisor:examiners) gives too much bias to the supervisor; a 40:60 distribution of marks would better reflect national norms for project assessment.

Gender biases: An in-depth cohort analysis across the degree programme is required to determine the root cause of the observed gender-based disparities in attainment in Part II and Part III and to provide a sound basis for future actions. Options for improvement could include (but are not limited to) the introduction of alternative methods of course assessment, and a review of mark descriptors for projects to ensure that these do not reflect or reward attributes which may lead to inadvertent gender bias.

Please highlight any good practice you encountered.

The students we met praised the marking of practical work throughout the Part II course, particularly where markers have taken time to link the practical work to lecture courses.

The students we met praised the welcoming and inclusive environment found in the Department.

Have you seen any evidence of grade inflation?

The data compiled does not suggest that there has been any significant grade inflation.

If this is your final year as external examiner? If so, have you seen improvements over your tenure? Has the Department acted on your advice?

N/A

Do you have any other comments?

There is not always an obvious connection between the material covered in Part II and Part III. It might be time for a course review, to consider what all students must cover as “core” Chemistry (and how this is built on from year to year of the course) and what it would be desirable for students to know as specialists in sub-disciplines.