

The University of Leeds
EXTERNAL EXAMINER'S REPORT

ACADEMIC YEAR: 2018-19 QAT Received 11/07/2019

Part A: General Information

Subject area and awards being examined

Title and Name of Examiner:

Faculty / School of:	Physics & Astronomy
Subject(s):	<i>Physics</i>
Programme(s) / Module(s):	All programmes and modules in the School of Physics & Astronomy
Awards (e.g. BA/BSc/MSc etc):	BSc, MPhys

Part B: Comments for the Institution on the Examination Process and Standards

Points of innovation and/or good practice

Please highlight areas of innovation or good practice within the programmes or processes you have been involved with in this box.
 The delivery of exam papers and solutions was done in a timely and efficient manner. I found the exam papers and solutions to be of a high standard and to be largely free of errors, so this indicates that high quality internal checking processes are being employed. When I arrived to check marking procedures and to attend the exam board meeting, I was given access to a computer and a data base of exam marks. The software provided by the department allowed me to analyse in a highly efficient and graphical manner the performance across all modules and projects, and was extremely useful for getting an overview of student performance. I wish we had this software at my own institution!

Enhancements made from the previous year

Please highlight any enhancements made to the programme(s) or processes over the past year in this box.
 This was my first year

Matters for Urgent Attention

If there are any areas which you think require urgent attention before the programme is offered again please note them in this box
 No. I made some very moderate suggestions for improvement to BSc projects but these are certainly not urgent. As I mentioned in my oral report during the exam board meeting, it might be a good idea to introduce a requirement for final year BSc students to undertake some “independent” research work during their project, as some projects at present are essentially advanced literature reviews. This would help improve the student experience and the perhaps the employability skills of graduating students.

For Examiners in the first year of appointment only

1.	Were you provided with an External Examiner Handbook?	Y
2.	Were you provided with copies of previous External Examiners' reports and the School's responses to these?	N
3.	Were you provided with a External Examiner Mentor?	Y

For Examiners completing their term of appointment only

4.	Have you observed improvements in the programme(s) over the period of your appointment?	Y / N
5.	Has the school responded to comments and recommendations you have made?	Y / N
6.	Where recommendations have not been implemented, did the school provide clear reasons for this?	Y / N
7.	Have you acted as an External Examiner Mentor?	Y / N

Please comment on your experience of the programme(s) over the period of your appointment, remarking in particular on changes from year to year and the progressive development and enhancement of the learning and teaching provision, on standards achieved, on marking and assessment and the procedures of the School

Standards

8.	Is the overall programme structure coherent and appropriate for the level of study?	Y
9.	Does the programme structure allow the programme aims and intended learning outcomes to be met?	Y
10.	Are the programme aims and intended learning outcomes commensurate with the level of award?	Y
11.	Did the Aims and ILOs meet the expectations of the national subject benchmark (where relevant)?	Y
12.	Is the programme(s) comparable with similar programmes at other institutions?	Y

Please use this box to explain your overall impression of the programme structure, design, aims and intended learning outcomes.

From reading syllabi, checking exam papers, and looking at project reports, I have the impression that the Physics programmes are highly comparable with those at my own and other institutions. The material taught, the levels of the exams, the range of module choices, and the levels of project work all matched my expectations. In the case of the MPhys projects, I saw very high quality work that exceeded my expectations

13.	Is the influence of research on the curriculum and learning and teaching clear?	Y
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Please explain how this is/could be achieved (examples might include: curriculum design informed by current research in the subject; practice informed by research; students undertaking research)

The contents of advanced modules, and the final year BSc and MPhys projects, all strongly reflect the research interests and expertise of the staff in the School of Physics & Astronomy. This is particularly true of the MPhys projects, for which there is a wide choice available to the students because of the broad range of research undertaken within the School. It is clear that academic staff are using their day to day research activities to inform the projects offered to students.

14.	Does the programme form part of an Integrated PhD?	N
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Please comment on the appropriateness of the programme as training for a PhD:

The 4th year modules and projects provide excellent preparation for the top performing students who may wish to go on to PhD study.

15.	Does the programme include clinical practice components?	N
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Please comment on the learning and assessment of practice components of the curriculum here:

16.	Is the programme accredited by a Professional or Statutory Regulatory Body (PSRB)?	Y
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Please comment on the value of, and the programme's ability to meet, PSRB requirements here:

The programme is accredited by the Institute of Physics. It is clear that the programme easily matches the requirement of the accreditation in terms of both subject matter and the levels at which this is taught and examined.

