CONFIDENTIAL

EXAMINERS' REPORTS 2023
MATERIALS SCIENCE (MS)

Internal Examiners' Reports

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REPORT ON PRELIMINARY EXAMINATION IN MATERIAL SCIENCE

Part I

A. STATISTICS

Category	Number			Percentage		
	2022/23	2021/22	2020/21	2022/23	2021/22	2020/21
Distinction	10	9	12	26	20	27
Pass	26	25	27	64	57	61
Fail	4*	10	5	10	23	11

*3 candidates resat some or all the written papers in September, and two of them passed. One candidate who failed to achieve a passing grade in 2 papers in Trinity Term chose not to resit the papers until the following academic year, and so has no result to report this year.

Marking of scripts

Scripts are single marked except for borderline cases which are double-marked. In addition, the Chair selected some scripts at random to be double marked to ensure consistency of marking.

B. EXAMINING METHODS AND PROCEDURES

The conventions have been updated recently, and no further changes were made this year. Each Moderator was assigned the responsibility for setting and marking their principal paper, but they were also assigned a second paper from the outset.

With the course design having no lecture courses shorter than 8 lectures meant that all topics were examined, but some questions required knowledge from more than one lecture course. This approach is in line with standard practice in Part I examinations. Lecturers were asked to provide draft questions to ensure that the candidates were examined on material presented to this year's cohort. The overall aim for lecturers in setting the difficulty of questions was such that students who achieve a mark of 70% or more "*show excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and are able to use that knowledge innovatively and/or in unfamiliar contexts.*"

C. Please list any changes in examining methods, procedures and conventions which the examiners would wish the faculty/department and the divisional board to consider.

Materials Papers

Some questions submitted by the lecturers needed modification because they were too predictable or because they contained minor errors. The Moderators noted that most lecturers provided clear commentary alongside their worked answers. The paper averages for MS1, MS2 and MS3 were 60.4%, 60.8% and 62.8% respectively, in line with past norms, although there were a few poor attempts at all 3 papers.

It was found after the marks had been released that one question from three candidates had not been marked. These were marked by the chairman, and the marks amended appropriately. This resulted in the marks for one candidate being significantly upgraded after they had been released, and although it did not change their classification it did result in an extra prize being awarded for excellent performance.

Maths Paper

The 2022 Maths paper proved too difficult, and so there was a deliberate focus this year to make sure that the paper was appropriately challenging, but not too hard. As a result, special care was taken to scrutinise the submitted questions, and some new questions were requested from the Mathematics lecturers to avoid overlong derivations or material on the very edge of the curriculum. The average mark on the paper this year was 67.1%, much higher than in 2022, and the normal pass mark of 40% could be reinstated.

However, the marks spreadsheet for the Maths paper proved particularly unstable – not always accurately calculating the overall paper score from marks entered into the cells. This caused considerable confusion, and a lot of extra manual work in checking that the marks totals were correct.

This resulted in the marks for one candidate being significantly upgraded after they had been released, although it did not change their classification.

Coursework Paper
The coursework paper is made up of 50% from the first year practicals, 25% from the crystallography classes and 25% from the Computing for Materials Science course.

Computing for Materials Science (CMS)
The marks were reviewed and approved. It was noted that two candidates had not achieved the pass mark on this compulsory coursework, and they were asked to submit a satisfactory script for the written component. In one case this was found to be a result of a problem with the system recording a blank (i.e. zero byte files). The submission system should really provide an error to the student if this happens so that they can correct it before the deadline.

Crystallography coursework
The report from the Senior Demonstrator flagged no specific concerns.

Practicals
The Moderators considered a report from the Practical Class Organiser (PCO) which outlined events throughout the year which may have impacted on the candidates' performance and agreed that any action taken at the time had mitigated this impact.

The Moderators endorsed most of the PCO's recommended penalties as laid out in their report, but mitigated some where the degree of lateness was very marginal.

D. Please describe how candidates are made aware of the examination conventions to be followed by the examiners

Circulation by Senior Education Officer to all students and tutors by e-mail and published to the Departmental website.

A copy of the conventions for this examination is attached below.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

38 students were registered for the examination. All candidates took the same papers for the whole examination in Trinity Term.

33 candidates passed all papers without the need for any compensation. Under the conventions 1 further candidate was awarded a compensated pass in the MS3 paper. Of the successful candidates in Trinity Term, 10 were awarded Distinctions, all with total average marks above 75%.

Two candidates were also required to complete the coursework on Computing to achieve a passing grade.

4 candidates failed at least one paper, and 3 of these took the Long Vacation resits in September.

There were minor errors in the MS1 and MS2 papers which were taken into account in marking and were not deemed to have impacted the candidates' performance.

The prize for the best overall performance in Prelims was awarded to Joash (Kai) Poh, St Anne's College. The Prize for the best performance in 1st year Practicals was awarded to Maddie Hawley, St Catherine's College. The Armourers and Brasiers' Company / Rolls Royce Prize for outstanding overall performance in Prelims was shared between, Eliza Harris, Trinity College and Devajna Gopal, Queen's College. Anna Wu, Corpus Christi College and Arya Shenvi Kakodkar, St Anne's College were awarded a prize for excellent performance.

Long Vacation examinations

In the Long Vacation examinations, 2 of the 3 candidates passed the single paper they were resitting. 1 candidate failed to achieve a passing mark on either of 2 resit papers, and so are deemed to have failed the examination.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

Where approved by the Proctors, 4 candidates were allowed (i) extra time on account of dyslexia / dyspraxia, and/or (ii) other special arrangements.

Gender Issues:

Of the 38 candidates 15 were women and 23 men.

4 of the 9 distinctions were awarded to women.

The 2023 mean score showed no obvious gender bias: males 65% and females 64.8%.

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

This information is in the paper summaries attached.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIAL WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

[redacted]

[redacted]				

[redacted]

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

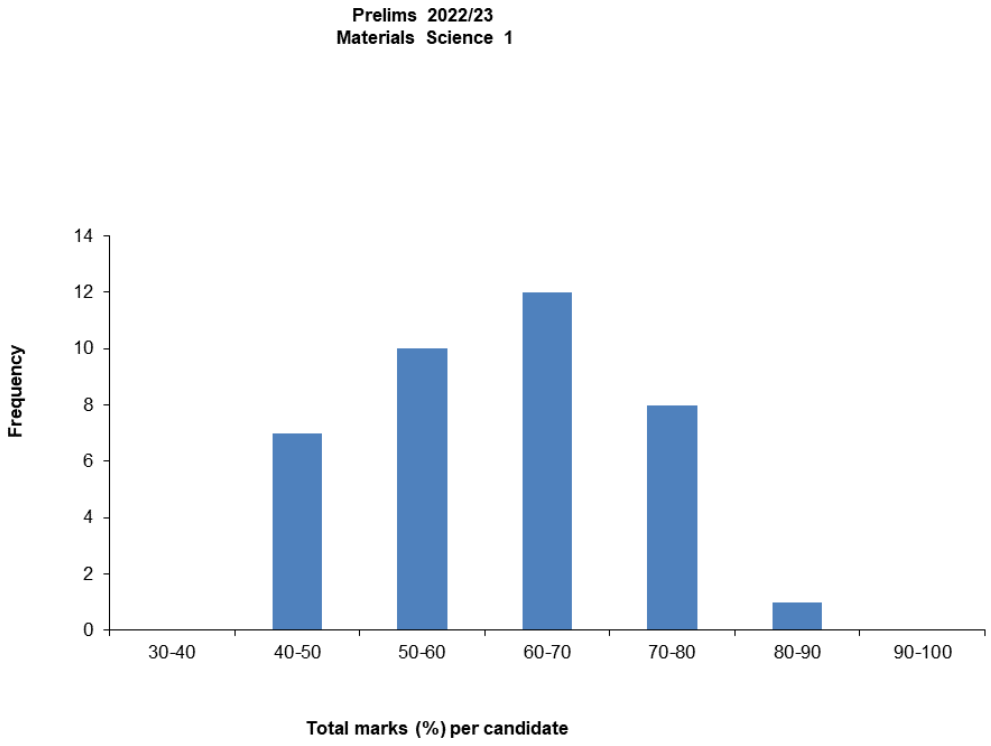
Professor H. Bhaskaran
Professor C.R.M. Grovenor (Chair)
Professor A.I. Kirkland
Dr E. Liotti

MS1 – Physical Foundations of Materials

Examiner: **Prof. Angus Kirkland**
Candidates: **38**
Mean mark: **60.37**
Maximum mark: **80**
Minimum mark: **41**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	33	10.67	17	5	Electromagnetic Properties and Devices
2	20	11.45	17	5	Electromagnetic Properties and Devices
3	34	13.74	19	8	The Study of Crystalline Materials by Diffraction
4	37	14.32	18	10	The Study of Crystalline Materials by Diffraction
5	1	13.00	13	13	Random Processes and Statistical Physics
6	8	7.38	11	3	Random Processes and Statistical Physics
7	33	10.36	15	3	Wave Mechanics, Quantum Theory and Bonding
8	23	13.13	19	2	Wave Mechanics, Quantum Theory and Bonding



General comments:

Specific Comments:

1) A very popular question where the average mark was below that for the paper. A small number of students scored well but a significant fraction attempted only parts a and b (i and ii). Very few students made progress in explaining the variation of the B field required in part c.

2) A question which was less popular than Q1 but where the mark distribution was similar. Part a was generally well answered but attempts at part b were mixed with very few students providing the explanation required in part c.

3) A popular question which was generally well answered. Almost all attempts scored close to maximum marks in part a and b. Part c contained a typographical error ($\sin 2\theta$ rather than $\sin^2\theta$. The majority of students assumed the correct form and for those whom did not this was compensated during marking.

4) A very popular question with a high average mark. Few students found the in plane mirrors in the two molecules in part a and some assumed BF_3 was pyramidal although the diagram clearly shows that it is planar. Only a few students correctly identified all the symmetry elements in part b leading to some incorrect assignments of the unit mesh. Part c was generally well answered although there were algebraic and numerical mistakes in parts i and ii in some cases.

5) Only one answer so no statistics are useful. The single attempt scored a mark close to the paper average.

6) An unpopular question with a low average mark. Part a was attempted by all with varying degrees of success but most students made no attempt at part c

7) A very popular question but with an average mark below to the paper average. Part a and b were generally well answered but few students made any progress with part c.

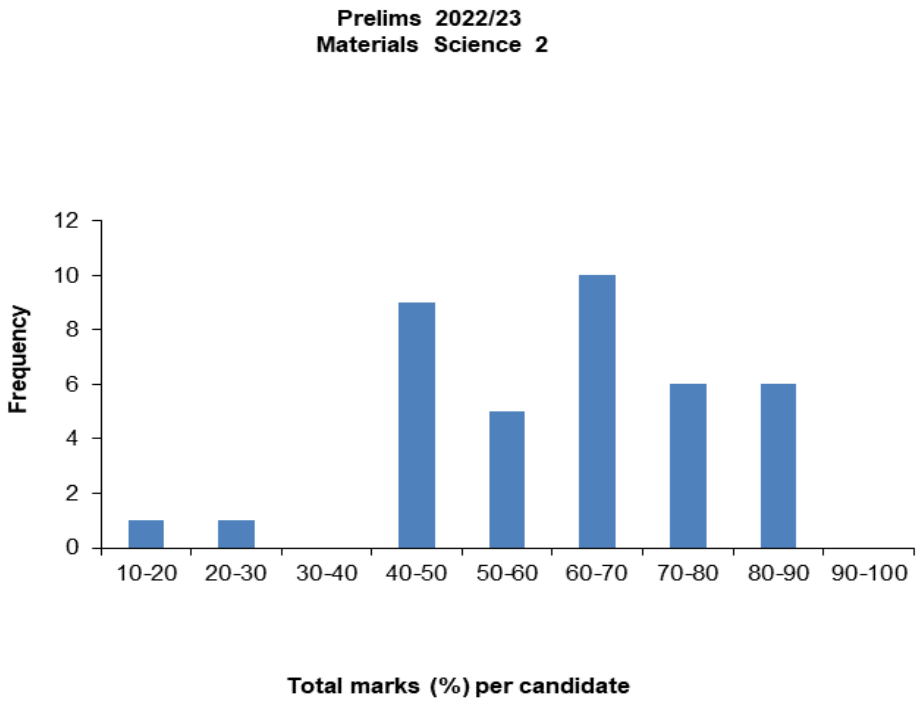
8) A less popular question than Q7 but with a higher average mark. Parts a to c were well answered although some students did not draw the correct plot required in part c. A number of students were not able to sketch the form of the wavefunction in part d and almost no student could explain part e.

MS2 – Structure and Mechanical Properties of Materials

Examiner(s): **Prof. Chris Grovenor**
Candidates: **38**
Mean mark: **60.8%**
Maximum mark: **89%**
Minimum mark: **19%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	23	13.0	20	0	Elasticity
2	15	11.1	18	5	Mechanical properties
3	34	12.6	20	3	Mechanical properties/Mohr's circle
4	31	10.0	17	0	Hume Rothery rules
5	1	8	8	8	Mechanical properties/Torsion
6	34	14.4	19	6	Bonding and structure
7	36	12.8	19	4	Dislocations
8	13	11.6	19	4	Plasticity and fracture



General comments:

A generally straightforward paper with an average of 60.8, and a wide spread of results. Two candidates failed to gain more than 30%, but 6 candidates awarded more than 80%. Q5 attracted only one answer, but all the others were attempted by a reasonable number of candidates. The quality of the explanations in some scripts was extremely poor, showing a limited grasp of scientific English.

Specific Comments:

1) A popular mechanics and materials selection question that was done with confidence by many candidates

2) A rather less popular question on brittle failure in ceramics and metal-ceramic composites. Many candidates had only a limited grasp of the equations for calculating the properties of composites.

3) A very popular question on Mohr's circle and yield criteria. There was an almost bimodal distribution of marks, with many excellent answers but quite a number of scripts showing only a limited understanding.

4) An extremely straightforward and popular question on Hume Rothery rules. The final part on ordering in Au-Cu alloys was done much worse than the rest of the question.

5) Only one candidate attempted this rather intimidating looking question on torsion of a pipe.

6) Another extremely straightforward and popular question on bonding in different materials. Many candidates achieved very high marks, but a few could not explain even basic bonding characteristics in a coherent manner.

7) A popular question on basic dislocation definitions and the OILS rule. The candidates found part (b) on diffraction contrast in the TEM most difficult to explain.

8) A set of pictures of deformed microstructures that was not popular, perhaps because it is an unusual question in Prelims. Some candidates found it hard to see what they were supposed to in the images, but others confidently connected them with the bookwork explanations of mechanical properties in the lectures.

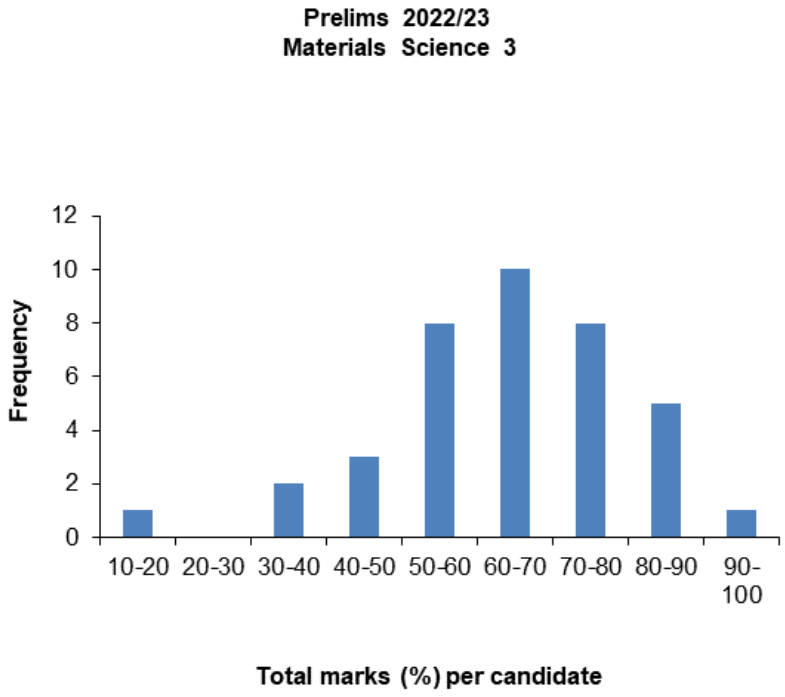
Long vacation resit: Of the two candidates who did not achieve the pass mark in the summer, one did not sit the resit papers, and the other, after double marking of the script, achieved a borderline passing mark.

MS3 – Transforming Materials

Examiner(s): **Dr Enzo Liotti**
Candidates: **38**
Mean mark: **62.8**
Maximum mark: **90**
Minimum mark: **17**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	23	7.70	17	2	Electrochemistry
2	18	8.39	17	1	Electrochemistry
3	27	12.59	17	8	Thermodynamics
4	34	13.91	19	4	Thermodynamics
5	35	16.94	20	10	Microstructure and processing of materials
6	33	15.42	20	7	Microstructure and processing of materials
7	16	8.56	17	0	Microstructure and processing of materials
8	1	7	7	7	Nanomaterials



General Comments

Overall most of the candidates passed the exams with good marks. Most of them had a good grasp of metallurgy and thermodynamics, but there was struggle on electrochemistry. Only one candidate answered the question on nanomaterials. It was noticeable that many students struggled with the calculations, despite using the correct procedure. Also several scripts were at the limit of readability.

Three candidates did not reach the pass mark.

LV resit: Two candidates had to resit MS3. Only one took the exam and failed.

Specific Comments

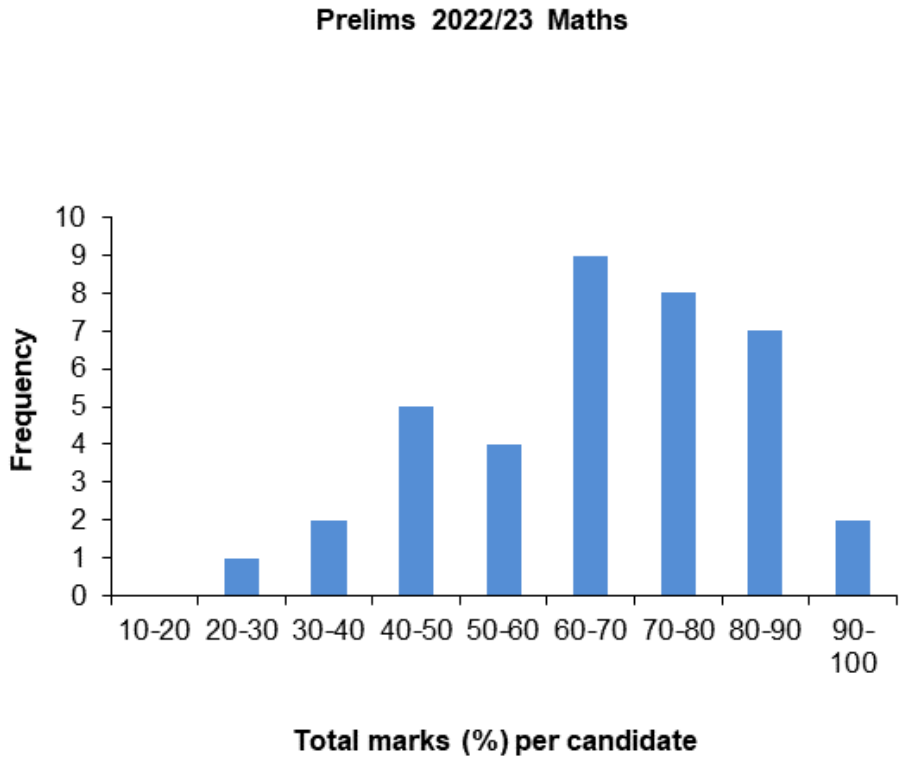
1) This question was about deriving potential-pH relationships for 4 given reactions. It was quite popular as ~60% of the candidates attempted it. On average it was the questions which scored the lowest. Students struggled quite a lot in part a, while part b was generally either answered very well or quite poorly.
2) Another electrochemistry question attempted by ~50% of candidates. Overall answers were slightly better than for question 1, but most of the marks were given for part e. Only 2 students got full mark for this part, while the others gave goodish answers.
3) This question on Ellingham diagrams and oxidation was popular (70% answer rate) and well answered. However, there was a mistake in the text of part c (the sign of both enthalpy and entropy of formation had the wrong sign) which affected and confused most of the students. The marking took account of this mistake.
4) Very popular, well answered question (90% answer rate) on thermodynamics. Student achieved top or near top marks in part a and b, but struggled more in part c, especially where a bit more calculation was required.
5) Most popular (92% answer rate) and best answered question about phase diagrams. Students showed understanding of all basic concepts of phase diagrams and the thermodynamics concepts needed to derive them.
6) Question about the Fe-C phase diagram, very popular (88% answer rate) and well answered. All parts were answered well.
7) Mixed question on precipitation processes concepts and polymer blends. 40% of students answered. Not very well answered. There was a lot of confusion about basic concepts of precipitation processes, often confusing solid-state transformations with solidification. Answers to parts c and d (polymer blends) were a mix, some did well, others quite poorly.
8) Only one candidate answered this question and gave a poor answer.

Mathematics for Materials Science

Examiner(s): Prof. Harish Bhaskaran
Candidates: 38
Mean mark: 66.13
Maximum mark: 95%
Minimum mark: 26%

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	38	5	8	0
2	37	6.31	8	0
3	37	6.32	8	1
4	38	7.58	8	0
5	38	4.08	8	0
6	38	5.82	8	0
7	37	4.19	8	0
8	37	4.97	8	0
9	36	6.17	8	1
10	37	6.81	8	2
11	10	14	25	1
12	21	14.81	25	0
13	35	15.20	25	3
14	17	15.44	24	0
15	35	17.14	25	4
16	31	15.94	25	0



General comments:

The exam paper had one minor error although no questions were raised in relation to the paper during or after the examination; this error was taken into account during the marking in favour of the candidates. The average mark was 66.13%, higher than the last examination, but at the level where one would expect an examination mean to be. The examiners concluded that this paper was relatively more straightforward than last year by design, although not significantly so. Thus, the higher mean is in part reflected by a higher level of preparedness than the previous year. The marks are normally distributed with a roughly Gaussian shape, and there appears to be a wide spread of outcomes with exceptionally well prepared candidates scoring 95% and the lowest mark being 26%. It is important to notice that all Part A questions and two Part B questions found at least one student able to work them out. For Part A questions, the average marks had a good range of distribution. Part B questions also had a mean well within the expected range. Q 11 was attempted by the least number of candidates(10), while Q13 and Q15 had 35 candidates attempting it. Once again, this year, reflecting trends from last year, it is very clear that the most popular and neatly-answered questions were those on matrices and determinants. The examiners determined that the examination was set at the correct level, and the passing mark should not be changed. There were three failures, who will be given an opportunity to resit the exam.

