CONFIDENTIAL

EXAMINERS' REPORTS 2018

MATERIALS SCIENCE (MS)
MATERIALS, ECONOMICS & MANAGEMENT (MEM)

Internal Examiners' Reports

REPORT ON PRELIMINARY EXAMINATION IN MATERIAL SCIENCE

Part I

A. STATISTICS

Category	Number			Percentage		
	2017/18	2016/17	2015/16	2017/18	2016/17	2015/16
Distinction	8	12	10	27	33	31
Pass	21	22	22	70	61	69
Fail	1	2	-	3	6	-

Marking of scripts

Scripts are single marked except for borderline cases which are double-marked.

B. NEW EXAMINING METHODS AND PROCEDURES

The conventions were updated last year but 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. The aim was to ensure greater scrutiny of the papers as well as improving familiarity prior to second marking.

It was decided that, in line with standard practice in Part I examinations, it was not necessary to set questions on every 4-lecture course and that questions may require knowledge from more than one lecture course. This follows the practice that was set last year. Guidance that is given to lecturers when they are asked to suggest questions in order to avoid similarity of questions to previous years. The aim was 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

The average marks for all three Materials papers are similar to last year, which is significantly lower than previous years, suggesting the efforts made to make these papers less predictable were successful. However the average marks are still considerably higher than for Finals and it is still the case that some questions did not extend the students enough. These more straightforward questions were easily spotted by the candidates and were answered by large proportions of the cohort. In order to make Prelims examinations a more realistic indicator of Finals performance and more useful preparation for the students, it is suggested that every question is very carefully assessed for where it extends the students beyond reproducing arguments given in the lectures or rehearsed in the tutorial questions/past exam papers. If it is not clear from the lecturer's worked solution and commentary which parts of the question fulfil this requirement, the Moderator should request this additional information from the lecturer in a timely manner. The aim is to have questions in the Materials papers that test basic knowledge with sections that are designed to challenge the students further and test their problem-solving skills.

It has been the case that some questions submitted by the lecturers needed considerable modification because they were too predictable or because they contained some errors. The Moderators were pleased to note that most lecturers provided commentary alongside their worked answers. However, it is still the case that worked answers were missing for some questions.

Maths Paper

The average mark on the Maths paper this year has dropped to 60% which is considerably lower than last year (80% in 2017). The Chair or Prelims exams contacted all Maths lecturers individually earlier in the year and asked them to introduce harder questions especially in section B of the paper in order

to improve differentiation between students. This year the Maths paper has indeed proven to be a harder challenge for students. The Moderators would like to thank the lecturers for the effort they made to rectify the situation.

Coursework Paper
The coursework paper is made up of 50% from the first year practicals and 50% from the crystallography classes.

Crystallography coursework
The Moderators reviewed the report from the Senior Demonstrator (SD) which described some ambiguity in some of the question sheets, introduced following a reworking the previous year. This had been allowed for at the time of marking and will be rectified for the next academic year. The moderators recorded some concern at the level of marking, noting an average mark of 85%, with a significant number of students achieving 100% in many classes. The Moderators agreed that this concern should be referred to DMAC for consideration.

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. It was agreed that overall the organization of practicals was satisfactory. However, the Moderators would wish to reinforce the need for SDs to understand their responsibilities.

The Moderators endorsed the PCO's recommended penalties as laid out in her report.
The Moderators considered two specific cases: On one occasion, an email had been submitted in defence of a late submission but the moderators considered that, as the rules were clear, and as the penalty imposed in line with the guidelines would have no significant impact on performance assessment, that the penalty should stand.
On another occasion, the candidate had submitted a practical very late and too close to the ultimate deadline for submission to the examiners for the SD to mark. The Moderators reviewed the candidate's practical work, noting many penalties had been imposed for late submission. As a result, the moderators felt that in this case no marks should be awarded for the last piece of work.
The Moderators make a recommendation that the Department consider the impact of a high number of accrued penalties, and also the rules about the deadline for marking of the last practical of the year to ensure the SDs are not placed under undue pressure.