Assessment and Feedback

17.	Does the programme design clearly align intended learning outcomes with assessment?	Y
<p><i>Please comment on the assessment methods and the appropriateness of these to the ILOs, in particular: the design and structure of the assessment methods, and the arrangements for the marking of modules and the classification of awards; the quality of teaching, learning and assessment methods that may be indicated by student performance.</i></p> <p>The assessment methods vary from module to module, but generally contain some mixture of homework, mid-term tests, and a final exam paper. These are very much aligned with national norms, and seem to be working well. One issue that I raised at the meeting was the fact that final year projects play an important role in students achieving good degrees, and the performance in taught modules is noticeably below that achieved in the projects. I believe this to be true at most other universities (it certainly is at my own), and is not necessarily a cause for concern, except that achievement levels in some module may be slightly below what is desirable. The exam team and teaching committee members made it clear to me that they are aware of this and are undertaking a review. I believe the teaching and project supervision provided by the School to be at a high level, and there is clearly a desire to maintain high academic standards while providing the students with a positive learning experience.</p>		
18.	Is the design and structure of the assessment methods appropriate to the level of award?	Y
19.	Were students given adequate opportunity to demonstrate their achievement of the programme aims and intended learning outcomes?	Y
<p><i>Please comment on the academic standards demonstrated by the students and, where possible, their performance in relation to students on comparable courses; the strengths and weaknesses of the students as a cohort:</i> <i>The achievements of the student cohort is mixed, and there is evidence that the current 2nd year students are struggling compared to previous 2nd year cohorts. I believe this is known from the exam performance of this cohort from last year too. Compared to other universities I would say the student performance is at the level expected, and the numbers of 2(i) and 1st class degrees is comparable. One area where I saw excellent performance was in the final year projects, where it is clear that the top performing students are given opportunities to really spread their wings and undertake independent research. I mentioned in my oral report to the exam board that the MPhys projects are the crowning glory of the degree programmes offered by the school.</i></p>		
<p><i>Please use this box to provide any additional comments you would like to make in relation to assessment and feedback:</i></p>		

The Progression and Awards Process

20.	Were you provided with guidance relating to the External Examiner's role, powers and responsibilities in the examination process?	Y
21.	Was the progression and award guidance provided sufficient for you to act effectively as an External Examiner?	Y
22.	Did you receive appropriate programme documentation for your area(s) of responsibility?	Y
23.	Did you receive appropriate module documentation for your area(s) of responsibility?	Y
24.	Did you receive full details of marking criteria applicable to your area(s) of responsibility?	Y
25.	Were you provided with all draft examination papers/assessments?	Y
26.	Was the nature and level of the assessment questions appropriate?	Y
27.	Were suitable arrangements made to consider your comments on assessment questions?	Y
28.	Was sufficient assessed work made available to enable you to have confidence in your evaluation of the standard of student work?	Y

29.	Were the examination scripts clearly marked/annotated?	Y
30.	Was the choice of subjects for final year projects and/or dissertations appropriate?	Y
31.	Was the method and standard of assessment appropriate for the final year projects and/or dissertations?	Y
32.	Were the administrative arrangements satisfactory for the whole process, including the operation of the Progression and Awards Board?	Y
33.	Were you able to attend the Progression and Awards Board meeting?	Y
34.	Were you satisfied with the recommendations of the Progression and Awards Board?	Y
35.	Were you satisfied with the way decisions from the School Special Circumstances meeting were communicated to the Progression and Awards Board?	Y

Please use this box to provide any additional comments you would like to make on the questions above:

I was very impressed with the efficiency and professionalism shown by the school. This is largely down to a few individuals who make up the exam team, and who clearly work extremely hard to make sure that any issues of anomalies are dealt with before the exam board meetings. I have complete confidence in the exam processes that the school employs and in the outcomes of those processes. I was pleased to see that the feedback and suggestions I provided during the exam board meeting were listened to and received in the spirit intended.