Specific Comments:

1) Standard question on complex numbers. Relatively straightforward, and while most students could get started, they were unable to continue. While they did relatively well on this question, it was a little disappointing that such a standard question which was for the average student to score high marks on was missed.
2) Straightforward question on computing the arc of a curve, most students did quite well on this question.
3) Standard question on computing the roots of a function, and using it to evaluate an integral. Most candidates did very well on this question
4) A question on limits, that was set more straightforwardly this year, as many candidates did poorly on this topic last year. The candidates on an average scored very high on this question.
5) A question on differentiation, that was very straightforward, yet candidates did not do very well on this one, although the average was just higher than 50%.
6) A straightforward question on differential equations, and most candidates were able to demonstrate a grasp of this subject.
7) A question on Maclaurin series that proved surprisingly challenging for many candidates, although the overall mark was over 50%.
8) A question on linear algebra, that could have been challenging conceptually. Most candidates did quite well on this one
9) Another question on vectors, that most candidates found relatively straightforward to score high on.
10) A linear algebra question to determine eigenvalues and eignevectors, straightforward and candidates did well on this question.
11) A long question on integrals attempted by only 10 candidates, but those who attempted it did reasonably well, scoring an average of 56%
12) A question on second order differential equations attempted by 21 students, scoring an average of ~60%. Once again, sketching the solution was the aspect that most students found very difficult suggesting a lack of conceptual understanding, but having a grasp of the methodology.
13) A question on PDEs, attempted by 35 students, scoring an average over 60%.
14) This was a more interesting question using a circuit model to prove a differential equation. It was attempted by 14 students amd those who attempted it scored an average of ~60%.
15) A question on linear algebra that was very popular (35 candidates attempted it). The average was over 68%, the highest for the longer questions.
16) Another question on linear algebra, that proved popular (31 attempts) with an average of over 60%.

There were two candidates who were given an opportunity to resit the paper in LV 2023. The resit paper was free of errors. One candidate passed the resit while the other failed.

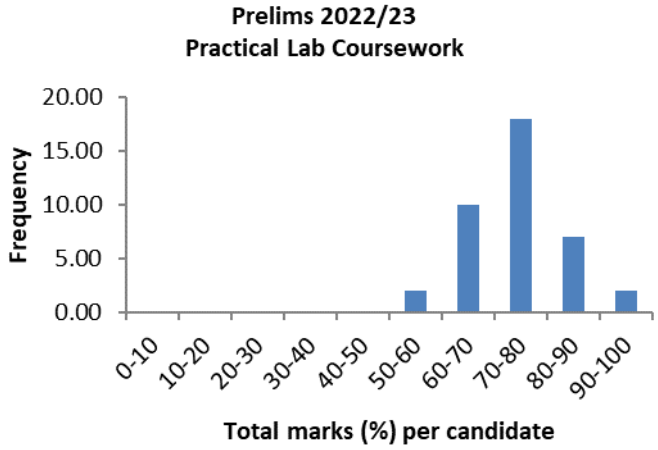
Practical Lab Coursework

Candidates: **38**
Mean mark: **73.7%**
Maximum mark: **90%**
Minimum mark: **50%**

Detailed comments on the coursework are as follows:

Lab No Lab Book Assessment (/3)	Average Mark	Highest Mark	Lowest Mark
1P3	2.5	3.0	2.0
1P4	2.0	3.0	1.0
1P5	2.0	3.0	1.0
1P6	2.0	3.0	1.0
1P7	2.0	3.0	1.0
1P8	2.3	3.0	1.0
1P9	2.6	3.0	1.0
1P10	2.4	3.0	1.0

Lab No Lab Report Assessment (/13)	Average Mark	Highest Mark	Lowest Mark
1P3 (not assessed)	n/a	n/a	n/a
1P5	8.4	13.0	2.0
1P8	11.0	13.0	6.0



1st year Practicals 2022-23

I have reviewed the marks from the 1st year Practicals 2022-23. Overall the year ran smoothly.

The lab notebooks were assessed for 8 practicals. Out of a maximum of 3 marks, the average was 2.2, increasing from 1.8 last year. Practicals requiring long reports averaged 9.6 marks out of 13 (73.8%).

Overall, there was a broad range of total marks ranging from 50 to 90%, while last year they ranged from 30 to 84%. The average mark was 72.6% (vs 62% last year). All candidates are therefore deemed to have passed the Practical Classes.

The following should be noted:

- A small and varied number of candidates completed an online version of the practicals due to testing positive for Covid, when it was not possible for lab weeks to be swapped to accommodate (this was largely in the early introductory – non-assessed – practicals).
- There were two of students who missed practicals due to illness. Medical evidence was received to cover their absence so they were formally excused.

For information:

Plagiarism:

1P10 Fabrication and Testing (lab book assessment)

One group of 3 students* submitted lab note book entries with differing preamble but with identical graphs and identical text interpreting and explaining the graphs. The text had been typed up printed out and the 3 students had glued the text into their lab books:

[redacted]

It is made clear to the students that the lab book must be their own work and I consider low-level plagiarism to have taken place. The moderators should consider the actions under item c) from the Conventions below. Note that with the lab book being marked out of 3, a 10% penalty is less than 1 mark change.

If plagiarism is suspected, the evidence will be considered by the Chair of the Moderators (or a deputy). They will make one of three decisions (https://academic.admin.ox.ac.uk/examiners):

a. No evidence, or insufficient evidence, of plagiarism – no case to answer.
b. Evidence suggestive of more than a limited amount of low-level plagiarism – referred to the Proctors for investigation and possible disciplinary action.
c. Evidence proving beyond reasonable doubt that a limited amount of low-level plagiarism has taken place – in this case the Board of Moderators will consider the case and if they endorse the Chair's judgement that a limited amount of low-level plagiarism has taken place will select one of two actions:
   i. Impose a penalty of 10% of the maximum mark available for the piece of work in question and a warning letter to be issued to the candidate explaining the offence and that the present incident will be taken into account should there be a further incidence of plagiarism. For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism (https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism).
   ii. No penalty, but a warning letter to be issued to the candidate explaining the offence, indicating that on this occasion it has been treated as a formative learning experience, and that the present incident will be taken into account should there be a further incidence of plagiarism. For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism (https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism).

Problems which occurred in the labs during the course of the year which the Moderators should be aware of as potentially affecting candidates' marks:

None.

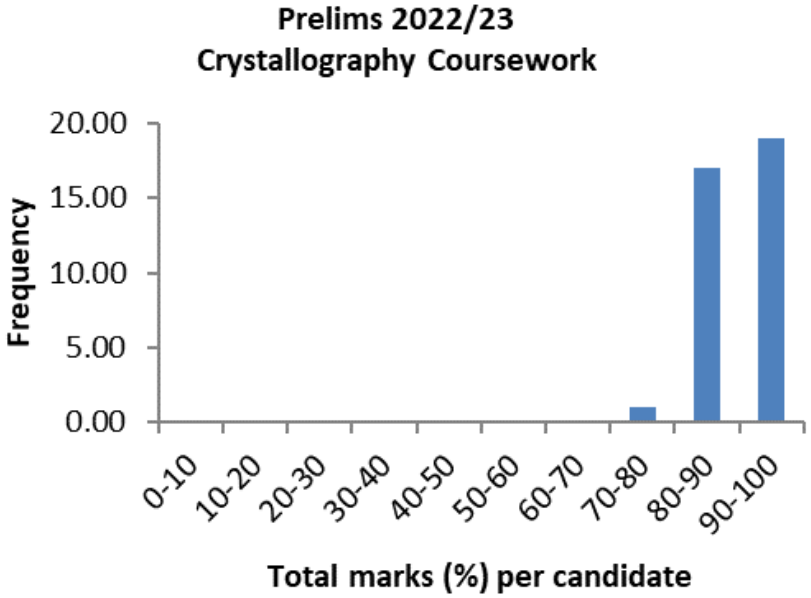
Practical Class Organiser – Pete Nellist
June 2023

Crystallography Class Coursework

Candidates: **38**
Mean mark: **89.21%**
Maximum mark: **97%**
Minimum mark: **82%**

Detailed comments on the coursework are as follows:

Demo No	Average Mark	Highest Mark	Lowest Mark
D2	9.1	9.7	8.0
D3	8.6	9.8	5.5
D4	8.2	9.1	6.6
D5	9.2	10.0	7.7
D6	9.3	10.0	7.5



Report from the 1st year Crystallography Class Organiser for 2022-23

This year the crystallography classes were supervised in person by Dr Ali Mostaed, Dr Alexandra Sheader, Miss Xinrui Huang and Mr Michael Furlan. A team of four works well for the large class size. Since it is crucial for the demonstrators to collaborate and collectively review the sheet before the sessions commence, they gather in person a few days prior to the sessions to individually discuss the completed sheets. This practice ensures a unified and coherent response to the students during the sessions.

The course consists of six classes, three in the Michaelmas term and three in the Hillary term, designed to support both the Crystallography lectures and Structures of Crystalline and Glassy Materials course. While the main emphasis of each class remains unchanged compared to previous years, slight modifications have been made to the content of the worksheets. This adjustment aims to discourage students from relying on marked worksheets from previous years. In addition, during the sessions, the demonstrator actively engages with the students, fostering an environment that prioritizes a conducive learning experience rather than simply focusing on assessment. Through their interactions, they create an atmosphere where students feel encouraged to participate, ask questions, and explore the subject matter deeply.

Figure 1 depicts the histogram displaying the distribution of students' grades during the 2022/23 academic year. Taking into account the guided nature of the class, as well as the availability of lecture notes and textbooks, a practical score of 70% or below indicates that the student faced challenges during that specific practical session. Nevertheless, as illustrated in Fig. 1, the vast majority of students performed well in their classes, with an average grade of 88% across the entire year group.

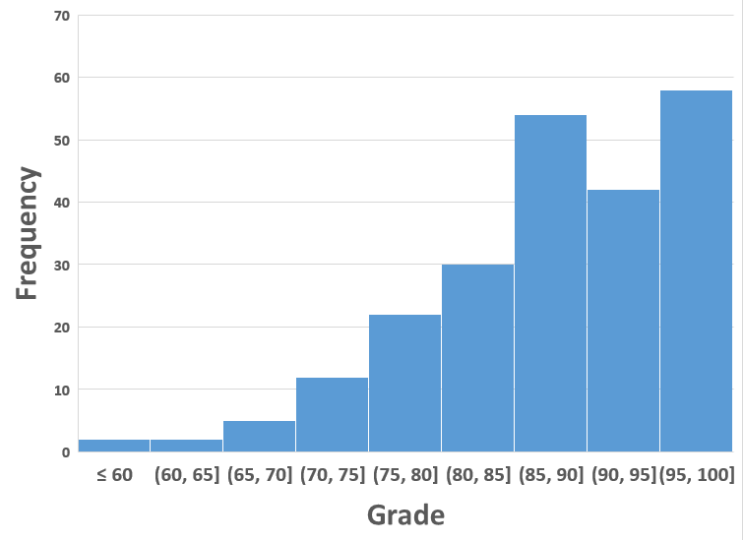


Fig. 1. Histogram representing the grades of the students during the 2022/23 academic year.

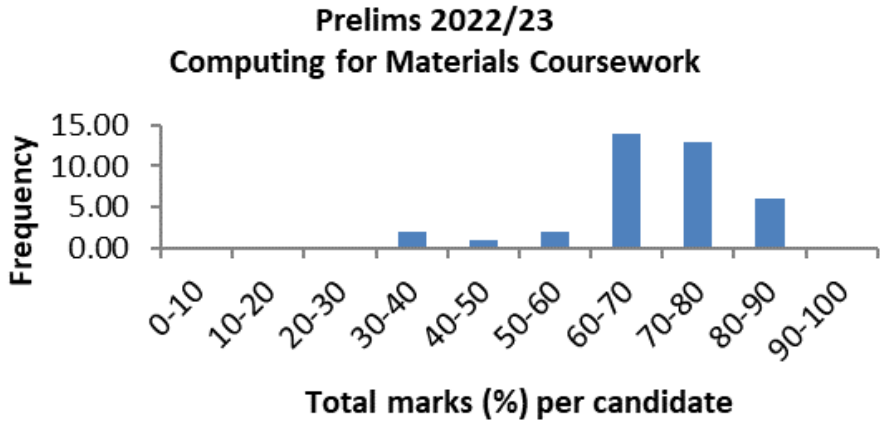
Each of the two senior demonstrators is responsible for evaluating half of the worksheets during each practical session. While they strive for consistency in their marking approach, slight variations of a few percent in their assigned grades may occur. To enhance overall consistency, it is advisable to adopt a grading scale ranging from A to F rather than relying solely on numerical values in the next academic years. This adjustment can promote greater uniformity and clarity in the grading process, ultimately benefiting the students' understanding of their performance.

Yours Sincerely,
Ali Mostaed
Crystallography Classes Organiser

Computing for Materials Science

Candidates: 38
Mean mark: 69.11%
Maximum mark: 84%
Minimum mark: 34%

Detailed comments on the coursework are as follows:



Report from the 1st year Computing for Materials Science convenor for 2022-23

The four classes were held in person this year, with the teaching split across two class rooms. The classes ran smoothly - it my impression that the number of students with prior computing experience continues to increase, and this helps the whole cohort. Support for the projects was provided through a dedicated email address and two demonstrator sessions. Only a small number of students attended the in-person sessions, and very few emailed questions were received.

The best reports included well presented graphs from carefully designed computational experiments. Observed phenomena were noted and discussed. Low scoring reports typically presented minimal results, without any discussion of the underlying science.

Almost all students submitted working code, and the wide distribution of marks was due to the varying quality of the submitted reports.

Jonathan Yates
Computing for Materials Science Course Leader 22-23

Prelims Examination Conventions 2022/23
Preliminary Examination in Materials Science

1. INTRODUCTION

Examination conventions are the formal record of the specific assessment standards for the course or courses to which they apply. They set out how examined work will be marked and how the resulting marks will be used to arrive at a final result progression decision and/or classification of an award.

These conventions apply to the Preliminary Examination in Materials Science for the academic year 2022/23. The Department of Materials' Academic (Undergraduate) Committee (DMAC) is responsible for approving the Conventions and considers these annually, in consultation with the examiners. The formal procedures determining the conduct of examinations are established and enforced by the University Proctors. These Conventions are a guide to the examiners and candidates but the regulations set out in the Examination Regulations have precedence. The Examination Regulations may be found at: www.admin.ox.ac.uk/examregs.

The paragraphs below indicate the conventions to which the examiners usually adhere, subject to the guidance of other bodies such as the Academic Committee in the Department, the Mathematical, Physical and Life Sciences Division, the Education Committee of the University and the Proctors who may offer advice or make recommendations to examiners.

The examiners are nominated by the Nominating Committee* in the Department and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. In Prelims the examiners are called "moderators". Formally, moderators act on behalf of the University and in this role are independent of the Department, the colleges and of those who teach the MS M.Eng. programme.

2. RUBRICS AND STRUCTURE FOR INDIVIDUAL PAPERS

Each of the five papers in Prelims, comprising the three Materials Science papers (MS1, MS2 & MS3), the Maths for Materials Science paper, and the Coursework Paper, are weighted equally towards the overall total for the Preliminary Examination. The moderators set the papers, but are advised to consult the course lecturers. The course lecturers are required to provide draft questions and exemplar answers if so requested by the moderators. There are no external examiners for Prelims. The assessed work for the practicals, the crystallography classes and the project work for Computing in Materials Science (CMS) together constitute the Coursework Paper.

Written Paper Format

The Materials Science papers 1 - 3 comprise eight questions from which candidates must attempt five. Each question is worth 20 marks. The maximum marks available for each of these papers are 100. There is no strict rule about how many questions are set on each lecture course in the Materials Science papers 1 - 3. As a result, (i) it should not be assumed that a question will be set on every lecture course and (ii) some questions may require knowledge from across the entire year.

The Maths for Materials Science paper consists of two sections, candidates are required to answer all questions in Part A and 4 from Part B. The total marks available for this paper are 180; the mark achieved then being weighted by a factor of 0.555' such that the paper contributes a maximum of 100 marks to the Preliminary Examination.

Examiners proofread the final 'camera-ready' pdf version of each examination paper. Great care is taken to minimise the occurrence of errors or ambiguities. Despite this care, on occasion an error does remain in a paper presented to candidates: if a candidate thinks there is an error or mistake in the paper, then they must state what they believe the error to be at the start of their answer to that question and if necessary, state their understanding of the question.

Coursework paper

The Coursework Paper comprises three examined elements of coursework: (i) for the Practical Course two full reports as specified in the MS Prelims Handbook, together with assessment of the student's laboratory notebook entries for each of the eight specified practicals also as detailed in the MS Prelims Handbook (normally these reports and notebook entries have been marked already as the practical

* for the 2022-23 examinations the Nominating Committee comprised Prof Assender, Prof Marrow & Prof. Speller.

course progresses); (ii) a set of reports for crystallography (completed under the class schedule); and (iii) project work for Computing in Materials Science.

For formal submission of the practical coursework, the Examination Regulations stipulate that candidates are required to submit the Materials Practical Class reports and laboratory notebooks to the Chair of Moderators by no later than 10 am on Friday of the sixth week of Trinity full Term. Further information on this is provided in the MS Prelims Handbook.
The only types of calculators that may be used in examinations are from the following series:

CASIO fx-83
CASIO fx-85
SHARP EL-531

Candidates are not permitted calculators in the Mathematics for Materials Science examination. A basic periodic table is provided in all Preliminary examinations and some Maths definitions and formulae are provided for the Maths examination. (These are available on Canvas).

3. MARKING CONVENTIONS

3.1 University scale for standardised expression of agreed final marks

Agreed final marks for individual papers will be expressed using the following scale: 0-100

3.2 Qualitative criteria for different types of assessment

Qualitative descriptors, based on those used across the Mathematical, Physical and Life Sciences Division, are detailed below:

70-100	The candidate shows excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and is able to use that knowledge innovatively and/or in unfamiliar contexts. The higher the mark in this band the greater will be the extent to which these criteria are fulfilled; for marks in the 90-100 range there will be no more than a very small fraction, circa 5-10%, of the piece of work being examined that does not fully meet all of the criteria that are applicable to the type of work under consideration. The 'piece of work' might be, for example, an individual practical report, a question on a written paper, or a whole written paper.
60-69	The candidate shows good or very good problem-solving skills, and good or very good knowledge of much of the material over a wide range of topics.
50-59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
40-49	The candidate shows reasonable understanding of at least part of the basic material and some problem solving skills. Although there may be a few good answers, the majority of answers will contain errors in calculations and/or show incomplete understanding of the topics.
30-39	The candidate shows some limited grasp of basic material over a restricted range of topics, but with large gaps in understanding. There need not be any good quality answers, but there will be indications of some competence.
0-29	The candidate shows inadequate grasp of the basic material. The work is likely to show major misunderstanding and confusion, and/or inaccurate calculations; the answers to most of the questions attempted are likely to be fragmentary

3.3 Verification and reconciliation of marks

During the marking process the scripts of all written papers remain anonymous to the markers. Each written paper is marked by a single moderator. Those papers identified by the moderator as having marks close to the boundaries of pass/fail and distinction/pass will be fully marked by a second moderator, who has sight of the first moderator's marks, but arrives at a formal independent mark. If the difference in these marks is small (~10% of the total available for the question, 2-3 marks for most questions), the two marks are averaged, with no rounding applied. Otherwise the moderators identify the discrepancy and read the answer again, either in whole or in part, to reconcile the differences. If after

this process the moderators still cannot agree, they seek the help of the Chair, or another moderator as appropriate, to adjudicate. For all other papers, the second moderator checks that the overall mark for each question is consistent with one of three sets of descriptor(s), namely those for <40, 40 to 69, or >= 70 as appropriate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this.

In the event that a possible error in the paper has been identified, the first moderator will consider the validity of the error and assess the impact of the error on candidates' choice of questions and on the answers written by those who attempted a question that contained an error, and will take this impact into account when marking the paper and prior to agreeing a final mark for all candidates.

First year practicals are assessed on a continual basis by the senior demonstrators. The work for the six crystallography classes is assessed by the Crystallography Class Organiser(s), the first of these classes being assessed formatively only. The project work for the Computing in Materials Science is assessed by the CMS senior demonstrator. Satisfactory performance in the practical work, in the crystallography classes, and in the CMS project work is defined in the MS Prelims Handbook. The Practical Courses Organiser reviews the marks for the practicals before they are considered by the moderators, drawing to their attention (i) any anomalously low or high average marks for particular practicals and (ii) any factors that impacted on the practical course, such as breakdown of a critical piece of equipment. The moderators review the practical, crystallography and project marks.

3.4 Scaling

Adjustment to marks, known as scaling, normally is not necessary for prelims.

3.5 Short-weight convention and departure from rubric

The rubric on each paper indicates a prescribed number of answers required (e.g. "candidates are required to submit answers to no more than five questions"). Candidates will be asked to indicate on the cover sheet which questions, up to the prescribed number, they are submitting for marking. Excepting section A of the Maths paper, for which all questions are compulsory, if this information is not provided then the examiners will mark the questions in numerical order by question number.

If the candidate lists more than the prescribed number of questions then questions will be marked in the order listed until the prescribed number has been reached. The examiners will NOT mark questions in excess of the prescribed number. If fewer questions than the prescribed number are attempted, (i) each missing attempt will be assigned a mark of zero, (ii) for those questions that are attempted **no** marks beyond the maximum per question indicated under section 2 above will be awarded and (iii) the mark for the paper will still be calculated out of 100 for MS1, MS2 & MS3 and out of 180 for the Maths for Materials Science paper.

3.6 Late- or non-submission of elements of coursework

Including action to be taken if submission has been or will be affected by illness or other urgent cause, and circumstances in which academic penalties may be applied.

The Examination Regulations prescribe specific dates and times for submission of the required elements of coursework to the Examiners (1. A set of five reports of crystallography coursework as specified in the MS Prelims Handbook (normally each individual report within the set has been marked already as the crystallography classes progress - penalties for late submission of an individual crystallography report are prescribed in the MS Prelims Handbook and are applied prior to any additional penalties incurred under the provision of the present Conventions.); 2. Two full reports of practical work as specified in the MS Prelims Handbook plus the student's laboratory notebook entries for the Prelims Practical Course (normally each individual report and laboratory notebook entries for each of the specified practical classes have been marked already as the Practical Course progresses - penalties for late submission of an individual practical report are prescribed in the MS Prelims Handbook and are applied prior to any additional penalties incurred under the provision of the present Conventions); 3. Project work for Computing in Materials Science as specified in the MS Prelims Handbook.) Rules governing late submission of these elements of coursework and any consequent penalties are set out in the 'Late submission and non-submission of a thesis or other written exercise' clause of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations (Part 14, 'Late Submission, Non-submission, Non-appearance and Withdrawal from Examinations' in the 2022/23 Regulations). A candidate who fails to submit an element of coursework by a prescribed date and time will be notified of this by means of an email sent on behalf of the Chair of Moderators.