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

Circulation by Deputy Administrator (Academic) to all students and tutors by e-mail, hard copy, and onto the Departmental website.

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

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

30 students were registered for the examination.

28 candidates passed all papers, without the necessity for compensation, with 1 candidate being compensated in the Maths paper. Of these 29 successful candidates in June, 8 were awarded Distinctions, all with marks of 75% or more (rounded). 1 candidate failed three papers, together with the practical work and as such the moderators considered the candidate had failed the entire examination.

The Moderators are pleased that there were no errors in papers to report.

The prize for the best overall performance in Prelims was awarded to Ben Jagger, of St Anne's College. The prize for the best performance in 1st year Practicals was also awarded to Ben Jagger. Additional prizes for outstanding performance were awarded to Yixuan Song of Mansfield College, and Jessica Wen of The Queen's College.

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

Where approved by the Proctors, 1 candidate was allowed (i) extra time on account of dyslexia / dyspraxia, and/or (ii) other special arrangements. These allowances seemed satisfactory.

Gender Issues:

Of the 30 candidates 12 were women and 18 men.

5 of the 8 distinctions were awarded to women.

In view of the small overall number of candidates, it is not sensible to draw conclusions from these data. The mean score for males was 66.7% and for females 72.3%.

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

All candidates took the same papers for the whole examination.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Attached.

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

There were no applications to consider regarding Factors Affecting Performance (FAP). Four medical certificates were received and considered by the Moderators when reviewing the final results, as shown in the table below. It was deemed that no further adjustment was necessary.

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

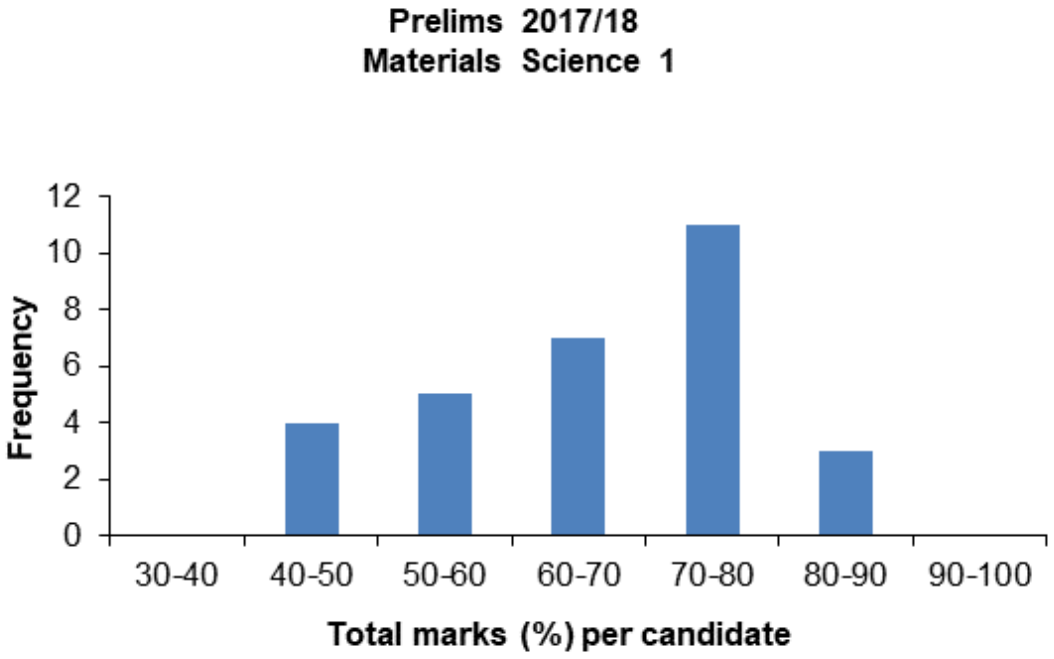
Professor S.C. Speller
Professor M.P. Moody
Professor K. Porfyrakis (Chair)
Dr E.K.R. Tarleton