Other comments

Please use this box if you wish to make any further comments not covered elsewhere on the form

Name of School and Head of School (or nominee)

Title and Name of Examiner:

Subject(s):

Physics and Astronomy

Programme(s) / Module(s):

Physics with Astrophysics

Awards (e.g. BA/BSc/MSc etc):

BSc, MPhys

Title and Name of Responder:

Position*:

Exams Officer

Faculty / School of:

EPS(MAPS)/Physics and Astronomy

Address for communication:

School of Physics and Astronomy

Email:

Telephone:

*If the individual responding to the report is not the Head of School please state their position within the School.

Completing the School response

The completed School response (including the full original report) must be sent directly to the External Examiner. A copy must also be emailed to the Quality Assurance Team at qat@leeds.ac.uk. External Examiners should receive a formal response no later than six weeks after receipt of the original report.

Response to Points of innovation and/or good practice

We thank _____ for positive comments about the examinations and arrangements for preparing them and handling the marks. As with _____ report on the Physics and Theoretical Physics degrees we are pleased that the value of our in-house developed mark analysis tool has been recognised by our external examiners.

Response to Enhancements made from the previous year

Not applicable

Response to Matters for Urgent Attention

If any areas have been identified for urgent attention before the programme is offered again please provide a specific response to them here:

The external examiner raised no matters for urgent attention. The comments with respect to the BSc projects we will address below.

Response to questions 1-7 (and related comments)

Schools may provide a general response; however, where Examiners raise specific points these must be addressed individually:

The external examiner raised no issues, but we realise that we failed to provide copies of his predecessors' reports and our responses. We apologise for this oversight which was a result of an unavoidable change of staff managing the examinations process both before and during the academic year.

Standards**Response to questions 8 to 16 (and related comments)**

Schools may provide a general response; however, where Examiners raise specific points these must be addressed individually:

We thank the external examiner for his positive comments on our standards and the incorporation of our research into our teaching. As the examiner notes, the degree programmes are accredited and our accreditation body defines a comprehensive framework that our programmes comply with.

Assessment and Feedback**Response to questions 17 to 19 (and related comments)**

Schools may provide a general response; however, where Examiners raise specific points these must be addressed individually:

The examiner raises the issue of the disparity in performance between the examination assessed modules and the coursework assessed final year projects, with the latter generally having a higher average and narrower distribution of marks. Notwithstanding reassurance that this is to be expected and is observed in comparable institutions, our analysis and the comments made by e on the related degree programmes incline us to think a closer match would be desirable. As with , notes that the performance in some examinations is a bit lower might be expected and we are seeking ways both through the structure of the curriculum and structure and level of individual module examinations to address this.

Both external examiners have encouraged us to ensure that the BSc ‘dissertation-style’ projects include opportunities for the students to demonstrate independent research work and are not simply a review of current literature with limited critical synthesis. We agree with this and through guidance to students, project supervisors and tweaks to the marking scheme will ensure that this is implemented in the coming session.

In this report, raises no specific issues around the assessment methods and notes that the range of assessment methods is appropriate and consistent with other institutions.

We thank for the positive comments on the overall level of teaching and project supervision and recognition of the commitment of the staff to “*maintain high academic standards while providing the students with a positive learning experience*”

The Progression and Awards Process

Response to questions 20-35 (and related comments)

Schools may provide a general response; however, where Examiners raise specific points these must be addressed individually:

raises no issues with the progression and award process. We would like to thank for praise of the SES and academic staff who prepare for the exam boards. Whilst there is undoubtedly a burden of work placed on those staff, this is outweighed by the overall saving of workload across the school.

Other comments

Response to items included in the ‘Other Comments’ section of the report

No comments were made.

The University of Leeds
EXTERNAL EXAMINER'S REPORT

ACADEMIC YEAR: 2018-19 QAT Received 28/06/2019

Part A: General Information

Subject area and awards being examined

Title and Name of Examiner:

Faculty / School of:

Physics and Astronomy

Subject(s):

Programme(s) / Module(s):

Awards (e.g. BA/BSc/MSc etc):

BSc/MPhys

Part B: Comments for the Institution on the Examination Process and Standards

Points of innovation and/or good practice

Please highlight areas of innovation or good practice within the programmes or processes you have been involved with in this box.

See next box

Enhancements made from the previous year

Please highlight any enhancements made to the programme(s) or processes over the past year in this box.

I was impressed by the attempts to engage year 1 students more fully in laboratory practicals with the use of video presentations.