Under the provisions permitted by the regulation, late submission of an element of coursework, as defined above, for Materials Science examinations will normally result in one of the following:

a) Under paras 14.3 to 14.6. In a case where illness or other urgent cause has prevented or will prevent a candidate from submitting an element of coursework at the prescribed date, time and place the candidate may, through their college, request the Proctors to accept an application to this effect. In such circumstances the candidate is strongly advised to (i) carefully read paras 14.3 to 14.6 of the aforesaid Part 14, where the mandatory contents of such an application to the Proctors are outlined and the several possible actions open to the Proctors are set out, and (ii) both seek the guidance of their college Senior Tutor and inform at least one of their college Materials Tutorial Fellows. Some, but not all, of the actions open to the Proctors may result in the work being assessed as though it had been submitted on time (and hence with no late submission penalty applied).

b) Under para 14.7. In the case of submission on or after the prescribed date for the submission and within 14 calendar days of notification of non-submission and without prior permission from the Proctors: subject to leave from the Proctors to impose an academic penalty, for the first day or part of the first day that the work is late a penalty of a reduction in the mark for the coursework in question of up to 10% of the maximum mark available for the piece of work and for each subsequent day or part of a day that the work is late a further penalty of up to 5% of the maximum mark available for the piece of work; the exact penalty to be set by the Moderators with due consideration given to the circumstances as advised by the Proctors. The reduction may not take the mark below 40%.

c) Under Para 14.3(5). In the case of failure to submit within 14 calendar days of the notification of non-submission and without prior permission from the Proctors: a mark of zero shall be recorded for the element of coursework and normally the candidate will have failed that element. As stated in the Special Regulations for the Preliminary Examination in Materials Science, failure of the coursework will normally constitute failure of the Preliminary Examination.

If a candidate is unable to submit by the required date and time for any reason other than for acute illness their college may make an application to the Proctors for permission for late submission. An extended deadline may be approved, or late submission excused where there are grounds of 'illness or other urgent cause'. Applications may be made in advance of a deadline, or up to 14 days from when the candidate is notified that they have not submitted. In all cases, the applications will be considered on the basis of the evidence provided to support the additional time sought.

Elements of coursework comprising more than one individual piece of assessed coursework

Penalties for late submission of individual practical reports and individual crystallography class reports are set out in the 2022-23 MS Prelims Handbook and are separate to the provisions described above.

The consequences of failure to submit individual practical reports or individual crystallography reports are set out in the MS Prelims Handbook (sections 10.6 and 11 of the 2022/23 version) and are separate to the provisions described above. In short, normally this will be deemed to be a failure to complete satisfactorily the relevant element of Materials Coursework and will therefore constitute failure of the Preliminary Examination as a whole, as stated in the Special Regulations for the Preliminary Examination in Materials Science.

Where an individual practical report or individual crystallography report is not submitted or is proffered so late that it would be impractical to accept it for assessment the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chair of the Moderators, permit the candidate to remain in the examination. In this case for the individual piece of coursework in question (i) the Moderators will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires submission/delivery of every individual piece of assessed coursework if the candidate is not to fail the examination as a whole.

3.7 Penalties for over-length work and departure from approved titles or subject-matter

This is not applicable to the Prelims examination.

3.8 Penalties for poor academic practice

Substantial guidance is available to candidates on what constitutes plagiarism and how to avoid committing plagiarism (see Appendix B of the Materials Prelims Handbook and https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism)

If plagiarism is suspected, the evidence will be considered by the Chair of the Moderators (or a deputy). They will make one of three decisions (https://academic.admin.ox.ac.uk/examiners):

(a) No evidence, or insufficient evidence, of plagiarism – no case to answer.

(b) Evidence suggestive of more than a limited amount of low-level plagiarism – referred to the Proctors for investigation and possible disciplinary action.

(c) Evidence proving beyond reasonable doubt that a limited amount of low-level plagiarism has taken place – in this case the Board of Moderators will consider the case and if they endorse the Chair's judgement that a limited amount of low-level plagiarism has taken place will select one of two actions:

(i) Impose a penalty of 10% of the maximum mark available for the piece of work in question and a warning letter to be issued to the candidate explaining the offence and that the present incident will be taken into account should there be a further incidence of plagiarism.
For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism (https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism).

(ii) No penalty, but a warning letter to be issued to the candidate explaining the offence, indicating that on this occasion it has been treated as a formative learning experience, and that the present incident will be taken into account should there be a further incidence of plagiarism. For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism (https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism).

3.9 Penalties for non-attendance

Unless the Proctors have accepted a submission requesting absence from an examination, as detailed in Section 14 of the Regulations, failure to attend an examination will result in the failure of the assessment. The mark for any resit of the assessment will be capped at a pass.

4. PROGRESSION RULES AND CLASSIFICATION CONVENTIONS

4.1 Qualitative descriptors

Qualitative descriptors, based on those used across the Mathematical, Physical and Life Sciences Division, are given below:

70-100	The candidate shows excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and is able to use that knowledge innovatively and/or in unfamiliar contexts.
60-69	The candidate shows good or very good problem-solving skills, and good or very good knowledge of much of the material over a wide range of topics.
50-59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
40-49	The candidate shows reasonable understanding of at least part of the basic material and some problem solving skills. Although there may be a few good answers, the majority of answers will contain errors in calculations and/or show incomplete understanding of the topics.
30-39	The candidate shows some limited grasp of basic material over a restricted range of topics, but with large gaps in understanding. There need not be any good quality answers, but there will be indications of some competence.

0-29	The candidate shows inadequate grasp of the basic material. The work is likely to show major misunderstanding and confusion, and/or inaccurate calculations; the answers to most of the questions attempted are likely to be fragmentary

4.2 Final outcome rules (Distinction, Pass, Fail)

The pass/fail border is at 40%.

The Moderators may award a distinction to recognise especially strong overall performance. Normally (i) at their discretion, the moderators may specify a mark in the range 70% to 79% such that candidates with an overall mark greater than or equal to this specified mark are awarded a distinction and (ii) a distinction will be awarded to all candidates with an overall mark of 80% or greater.

4.3 Progression rules

To pass the examination and progress to Part I, candidates are required to satisfy the moderators in all five papers, either at a single examination or at two examinations in accordance with the re-sit arrangements detailed below.

Failure in one or two written papers may be compensated by better performance in other written papers provided the candidate obtains at least 35% on the failed paper. Failure of three papers precludes compensation. Where compensation is permitted, only those marks in excess of 40 on a passed paper may be used towards compensation and normally this shall be at a rate of 3 marks to every deficit mark to be compensated.

For example, if two written papers are passed and marks of 36% and 38% are obtained in the remaining two written papers then the total for the four written papers must be at least 172 marks {36 + 38 + 2x40 + $\underline{\mathbf{3}}\times(4+2)$} for both failures to be compensated

The Moderators have the authority to use their discretion and consider each case on its merit.

Failure of the coursework paper will normally constitute failure of the Preliminary Examination. Materials coursework cannot normally be retaken. Exceptionally a candidate who has failed the coursework may be permitted jointly by the Moderators and the candidate's college to retake the entire academic year.

4.4 Use of Vivas

There are no vivas in Prelims.

5. RESITS

Candidates who pass the coursework paper and fail one or two written papers will be asked to resit only those written papers.

Candidates who pass the coursework paper and fail more than two written papers will be asked to resit all four written papers.

The resits usually take place in September. To pass a resit paper the candidate must obtain at least 40%, and normally no compensation is allowed. There is only one opportunity to resit the examination, and failure to pass a resit examination normally results in the candidate being prohibited from progressing to Part I. Exceptionally, a college may allow a student to suspend studies for a year and take Prelims a second time the following June.

The Moderators have the authority to use their discretion and consider each case on its merit. In such cases they will take into account a candidate's profile across all elements of assessment together with, subject to guidance from the Proctors where appropriate, any other factors they deem to be relevant.

The mark for any resit required due to non-attendance will be capped at a pass.

6. MITIGATING CIRCUMSTANCES NOTICES TO EXAMINERS (MCE)

[For **late- or non-submission** of elements of coursework, including cases due to illness or other urgent cause, see section 3.6 of the present Conventions.]

A candidate's final outcome will first be considered using the classification rules/final outcome rules as described above in section 4. The exam board will then consider any further information they have on individual circumstances.

There are two applicable sections of the University's *Examination Regulations*.

• **Part 13 Mitigating Circumstances: Notices to Examiners** relates to unforeseen circumstances which may have an impact on a candidate's performance.
• **Part 12 Candidates with Special Examination Needs** relates to students with some form of disability.

Whether under Part 12 or Part 13, a mitigating circumstances notice to examiners should be submitted by the candidate through student self-service/eVision, or by the college on behalf of the candidate as soon as circumstances come to light. Candidates with alternative arrangements under Part 12 will not be considered under this mitigating circumstances process if they do not submit a separate mitigating circumstances notice.

Where a candidate or candidates have made a submission, under Part 12 or Part 13, that unforeseen factors may have had an impact on their performance in an examination, the moderators will meet to discuss the individual notice and band the seriousness of each notice on a scale of 1-3 with 1 indicating minor impact, 2 indicating moderate impact, and 3 indicating very serious impact.

Normally, this MCE meeting comprises two parts: Part A and Part B. Part A will take place before the meeting of the moderators at which the examination results are reviewed. When reaching these decisions on MCE impact level, the moderators will take into consideration, on the basis of the information provided to it, the severity and relevance of the circumstances, and the strength of the evidence. Moderators will also note whether all or a subset of written papers and/or elements of coursework were affected, being aware that it is possible for circumstances to have different levels of impact on different written papers and elements of coursework. The banding information is used at Part B of the MCE meeting: in Part B a candidate's results are discussed in the light of the impact of each MCE and recommendations formulated regarding any action(s) to be taken in respect of each MCE.

Further information on the procedure is provided in the *Examination and Assessment Framework, Annex E* and information for students is provided at https://www.ox.ac.uk/students/academic/exams/problems-completing-your-assessment. It is very important that a candidate's MCE submission is adequately evidenced and, where appropriate, verified by their college; the University forbids the Board of Moderators from seeking any additional information or evidence.

7. DETAILS OF EXAMINERS AND RULES ON COMMUNICATING WITH EXAMINERS

The Moderators in Trinity 2023 are: Prof Harish Bhaskaran, Prof. Chris Grovenor (Chair), Prof, Angus Kirkland and Dr Enzo Liotti. It must be stressed that to preserve the independence of the Moderators, candidates are not allowed to make contact directly about matters relating to the content or marking of papers. Any communication must be via your college, who will, if the matter is deemed of importance, contact the Proctors. The Proctors in turn communicate with the Chair of Prelims.

Candidates should not under any circumstances seek to make contact with individual Moderators.

ANNEX

Summary of maximum marks available to be awarded for different components of the MS Preliminary Examination in 2023:

Component	Mark
Materials Science 1: Physical Foundations of Materials	100
Materials Science 2: Structure and Mechanical Properties of Materials	100
Materials Science 3: Transforming Materials	100
Mathematics for Materials Science	100
Coursework Paper:	
Crystallography Classes	25
Practicals	50
Computing in Materials Science	25
Total	***500***

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS SCIENCE, PART I EXAMINATION

Part I

A. STATISTICS

(1) **Numbers and percentages in each category**

The Part I Examination in Materials Science is unclassified. No distinctions are awarded.

Category	Number			Percentage		
	2022/23	2021/22	2020/21	2022/23	2021/22	2020/21
Distinction	n/a	n/a	n/a	n/a	n/a	n/a
Pass	46	41	41	97.8	100	100
Fail	0	0	0	2.2	0	0

(2) **If vivas are used**

As stated in the Examination Conventions, vivas are not used in the Part I examination.

(3) **Marking of scripts**

All scripts were double-blind marked by the Examiners and Assessors. The full procedures are described in the Examination Conventions.

B. NEW EXAMINING METHODS AND PROCEDURES

Exam format:

The 2023 Exams were sat in closed book format in Examination Schools, as had been decided to be the preferred format by Faculty in MT 2022. For the first time, individual course lecturers were used as one of the two markers for the questions they had set in the GP papers, mirroring the long-standing process used in the OP papers. This was regarded as being successful, with the examinations committee welcoming the expertise of the course lecturers during the marks reconciliation process.

As per the 2022 exams, the University operated no exam paper corrections process during the 2023 exams whereby candidates could raise queries about potential errors within the first 30 minutes and receive feedback from an examiner; instead candidates were instructed to note any suspected error in their scripts so that examiners could assess and, if necessary, make adjustments when marking.

Examiners were aware of an error in a given equation for Q8 of GP4. Many candidates spotted the error, but where they did not the examiners were confident they could still mark the question in a fair way.

A minor error in the hint to students given in Q1 of OP1 was noted by some, but not all, students. The error involved a subscript which should have been a superscript. The examiners and assessor were aware of the error during marking and were confident that they had been able to mark the question in a fair way for all candidates.

A more significant event involved a corrupted version of OP1. Before the examinations were sat, the Chair of Examiners reviewed the printed versions of the papers in the Examinations School. This allowed for the discovery that OP1 was unusable because the PDF version had been corrupted in translation between the Sharepoint folder in which he had put the final approved versions and a separate Sharepoint folder (invisible to him) that is then seen by the Examinations School. The Examinations School were able to reprint the paper in good time before the date the paper was sat. Unfortunately, a student with special arrangements sitting the paper in a college setting was given one of the unusable versions. The student pointed this out to the invigilator soon after the start of the examination. On this discovery, the Chair understands that the Examinations School emailed all colleges hosting special arrangement students with the correct PDF. The Chair's understanding is that no additional time was given to students because of this, and the Chair was not directly made aware of this event (he only became aware because the academic registrar at one of the colleges involved mentioned it in passing at an unrelated meeting). A different student sitting the paper in a different college setting was given the correct paper at the start, and then had it replaced with a new paper which was then identical to the first one given. This confusion

resulted in distress for this student and the submission of a resulting MCE which ultimately required the mark for an entire paper to be disregarded.

My two specific recommendations resulting from these events are:

1. That the checking of printed copies of the papers becomes a routine part of the process. This year it took a few prompts from the Chair before access to the papers was arranged.

2. That the Sharepoint directory in which the Chair saves their approved PDF files is the one from which the Examinations School download the PDFs for printing. This avoids the risk of files changing during the translation/copying process.

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

As has occurred in previous years, the examiners felt very uncomfortable being asked to assess very personal medical information provided in MCE statements. Their concerns are: (i) That students should not be put in the position of disclosing very personal information in the knowledge that it will be seen by their lecturers especially as student names are not redacted. (ii) That academic staff do not have the professional expertise to evaluate the potential impact of many of the conditions reported. (iii) That it is clear that students and indeed colleges are not aware of the types of actions examiners can take in response to MCEs.

We understand a review of the MCE process is underway, which we feel is urgently needed.

The practice of using Latex to format the examination papers was welcome by the majority but not all of the examiners. Because of variations in experience with Latex compounded by some health issues during the paper setting process, the final formatting of papers and compilation of answer packs fell disproportionately across the examinations committee resulting in some unacceptably high burdens on some members. Faculty might consider whether, if use of Latex is now considered well established, whether training of a member of the support staff might be appropriate to support paper setting, as occurred when Word was used.

D. EXAMINATION CONVENTIONS

Examination Conventions were issued to all of the candidates, sent electronically along with other information in a letter from the Chair of Examiners. The Examination Conventions were agreed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There were 46 candidates for the examination, all of whom were awarded Honours with the exception of one candidate who failed to progress to Part II. The examination consisted of six written papers plus coursework that included a Team Design Project, a Business Plan, Industrial Visit reports and Practical work carried out during the 2nd year. Seven candidates opted to take a Supplementary Subject; three candidates opted to take the Foreign Language Option. These replaced the Business Plan. In addition, candidates completed further coursework in the 3rd year in the form of a compulsory Introduction to Materials Modelling course and either a module on Materials Characterisation (twenty candidates) or a module on Atomistic Modelling (twenty-one candidates).

Each written paper lasted three hours. For the General Papers, candidates were required to answer five questions out of eight, as in previous years. For the Options Papers, candidates were offered ten questions in five sections each containing two questions; candidates were required to answer four questions, one from each of three sections and one from any of the same three sections. Returning students were offered two additional questions in a separate section from a discontinued course.

Written papers were double-blind marked. Each question was marked by the course lecturer (if not an Examiner then appointed as an Assessor) and an Examiner. Raw marks were reconciled in the usual way.

Team Design Projects were marked by two Examiners. Teams were marked as groups. The allocation of bonus or penalty marks is permitted under the Conventions, and indeed one candidate was marked up by 2 marks.

The Business Plans, submitted in the second year, were marked by two Assessor, one of whom is an innovation project manager from MedSci Division, again with teams being marked as a group.

Candidates' work on the two coursework modules was marked by two Assessors. One of the Examiners reviewed the marks for a number of representative scripts from both modules to ensure consistency between them, but felt that no further moderation of marks was necessary.

Reports for each of the Industrial Visits were assessed by the Industrial Visits Organiser, appointed as an Assessor.

In the 2023 Part I exams the following scalings were applied to marks for the written papers following the procedures set out in section 3.4 of the Examination Conventions:

Following procedure (b), a scaling of +3 was applied to marks for GP4, OP1 and OP2.

No further scaling was applied following procedure (c).

As part of the consideration of Mitigating Circumstances (as per Annex E of the university Examinations and Assessment Framework) due to the pandemic, a further scaling of +3 marks was applied to all written papers on the basis that the 2023 Part I cohort had not had the benefit of sitting final school examinations prior to Oxford, their Prelims examinations has been open book sat in their rooms and much of their first year teaching had been remote. The Examiners deemed this to be a *disruption to teaching and learning*.

The raw overall mean mark for Part I was at 60.99; paper averages for all papers were below 60%. (GP1 59.48, GP2 58.85, GP3 58.96, GP4 55.17, OP1 55.50, OP2 56.42). The raw paper mean mark was 57.19%.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

The performance of the male and female candidates was as follows:
Written Papers Averages – M 62.05%, F 61.70% (Overall 61.95%) after scaling.
Coursework Averages – M 71.17 F 72.54 (Overall 72.07)
Overall Part I Averages – M 64.3%, F 64.4% (Overall 64.12)

Insofar as can be judged from the small sample size, the performance of male and female candidates on the written papers was not significantly different. This statement is based on the difference in the average mark between male and female candidates being 0.35% compared with the standard errors in the written paper averages, which was ±0.87% points for the male candidates and ±2.44% points for the female candidates. In coursework the female candidates again performed better, and the difference appears to be just about statistically significant – the difference in average marks was 1.37% compared with standard errors of 1.2% and 1.5% respectively. The better performance of female candidates than male candidates in coursework continues a trend noted in previous years Examiners' reports.

Students with SpLDs were given time extensions in the normal way.

	Overall mark		Written Examinations		Coursework	
mark (%)	Male	Female	Male	Female	Male	Female
30-40	-	-	1-	-	-	-
40–50	1		3	3		
50–60	11	4	12	3		
60–70	12	6	8	4	13	3
70–80	6	4	4	4	19	11
80–90	2		4			
90-100						
Totals	32	14	32	14	32	14

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same papers for the whole examination, in that there were no optional written papers.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Detailed comments on the written examination papers and overall candidates' performance on individual questions are attached.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

For coursework, two applications for consideration of Mitigating Circumstances: Notices to Examiners were received for the board in TT23. [redacted]

For the written examinations, eight applications for consideration of Mitigating Circumstances: Notices to Examiners were received. [redacted]

The Examiners considered each case carefully and a fair course of action was agreed. [redacted]

All processing of Part I MCE applications was documented in the MCE reports to be made available to Examiners for Part II.

[redacted]				

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. J.T. Czernuszka	Prof. S. Lozano-perez
Prof. M.R. Castell	Prof. P.D. Nellist (Chair)
Prof. N. Grobert	Prof. J.M. Smith
Prof. G. Williams (External)	Prof. P. Midgley (External)

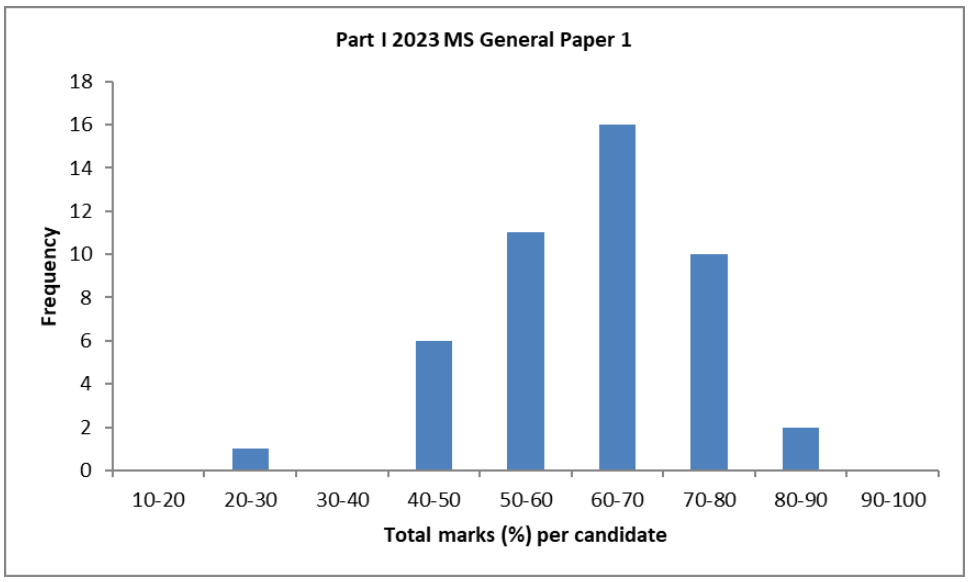
Professor Castell is to be thanked for stepping in at short notice when an initially appointed examiner was unable to continue due to ill-health.

GP1 – STRUCTURE AND TRANSFORMATIONS

Examiner: Prof. Sergio Lozano-Perez
Candidates: 46
Mean mark: 62.48
Maximum mark: 80
Minimum mark: 27

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	44	11.63	18.5	6	Selection & Production of Engineering Materials
2	38	10.92	19.5	4.5	Selection & Production of Engineering Materials
3	29	11.10	19.5	4	Materials- End of Life
4	41	13.21	20	2	Materials- End of Life
5	45	13.17	18.5	1.5	Materials- End of Life
6	0	0	0	0	Processing for Control of Materials Properties and Performance
7	7	7.86	13.5	5	Processing for Control of Materials Properties and Performance
8	26	10.94	17	4	Processing for Control of Materials Properties and Performance



General Comments

The GP1 paper had a slightly higher average mark when compared to last year (62.5 vs 61.6). This cohort experienced a limited impact of COVID in their first year, but the option of taking the lectures online resulted in a lower than average “in-person” lecture attendance in subsequent years. The consequences of this change in habits are still not clear, but might need some consideration when overall marks are compared between years. The style of the questions reflects the new policy agreed by faculty, where open-book style questions are encouraged. This resulted on questions where, even when a definition was expected in the answer, some sort of reasoning or links with other aspects of the subject were expected too. In general, there were not many “top marks” answers and most of the students seemed to lack that deeper understanding. There is a correlation between the popularity of the questions chosen and the marks achieved, with the three most popular choices providing the highest marks, indicating that the students were aware of their understanding of the questions.