MS1 – Structure of Materials

Examiner: **Professor Michael Moody**
Candidates: **30**
Mean mark: **67.07%**
Maximum mark: **86%**
Minimum mark: **41%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	28	15.46	20	8	Ceramics and Semiconductors
2	18	11.22	15	8	Metals & Alloys
3	9	11.89	16	3	Polymers & Composites
4	19	11.84	18	6	Defects in Crystals
5	14	11.93	16	7	Elementary Quantum Theory & Bonding
6	11	13.36	18	7	Crystallography & Diffraction
7	23	13.70	20	8	Crystallography & Diffraction
8	26	16.00	19	10	Crystallography & Diffraction



General comments:

The average mark was 67.07%, however a wide spread can be seen in the distribution with many students scoring significantly higher grades. The most popular question was Q1, on the short lecture course on Ceramics and Semiconductors. It required standard bookwork and relatively simple calculations similar to problems encountered previously by the students and hence received high marks. The other very popular question was based on the Crystallography and Diffraction lecture course, Q8. In particular, students were very familiar with the vector calculations in this question, and well prepared for the bookwork comparison of the different techniques for determining crystallographic structure, and hence high marks were also achieved for this question. It is somewhat surprising that Q2, on Metals and Alloys, had the lowest average mark, given that it required the discussion of some straightforward examples directly from the course notes. The Polymers and Composites question, Q3 was unpopular again this year with only 9 attempts (although more than the 5 attempts in 2017), despite requiring only standard bookwork. As highlighted by previous moderators, this suggests that the students are strategically avoiding learning this lecture course.

Specific Comments:

1) Ceramics and Semiconductors: A very popular question attempted by nearly every candidate. Part a) was done well, however, it was probably too straightforward to provide information worth 2 marks for each of the examples. Part b) was also well addressed in general, however, answers could have been structured more clearly. In terms of thermal properties of the different materials, conduction was nearly always discussed but melting points overlooked. The examiner suggests questions of this type should be more focussed/specific to achieve 4 marks. Part c) was generally not explained clearly, with many candidates focussing on packing volumes rather than addressing the electrostatic consequences of bringing the large anions into closer proximity. The quality of answer for Part d) was mixed, however, many candidates did correctly identify the correct structure and critical radius ratio.

2) Metals and Alloys: Part a) was generally well done, however, many candidates lost marks for providing very limited answers comprising overly brief definitions. Part b), few candidates specifically discussed the tendency for carbon to occupy the smaller octahedral sites in the BCC ferrite phase. In Part c) the formation of the sigma phase was seldom identified as the cause of embrittlement and well described even less frequently. Part d) many candidates erroneously focussed on valency differences rather than size factor.

3) Polymers and Composites: Part a) was not answered well in general. There was a tendency for candidates to waffle and incorporate irrelevant and incorrect information. Many candidates did not provide a clear comparison between the three respective cases – properties and examples were often mixed up between the different classes. Part b) most knew the Rule of Mixtures, however, the assumptions that this is based on were often omitted or not clearly stated. Part c) was answered well and usually to a high standard.

4) Defects in Crystals: Part a) was generally well answered with candidates providing clear illustrations of the different stacking faults, accompanied with clear explanations. In Part b) most did not attribute the increased number of interfaces where the stacking is out of sequence in the case of the extrinsic stacking fault to be the reason for its increased energy relative to the intrinsic stacking fault. Part c) was a challenging question. Given that this specific case had not been presented previously in lectures, candidates were not necessarily penalised for incorrect identification of the relevant Burgers vector. However, the concepts involved in this calculation were generally not well defined by candidates, particularly explicitly explaining the contributions to the overall energy associated to the dislocation. Also factoring in the length (circumference) of the dislocation and converting units from J to eV caused problems. Part d) was not done well, many discussed the relevant concept relating Burgers vector to expansion/contraction of the dislocation loop without specifically addressing the presented case.