The analysis of the marks data was particularly thorough and informative, albeit with a slant that might be less accessible to non-physicists.

Matters for Urgent Attention

If there are any areas which you think require urgent attention before the programme is offered again please note them in this box

None urgent in the above sense. I have noted a few points below where I think some reflection might be useful.

For Examiners in the first year of appointment only

1.	Were you provided with an External Examiner Handbook?	Y / N
2.	Were you provided with copies of previous External Examiners' reports and the School's responses to these?	Y / N
3.	Were you provided with a External Examiner Mentor?	Y / N

For Examiners completing their term of appointment only

4.	Have you observed improvements in the programme(s) over the period of your appointment?	Y / N
5.	Has the school responded to comments and recommendations you have made?	Y / N
6.	Where recommendations have not been implemented, did the school provide clear reasons for this?	Y / N
7.	Have you acted as an External Examiner Mentor?	Y / N

Please comment on your experience of the programme(s) over the period of your appointment, remarking in particular on changes from year to year and the progressive development and enhancement of the learning and teaching provision, on standards achieved, on marking and assessment and the procedures of the School

Standards

8.	Is the overall programme structure coherent and appropriate for the level of study?	Y
9.	Does the programme structure allow the programme aims and intended learning outcomes to be met?	Y
10.	Are the programme aims and intended learning outcomes commensurate with the level of award?	Y
11.	Did the Aims and ILOs meet the expectations of the national subject benchmark (where relevant)?	Y
12.	Is the programme(s) comparable with similar programmes at other institutions?	Y
<p>Please use this box to explain your overall impression of the programme structure, design, aims and intended learning outcomes.</p> <p>The programme follows a largely traditional structure for degrees in physics. The core material goes beyond the subject benchmarks, consistent with comparable (research-intensive) institutions, perhaps a little ambitious for the range within AAB/ABB or above entry grade students. There is a particularly strong link between the research in the Department and final year options.</p>		
13.	Is the influence of research on the curriculum and learning and teaching clear?	Y
<p>Please explain how this is/could be achieved (examples might include: curriculum design informed by current research in the subject; practice informed by research; students undertaking research)</p> <p>The question appears to be aimed at discipline research where there is a strong link with final year options and projects. Of equal importance is the link with pedagogic research in the discipline demonstrated in some of the teaching, particularly the introduction of spaced repetition and the physics education projects</p>		
14.	Does the programme form part of an Integrated PhD?	N
<p>Please comment on the appropriateness of the programme as training for a PhD:</p>		
15.	Does the programme include clinical practice components?	N
<p>Please comment on the learning and assessment of practice components of the curriculum here:</p>		
16.	Is the programme accredited by a Professional or Statutory Regulatory Body (PSRB)?	N
<p>Please comment on the value of, and the programme's ability to meet, PSRB requirements here:</p>		

Assessment and Feedback

17.	Does the programme design clearly align intended learning outcomes with assessment?	Y
<p>Please comment on the assessment methods and the appropriateness of these to the ILOs, in particular: the design and structure of the assessment methods, and the arrangements for the marking of modules and the classification of awards; the quality of teaching, learning and assessment methods that may be indicated by student performance.</p>		

The alignment is fine. I have a comment relating to the ILOs after q35 and a comment on the possible link between student performance and design after q19.

18.	Is the design and structure of the assessment methods appropriate to the level of award?	Y
19.	Were students given adequate opportunity to demonstrate their achievement of the programme aims and intended learning outcomes?	Y

Please comment on the academic standards demonstrated by the students and, where possible, their performance in relation to students on comparable courses; the strengths and weaknesses of the students as a cohort:

The course is of a high standard and the best students do remarkably well. There seems to be some evidence of lack of engagement by a significant number of students which may have impacted on examination performance.

Please use this box to provide any additional comments you would like to make in relation to assessment and feedback:

I want to comment on the failure rate on modules. There seems to be a particular problem in the second semester of year 2. The best students can clearly cope, but the weaker students appear to struggle. I looked at some of the scripts here. What you often find with students who have essentially given up is fragments of answers and nonsense. This does not appear to be the case (in as far as a casual survey can determine). It looks as if the weaker students are overwhelmed by the amount of material. (So, this is a hypothesis for further research, not a conclusion.)