Questions:

1) A very popular question, chosen by 96% of the students, with an average mark of 56%. Sections a) and b) provided most of the marks while very few were able to provide a coherent answer for c)

2) A relatively popular question, taken by 86% of the students, with an average mark of 55%. Most students seem relatively familiar with sections a) and b), although some lacked the understanding of what makes a production method costly. Section c) had more of a bimodal distribution where some students got most right while others got most wrong.

3) Question 3 was attempted by 63% of the students, obtaining an average mark of 55%. Section a) carried the bulk of the marks and require a description of recycling methods covered in the lectures. Few students were familiar with all methods and some got confused and described the wrong one. Section b) was answered well by the majority of students.

4) Question 4 was a popular choice, attempted by 89% of the students, with an average mark of 66% (highest). Section a) asked the students to produce a Pourbaix diagram of a metal they’ve never used before and most of them did it satisfactorily. Sections b) and c) required some discussion on how Ni performs in general in water and how it could be protected. There were some good answers in general. Section d) produced some interesting answers which, although not entirely correct, showed some understanding of the topic and were acknowledged by partial marks.

5) This was the most popular question of the paper, attempted by all students but one (98%), achieving an average mark of 66% (2nd highest). The question presented the students with a “real-life” scenario and required a description and explanation of the causes and potential solutions. Section a) was straight forward and answered correctly by the majority. Section b) required some calculations to determine the right choice. Most of the students realized this. Question c) required the actual calculations performed by corrosion engineers to protect the material system described in the questions. The majority of students got them right.

6) Question 6 was not attempted by any student. A discussion with the lecturer (question setter) couldn’t identify the reason for this, other than there might have been easier choices.

7) Question 7 was attempted by 15% of the students (lowest, ignoring Q6), with an average mark of 39% (lowest). Questions 6 and 7 were submitted by the same lecturer. Sections a) and b)was “text-book” style, however, they students only achieved 64% and 57%, respectively, of the marks. Section c) required some calculations which were not done correctly by most of the student, the average mark was 22%. Section d) required some discussion on a hypothetical diffusion situation, but the scores were also low. Section e) got the highest marks with an average of 57%.

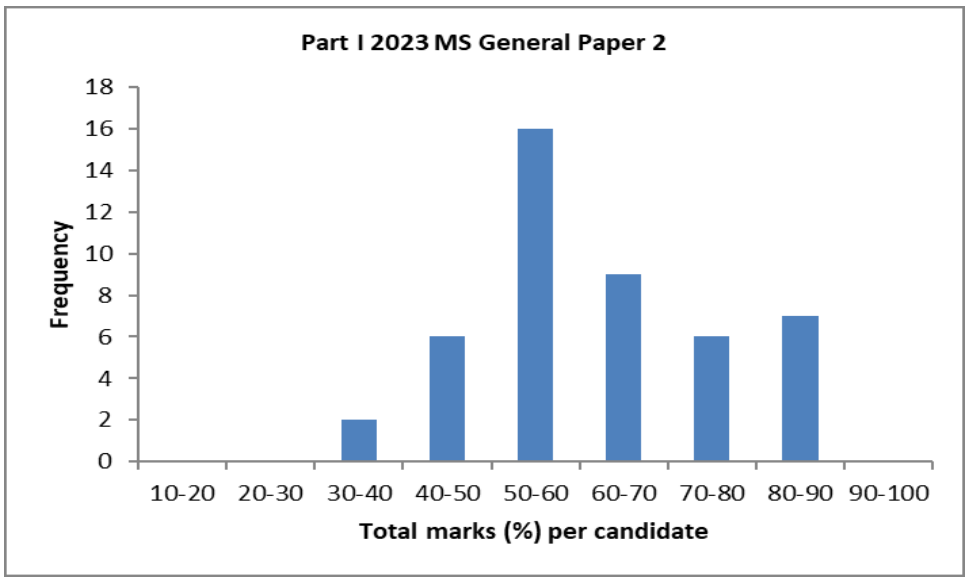
8) This question was not very popular, with only 57% of the students attempting it. The average mark was 55%. Section a) asked for descriptions of common criteria covered in the lectures and the answers were generally good. Section b) required some calculations to link the use of the data with the choice of plasticity criteria. Only a few students were able to answer correctly the 3 subsections, but most showed an acceptable understanding. Section c) asked how to construct a forming limiting diagram and how to link it to the observations presented in previous sections. Only a small fraction of the students was able to do it, although most had a basic knowledge of this type of diagrams.

GP2 – ELECTRONIC PROPERTIES OF MATERIALS

Examiner: Prof. Jason Smith
Candidates: 46
Mean mark: 61.85
Maximum mark: 89
Minimum mark: 32

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	35	10.53	18	1	Electronic Structure of Materials
2	27	11.20	17.5	3.5	Electronic Structure of Materials
3	37	10.70	18.5	5	Magnetic Properties of Mateierlas
4	28	13.11	19	5.5	Magnetic Properties of Mateierlas
5	12	14.96	17	11.5	Semiconductor Materials and Devices
6	35	11.03	18.5	3	Semiconductor Materials and Devices
7	33	13.48	18	7	Electrical & Optical Properties of Materials
8	23	10.85	18.5	2.5	Electrical & Optical Properties of Materials



General Comments

A good mix of answers with some candidates showing excellent breadth of knowledge and depth of understanding evidenced by problem-solving, and others showing some good knowledge in certain areas but less depth of understanding. A reasonably even spread of attempts across the eight questions with the exception of Question 5 which attracted only 12 attempts but returned the highest average score.

1) A popular question on the electronic structure of a nanowire using Bloch's theorem, but with a low average mark of 10.53. Many candidates struggled with the use of periodic boundary conditions to quantize k, and showing that N states fall within each band (parts a and b). In some cases this fed into errors in calculating the Fermi wavevector and Fermi energy. Very few candidates sketched the density of states in part d correctly which cost several marks. The effective mass question in part e was quite well done.

2) A moderately popular question on atomic structure with a focus on Na, attracting an average mark of 11.20. Part a on the radial wavefunction, spherical harmonics and Aufbau principle was quite well done, as was part b which required reading information off an energy level diagram provided. Part c on Fermi's Golden Rule was more challenging and many students were unable to construct the required integrals although a few did this part well and achieved high marks

3) A popular question on magnetism with a low average mark of 10.70. Part a on experimental determination of type of magnetism was generally done well, as was part bi on evaluating diamagnetic susceptibility of silicon, although several answers contained numerical errors which were not spotted. Part bii on doped silicon elicited mixed responses – very few understood the full picture of how the susceptibility would vary with temperature. Part c asked for an anisotropic susceptibility to be expressed as a tensor – some candidates did this well but other struggled. Part d on crystallisation in a magnetic field elicited a good number of sensible answers.

4) A moderately popular question on superconductivity with an average mark of 13.1. Part a tested understanding of the superconducting phase transition as it relates to the Gibbs energy and most students grasped this fairly well. Part b regarding the distribution of magnetic fields and currents in a thin plate was also done quite well with most diagrams correct. The first two parts of c elicited good attempts but the third part, the stretch question testing understanding of advanced concepts, did not attract high scores.

5) A question on pn junction solar cells attempted by only about a quarter of candidates but with the highest average mark of 14.96. Most answers showed good familiarity with the devices and a good level of understanding of the basic operation, including in many cases the effect of parasitic series resistance. Candidates also showed good ability to identify parameters related to recombination losses.

6) A popular question on semiconductors with an average mark of 11.03. Candidates were generally able to draw band diagrams for the different semiconductors showing how they vary with doping. Part c, requiring candidates to calculate intrinsic carrier concentrations, was less well done, although many students showed good qualitative understanding of the basic physics regarding excitation energies and temperature dependence.

7) A popular question on polar materials with an average score of 13.48. Answers were generally good, with marks lost for small misunderstandings or omissions in explanations. The last two parts of the question, concerning energy loss mechanisms and measurement methods, elicited only a few good answers allowing the strongest candidates to show their understanding.

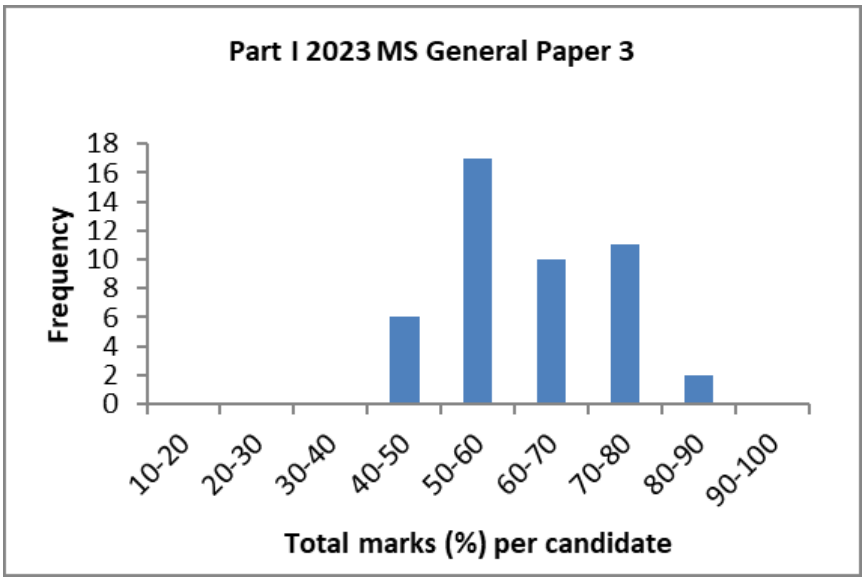
8) A question on optical fibres answered by about half the candidates, with an average score of 10.85. Some candidates answered the question well and there were some good answers to the calculation of coupling angles in part b although many candidates neglected to include the refraction of light entering the fibre. Part c on Brewster's angle was also done moderately well. overall candidates attempted only part of the question suggesting time constraints.

GP3 – MECHANICAL PROPERTIES OF MATERIALS

Examiner: Professor Peter Nellist
Candidates: 46
Mean mark: 61.96
Maximum mark: 81.5
Minimum mark: 39

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	32	10.39	16	3	Structural Failure of Materials
2	33	11.85	19.5	1	Structural Failure of Materials
3	34	11.63	20	4.5	Structural Failure of Materials
4	17	10.35	15	4.5	Structural Failure of Materials
5	38	12.96	19.5	1	Plastic Deformation of Materials
6	16	12.44	18.5	9	Plastic Deformation of Materials
7	18	10.58	18	4.5	Elastic Deformation of Materials
8	42	12.53	18	6	Elastic Deformation of Materials



General Comments

The paper was generally well-balanced with relatively small variations in mean marks and all had a reasonable number of attempts. Most questions saw some very poor answers with low marks, but many questions also saw high marks with excellent answers, and there is a slight bimodality in the marks distribution. The examiners felt the questions were fair and a good test of ability.

Questions:

1) A fatigue question regarding monitoring of cracks in an aircraft wing. Most students were able to discuss the differing use of K for fracture and fatigue in part (a). Part (b) was a fairly standard Paris law question. Part (c) was more challenging, and relatively few students noted improved NDI was going to give a much higher life than changing the alloy because although the alloy could change the fracture crack length, most of the fatigue life is at crack lengths close to the initial crack. For part (d), many students did note the environmental aspects of the question.

2) A generally well-answered question on fibre pull-out in composites. Some students were not fluent on the explanation required for part (a), but were more comfortable with the fairly standard derivations led through in parts (b) and (c). Many students could use the information in the figure to calculate a value for Gc, but they struggled a bit more with the explanation in part (e) which was more testing of understanding.

3) A generally well-answered question on fracture. The length and apparent complexity of the problem did not deter students. Many students were fluent in answering parts (a) and (b). Some students overcomplicated their answers to part (c), which was straightforward once it was realised which were the important parts of the equations given.

4) A less popular question on the topic of creep. The question was a little less well answered than some of the others which was a little surprising given that parts (a), (b) and (c) required on a basic knowledge of creep. Part (d) was more challenging, and few students noted that the Kachanov approach gives finite lifetime unlike the exponential model.

5) A popular and well-answered question on dislocation interactions. Most students were fluent in handling the Peach-Köhler formula and the coordinate system change. Part (d) challenged some students who missed the point about possible cross-slip.

6) A less popular but well-answered question about hardening mechanisms. Part (a) required little more than accurate data handling. Part (b) was more testing and required understanding of the hardening mechanisms, which was demonstrated by many students.

7) A less popular question on elasticity which the students found to be challenging. Students who knew the material were able to answer part (a) fluently and parts (b)(i) and (ii). Part (b)(iii) was a Mohr's circle which many students found more challenging.

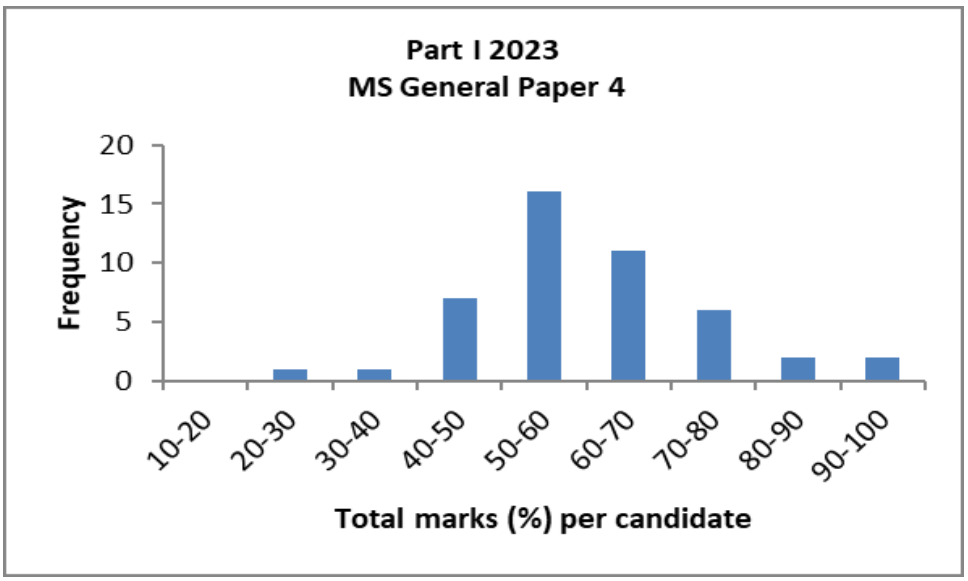
8) A very popular and well-answered question covering both the elastic properties of polymers and the role of free volume in polymers. Most students were comfortable with the rule of mixtures approach needed for the composite question, and again discussing free volume.

GP4 – ENGINEERING APPLICATIONS OF MATERIALS

Examiner: Prof. Jan Czernuszka
Candidates: 46
Mean mark: 61.17
Maximum mark: 91
Minimum mark: 24

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	26	10	17	3	Characterisation of Materials
2	28	9	17	1	Characterisation of Materials
3	29	13	19	3	Characterisation of Materials
4	24	12	20	7	Phase Transformations
5	34	12	19	4	Phase Transformations
6	23	9	16	3	Phase Transformations
7	37	13	19	10	SMTP
8	24	11	20	4	SMTP



General Comments

This is the second year that papers have been based on the new course structure. The mean mark was lower than last year's. Overall, there was a broad spread of marks, some truly exceptional including full (or almost full) marks.

Questions:

1) A question concerning aberrations in electron microscopes. There was a broad spread of results – a few of which showed a very good understanding of the subject.

2) A question relating to XRT and XCT. A few very good answers that worked out the correct systematic absences. Part (c) was less well answered in general.

3) A question regarding a broad range of microscopical and specimen preparation techniques that could be chosen to solve a particular problem. In this case, regarding the microstructure of Al-based microspheres. Part (d) was least well answered overall.

4) A question about diffusional processes. Marks were lost in (c) by not being able to explain the spinodal decomposition process sufficiently. Part(d) was the least well answered part.

5) A straightforward microstructural determination question. It was not obvious to this examiner how candidates could not get full marks.

6) A question on crystallisation kinetics, including the Avrami-Johnson-Mehl equation. It was difficult to spot which part of this question candidates found most troublesome – for those that did.

7) The most popular question. With the smallest spread of results. Candidates found part (d) the most difficult.

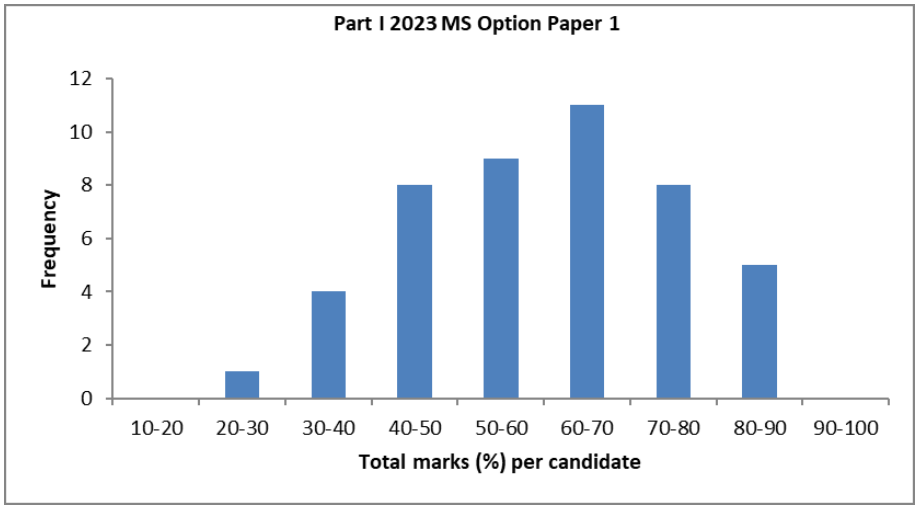
8) A straightforward question related to specific heat. Marks tended to be lost towards the latter part of the question.

Materials Options Paper 1

Examiner: Prof. Martin Castell
Candidates: 46
Mean mark: 61.50
Maximum mark: 86
Minimum mark: 30

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	24	12.60	22.5	4	Engineering ceramics: synthesis and properties.
2	24	14.13	22	8	Engineering ceramics: synthesis and properties.
3	18	11.69	19.5	3.5	Prediction of materials properties.
4	25	13.10	24	4	Prediction of materials properties.
5	17	14.94	23	7.5	Magnetic and superconducting materials.
6	3	14.83	16.5	12.5	Magnetic and superconducting materials.
7	10	13.35	18	6	Materials and devices for optics and optoelectronics.
8	5	6.50	12.50	3	Materials and devices for optics and optoelectronics.
9	25	15.30	22	3.5	Microstructural control in engineering alloys.
10	27	16.06	22.5	9.5	Microstructural control in engineering alloys.
11	3	18.5	6.5	6.06	Advanced manufacture with metals and alloys.
12	3	14.00	18.5	11	Advanced manufacture with metals and alloys.



General Comments

There was a change of examined courses compared with the TT22 OP1 exam. The OP1 course taught in 21/22 was entitled “Advanced manufacture with metals and alloys” whereas the course taught in 22/23 was “Microstructural control in engineering alloys”. There were three returning students who had taken the 21/22 course, so two questions related to this course were included in the paper with a note stating “-for those candidates who took this course in academic year 2021-22”. Prior to scaling the mean of the paper was 55.5% and this was adjusted to 61.5% following scaling. The distribution of marks was broad, reflecting a significant spread of ability in answering the questions.

Questions:

1) This question concerned the manufacture and mechanical testing of an alumina disc. It was a popular question and answered by 24 students. The first three parts (a-c) of the question related to manufacture were generally answered well. Many of the students had difficulty with part (ii) of the mechanical testing part (d) involving the construction of an SPT diagram, and they subsequently were also not able to answer part (iii) which relied on the successful answer to part (ii).

2) This question was on the microstructure and mechanical properties of zirconia-toughened alumina. The students had to interpret two micrographs, explain toughening mechanisms in these ceramics, and carry out a calculation related to a thermal quench. The question was popular and answered by 24 students. Most students answered the descriptive elements well, but some could not accurately remember the relevant formula for the thermal quench and hence lost marks in parts (e) and (f).

3) This question was on the modelling of a Cl2 molecule. The question started with a relatively simple element in (a), and then progressed to quite a complicated mathematical derivation in (b). If the students were unable to successfully complete (b) then they were likely to have difficulty in the subsequent sections. Parts (c) and (d) were book work, but some students had difficulty in calculating frequency in (d) meaning that they could not then sensibly compare it with the experimental value. Part (f) was relatively straightforward, although many students did not manage to calculate the results. Part (g) required some speculative reasoning on the modelling of an Ar2 molecule, and this was only completely addressed by a few students. The question was popular and answered by 18 students.

4) This question concerned the foundations of density functional theory. The students were asked to derive expressions of varying mathematical complexity related to Kohn-Sham and Thomas-Fermi theories. The solutions for (a) and (b) were relatively straightforward, but a deeper mathematical understanding was required for (c) and (d) and some students found these sections challenging. Part (e) was mainly descriptive. The question was popular and answered by 25 students.

5) This question was on the processing and superconducting properties of Nb3Sn alloys. The students had to describe the advantages of using this alloy, compare two micrographs of differently processed superconducting wires, interpret some graphs to determine whether it is better to use high chemical potential Sn sources, and finally to discuss two wire processing methods. The question was of average popularity and answered by 17 students. The students tended to get higher marks for the earlier subsections of the question compared with the later subsections as one would expect for a well-structured question.

6) This question was divided into three sections: (a) the electronic energy levels of electrons in a Co2+ ion and how they are influenced by a magnetic field, (b) a spin valve involving magnetic nanoparticles, and (c) a calculation related to spin operators. The question was unpopular with only 3 students answering it. Sections (a) and (c) were generally answered well, with some difficulty shown in the answers to section (b).

7) This question was on the spectral power density of a black body a(i)-a(iii), and on solar cells a(iv)-b. The question was not particularly popular with 10 students answering it. In part (a) most students did well apart from the high scoring sections (ii) and (iii) which involved some mathematical manipulations. In particular, the numerical approach to the derivate of the spectral power density equation was not answered correctly by a single student. In part (b) the answers were of variable quality.

8) This question was on the use of dielectric thin films for anti-reflection coatings and mirrors (a-c) and the properties of an optical cavity of a solid state laser (d). The question was not popular and only answered by 5 students. The question was not intrinsically or mathematically difficult, but good revision of the lecture notes would have been necessary. All the answers to this question were poor.

9) This question was on the corrosion resistance of stainless steel and titanium alloys (a-c) and martensitic transformations (d,e). It was a popular question, answered by 25 students. Most answers were good on the stainless steel parts, but it was clear that generally less was known related to the titanium alloy questions.