5) Elementary Quantum Theory and Bonding: The initial questions relating to defining the Heisenberg Uncertainty Principle and wave packets were generally very well answered. However, candidates had difficulty deriving expression for the group velocity of a photon and free electron, respectively, in a vacuum. The quality of explanations of the difference between the propagation of a photon and a free electron was very mixed. Many candidates seemed confused by what the question was actually asking for. There were many good attempts at Part d) with candidates working towards the correct answer. However, often candidates did not explicitly "show" their logic (as requested by the question!) and made unexplained sometimes, sometimes erroneous, jumps in reason that could not be followed by the examiners.

6) Crystallography and Diffraction: Most candidates could give a coherent definition of *crystallographic restriction*, although in many cases this could have been better refined. Candidates were asked to identify symmetry elements in two unit cells, in Part b) and Part c), respectively. This was straightforward and most found this very easy. Drawing the stereogram in the first component of Part d) was straightforward for most, but all found the introduction of the screw axis challenging and most did not even attempt a guess at this. The centring of the stereogram around the (1-10) in Part e) made this question considerably more difficult for many candidates, however there were some good attempts.

7) Crystallography and Diffraction: This question on the diffraction of light was generally done to a high standard by many candidates. Most confusion was centred on Part b) and how the diffraction pattern changed with increasing number of slits, changing the width of the slits and spacing between slits. Also candidates had difficulty with Part d) and how the diffraction pattern is affected by changing the angle of incidence onto the slits. Most erroneously simply added (or subtracted) the angle of incidence to the angle of the 2^{nd} order intensity maximum measured for normal incidence of light onto the slits.

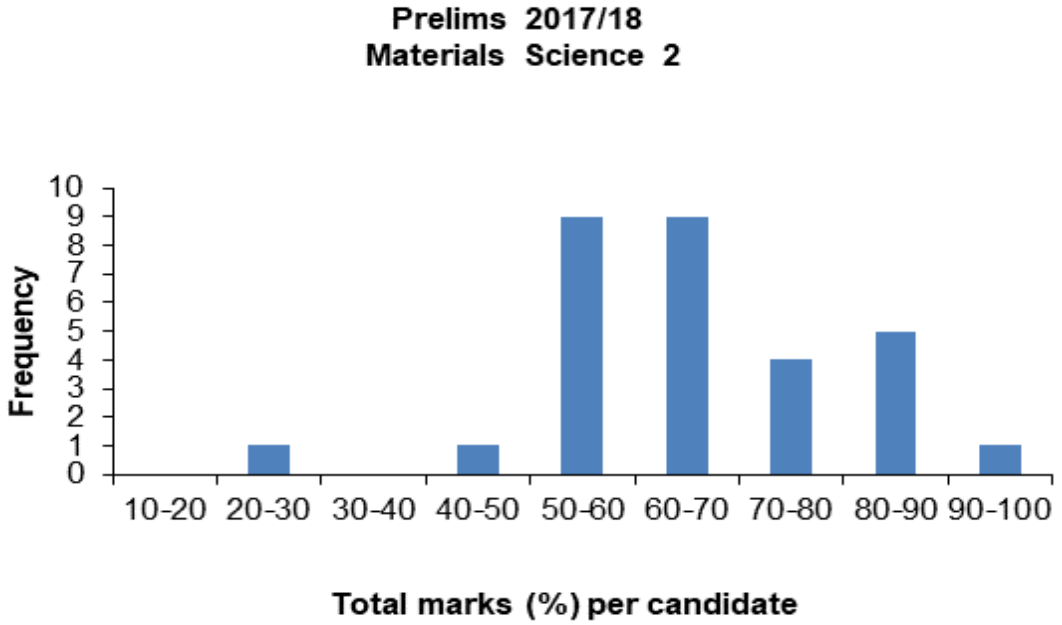
8) Crystallography and Diffraction: This was a very popular question. Part a) was done well, a criticism would be that candidate could have had a better focus on the materials applications and the usefulness of the information that could be obtained. Candidates found the crystallography calculations in Part b) very easy. Part c) was also for the most part done well, with few problems comparing the arrangement of atoms between FCC and BCC unit cell.