The material in the programme in scope and level is not out of line with other institutions (this is largely core physics) so again one might ask if it is the density that may be the issue. (Other hypotheses might include an inappropriate rote learning strategy that weaker students often adopt.) In any case, this is something that needs to be considered: I find it difficult to be comfortable with significant failure rates on pre-requisite core material amongst students with the entry grades of these cohorts. (So one approach might be to consider what really are core pre-requisites that have to be taught in year 2.)

As far as optional modules are concerned, I don't have a problem with students discovering topics they can't master, hence bringing the average for the module down, as long as this does not have a disproportionate impact on the overall grade (which in a modular system usually means some mark scaling is required). One just needs to be sure that it's the subject that is intrinsically more difficult (often the case when a module draws on a lot of mathematical pre-requisites) not that the module is overloaded.

The Progression and Awards Process

20.	Were you provided with guidance relating to the External Examiner's role, powers and responsibilities in the examination process?	Y
21.	Was the progression and award guidance provided sufficient for you to act effectively as an External Examiner?	Y
22.	Did you receive appropriate programme documentation for your area(s) of responsibility?	Y
23.	Did you receive appropriate module documentation for your area(s) of responsibility?	Y
24.	Did you receive full details of marking criteria applicable to your area(s) of responsibility?	Y
25.	Were you provided with all draft examination papers/assessments?	Y
26.	Was the nature and level of the assessment questions appropriate?	Y
27.	Were suitable arrangements made to consider your comments on assessment questions?	Y
28.	Was sufficient assessed work made available to enable you to have confidence in your evaluation of the standard of student work?	Y
29.	Were the examination scripts clearly marked/annotated?	Y
30.	Was the choice of subjects for final year projects and/or dissertations appropriate?	Y /N

31.	Was the method and standard of assessment appropriate for the final year projects and/or dissertations?	Y / N
32.	Were the administrative arrangements satisfactory for the whole process, including the operation of the Progression and Awards Board?	Y
33.	Were you able to attend the Progression and Awards Board meeting?	N
34.	Were you satisfied with the recommendations of the Progression and Awards Board?	Y
35.	Were you satisfied with the way decisions from the School Special Circumstances meeting were communicated to the Progression and Awards Board?	Y

Please use this box to provide any additional comments you would like to make on the questions above:

I attended the panel meeting prior to the final awards board. There was a particularly rigorous discussion of comparability and performance on modules aided by a detailed analysis. The statistical analysis was available to me prior to the meeting and helped inform scrutiny. The Department is to be commended on the attention given to considerations of balance and equity in the assessment process and the rigour of the process itself. I am happy with all the outcomes of that meeting. .

I want to comment on final year projects, in particular the BSc projects.

First, the standard of the best of these was outstanding and the documentation of the process of supervision was excellent.

Second a couple of issues which might be worth reflecting on. The range of achievement in the projects was large. I wonder if this is reflected in the mark range. Almost all students achieved a 2(i) or above in their project in my view appropriately. That is something to be celebrated not re-scaled. But at the top end, if a student performs as well as could be expected at this stage of their education – where for example on the feedback form the examiners can suggest no room for improvement - I see no reason not to award marks in the 90's. This might help reflect the range of achievement.

Then on the nature of the projects. A fair number of these were dissertations, that is, reviews of the literature with no particular research question. I think it is quite difficult to grade these fairly in comparison with research projects (although expanding the range of marks will help). However, assessment aside, I feel that it is educationally limiting if a student's only project work is of this review type. I would like to suggest the Department consider giving all students the experience of working on a research question for which the answer is not known. It doesn't have to be complicated, just something that requires judgement. (As a trivial example, even in a review students might be asked to plot a histogram of the different categories of paper and comment, or better still, learn how to do a systematic review.) At least, a review should address a research question or be for a particular audience (judgement required). The Department may decide that there are reasons why I am wrong on this, but I think it would be good to be clear as to what they are and how they benefit the student.

Other comments

Please use this box if you wish to make any further comments not covered elsewhere on the form

Only to thank the administrative staff for their efficiency and to the examinations officer for his courtesy in responding to my requests for information.

Name of School and Head of School (or nominee)

Title and Name of Examiner:

Subject(s):

Physics and Astronomy

Programme(s) / Module(s):

Physics, Theoretical Physics

Awards (e.g. BA/BSc/MSc etc):

BSc and MPhys

Title and Name of Responder:

Position*:

Examinations Officer

Faculty / School of:

MAPS/Physics and Astronomy

Address for communication:

School of Physics and Astronomy

Email:

Telephone:

*If the individual responding to the report is not the Head of School please state their position within the School.