10) This question was on the use of light metal alloys in automobiles. Part (a) was a straightforward question on the justification of the desirability of light alloys. Part (b) asked the students to discuss aluminium, magnesium, and titanium alloys in the context of automobiles. Most students were able to answer this question well. Where they often lost marks was in the general discussion of the alloy, as opposed to the specific relevance to automobiles. This was the most popular question, with 27 answers.

11) This question was for returning students who had taken the related course in the academic year 21/22. Three students answered the question, which was on (a) hypereutectic alloys, (b) dendrite fragmentation, and casting (c,d). The question was not of graded difficulty, so whether an answer was good or not depended on which subject areas the student was most familiar with.

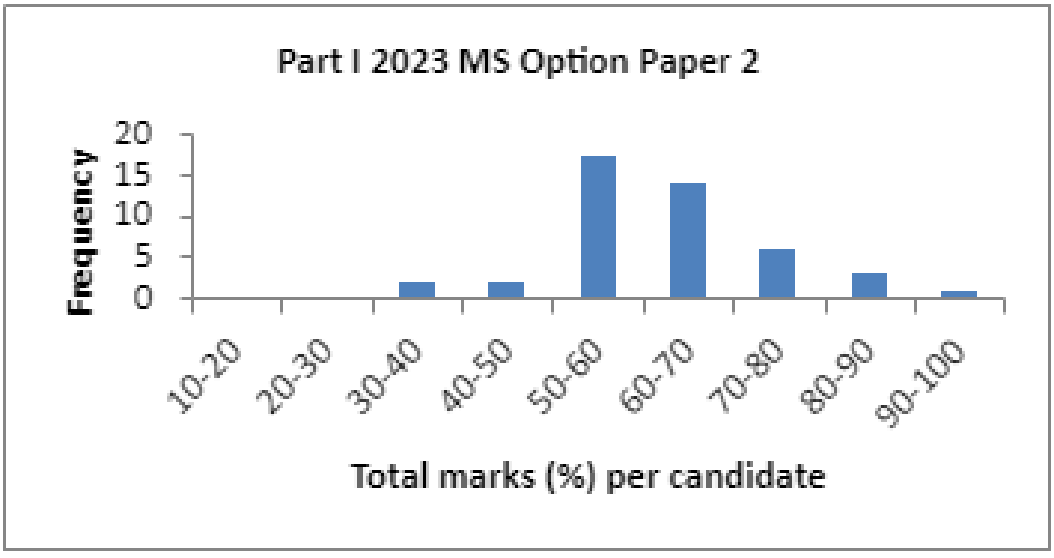
12) This question was for returning students who had taken the related course in the academic year 21/22. The question was divided into five parts, each one of which was related to a different technique for joining materials together. Each part was of equal difficulty, and the students scored well if they knew the answer or poorly if they mainly guessed.

Materials Options Paper 2

Examiner: **Prof Nicole Grobert / Prof Peter Nellist**
Candidates: **44**
Mean mark: **62.42**
Maximum mark: **96**
Minimum mark: **37**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	8	7.25	15	3	Materials for Nuclear Systems
2	24	15.19	22	7	Materials for Nuclear Systems
3	19	11.82	24.5	2	Advanced Polymers
4	27	10.15	21	2	Advanced Polymers
5	30	16.73	21	9.5	Biomaterials and Natural Materials
6	10	12.35	17	9	Biomaterials and Natural materials
7	28	17.45	24	4	Enabling Nanotechnology
8	22	14.57	24	8	Enabling Nanotechnology
9	10	15.50	21.5	9	Quantum Materials
10	2	9.00	13	5	Quantum Materials
11	0	0	0	0	Devices
12	0	0	0	0	Devices



General Comments

The performance on the paper was satisfactory. Whilst there was a reasonable spread of take up of questions 2-9, questions 1 and 10 were less popular, and 11 and 12 were not selected by any of the candidates. This year, the Biomaterials, Advanced Polymer, and the Enabling Nanotechnology question were the most popular. The spread in performance was fairly consistent normal distribution, with a steep increase in the 50-60 range. The handwriting across the board was very poor and often illegible with an exception of very few candidates whose handwriting was exceptionally clear.

Questions:

1) Question 1 on Materials for Nuclear Systems was selected by 18 % of the students. The first half of the question (part a and b) was generally answered at a superficial level compared to the detail discussed in the course. In particular, most did not explain why the light carbon atom is an effective neutron moderator, nor did they explain the effect (or benefit) of moderation on the probability of fissile reactions in the fuel. Few identified the important physical and mechanical properties and most did not connect these to both the crystal structure and microstructure (porosity, texture). Part c, half of the question was answered well by some, but quite a few confused the effects of irradiation on metals with those in graphite. The specifics of this were discussed in the course and part d, was not answered correctly by any of the students albeit the content was discussed in lectures, too.

2) Question 2 on Materials for Nuclear Systems was chosen by 55 % of the students. Several students did not answer Part a and defined a variable that was not asked for whilst many did not provide any unit for energies, several unusual guesses were provided from weaker candidates. For the second half of part a, most Candidates could provide statements yet only the strongest candidates could bring them together which was required to answer the question. In part b, the g b = 0 invisibility criterion for loop invisibility was known by most. Weaker candidates guessed at the type of loops in bcc. Stronger could work it out or knew. Several candidates produced some excellent sketches showing strong understanding of the course. Weaker candidates missed the difference between ion and neutron irradiation or the effect higher temps would have on loop size.

3) Question Q3 on Advanced Polymers was a straight forward question. Students who carefully followed the should have been able to answer all questions by reading the lecture notes and tutorial questions, as well as attending or watching the lectures. Most students understood the questions and answered them based on their level of preparation for the exam. However, less than 10% of students were well-prepared for the exam and could answer almost all the questions, while less than 10% did not understand the questions and gave unrelated answers. Only Q3-b was based on solving a problem. Most students knew the equations but struggled with solving the problems and obtaining final answers. However, students in this section showed higher than average performance (above 60%). The average mark of 11.82 for Q3 was the highest of the four parts the cohort performed the weakest on average.

4) Question Q4a was aimed at the fundamental understanding of the course. Students should have been able to answer these questions by understanding the topic and physical behaviour of polymers. The students performed at an average level for this type of question. The second type of question was based on the students' general knowledge of the course, and they should have been able to answer them based on their level of knowledge and exam preparation. However, students performed less than average for this type of question. Overall, their performance was lower than was expected on given the level of questions asked.

5) Question 5 on Biomaterials and Natural Materials was the most popular question of OP2 with 30 students making an attempt. The average mark was 67%. Although the students showed generally good knowledge of the topic, some further reasoning was expected as many parts of the question were text-book style inviting the students to apply this knowledge.

6) Question 6 on Biomaterials and Natural Materials was taken up by only 10 students who scored an average mar*k of 49%.* The question addressed a range of topics including phospholipids and hydrogels. The first half of Q6 (a, b) the students scored reasonably well whereas part cc) and d) they found more difficult. The scores in part d) which required some more thinking beyond book knowledge were particularly low.

7) Question 7 on Enabling Nanotechnology The total average mark for Q3 (19 students) was 51%, and for Q4 (27 students) was 43%. Overall, their performance was lower than average. As previously mentioned, the exam questions were not difficult. It was expected that their performance would be better. There were two questions based on the subject matter covered in the Enabling Nanotechnology course. Q7 was based primarily on general understanding of microelectronic device technology and their application, whereas Q 8 tested specific concepts and their manufacturing. There were 28 attempts on Q7. Overall the best students were able to score the full 25, while the weaker students struggled on the harder sections, particularly related to the one on Wien Displacement Law. However most students showed a reasonably god understanding of the material and the average student was able to get a reasonable score suggesting that the question level was correct

8) Question 8 on Enabling Nanotechnology was taken up by 22 students. Most students struggled on the more conceptual fabrication process flow question, as expected, but also a larger number struggled on the Dennard Scaling question than was expected as the latter was set for the average student. Good students were able to score very high on this question, suggesting that the level of the question was just about right.

9) Question 9 on Quantum Materials was taken up 10 candidates who scored an average of 58%. Almost all candidates scored at least one mark in each of the section. With a few exceptions in b) where some zero marks were also present.

10) Question 10 on Quantum Materials was the least popular question of this paper with only two attempts made. The average score was 36%, *i.e.*, the second lowest of the paper after Q1.

11) Question 11 on Devices was not selected by any candidate. (This question was included for the returning students)

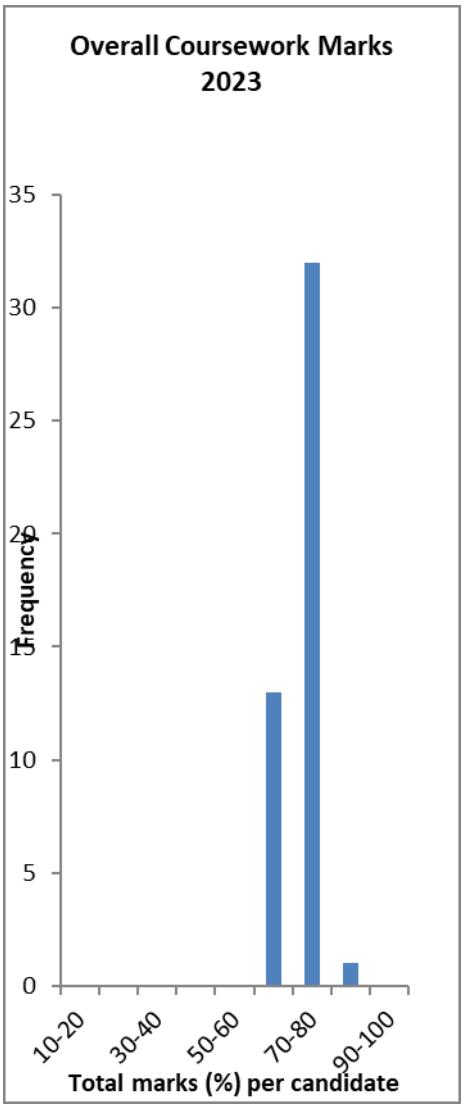
12) Question 12 on Devices was not selected by any candidate. (This question was included for the returning students)

COURSEWORK

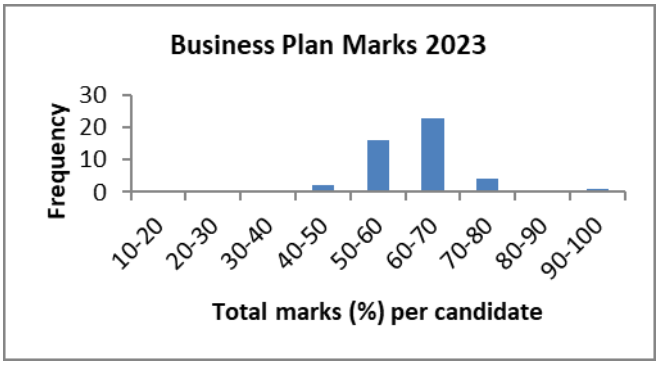
A maximum of 200 marks are available for Part I coursework which comprises:

- Y2 Entrepreneurship Module: Business Plan – 20 marks
- Y2 Industrial Visit and Talks Reports – 10 marks
- Y2 Practical Lab Reports – 60 marks
- Y3 Introduction to Modelling in Materials – 30 marks
- Y3 Option Modules: Advanced Characterisation/Atomistic Modelling– 30 marks
- Y3 Team Design Projects – 50 marks

Overall coursework marks were good, and in the range expected for what is generally continuously assessed work.

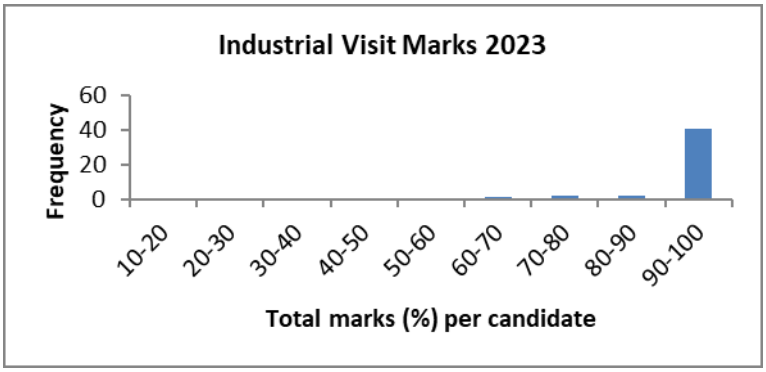


The **Business Plan** marks (average 66.17%) were in a relatively narrow range.

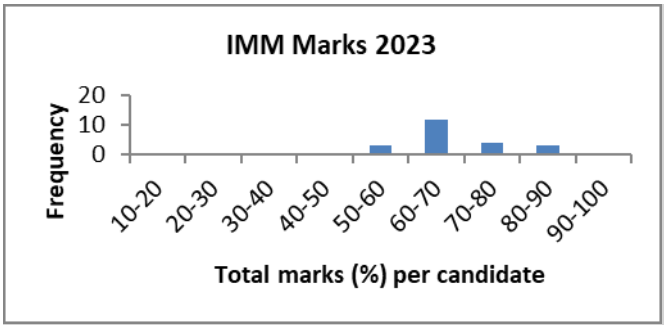


[Report from assessor pending]

The **Industrial Visits** mark (average 96.38%) are near-perfect, as full marks can be obtained by producing a good report; the small number of reports that are only satisfactory or late are strongly penalised.



Marks for the compulsory **Introduction to Modelling in Materials** module (average 65.71%) ranged throughout the lower 2nd to 1st class boundaries.



Report on the Introduction to Modelling for Materials Science module

Introduction to Materials Modelling

This was the third year of teaching the course in its current format - but the first time we have been able to run in person. Due to the size of the cohort we gave lectures to the whole group in the morning, and then ran two practical session back to back in the afternoons. We made available the walkthrough videos from last year, as these were a useful resource after the taught element had ended.

There were no issues with any of the software packages or computer systems this year. All students completed the practical sessions in the first week.

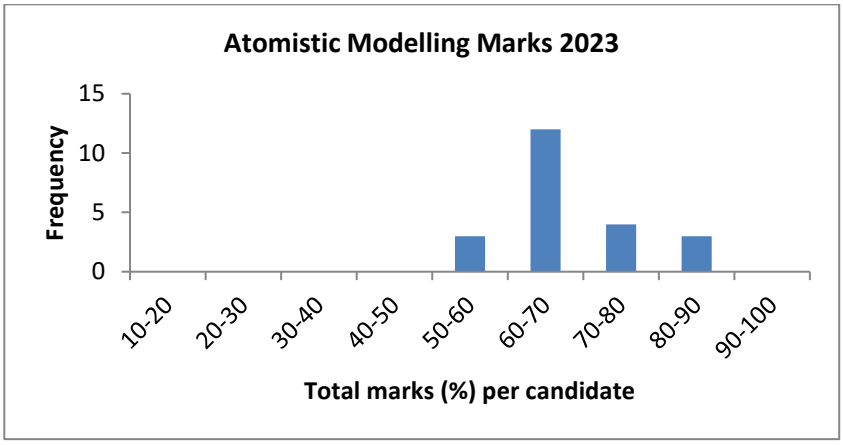
We felt there were more weaker project reports this year. A number of students appeared to not engage fully with the projects. There was some evidence that those students waited until quite late to start the projects. Many students would have benefited from asking for advice from the demonstrators. As is usual we provided support over email in the first instance - very few students took advantage of this. However, as usual, there were some very strong reports.

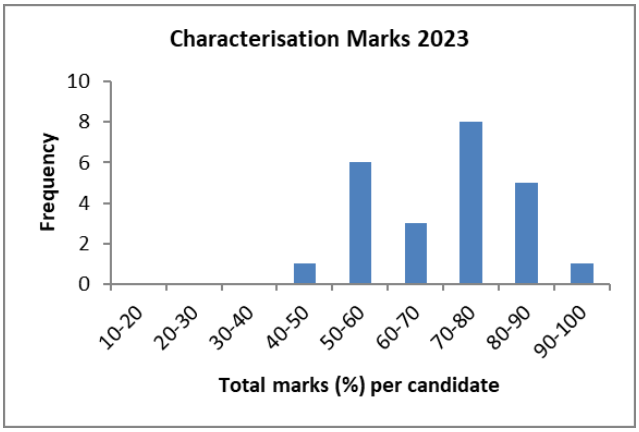
The finite element project was, again, the least popular project. This is currently run using Matlab, whilst other projects run in Jupyter notebooks. We have found a finite element package with a python interface, and so will rewrite this project in python for next year. We think that the unified platform will encourage a more even take up of projects.

—

Prof. Jonathan Yates
Professor of Materials Modelling, Dept of Materials, University of Oxford
Dean / Tutor for Materials Science, St Edmund Hall, Oxford.

The option modules, **Atomistic Modelling** (average 68.38%) and **Advanced Characterisation** (average 70.45%), exhibit a full range from lower 2nd class to good 1st class marks. The work done was reviewed independently by the Examiners.





Report on Atomistic Modelling Option Module

The Atomistic Modelling module followed the same format as the previous year, being run in-person in the teaching room in the MML. 22 students + 1 visitor took the course. The first week consisted of morning and afternoon sessions, starting with a 30-40 minute lecture followed by a hands-on practical session. In the second week, students were assigned pseudo-randomly (balanced across colleges) one out of three possible projects The teaching room remained available as a work space in this time. Support was given via email.

Each student was given a user account on one of three multi-core Linux servers based in the Department. The students were instructed how to install and use freely available software (e.g. MobaXterm) to access these servers from the various operating systems installed on their own personal computers. The modelling calculations were performed using CASTEP, with additional postprocessing and analysis performed using the OptaDOS and SUMO packages. All of these packages were pre-installed on the servers and the students instructed how to run software serially and in parallel. There were no significant technical issues.

This year the course was delivered in weeks 1 and 2 of Hilary with an anomalously large gap between this and the submission deadline of week 6, due to exam regulation requirements. To maintain parity with previous years, the students were given a time-limited period to complete their calculations (up to Tuesday week 3). Two students requested and were granted short extensions to this deadline due to illness.

As in the previous year, the written reports were of a good standard overall. There were some cases where students had apparently run out of time to complete a full set of calculations and/or to seek support to resolve a technical problem, demonstrating the importance of engaging with the projects early in the second week and taking advantage of the support channels available.

Dr C.E. Patrick
2022-23

Report on the Characterisation of Materials Option Module

This module is intended as a hands-on learning experience for students to further their theoretical understanding of materials characterisation techniques and to develop skills in its practical implementation in the laboratory across a range of instruments. It is also intended to develop skills and experience in independent and unguided research leading into their Part II year.

At this point the module organisers must thank the Teaching Laboratory Manager Diana Passmore for her invaluable contributions organising the course and facilitating the increased numbers of students in the laboratory. Organisers would also like to acknowledge Dr Megan Carter for her significant input to the planning of the course and leadership in the day-to-day running of the module. Finally the organisers also thank the team of dedicated Junior Demonstrators who facilitated the training and supported access to the microscopes. Dr Megan Carter, Martin Meier, Laura Wheatley, Victoria Strutt and Bradley Young,

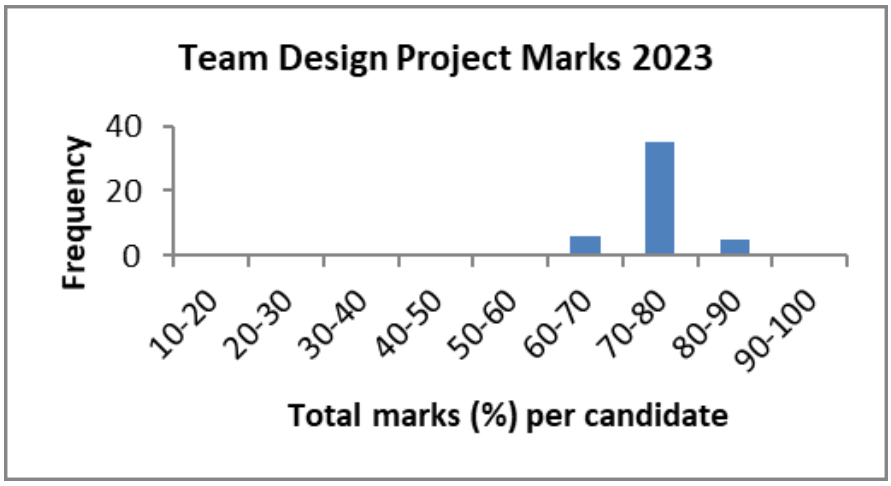
went above and beyond to guide, support and solve problems for the students throughout the duration of their time in the lab.
Based largely on previous observations from the Junior Demonstrators, and the increased size of the cohort in the past two years, the most significant difference in the teaching of the module this year was the replacement of the guided practicals. Instead of these sessions, where groups of students were introduced to the instruments in the laboratory setting, the students were given lectures focussing on the more practical aspects of specimen preparation, experiment and data analysis software, with particular emphasis on SEM and XRD. The aim was to ensure that students were as prepared as possible for their experiments, and made the most of their limited access, when arriving for a scheduled session on one of the instruments, supported by the Junior Demonstrators.

In the laboratory students had access to optical microscopy, SEM, EDX, XRD, micro indentation and an optical emission spectrometer. Given the time constraints, informal feedback indicated that for the most parts students had sufficient access to instruments to complete their reports. Junior Demonstrators reported that in comparison to students from the previous year, whose laboratory training had been more severely interrupted by COVID, this year's students were more confident in this hands-on setting and more adventurous in some of the experiments that they undertook.

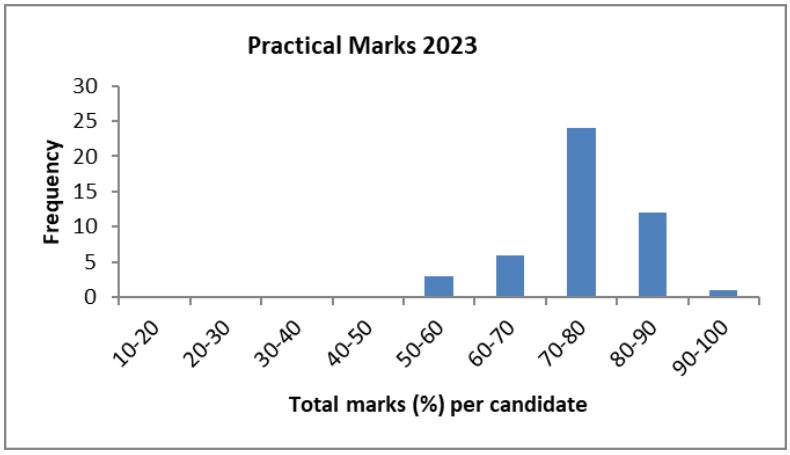
The average grade for the marked reports was approximately 71, which in line with previous years. However, there were specific aspects of the reports that assessors felt could be improved. One of the most significant concerns was an inability to identify a compelling narrative motivating their research. Many of the reports either did not present a novel and cohesive motivation for why the results and the interpretation of their results was interesting from a materials science perspective, or adopted an overly simplistic theme, for example, simply confirming some well-known phenomenon previously presented in lecture notes or a text book. This issue was most notable in the *Introduction Section and Summary and Conclusions* section*s,* respectively. The assessors also note some basic issues around clarity, for example, providing enough description in the *Results Section* in the main text such that the reader can immediately understand what is the nature of the image being presented, or drawing attention to any specific aspect of the result that will be further interpreted in the *Discussion Section*. There was also often limited imagination shown in the Future Work Section, with many students simply stating what they would do with the same techniques if they had a longer time to undertake their experiments, rather than discussing the new information that might be gleaned from other complementary and/or more advanced microscopy techniques that they were introduced to in the lectures (and also in the 2nd year characterisation course).).

Prof M.P. Moody
Trinity 2023

The **Team Design Project** marks (average 73.78%) show a moderate narrow range, close to the upper second/first class level, which is reasonable given the sustained effort in a group task.



The marks for **Practical Classes** (average 75.47%) have been reviewed by the Practical Class Organiser, who concluded that, although the range of marks for an individual practical varied from practical to practical, all students have been treated equally.



Report from the Practical Courses Organiser
Materials Science 2nd year Practical Labs in 2021/22
2st year Practicals 2021-22

I have reviewed the marks from the 2nd year Practicals from 2021-22. This year, after Covid19 restrictions were lifted, all practicals were in the labs. Those students self-isolating were offered an online version of the practical as a pre-recorded video accompanied by the datasets acquired for the students to work on. This resulted in a very low number of students missing practicals.

There is quite a wide range of overall average marks, assuming the standard penalties are applied, ranging from 45 to 92% (the previous year they ranged from 51 to 90%), with an average and median of 74% (compared to 77% last year). These general results are in line with past years records, having recovered substantially from the worst Covid-affected year, when it was 66%. The range of marks for an individual practicals vary from practical to practical. They were all within 20% of each other. The average lab notebook marks was 1.7, close to our objective of 2, but lower than last year (2.4), while the average on the reports was 10 (out of 13), same as last year.

Gender: I have assessed the marks for gender imbalance by looking to see who has received the highest and lowest marks for each practical. They are similar within 5%.

Late penalties

[redacted]

Plagiarism: No cases of plagiarism were reported by the senior demonstrators.

Practical Class Organiser– Sergio Lozano-Perez
June 2023

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS SCIENCE, PART II EXAMINATION

Part I

A. STATISTICS

(1) **Numbers and percentages in each category**

Candidates are given a mark on the basis of their performance in the Part II examination and then given a classification on the basis of their performance across Part I and Part II.

Class	Number					Percentage (%)				
	22/23	21/22	20/21	19/20	18/19	22/23	21/22	20/21	19/20	18/19
I	13	15	19	19	9	32.5	36.6	65.5	57.6	31%
II.I	23	22*	9	12	16	57.5	53.7	31.0	36.4	55%
II.II	4	4	1	2	3	10	9.8	3.4	6.0	10%
III	-	-	-	-	1	-	0	0	0	3%
Pass	-	-	-	-	-	-	0	0	0	-
Fail	-	-	-	-	-	-	0	0	0	-
Total	40	41*	29	33	29	-	-	-	-	-

* 1 candidate completed with a BA (hons)

The examiners note that a significantly higher proportion of Class 1 degrees were awarded in 2019/20 and 2020/21 than in 2018/19, and that in 2021/22 the distribution returned closer to pre-pandemic levels of around one-third of students achieving a Class 1. That trend continues into 2022/23, albeit with a slightly smaller fraction of Class 1 degrees.

(2) **The use of vivas**
The mark for the Part II is for the thesis alone. All candidates were given a viva solely to clarify points of detail and to ensure that the thesis presented had been prepared by the candidate being examined. The discussion in vivas was led by the Internal Examiners or Assessor who had read the thesis fully, and one of the External Examiners also had the opportunity to ask questions.

(3) **Marking of theses**
All theses were double blind marked by two Internal Examiners or an Internal Examiner and Assessor, and were inspected by one External Examiner. Due to the modest number of candidates, which makes it easy to identify who is working on a particular research topic, anonymous marking is not possible. Provisional marks were exchanged in advance of the viva, to allow a brief discussion of differences of assessment, which if necessary could be explored further during the viva. Following the viva, a final agreed mark was decided between the Examiners/Assessor who were present. The two internal Examiners/Assessors who read the thesis provided the greatest input to the decision-making process.

B. NEW EXAMINING METHODS AND PROCEDURES

New methodology had been implemented in 2020 to implement changes that the Department had resolved to introduce prior to the Covid pandemic, and those that were in response to the pandemic. All of these procedures were used again this year EXCEPT the use of a “safety net”. The same report form template was completed by each session Chair as was implemented last year.

All vivas were carried out with Examiners, Assessors and Candidates present in person, with the exception of one examiner who attended online for their vivas. The raw marks for the thesis were reconciled by the Examiners to generate a final mark immediately after the viva.

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

None.

D. EXAMINATION CONVENTIONS

The current year's Conventions were put on the Departmental website and sent electronically to all candidates. The Examination Conventions were assessed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

Of the 40 candidates whose results were ratified by the examiners all were awarded Honours. The examination required the candidates to submit a thesis (maximum 12,000 words) on a research project carried out by candidates during the year, usually in the Department of Materials. Candidates were given a 30 minute viva, during which they were asked detailed questions on their thesis and research work.

The theses were mostly of a high quality, and the candidates were able to explain their work well in the vivas. The marks for the Part II examination ranged from 56% to 90% with an overall mean mark just below the 2:1/1st class boundary. The External Examiners played an important role in the discussions that led to the decisions on the final marks for the candidates and the Chair would like to express his thanks to both of them for their hard work in inspecting the substantial number of Part II theses and contributing to the vivas.

Eight assessors were appointed in addition to the six examiners. This increase compared to last year was due to the increased number of theses (40). Most examiners marked 8 theses, but two marked 9 and the Chair marked 10. Given the reduced Part I marking load, these numbers were felt to be manageable.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

The mean mark for theses written by female Part II candidates was 69.95% while the mean mark for theses written by male candidates was 66.95%. The standard error in these figures was 1.94% and 1.66% respectively.

There were no applications for consideration for specific learning difficulties made for the Part II component of the exam process this year (although a Form 2D alerting the examiners to an SpLD of some sort was included where appropriate).

	Overall mark		Part II Project		Part I Mark	
mark (%)	Male	Female	Male	Female	Male	Female
30-40	-	-	-	-	-	-
40–50	-	-	-	-	-	-
50–60	4	3	3	-	3	3
60–70	12	9	11	12	12	8
70–80	4	5	6	3	5	7
80–90	1	2	-	4	1	1
90-100	-	-	1	-	-	-
Totals	21	19	21	19	21	19

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same examination, producing a thesis and attending a viva. The statistics on the final marks for both Part I (2022) and Part II for these candidates are given above.

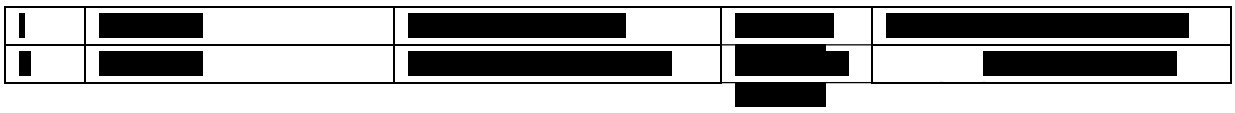
D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Comments on the overall candidates' performance in the Part II coursework are attached.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

Mitigating Circumstance: Notices to Examiners.

Two applications for consideration of Mitigating Circumstances: Notices to Examiners were submitted. The examiners considered the cases carefully and a fair course of action was agreed. This was documented in MCE reports. No classifications were changed on the basis of Part II MCEs. There were also 18 MCEs referred to this year's Part II board by last year's Part I board. As a result of these MCEs, one candidate had their classification increased from 2.2 to 2.1.



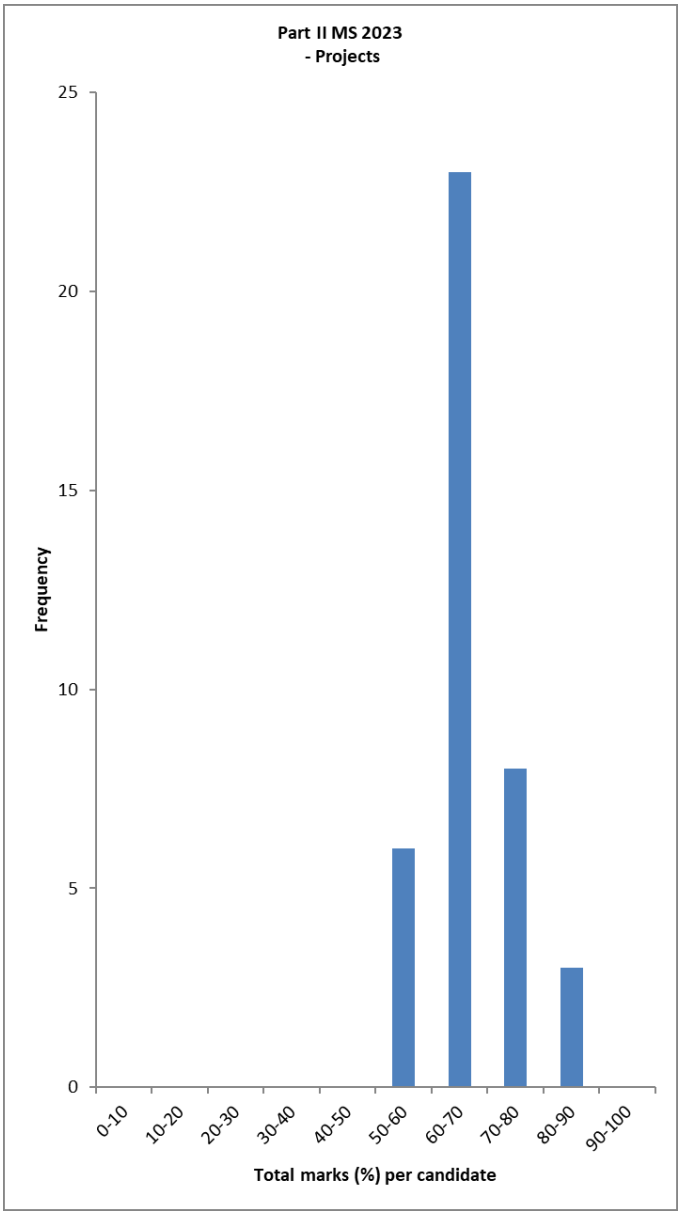
F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. J.T. Czernuszka	Prof. T.J. Marrow
Prof. N. Grobert	Prof. P.D. Nellist (Chair)
Prof. S. Lozano-perez	Prof. J.M. Smith
Prof. G. Williams (External)	Prof. P. Midgley (External)

Professor Marrow is to be thanked for stepping in at short notice when an initially appointed examiner was unable to continue due to ill-health.

Report on Part II Projects

Candidates: **40**
Mean mark: **68.38%**
Maximum mark: **90%**
Minimum mark: **56%**



General Comments

When considering these comments, see also the Chair's narrative "B. NEW EXAMINING METHODS AND PROCEDURES".

As in previous years, the majority of the Part II theses were of a very high standard and the students defended their work very effectively in the vivas.

This year students were able to carry out their Part 2 projects in the normal way.

Examination Conventions 2022/23
Materials Science - Final Honours School

1. INTRODUCTION

Examination conventions are the formal record of the specific assessment standards for the course or courses to which they apply. They set out how examined work will be marked and how the resulting marks will be used to arrive at a final result, a progression decision and/or classification of an award.

These conventions apply to the Final Honours School in Materials Science for the academic year 2022-23. The Department of Materials' Academic (Undergraduate) Committee (DMAC) is responsible for approving the Conventions and considers these annually, in consultation with the examiners. The formal procedures determining the conduct of examinations are established and enforced by the University Proctors. These Conventions are a guide to the examiners and candidates but the regulations set out in the Examination Regulations have precedence. Normally the relevant Regulations and MS FHS Handbook are the editions published in the year in which the candidate embarked on the FHS programme. The Examination Regulations may be found at: https://examregs.admin.ox.ac.uk/.

The paragraphs below indicate the conventions to which the examiners usually adhere, subject to the guidance of the appointed external examiners, and other bodies such as the Academic Committee in the Department, the Mathematical, Physical and Life Sciences Division, the Education Committee of the University and the Proctors who may offer advice or make recommendations to examiners.

The examiners are nominated by the Nominating Committee[1] of the Department and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. Formally, examiners act on behalf of the University and in this role are independent of the Department, the colleges and of those who teach the MS M.Eng. programme. However, for written papers on Materials Science in Part I examiners are expected to consult with course lecturers in the process of setting questions.

2. RUBRICS AND STRUCTURE FOR INDIVIDUAL PAPERS

All papers are set by the examiners in consultation with course lecturers. The responsibility for the setting of each examination is assigned to an examiner, and a second examiner is assigned as a checker.

The examiners, in consultation with lecturers, produce suggested exemplar answer and marking schemes for every question set, including a clear allocation of marks for each part or sub-part of every question. These are annotated to indicate what is considered 'book-work', what is considered to be 'new material' requiring candidates to extend ideas from what has been covered explicitly in the course, and what is considered to be somewhere in between. This enables the examiners to identify how much of the question is accessible to less strong candidates and the extent to which the question has the potential to differentiate among the very best candidates. The marking scheme for each question aims to ensure that weaker candidates can gain marks by answering some parts of the question, and stronger candidates can show the depth of their understanding in answering other parts. The wording and content of all examination questions set, and the suggested exemplar answer and marking schemes, are scrutinised by all examiners, including the external examiners. The marking schemes are approved by the examining board alongside the papers.

Examiners check that questions are of a consistent difficulty within each paper and between papers.

Examiners proofread the final 'camera-ready' pdf version of each examination paper. Great care is taken to minimise the occurrence of errors or ambiguities. Despite this care, on occasion an error does remain in a paper presented to candidates: if a candidate thinks there is an error or mistake in the paper, then they must state what they believe the error to be and if necessary, state their understanding of the question.

All General Papers comprise eight questions from which candidates attempt five. Each question is worth 20 marks. The maximum number of marks available on each general paper is 100. There is no strict rule about how many questions are set on each lecture course in the General Papers. As a result, (i) it should not be assumed that a question will be set on every lecture course and (ii) some questions may require knowledge from across the core courses from Years 1 and 2.

[1] for the 2022-23 examinations the Nominating Committee comprised Prof Assender, Prof Marrow & Prof. Speller.

Materials Option papers comprise one section for each twelve-hour Options lecture course, each section containing two questions worth 25 marks: candidates are required to answer one question from each of any three sections and a fourth question drawn from any one of the same three sections. The maximum number of marks available on each option paper is 100, and all questions carry equal marks. Questions are often divided into parts, with the marks for each part indicated on the question paper.

The only types of calculators that may be used in examinations are from the following series:

CASIO fx-83
CASIO fx-85
SHARP EL-531

Candidates are required to clear any user-entered data or programmes from memories immediately before the exam begins. The invigilators may inspect any calculator during the course of an exam.

3. MARKING CONVENTIONS

3.1 University scale for standardised expression of agreed final marks

Agreed final marks for individual papers will be expressed using the following scale: 0-100.

3.2 Qualitative criteria for different types of assessment

Qualitative descriptors, based on those used across the Mathematical, Physical and Life Sciences Division, are detailed below:

70-100	The candidate shows excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and is able to use that knowledge innovatively and/or in unfamiliar contexts. The higher the mark in this band the greater will be the extent to which these criteria will be fulfilled; for marks in the 90-100 range there will be no more than a very small fraction, circa 5-10%, of the piece of work being examined that does not fully meet all of the criteria that are applicable to the type of work under consideration. The 'piece of work' might be, for example, an individual practical report, a question on a written paper, or a whole written paper.
60-69	The candidate shows good or very good problem-solving skills, and good or very good knowledge of much of the material over a wide range of topics.
50-59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
40-49	The candidate shows reasonable understanding of at least part of the basic material and some problem solving skills. Although there may be a few good answers, the majority of answers will contain errors in calculations and/or show incomplete understanding of the topics.
30-39	The candidate shows some limited grasp of basic material over a restricted range of topics, but with large gaps in understanding. There need not be any good quality answers, but there will be indications of some competence.
0-29	The candidate shows inadequate grasp of the basic material. The work is likely to show major misunderstanding and confusion, and/or inaccurate calculations; the answers to most of the questions attempted are likely to be fragmentary.

3.3 Verification and reconciliation of marks

Part I Written Papers

During the marking process the scripts of all written papers remain anonymous to the markers. The markers are guided by the suggested exemplar answer and marking schemes.

All papers are marked by course lecturers acting as assessors and an examiner. All scripts are double marked, blind, by the markers each awarding an integer mark for each question. After individual marking the two markers meet to agree marks question by question. If the differences in marks are small (~10% of the maximum available for the question, 2-3 marks for most questions), the two marks are averaged, with no rounding applied.

Otherwise the markers identify the discrepancy and read the answer again, either in whole or in part, to reconcile the differences. If after this process the markers still cannot agree, they seek the help of the Chair, or another examiner as appropriate, to adjudicate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this.

In the event that a possible error in the paper has been identified, the examiners will consider the validity of the error and assess the impact of the error on candidates' choice of questions and on the answers written by those who attempted a question that contained an error, and will take this impact into account when marking the paper and prior to agreeing a final mark for all candidates.

The external examiners provide an independent check on the whole process of setting and marking.

Part I Coursework

In some of the descriptions of marking for individual elements of *coursework* the term 'double marked, blind,' is used; this refers to the fact that the second marker does not see the marks awarded by the first marker until they have recorded their own assessment, and does not indicate that the candidate is anonymous to the markers.

(1) *Second Year Practicals*

Second year practicals are assessed continually by senior demonstrators in the teaching laboratory and in total are allocated a maximum of 60 marks. Part I examiners have the authority to set a practical examination.

(2) *Industrial Visits and Talks*

Reports on Industrial Visits and Industrial Talks are assessed by the Industrial Visits Academic Organiser on a satisfactory / non-satisfactory basis, and in total are allocated a maximum of 10 marks. Guidance on the requirements for the reports is provided at the annual 'Introduction to Industrial Visits' talk. Formative feedback is provided on the first of the Industrial Visit reports.

(3) *Entrepreneurship*

The business plan for the Entrepreneurship module is double marked, blind, by two assessors appointed by the Faculty of Materials. The written business plan is allocated a maximum of 20 marks. Guidance on the requirements for the written business plan and an outline marking scheme are published in the FHS Course Handbook. Further guidance is provided throughout the course, the slides from which are published on Canvas.

If the Foreign Language Option or a Supplementary Subject has been offered instead of the Business Plan, the reported % mark, which is arrived at in accordance with the CVCP degree class boundary descriptors, is divided by five to give a mark out of 20.

(4) *Team Design Project*

The team design project is double marked, blind, by two of the Part I Examiners. They then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each project and each team member. Supervisors of the projects submit a written report to the examiners on the work carried out by their teams and these are taken into consideration when the examiners decide the final agreed marks. Industrial representatives may be asked to contribute to the assessment process. The project is allocated a maximum of 50 marks, of which 25 are for the written report and 25 for the oral presentation. The same two examiners assess both the reports and the presentations. Guidance on the requirements for the report and an outline marking scheme are provided in the 'Team Design Projects Briefing Note' published on Canvas.

(5) *Introduction to Modelling in Materials*

The reports for this module are double marked, blind, by the module assessors. Normally, at least one of the two assessors for each report will be a module organiser. The assessors then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each report. The lead organiser for the Introduction to Modelling in Materials Module submits to the Assessors and Examiners of the module a short report which provides (i) a summary of the availability of the software & hardware required for each mini-project and (ii) any other pertinent information. The reports for the Introduction to Modelling in Materials module are allocated a maximum of 30 marks (each of two reports allocated a maximum of 15 marks). Guidance on the requirements for the reports and an outline marking scheme are published on Canvas.

(6) *Advanced Characterisation of Materials and Atomistic Modelling Modules*

The reports for these modules are double marked, blind, by the module assessors. Normally, at least one of the two assessors for each report will be a module organiser. The assessors then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each report. One of the Examiners oversees this process, sampling reports to ensure consistency between the different pairs of assessors and the two modules. The lead organiser for the Characterisation Module submits to the Assessors and Examiners of the module a short report which provides, by sample set only, (i) a summary of the availability of appropriate characterization instruments and/or data during the two-week module and (ii) any other pertinent information. An analogous report is provided by the lead organiser for the Atomistic Modelling Module in respect of the software & hardware required for the project. The report for the Characterisation Module is allocated a maximum of 30 marks and the report for the Atomistic Modelling Module is also allocated a maximum of 30 marks. For each module, guidance on the requirements for the reports and an outline marking scheme are published on Canvas.

Part II Coursework

The Part II project is assessed by means of a thesis which is submitted online to the Examiners, who will also take into account a written report from the candidate's supervisor. The marking criteria are published in the Part II Course Handbook.

The Supervisor's report is divided into Parts A & B: Part A provides simple factual information that is of significance to the examiners, such as availability of equipment, and is seen by the two markers before they read and assess the thesis. Part A does **not** include personal mitigating circumstances which, subject to guidance from the Proctors, normally are considered only in discussion with **all** Part II examiners thus ensuring equitable treatment of all candidates with mitigating circumstances. Part B of the supervisor's report provides their opinion of the candidate's engagement with the project and covers matters such as initiative and independence; it is not seen by the examiners until the discussion held after the viva.

The project is allocated a maximum of 400 marks, which is one third of the maximum available marks for Parts I and II combined. Two Part II examiners read the thesis (including the final chapter with the reflective accounts of project management, health, safety & risk assessment processes, and ethical and sustainability considerations), together with Part A of the supervisor's report, and each of them independently allocates a provisional mark based on the guidelines***** published in the course handbook. In addition, normally the thesis will be seen by one of the two external examiners.

A *viva voce* examination is held: the purpose of the viva is to clarify any points the readers believe should be explored, and to ascertain the extent to which the work reported is the candidate's. Any examiners who have supervised the candidate's Part II project or are their college tutor will not be present at the viva or the subsequent discussion. Normally four individuals will have specified examining roles: Two examiners, or one examiner and an assessor, who have read the thesis entirely; the external examiner to whom the thesis was assigned; and an examiner acting as the session Chair who will complete any necessary documentation for that viva. Other examiners beyond these four individuals will be present to the extent possible given the existence of parallel sessions. A discussion involving all examiners present is held after the viva, during which Part B of the supervisor's report is taken into account. The outcome of the discussion is an agreed mark for the project. In arriving at the agreed mark the Examiners will take into account all of the following, (i) the comments and provisional marks of the original markers, (ii) the candidate's understanding of their work as demonstrated during the viva and (iii) the opinion of the external examiner who has seen the thesis.

If the two provisional marks allocated in advance of the viva differ significantly (that is, normally by more than 10% of the maximum available for a Part II project) this will be addressed explicitly during the discussion after the viva. In the majority of other cases the viva has only a small influence on the agreed mark awarded to a Part II thesis.