Completing the School response

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Response to Points of innovation and/or good practice

See below

Response to Enhancements made from the previous year

We thank the examiner for his positive comments. The introduction of a group-work video making task in level 1 laboratory has been as a result of feedback from our accreditation body and we are pleased by how it has gone in its first year. The mark analysis tool has been developed in the absence of a University provided tool and, as the examiner alludes to, is largely intended for supporting discussion and monitoring within the school.

Response to Matters for Urgent Attention

If any areas have been identified for urgent attention before the programme is offered again please provide a specific response to them here:

We note that there are no urgent matters and will address the other points below.

Response to questions 1-7 (and related comments)

Schools may provide a general response; however, where Examiners raise specific points these must be addressed individually:

Not applicable for this examiner

Standards**Response to questions 8 to 16 (and related comments)**

Schools may provide a general response; however, where Examiners raise specific points these must be addressed individually:

We will combine our response to the comments following Q12 with the broader points raised by the examiner in the responses below.

Assessment and Feedback

Response to questions 17 to 19 (and related comments)

Schools may provide a general response; however, where Examiners raise specific points these must be addressed individually:

The examiner raises a concern over the rather high failure rate in the core level 2 modules, in particular the semester 2 modules and possible evidence for disengagement of the weaker students. Broadly we accept and share the examiner's analysis of the situation and this has been a matter of growing concern within both the STSEC and the wider staff body.

We believe that this problem has a number of complex factors that include changes over the last decade in the volume of rote learning that students are encouraged to undertake in A-level physics at schools, which increasingly conflicts with the deliberate intention to set single broad examination papers when the current core module structure was implemented in 2006. The material in semester 2 of the second year is the most complex and demanding of the core material required for accreditation and the cumulative nature of the subject means that students that temporarily disengage for whatever reason can struggle to re-engage in learning.

Some of the issues of avoiding overwhelming of the weaker students will be addressed through clearer guidance from teaching staff on material that is expected to be memorised and emphasising that credit is given for the methods of derivation and not just, for example, for reproducing a sequence of lines of algebra. We do not believe this will be sufficient on its own to rectify the issue and we are actively considering both changing the scope of some of the core mathematical material required for the non-theoretical physics programmes and the format of the examination assessments for the core Physics module. The timetable for the implementation of these parts of the solution is contingent on permissions to change modules and programmes in the catalogues.

We hope that current work being undertaken by the Physics Education Research group in the school will contribute to our understanding of the issues of student engagement in the second year and further assist in defining an effective forward looking strategy in this area.

The Progression and Awards Process**Response to questions 20-35 (and related comments)**

Schools may provide a general response; however, where Examiners raise specific points these must be addressed individually:

We note that although the two external examiners who work with the school nominally cover different programmes, since Physics and Astronomy are commonly taught within a single academic unit in most Universities, we invite comment from both examiners on all of the programmes. To avoid both examiners having to attend both internal and award boards, they each attend one and that the other examiner, _____ did attend the progression and awards board and we look forward to his comments on that part of our processes. _____ does not raise specific issues in this section.

Other comments**Response to items included in the 'Other Comments' section of the report**

We thank _____ for his comments on the final year projects – in particular on the scope of the 'Dissertation' style BSc projects. This is, again, an area that is under active consideration by both the STSEC and staff body in advance of receiving the examiner's report. In recent years we have undertaken some work to realign the marking criteria with those used at other levels and with the ILOs and this has resulted in a better utilisation of the upper end of the marking scheme, however without the desired stretching of the mark distribution and we will further revise the marking criteria and guidance to staff to better achieve this going forwards.

The comparability of dissertation type work with more traditional experimental, computational and theoretical projects has also been the subject of consideration within the staff body. We particularly thank our external examiners for helpful discussions during their visits and in the report. For the forthcoming year we will require staff offering such projects to clearly identify a specific research question to be addressed and to require the students to explicitly include a section where they will synthesise a response to the question. Guidance to staff assessing the projects will make it clear that the first class criteria cannot be reached without a substantial aspect of synthesis and critical evaluation of the central research question.