*****These guidelines may change and candidates are notified of any such changes before the end of Hilary Term of their 4th year.

3.4 Scaling

Part I Written Papers

As the total number of candidates is small, it is not unusual for mean marks to vary from paper to paper, or year to year. It is not therefore normal practice to adjust marks to fit any particular distribution. However, where marks for papers are unusually high or low, the examiners may, having reviewed the difficulty of the paper set or other circumstances, decide with the agreement of the external examiners to adjust all marks for those papers.

Such adjustment is referred to as 'scaling' and the normal procedure will be as follows:

a. Papers with a *mean taken over all candidates* of less than 55% or more than 75% are normally adjusted to bring the *mean* respectively up to 55% or down to 75%. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the paper.

b. For papers with a mean in the ranges either of 55-60% or 70-75%, including those scaled under (a) above, the questions and typical answers are compared in order to ascertain, with the help of the external examiners, whether the marks are a fair reflection of the performance of the candidates as measured against the class descriptors. If not, the marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the question or for the paper.

c. The mean mark and the distribution of marks, both taken over all written papers, are considered, again with the help of the external examiners, in order to ascertain whether these overall marks are a fair reflection of the performance of the candidates as measured against the class descriptors. If not, the overall marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's overall score.

Part I Coursework

Adjustment to marks, known as scaling, normally is not necessary for coursework.

The Practical Courses Organiser reviews the marks for the practicals before they are considered by the examiners, drawing to their attention (i) any anomalously low or high average marks for particular practicals and (ii) any factors that impacted on the practical course, such as breakdown of a critical piece of equipment. The examiners review the practical marks.

Part II Coursework

Adjustment to marks, known as scaling, normally is not necessary for the Part II theses**.**

3.5 Short-weight convention and departure from rubric

Part I Written Papers

The rubric on each paper indicates a prescribed number of answers required (e.g. "candidates are required to submit answers to no more than five questions"). Candidates will be asked to indicate on their cover sheet which questions, up to the prescribed number, they are submitting for marking. If this information is not provided then the examiners will mark the questions in numerical order by question number. If the candidate lists more than the prescribed number of questions then questions will be marked in the order listed until the prescribed number has been reached. The examiners will NOT mark questions in excess of the prescribed number. If fewer questions than the prescribed number are attempted, (i) each missing attempt will be assigned a mark of zero, (ii) for those questions that are attempted **no** marks beyond the maximum per question indicated under section 2 above will be awarded and (iii) the mark for the paper will still be calculated out of 100. In addition, for the Materials Options Papers, as per the rubric, the examiners will mark questions from only three sections. Should a candidate attempt questions from more than three sections the examiners will mark those questions from the first three sections in the order listed by the candidate on the covering page. If this information is not provided then the examiners will mark the sections in alphabetical order by section delineator (section A, section B, etc.).

Part I Coursework

It is a requirement for candidates to submit an element of coursework for each of the following: Practical Classes; Industrial Visits and Talks; Entrepreneurship Coursework (or substitution); Team Design Project;

Introduction to Modelling in Materials, Advanced Characterisation of Materials or Atomistic Modelling. For the Practical Classes and Industrial Visits & Talks, the element of coursework comprises a set of reports: reports submitted on four Industrial Visits and two Industrial Talks and reports submitted on ten Practical Classes as specified in the Course Handbook. In these cases, a candidate must submit a report for each visit and talk/practical in order to satisfy the examiners. Failure to complete satisfactorily one or more elements of Materials Coursework normally will constitute failure of Part I of the Second Public Examination. Further details about this are provided in the Course Handbook.

3.6 Late- or non-submission of elements of coursework

Including action to be taken if submission has been or will be affected by illness or other urgent cause, and circumstances in which academic penalties may be applied.

The Examination Regulations prescribe specific dates and times for submission of the required elements of coursework to the Examiners (1. One piece of Entrepreneurship Coursework; 2. A set of reports of practical work as specified in the Course Handbook (normally each individual report within the set has been marked already as the laboratory course progresses - penalties for late submission of an individual practical report are prescribed in the Course Handbook and are applied prior to any additional penalties incurred under the provision of the present Conventions.); 3. A Team Design Project Report and associated oral presentation; 4. A set of reports on Industrial Visits and Talks as specified in the course handbook; 5. A report on the work carried out in the Introduction to Modelling in Materials module; 6. A report on the work carried out in either the Characterisation of Materials module or the Atomistic Modelling module; and 7. A Part II Thesis). Rules governing late submission of these seven elements of coursework and any consequent penalties are set out in the 'Late submission and non-submission of a thesis or other written exercise' clause of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations (Part 14, 'Late Submission, Non-submission, Non-appearance and Withdrawal from Examinations' in the 2022/23 Regulations). A candidate who fails to submit an element of coursework by a prescribed date and time will be notified of this by means of an email sent on behalf of the Chair of Examiners.

Under the provisions permitted by the regulation, late submission of an element of coursework, as defined above, for Materials Science examinations will normally result in one of the following:

(a) Under paras 14.3 to 14.6. In a case where illness or other urgent cause has prevented or will prevent a candidate from submitting an element of coursework at the prescribed date, time and place the candidate may, **through their college**, request the Proctors to accept an application to this effect. In such circumstances the candidate is **strongly** advised to (i) carefully read paras 14.3 to 14.6 of the aforesaid Part 14, where the mandatory contents of such an application to the Proctors are outlined and the several possible actions open to the Proctors are set out, and (ii) both seek the guidance of their college Senior Tutor and inform at least one of their college Materials Tutorial Fellows. Some, but not all, of the actions open to the Proctors may result in the work being assessed as though it had been submitted on time (and hence with no late submission penalty applied).

(b) Under para 14.7. In the case of submission on or after the prescribed date for the submission and within 14 calendar days of notification of non-submission and without prior permission from the Proctors: subject to leave from the Proctors to impose an academic penalty, for the first day or part of the first day that the work is late a penalty of a reduction in the mark for the coursework in question of up to 10% of the maximum mark available for the piece of work and for each subsequent day or part of a day that the work is late a further penalty of up to 5% of the maximum mark available for the piece of work; the exact penalty to be set by the Examiners with due consideration given to the circumstances as advised by the Proctors. The reduction may not take the mark below 40%.

(c) Under Para 14.3(5). In the case of failure to submit within 14 calendar days of the notification of non-submission and without prior permission from the Proctors: a mark of zero shall be recorded for the element of coursework and normally the candidate will have failed Part I or II as appropriate of the Examination as a whole.

If a candidate is unable to submit by the required date and time for any reason other than for acute illness their college may make an application to the Proctors for permission for late submission. An extended deadline may be approved, or late submission excused where there are grounds of 'illness or other urgent cause'. Applications may be made in advance of a deadline, or up to 14 days from when the candidate is notified that they have not submitted. In all cases, the applications will be considered on the basis of the evidence provided to support the additional time sought.

It should be noted that the maximum extension that the examiners can normally accommodate for a Part II thesis to be examined in the 2022/23 session is 7days. Any extension awarded for longer may mean the assessment will either be considered by an extraordinary examination board or the scheduled examination board in the next academic year.

Elements of coursework comprising more than one individual piece of assessed coursework

Penalties for late submission of individual practical reports are set out in the 2021/22 MS FHS Handbook and are **separate** to the provisions described above.

The consequences of failure to submit individual practical reports or failure to submit/deliver other individual pieces of assessed coursework that contribute to one of the *elements* of coursework scheduled in the Special Regulations for the Honour School of Materials Science are set out in the MS FHS Handbook (sections 7 and 10.7 of the 2021/22 version) and are **separate** to the provisions described above. In short normally this will be deemed to be a failure to complete satisfactorily the relevant element of Materials Coursework and will therefore constitute failure of Part I of the Second Public Examination.

Where an individual practical report or other individual piece of assessed coursework that contributes to one of the *elements* of coursework scheduled in the Special Regulations for the Honour School of Materials Science is not submitted or is proffered so late that it would be impractical to accept it for assessment the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chair of the Examiners, permit the candidate to remain in the examination. In this case *for the individual piece of coursework in question* (i) the Examiners will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires submission/delivery of every individual piece of assessed coursework if the candidate is not to fail the examination as a whole.

3.7 Penalties for over-length work and departure from approved titles or subject-matter

For elements of coursework with a defined word limit: if a candidate exceeds this word limit without permission normally the examiners will apply a penalty of 10% of the maximum mark available for the piece of work. [It is only possible to apply for permission to exceed a word limit if the Examination Regulations for the specific element of coursework concerned state explicitly that such an application is permitted, excepting that the Proctors may, exceptionally, under their general authority grant such permission.]

3.8 Penalties for poor academic practice

Substantial guidance is available to candidates on what constitutes plagiarism and how to avoid committing plagiarism (see Appendix B of the 21/22 FHS Course Handbook and https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism?wssl=1)

If plagiarism is suspected, the evidence will be considered by the Chair of the Examiners (or a deputy). They will make one of three decisions (https://academic.admin.ox.ac.uk/examiners):

(d) No evidence, or insufficient evidence, of plagiarism – no case to answer.

(e) Evidence suggestive of more than a limited amount of low-level plagiarism – referred to the Proctors for investigation and possible disciplinary action.

(f) Evidence proving beyond reasonable doubt that a limited amount of low-level plagiarism has taken place – in this case the Board of Examiners will consider the case and if they endorse the Chair's judgement that a limited amount of low-level plagiarism has taken place will select one of two actions:

(iii) Impose a penalty of 10% of the maximum mark available for the piece of work in question and a warning letter to be issued to the candidate explaining the offence and that the present incident will be taken into account should there be a further incidence of plagiarism. For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism

(https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism?wssl=1).

(iv) No penalty, but a warning letter to be issued to the candidate explaining the offence, indicating that on this occasion it has been treated as a formative learning experience, and that the present incident will be taken into account should there be a further incidence of plagiarism. For a student who remains on course in addition there will be a requirement to demonstrate to their college Materials Tutorial Fellow that in the period between the present offence and the next submission of work for summative assessment they have followed to completion the University's on-line course on plagiarism (https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism?wssl=1).

3.9 Penalties for non-attendance

Unless the Proctors have accepted a submission requesting absence from an examination, as detailed in Section 14 of the Regulations, failure to attend a written examination in Part I or the *viva voce* examination in Part II will result in the failure of the whole Part.

4. PROGRESSION RULES AND CLASSIFICATION CONVENTIONS

4.1 Qualitative descriptors of classes (FHS)

The following boundaries (CVCP) and descriptors (MPLSD) are used as guidelines:

Class I Honours 70 – 100	The candidate shows excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and is able to use that knowledge innovatively and/or in unfamiliar contexts.
Class II(i) Honours 60 – 69	The candidate shows good or very good problem-solving skills, and good or very good knowledge of much of the material over a wide range of topics.
Class II(ii) Honours 50 – 59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
Class III Honours 40 - 49	The candidate shows reasonable understanding of at least part of the basic material and some problem solving skills. Although there may be a few good answers, the majority of answers will contain errors in calculations and/or show incomplete understanding of the topics.
Pass 30 - 39	The candidate shows some limited grasp of basic material over a restricted range of topics, but with large gaps in understanding. There need not be any good quality answers, but there will be indications of some competence.
Fail 0 - 29	The candidate shows inadequate grasp of the basic material. The work is likely to show major misunderstanding and confusion, and/or inaccurate calculations; the answers to most of the questions attempted are likely to be fragmentary only.

In reaching their decisions the examiners are not permitted to refer to a candidate's outcome in, or profile across the assessments in, the First Public Examination ('Prelims').

In borderline cases the examiners use their discretion and consider the quality of the work the candidate has presented for examination over the whole profile of FHS assessments; thus for Part I outcomes the Part I assessments, and for overall degree outcomes the assessments for both Parts I and II. The external examiners often play a key role in such cases.

4.2 Classification rules (FHS)

Part I:

The examiners are required to classify each candidate according to their overall average mark in Part I as (a) worthy of Honours, (b) Pass or (c) Fail. The examiners do not divide the categories further but tutors and students may infer how well they have done from their marks.

Unclassified Honours –A candidate is allowed to proceed to Part II only if they have been adjudged worthy of honours by the examiners in Part I and normally obtained a minimum mark of 50% averaged over all elements of assessment for the Part I Examination.

Candidates adjudged worthy of honours and obtaining a minimum mark of 50% averaged over all elements of assessment for the Part I Examination normally proceed to Part II but they may, if they wish and subject to approval from the relevant bodies, leave after Part I in which case an Unclassified Honours B.A. degree will be awarded.

Candidates adjudged worthy of honours who do not obtain a minimum mark of 50% averaged over all elements of assessment for the Part I Examination may, if they wish and subject to approval from the relevant bodies, leave after Part I in which case an Unclassified Honours B.A. degree will be awarded or may retake Part I the following year (subject to college approval).

Pass – The examiners consider that the candidate is not worthy of honours and therefore will not be allowed to proceed to Part II. The candidate may leave with a B.A. (without honours) or may retake Part I the following year (subject to college approval).

Fail – The examiners consider that the candidate is not worthy of a B.A. The candidate either leaves without a degree or may retake Part I the following year (subject to college approval).

Part II:

Classified Honours – Once marking is completed for both Parts I and II an overall percentage mark is computed for each candidate and classification then takes place. Subject to the requirement that Part II be adjudged worthy of honours (see below), classification is based solely on the overall percentage mark; the candidate's profile of marks from each element of assessment is only taken into account in borderline cases. However, a candidate cannot be awarded an M.Eng. degree unless their performance in Part II is adjudged worthy of honours i.e. a candidate must be adjudged worthy of honours both in Part I and in Part II to be awarded the M.Eng. degree. Failure to achieve honours in Part II will result in the candidate leaving with an unclassified B.A. (Hons) irrespective of the aggregate mark.

Pass – Notwithstanding the award of unclassified honours in Part I, the examiners consider that the candidate's overall performance is not worthy of an M.Eng. The candidate is listed as a Pass on the class list and is awarded an unclassified B.A. (Hons) on the basis of Part I performance.

Fail – The examiners consider that the candidate's overall performance is not worthy of an M.Eng. and that the performance in Part II is not worthy of a Pass. The candidate is excluded from the class list but is nevertheless awarded an unclassified B.A. (Hons) on the basis of Part I performance.

- The examiners cannot award unclassified honours on the basis of Part II performance unless permitted to do so by the Proctors.
- Nevertheless, candidates awarded a Pass or a Fail by the Part II examiners leave with an unclassified B.A. (Hons) because they were judged worthy of that in Part I (i.e. their degree is the same as if they had left immediately after Part I).
- In terms of the degree awarded, there is no difference between a Pass and a Fail in Part II. The only difference is whether or not the name appears on the class list.
- Candidates cannot normally retake Part II because the Examination Regulations require that they must pass Part II within one year of passing Part I. This rule can be waived only in exceptional circumstances, with permission from the Education Committee.

4.3 Progression rules

The attention of candidates for Part I of the Examination is drawn to key phrases in clauses 8 and 11 of Section A and clause 3 under Part I of Section B of the Special Regulations for the Honour School of Materials Science:

Section A. 8. No candidate for the degree of Master of Engineering in Materials Science may present themselves for examination in Part II unless they have (a) been adjudged worthy of Honours by the Examiners in Part I and (b) normally obtained a minimum mark of 50% averaged over all elements of assessment for the Part I Examination.

Section A. 11. To achieve Honours at Part I normally a candidate must fulfil all of the requirements under (a), (b) & (c) of this clause. (a) Obtain a minimum mark of 40% averaged over all elements of assessment for the Part I Examination, (b) obtain a minimum mark of 40% in each of at least four of the six written papers sat in Trinity Term of the year of Part I of the Second Public Examination, and (c) satisfy the coursework requirements set out in Section B, Part I [of the Regulations].

Section B. Part I. 3. In the assessment of the Materials coursework, the Examiners shall take into consideration the requirement for a candidate to complete satisfactorily the coursework to a level prescribed from time to time by the Faculty of Materials and published in the Course Handbook. Normally, failure to complete satisfactorily all six elements of Materials Coursework will constitute failure of Part I of the Second Public Examination.

4.4 Use of vivas

There are no vivas in the Part I examination.

In Part II, a *viva voce* examination is held for all candidates.

The purpose of the viva is to clarify any points the readers believe should be explored, and to ascertain the extent to which the work reported is the candidate's.

It is stressed that it is the scientific content of the project and the candidate's understanding of their work that is being considered in the viva.

5. RESITS

In the event that a candidate obtains a mark of less than 50% averaged over all elements of assessment of Part I, or if a candidate fails to satisfy the examiners, a resit is permitted. Such a candidate may re-enter for the whole of the Part I examination on one occasion only, normally in the examining session in Trinity Term 2024, following the examiners' original decision. The examination will cover the same material as the original examination and will follow the same rubric. If such a candidate is adjudged worthy of honours and achieves a mark of 50% or more averaged over all elements of assessment in Part I, the candidate may progress to Part II but will carry forward only a capped mark of 50% for Part I.

Part II may be entered on one occasion only.

6. MITIGATING CIRCUMSTANCES NOTICES TO EXAMINERS (MCE)

[For **late- or non-submission** of elements of coursework, including cases due to illness or other urgent cause, see section 3.6 of the present Conventions.]

A candidate's final outcome will first be considered using the classification rules/final outcome rules as described above in section 4. Cohort-wide adjustments will then be considered, e.g. any scaling. The exam board will then consider any further information they have on individual circumstances.

There are two applicable sections of the University's *Examination Regulations*.

• **Part 13 Mitigating Circumstances: Notices to Examiners** relates to unforeseen circumstances which may have an impact on a candidate's performance.
• **Part 12 Candidates with Special Examination Needs** relates to students with some form of disability.

Whether under Part 12 or Part 13, a mitigating circumstances notice to examiners should be submitted by the candidate through student self-service/eVision, or by the college on behalf of the candidate as soon as circumstances come to light. Candidates with alternative arrangements under Part 12 will not be considered under this mitigating circumstances process if they do not submit a separate mitigating circumstances notice.

Where a candidate or candidates have made a submission, under Part 12 or Part 13, that unforeseen circumstances may have had an impact on their performance in an examination, a subset of the internal examiners will meet to discuss the individual applications and band the seriousness of each application on a scale of 1-3 with 1 indicating minor impact, 2 indicating moderate impact, and 3 indicating very serious impact.

For Part I, normally, this MCE meeting will take place before Part A of the meeting of the internal examiners at which the examination results are reviewed. When reaching these Part I decisions on MCE impact level, a subset of internal examiners will take into consideration, on the basis of the information received, the severity and relevance of the circumstances, and the strength of the evidence provided in support. This subset of examiners will also note whether all or a subset of written papers and/or elements of coursework were affected, being aware that it is possible for circumstances to have different levels of impact on different written papers and elements of coursework. The banding information is used at Part B of the meeting of the Part I internal examiners at which the examination results are reviewed: in Part B a candidate's results are discussed in the light of the impact of each MCE and recommendations to the Finals Board formulated regarding any action(s) to be taken in respect of each MCE.

For Part II, a subset of internal examiners will meet to band the seriousness of each notice in advance of the Part II vivas and prior to sight of any preliminary marks awarded by the internal examiners. When reaching these decisions on MCE impact level, the subset of examiners will take into consideration, on the basis of the information received, the severity and relevance of the circumstances, and the strength of the evidence. The banding information will be used at Part B of the meeting of Part II internal examiners, which is held after the vivas, at which the marks agreed following the discussion after the viva are reviewed and recommendations to the Finals Board formulated regarding any action(s) to be taken in respect of each MCE.

Further information on the procedure is provided in the *Examination and Assessment Framework, Annex E* and information for students is provided at https://www.ox.ac.uk/students/academic/exams/problems-completing-your-assessment. It is very important that a candidate's MCE submission is adequately evidenced and, where appropriate, verified by their college; the University forbids the Board of Examiners from seeking any additional information or evidence.

Candidates who have indicated they wish to be considered for DDH/DDM[2] will first be considered for a classified degree, taking into account any individual MCE. If that is not possible and they meet the DDH/DDM eligibility criteria, they will be awarded DDH/DDM.

7. DETAILS OF EXAMINERS AND RULES ON COMMUNICATING WITH EXAMINERS

The Materials Science Examiners in Trinity 2023 are: Prof. Jan Czernuszka, Prof. Nicole Grobert, Prof. Sergio Lozano-Perez, Prof. Pete Nellist (Chair), Prof. Jason Smith and Prof. Andrew Watt. The external examiners are Prof. Geraint Williams, Swansea University, and Prof. Paul Midgeley, University of Cambridge.

It must be stressed that to preserve the independence of the examiners, candidates are not allowed to make contact directly about matters relating to the content or marking of papers. Any communication must be via the candidate's college, who will, if the matter is deemed of importance, contact the Proctors. The Proctors in turn communicate with the Chair of Examiners.

Candidates should not under any circumstances seek to make contact with individual internal or external examiners.

[2] DDH/DDM – Declared to have Deserved Honours / Declared to have Deserved Masters

ANNEX

Summary of maximum marks available to be awarded for different components of the MS Final Examination in 2023 (For Part I and Part II students who embarked on the FHS respectively in 2021/22 and 2020/21)

	Component	Mark
Part I	General Paper 1	100
	General Paper 2	100
	General Paper 3	100
	General Paper 4	100
	Materials Options Paper 1	100
	Materials Options Paper 2	100
	Practicals	60
	Industrial Visits and Talks	10
	Entrepreneurship coursework	20
	Team Design Project	50
	Introduction to Modelling in Materials	30
	Characterisation or Atomistic Modelling module	30
Part I Total		*800*
Part II	Thesis	400
Overall Total		*1200*

8. APPENDIX – B.A. IN MATERIALS SCIENCE (EXIT AWARD ONLY)

In their 3rd year, a candidate may opt to transfer out of the M.Eng. programme and seek to exit with a classified B.A. award, via one of the following routes:

- Route 1 – Transfer to the B.A. at the start of the 3rd year
- Route 2 – Transfer to the B.A. at the end of the 3rd year

Route 1

Such a candidate will have studied a reduced subset of Options courses and undertaken an additional element of coursework, comprising a literature-based research module. In this case, the candidate will sit the same Option papers as all other Part I candidates but for each paper will answer only two questions in a reduced timeframe of 1.5 hours. The maximum number of marks available on each option paper is 50, and questions carry equal marks. The literature-based research module will be assessed by means of an extended essay of up to 4,000 words which is submitted to the examiners, who will also take into account a written report from the candidate's academic advisor for this research module. The essay is double marked, blind, by two examiners and allocated a maximum of 50 marks.

Route 2

Such a candidate will have completed the same elements of assessment as for Part I of the M.Eng. and in addition will be required to undertake a literature-based research module during the Long Vacation following the written papers. Consideration of all the results will be made by the examiners in the Trinity term of the year following the written papers. The literature-based research module will be assessed by means of an extended essay of up to 4,000 words which is submitted to the examiners, who will also take into account a written report from the candidate's academic advisor for this research module. The essay is double marked, blind, by two examiners and allocated a maximum of 50 marks.

The examiners will apply to the extended essay the conventions detailed above in relation to:

- *Short-weight and departure from rubric*
- *Late or non-submission*
- *Over-length work and departure from approved titles or subject-matter*

The examiners will apply the conventions that relate to the M.Eng. as detailed above to all other elements of assessment for the B.A.

The qualitative descriptors of classes given in Section 4.1 also apply to the B.A.

Once marking is completed an overall percentage mark is computed for each candidate and classification then takes place. Subject to being adjudged worthy of honours, classification is based solely on the overall percentage mark; the candidate's profile of marks from each element of assessment is taken into account only in borderline cases.

Classified Honours – To be adjudged worthy of Honours normally a candidate must obtain a minimum mark of 40% averaged over all elements of assessment, obtain a minimum mark of 40% in each of at least four of the six written papers, and satisfy the coursework requirements.

Pass – The examiners consider that the candidate's overall performance has reached an adequate standard but is not worthy of Honours. The candidate is listed as a Pass on the class list and is awarded a B.A. (without honours).

Fail – The examiners consider that the candidate's overall performance is not worthy of a B.A.

In the event that a candidate obtains a mark of less than 40% averaged over all elements of assessment, or if a candidate fails to satisfy the examiners, a **resit** is permitted. Such a candidate may re-enter for the whole of the examination on one occasion only, normally in the year following the examiners' original decision. The examination will cover the same material as the original examination and will follow the same rubric. If such a candidate is adjudged worthy of honours, as defined under 'Classified Honours' above, the examiners may award a 3rd class Honours classification. The Examiners shall be entitled to award a Pass to a candidate who has reached a standard considered adequate but who has not been adjudged worthy of Honours on the occasion of this resit.

ANNEX

Summary of maximum marks available to be awarded for different components of the MS Final Examination in the B.A. (Hons) exit award in 2023

Route 1

	Component	Mark
Part I	General Paper 1	100
	General Paper 2	100
	General Paper 3	100
	General Paper 4	100
	Materials Options Paper 1	50
	Materials Options Paper 2	50
	Practicals	60
	Industrial Visits and Talks	10
	Entrepreneurship coursework	20
	Team Design Project	50
	Introduction to Modelling in Materials	30
	Characterisation or Atomistic Modelling module	30
	Literature-based research module	50
Overall Total		**750**

Route 2

	Component	Mark
Part I	General Paper 1	100
	General Paper 2	100
	General Paper 3	100
	General Paper 4	100
	Materials Options Paper 1	100
	Materials Options Paper 2	100
	Practicals	60
	Industrial Visits and Talks	20
	Entrepreneurship coursework	20
	Team Design Project	50
	Introduction to Modelling in Materials	30
	Characterisation or Atomistic Modelling module	30
	Literature-based research module	50
Overall Total		**850**

Reports from the External Examiners for Materials

External examiner name:	Prof Geraint Williams	
External examiner home institution:	Swansea University	
Course(s) examined:	Materials Science Parts I and II	
Level: (please *delete as appropriate*)	Undergraduate	

Please complete both Parts A and B.

Part A				
	*Please (✓) as applicable**	**Yes**	**No**	**N/A / Other**
A1.	Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience? *[Please refer to paragraph 6 of the Guidelines for External Examiner Reports].*	✓		
A2.	Do the threshold standards for the programme appropriately reflect: (i) the frameworks for higher education qualifications, and (ii) any applicable subject benchmark statement? *[Please refer to paragraph 7 of the Guidelines for External Examiner Reports].*	✓		
A3.	Does the assessment process measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?	✓		
A4.	Is the assessment process conducted in line with the University's policies and regulations?	✓		
A5.	Did you receive sufficient information and evidence in a timely manner to be able to carry out the role of External Examiner effectively?	✓		
A6.	Did you receive a written response to your previous report?	✓		
A7.	Are you satisfied that comments in your previous report have been properly considered, and where applicable, acted upon?	✓		
**** If you answer "No" to any question, you should provide further comments when you complete Part B.***				

Part B
B1. Academic standards

a. *How do academic standards achieved by the students compare with those achieved by students at other higher education institutions of which you have experience?*

The majority of the student cohort demonstrate a high level of academic achievement across all types of assessments, including examinations, coursework, laboratory classes and research projects. The standards compare extremely favourably with other institutions offering Materials science and engineering degree schemes."

b. *Please comment on student performance and achievement across the relevant programmes or parts of programmes and with reference to academic standards and student performance of other higher education institutions of which you have experience (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

The Materials Science MEng programme offers a comprehensive curriculum that covers a wide range of topics. It maintains an excellent balance of subject matter, necessitating a thorough understanding of modules taught during the first two years, as assessed in the Part I examinations. The questions presented in both general and optional papers were appropriately demanding, evaluating students' analytical and problem-solving abilities as well as their aptitude for effectively condensing the course material. During the external examiner visit in late June I was able to scrutinise exam scripts from all four general papers and the 2 options papers. A limited selection, identified as being from students in the top, middle and bottom of the mark ranges was scrutinised. It was clear that the marks awarded were in line with the quality of the answers submitted. It was noted that average marks for 3 of the papers were low (around 55%) and that a scaling factor would be used to bring the average marks into line with previous years. Despite this, I believe that the performance level of students in the Part I exams is comparable to, if not surpassing, that of students on materials courses in other top UK universities.

During my visit as an external examiner this year I again had the opportunity to meet with a selection of Part II candidates for their research project viva. Out of the 20 vivas conducted over my four-day visit, the majority of students gave a high quality performance. They confidently discussed their results and provided plausible answers to the questions posed by the three examiners. The students who perhaps did not do as well were usually let down by a haphazardly structured and poorly written thesis and were less confident in the viva. Upon reviewing the dissertations I noted that in general there was significantly more content in terms of empirical results than in the previous two years. This was not entirely unexpected given that the past two academic sessions had been impacted by the covid pandemic and its aftermath. In conclusion therefore, the students' achievements in the research project aspect of the MEng course are of a high standard and continue to compare favourably with other institutions offering Materials Science and Engineering programmes.

B2. Rigour and conduct of the assessment process

Please comment on the rigour and conduct of the assessment process, including whether it ensures equity of treatment for students, and whether it has been conducted fairly and within the University's regulations and guidance.

The examination process for Materials Science part I examination in Oxford differs significantly from the approach employed by other UK universities I am familiar with. Typically, in these universities, the module lecturers both set the exam papers and carry out the marking. Academic colleagues act as second markers, mainly checking the accuracy of totalling partial marks for individual answers in the exam scripts. In contrast, Oxford's approach is more rigorous and fair, but also more time-consuming, utilising two independent academic examiners and implementing

a double-blind marking system for the papers. After marking, the two examiners must reach a consensus on the final marks for each question if there is a discrepancy in the allocation of marks based on the model answers. This year, the question setters were involved with the marking of all papers, in contrast to previous years where both markers were independent of the paper setting process. As a result there seemed to be less discrepancy in the marks awarded for individual questions during the double blind marking process, which suggests that this new development has been advantageous. As per previous years, I was impressed by the quality and rigor of the model answers, which I had ample time to evaluate although there seemed to be more errors in the draft questions and exemplar answers than in previous years. Nevertheless, the part I assessment process is carried out in the fair and transparent manner and adheres to the university's regulations.

The evaluation process for part II research projects, which encompasses the entirety of the final year for MEng students, again differs somewhat from the approach followed in other universities. Typically, the project supervisor in other universities plays a role in marking the final dissertation. In contrast, Oxford employs an examination board consisting of six senior academics, along with additional assessors, to assess student thesis submissions and conduct vivas. External examiners are also invited to evaluate a selection of thesis submissions, participate in viva questioning, and provide their opinion on the final mark, if appropriate. In previous reports, I raised questions about why the viva did not include a short PowerPoint presentation by the student, highlighting the key aspects of their project. However, upon experiencing face-to-face vivas, I recognised that allowing the student a few minutes at the beginning of the session to deliver a concise summary of their work without visual aids proved to be a more valuable assessment measure than a brief presentation. The vivas were conducted fairly, openly, and in a friendly manner. The approximately 10 minutes allocated between vivas proved useful in allowing the external examiner and the examination board to discuss individual opinions regarding the dissertations and determine their respective lines of questioning. The assessment process for part II projects is conducted with both rigour and fairness, making use of a marking rubric and comment sheet that is sufficiently detailed, enabling a clear evaluation of the strengths and weaknesses of each thesis and providing insights into how the marks were allocated.

B3. Issues

Are there any issues which you feel should be brought to the attention of supervising committees in the faculty/department, division or wider University?

In the time allotted to scrutinise examination scripts and other written assessments during the external examiner annual visit, it is only possible to evaluate a limited selection of material. In addition the need to correlate written answers with marksheets available only on the online external examiner sharepoint site is both time-consuming and cumbersome. I feel that it would be good practice next year to carry out some pre-sifting of exam scripts prior to the scheduled external examiner appraisal of assessments. Selecting representative scripts from all sets of papers which provide examples of submissions from students in the top, middle and bottom of the mark bands would allow more efficient use of the external examiners' time. This practice is commonplace in other institutions within which I have acted as an external examiner.
The entirety of the students' Part II mark is based on the exam board's assessment of the dissertation and viva performance. Both external examiners felt that the overall part II mark could also include a weighted component (10% -20%?) based on the presentation on their research project which they are required to provide in front of an audience of their peers and Materials academics a few months prior to the viva. Having a component of the part II project assessed earlier in the year would ease some of the pressure on students in the final month of their studies.

Additionally, it was noted that grades for the majority of the Part I examinations were generally lower compared to pre-2021 averages. Consequently, the examination board implemented a scaling method to align the average marks for all papers with those from previous years and historical patterns. The chairman of the examination board provided a thorough explanation of

the procedure and rationale behind the extent of scaling, ensuring that the process was conducted transparently and in accordance with the university's examination standards. Therefore, I have full confidence that everything was carried out in a transparent manner, adhering to the university's examination protocols.

B4. Good practice and enhancement opportunities

*Please comment/provide recommendations on any **good practice and innovation relating to learning, teaching and assessment**, and any **opportunities to enhance the quality of the learning opportunities** provided to students that should be noted and disseminated more widely as appropriate.*

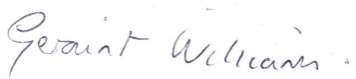
It was noted that this year, the question setters for all 4 general papers and the two options papers were now involved in the part I examinations marking process. In previous years only the question setters for options papers were part of the assessment process. This represents a logical and welcome development and seems to have already shown some benefit in term of better agreement between the two markers involved in the double blind marking procedure.

In my previous reports I have commented upon the time-consuming process of dealing with numerous mitigating circumstances for individual students within the external exam board meeting. I'm glad to report that previous comments have been acted upon, and that most of the discussion of mitigating circumstances (MCs) now forms part of a preceding internal meeting. Consequently the consideration of individual student MCs at the external examiners meeting is far more streamlined and time-efficient than in previous years.

B5. Any other comments

Please provide any other comments you may have about any aspect of the examination process. Please also use this space to address any issues specifically required by any applicable professional body. If your term of office is now concluded, please provide an overview here.

I would like to express my gratitude to Tom Heath for his help in organising my accommodation in Oxford and ensuring timely access to all the necessary course materials and access to the online learning platform. As mentioned previously, the MEng Materials Science program maintains its exceptional quality of education in this field, thanks to the expertise of academic staff who are international leaders in their research areas. It also fosters the development of exceptionally skilled graduates, several of whom I am confident will emerge as future influential figures in this field.

Signed:	
Date:	13/7/2023

External examiner name:	Paul Midgley	
External examiner home institution:	University of Cambridge	
Course(s) examined:	Materials Science, Part I and Part II	
Level: (please *delete as appropriate*)	Undergraduate	

Please complete both Parts A and B.

Part A				
	*Please (✓) as applicable**	**Yes**	**No**	**N/A / Other**
A1.	Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience? *[Please refer to paragraph 6 of the Guidelines for External Examiner Reports].*	✓		
A2.	Do the threshold standards for the programme appropriately reflect the frameworks for higher education qualifications and any applicable subject benchmark statement? *[Please refer to paragraph 7 of the Guidelines for External Examiner Reports].*	✓		
A3.	Does the assessment process measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?	✓		
A4.	Is the assessment process conducted in line with the University's policies and regulations?	✓		
A5.	Did you receive sufficient information and evidence in a timely manner to be able to carry out the role of External Examiner effectively?	✓		
A6.	Did you receive a written response to your previous report?	✓		
A7.	Are you satisfied that comments in your previous report have been properly considered, and where applicable, acted upon?	✓		
**** If you answer "No" to any question, you should provide further comments when you complete Part B.***				

Part B

B1. Academic standards

a. *How do academic standards achieved by the students compare with those achieved by students at other higher education institutions of which you have experience?*

Having had the opportunity to be part of the assessment process for the first time as External Examiner this year, I can say that the academic standards achieved by the overwhelming majority of students compares very favourably with those of students at my own institution and others at which I have had some experience.

b. *Please comment on student performance and achievement across the relevant programmes or parts of programmes and with reference to academic standards and student performance of other higher education institutions of which you have experience (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

Part II. I had the pleasure of being part of the viva process for the Part II students. At the viva, which lasted approximately 25-30 minutes, the candidates answer questions from two Examiners (or Assessors) with the Chair acting in a neutral capacity and the External able to ask questions throughout the viva, but in the main reserving questions for towards the end. From what I saw this process worked very well, was undertaken in a clear, professional but friendly manner, and encouraged the candidates to discuss their results in the light of the questions. The candidates were asked to take a few minutes to summarise their main achievements at the start. Most did so well, some went a little over time. At the end of the viva the final scores were agreed between the two internal Examiners with further agreement from the External. Most of the time, the marks were sufficiently close to enable the viva performance to broadly confirm scores. In some cases, where marks diverged significantly, the viva was very helpful in indicating which way the marks should be adjusted. Overall the performance of the students was excellent. Many demonstrated detailed understanding of the subject and had clearly enjoyed their time undertaking the research project. Many of the projects' results were at a level to be considered for writing up into a journal publication, with the student ability equal or even exceeding some first year doctoral students.

Part I. The Part I exams cover content found in the whole of the Materials course (over the first three years). The degree course taught in Oxford is wide-ranging covering fundamental and core subjects through to more advanced subjects (examined in the Options Papers). The questions were at a level appropriate for third year students, they were challenging and probing of the student's analytical and problem-solving skills. The time available to the Externals to scrutinise the scripts and coursework etc was limited but from what I saw the answers submitted by the top students were indeed outstanding and compared well to similar 'top' students at my own institution. I also looked carefully at some of those students who had been 'promoted' above borderlines due to the scaling process (see comments also in B4) and I was comfortable that those students in each class had been given the correct mark. The final scaled mark distribution looked very reasonable. Overall, the achievements of the cohort are excellent and the students compare very favourably with others at my own and similar universities in the UK.

B2. Rigour and conduct of the assessment process

Please comment on the rigour and conduct of the assessment process, including whether it ensures equity of treatment for students, and whether it has been conducted fairly and within the University's regulations and guidance.

Part II. For the Part II student thesis, there are very clear descriptors given to Internal Examiners (and Assessors) regarding what aspects of the report to consider when marking. These appear to have been followed well and very careful thought and justification given to the final mark for the thesis. The vivas were conducted in a fair, open and friendly manner with sufficient time given to students to enable them to consider their answers and with follow-up questions as needed. The time allocated to questions (ca. 25-30 mins) was sufficient to enable a confirmation of the final score. At the beginning of the viva the student is asked to spend a few minutes summarising their main achievements. Some students brought in written notes to help in this process but there was no visual presentation in the form of powerpoint slides (see comments in B4). The viva itself was not marked separately but was used as a guide to enable the two Examiners to agree on their final marks for the thesis. The External Examiner was given ample opportunity to ask questions and to comment on the agreed marks. The Chair completed the viva report and noted the reasons for any changes to the initial marks. The whole process was completed in a fair and rigorous fashion.

Part I. The assessment of the students over their first three years differs from many other universities in that the only meaningful exams are concentrated in a short period at the end of the third year (Part I). From what I saw the exams had been marked in a fair and rigorous fashion. Each paper was double marked (as they are in my own institution) with the Examiners agreeing on a final mark (moderation) after some discussion. As has been commented on in previous years this is very much a 'gold standard'. Whilst undoubtedly time-consuming, as has been noted in previous External Examiner's reports, I would encourage the Department to continue with this approach if at all possible. I noted that where marks of the Examiners diverged significantly comments were made in the markbook indicating the actions taken to find common ground – which is very helpful.

In reviewing the marks for Part I the average mark was below what was considered to be the norm. The marks were scaled by adding 3 marks to each of papers GP4, OP1 and OP2. In addition a further 3 marks were added across the cohort for each paper. I understand this type of scaling has been typical in recent years and in my view has been applied in a fair and transparent manner following university guidelines (see also comments in B4).

The draft Part I exam papers were sent and reviewed in good time with small errors spotted and suggestions from External Examiners noted and with a formal reply to the Externals submitted shortly afterwards. Most of the model/exemplar answers were extremely helpful and well annotated but there were one or two which were lacking detail in their draft form.

In one of the papers (OP1) two questions had to be re-drafted as the original questions had been sent from one Oxford colleague to another by email rather than through a secure portal. The new questions were drafted and then checked by Externals in good time.

B3. Issues

Are there any issues which you feel should be brought to the attention of supervising committees in the faculty/department, division or wider University?

Although it seems not unusual in recent years, it felt to me that there were a relatively large number of mitigating circumstances to consider. These were all considered very carefully by the Exam Board and decisions made clearly and professionally. In one case at Part II there was a need to consider whether the mitigating circumstances should lead to a 'promotion' of one candidate to a higher class. It was clear from the discussion that it was difficult to make such a judgment and to 'quantify' the mitigation, although an agreed decision was ultimately reached. My own view is that it would help if such cases could be reviewed first by a medical professional with some degree of quantification then suggested to the Exam Board.
I was also a little concerned by the number of 'suspensions', where students do not sit exams and then come back to repeat the year. I was told that the number this year was not atypical, at least for years since the covid pandemic (see comments in B4).

B4. Good practice and enhancement opportunities

Please comment/provide recommendations on any ***good practice and innovation relating to learning, teaching and assessment****, and any* ***opportunities to enhance the quality of the learning opportunities*** *provided to students that should be noted and disseminated more widely as appropriate.*

The Department may wish to consider small changes to the way that the Part II is assessed. Whilst the bulk of the marks will always be for the Part II thesis, there is an additional opportunity to assess the student's skills in communication, rewarding excellence in the communication of science, as well as the science itself. One possibility is for Examiners to assess a powerpoint presentation, perhaps given towards the end of the project, in terms of the way the project is presented (visually and orally), questions answered, as well as its scientific content. (In my own institution such presentations are given to an audience composed of Part II and Part III students and the relevant Examiners.)

The Department may also wish to consider allowing students to make a short visual presentation at the start of their Part II viva, in the form of powerpoint slides etc.

There is also a possibility for the Department to spread the potential 'stress' to students of the Part I exams over two years by having formal examinations at the end of the second year, covering the first two years work, with perhaps a diminished number of papers/questions at Part II. I understand this has been discussed previously but may be worth considering again in this immediate post-covid era.

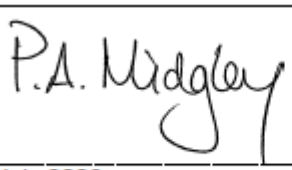
The current scaling system is a simple addition of marks across the cohort and/or marks for a particular paper or papers. Whilst simple and transparent, the Department may wish to reflect on the use of other scaling systems. Adding marks using the current system will tend to increase lower marks more (as a percentage of their raw mark) and higher marks less.

B5. Any other comments

Please provide any other comments you may have about any aspect of the examination process. Please also use this space to address any issues specifically required by any applicable professional body. If your term of office is now concluded, please provide an overview here.

I would like to thank the whole Department for being such excellent hosts and in particular the Chair of Examiners, Philippa Moss and Tom Heath for their very helpful emails and communication throughout the process, timely production of papers and reports, updating Externals as appropriate and in answering swiftly and precisely any questions I may have had.

It was a pleasure to examine such an excellent set of students and I look forward to continuing to do so over the next three years.

Signed:	
Date:	5 July 2023

Department of Materials Academic (Undergraduate) Committee

RESPONSE TO EXAMINERS' REPORTS 2023

Faculty of Materials
Department of Materials Academic (Undergraduate) Committee

Preliminary Examination in Materials
and
Honour School of Materials Science (MS) Parts I & II

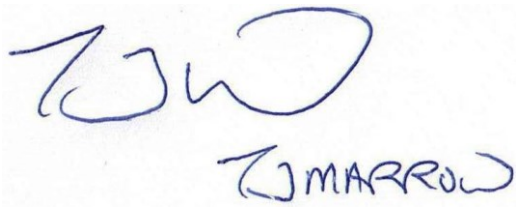
We are very grateful to the external examiners for their very positive contributions to the examining process, and also the insightful comments they have provided. The reports have been reviewed by the Department of Materials Academic (Undergraduate) Committee, DMAC, and have also been seen by the Faculty.

With respect to the reports of the External Examiners:

- We appreciate the supportive feedback. We will return to our former practice of selecting representative scripts from all sets of papers to provide examples of submissions from students in the top, middle and bottom of the mark bands. All scripts will also be available, if required.
- We note the suggestion that the overall Part II mark might include a weighted component based on the presentation on their research project. The students are currently required to provide this in front of an audience of their peers and Materials academics, and this is a formative assessment that allows us to provide some feedback. This would not be possible if it were a summative assessment that contributed to the overall Part II mark. We are planning a review of the Part II assessment, and this will be considered.
- We note the suggestion that we consider formal examinations at the end of year 2. Faculty are currently discussing a wide-ranging review of our assessment methods.

With respect to the report of the Chair of Examiners:

- To further reduce the potential for examination paper errors, we are following the recommendations of the Chair of Examiners to ensure that a final checking of the hard-copy printed papers is a routine part of the process. Previously the check was of an electronic proof (PDF). To avoid the risk of files changing during the translation/copying process, the Sharepoint directory into which the Chair saves their approved PDF files will be the same directory from which the Examinations School download the PDFs for printing.
- Our agreed practice is to use LaTeX to format the examination papers, but we have noted that there are variations in experience with LaTeX amongst the examiners. We are consulting on whether LaTeX training of a member of the support staff might be appropriate to support the paper setting process.
- The comments from the coordinators of the Characterisation of Materials Option Module and the alternative Atomistic Modelling Option Module, with respect to report quality, have been discussed with the coordinators. The reports on these modules are important preparation for Part II, and written feedback is not provided on this summative assessed piece of work. There is written guidance issued to the students on the requirements of the reports, and the expectations of the assessors will be emphasised to the students with reference to the comments in the examiners' report.
- The examiners note their discomfort in assessing MCE statements, and we await the outcomes of the current review of the MCE process.



T.J. Marrow, Chair of DMAC, 19/12/23