MS2 – Properties of Materials

Examiner(s): **Professor Susie Speller**
Candidates: **30**
Mean mark: **65.18%**
Maximum mark: **93%**
Minimum mark: **29%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	5	8.60	15	0	Electricity and Magnetism
2	3	9.50	12.5	7	Electricity and Magnetism
3	30	13.67	18.5	7	Elasticity
4	5	13.40	19	8	Elasticity
5	30	14.23	20	6	Elasticity/Fracture
6	30	12.30	19	5	Mechanical Properties
7	20	13.45	19	6	Mechanical Properties
8	27	12.67	17	4	Kinetic Theory of Gases



General comments:

Overall performance on this paper was very similar to the last year and allowed for clear differentiation between weak and strong students. Most of the questions on Elasticity and Mechanical Properties were very popular, particularly questions 3, 5 and 6 which were attempted by every candidate. However, the overall marks for these questions do not suggest they were considerably easier than the others. The Electricity and Magnetism questions were unpopular, as usual, and this year the average marks for these questions were considerably lower than the average marks on the other questions. This was mainly a result of some very poor attempts from weaker candidates, probably attempting these questions as a last resort. The highest mark obtained was 92%, but at the other end of the spectrum, one candidate scored less than the pass mark. Overall, as in previous years, candidates preferred descriptive questions and those involving textbook derivations.

Specific Comments:

1) An unpopular question on electrostatics. Most candidates were able to explain Gauss's law and could apply the superposition principle to figure out the electric fields in different regions of the device. None of the candidates correctly worked out the charge distribution within the plates, but there were some reasonably good attempts at explaining the effect of inserting a dielectric material into the device.

2) This question on Maxwell's equations was very unpopular, possibly because there had not been a similar question in recent papers. Most candidates demonstrated a good understanding of the Faraday-Maxwell law of electromagnetic induction and could explain why the electric and magnetic fields inside a perfect conductor are zero. However, there were very few attempts to the final part of the question on applying the electromagnetic boundary conditions, and those that did made errors.

3) A very popular question on Mohr's circle, attempted by all candidates. Most could apply Mohr's circle for stress correctly, although some could not explain the sign convention they had used and made errors in the direction of rotation from the initial co-ordinate system into the principal axes. Calculating Mohr's circle for strain was much more problematic, with many candidates failing to use Hooke's law properly to calculate the normal strains and/or using the initial co-ordinate system and ignoring the shear strain components.

4) This question on beam theory was notably unpopular compared to the other questions in the mechanics area. It is not immediately obvious why this is the case, unless the students were put off by the derivation in part (a) which has not been asked for in recent papers. On the whole, the answers were reasonably good and the average mark was very similar to the other questions.

5) All of the candidates attempted this question on asymmetric three-point bending of a ceramic bar. In general, the standard calculations of shear stress and moment were performed well. Most could calculate the fracture toughness from the information given, although there were some errors in simply calculating the cross-sectional area of the beam. The final part of the question provided good differentiation between the candidates, with the weaker students typically failing to realise that the bending moment at the point of failure was reduced.

6) A very popular and fairly standard Mechanical properties question, with attempts from all candidates. The students were usually able to demonstrate a good understanding of the factors influencing yield stress and most could show the energetic argument for the formation of looks between dislocations. Fewer clearly explained why the locks are sessile. A few candidates got confused between these locks formed from undissociated dislocations in bcc crystals and locks formed from partial dislocations in fcc crystals. Answers to the final part of the question on failure mechanisms in bcc metal were variable in quality.

7) This less popular question involved identifying and explaining four different microstructural features in images of deformed materials. Almost all the candidates recognised Luders bands from the image (which featured in the lecture notes), but fewer knew that they occur in materials exhibiting a yield drop. Many students identified image (b) as Frank-Read sources with bowed dislocations between pinning sites, and could explain how they work. Fewer discussed jog formation. Deformation twins proved to be the most challenging for the students to identify, and some credit was given to students who thought the features were stacking faults between partial dislocations. The majority gave good, detailed explanations of dislocations bowing around precipitates.

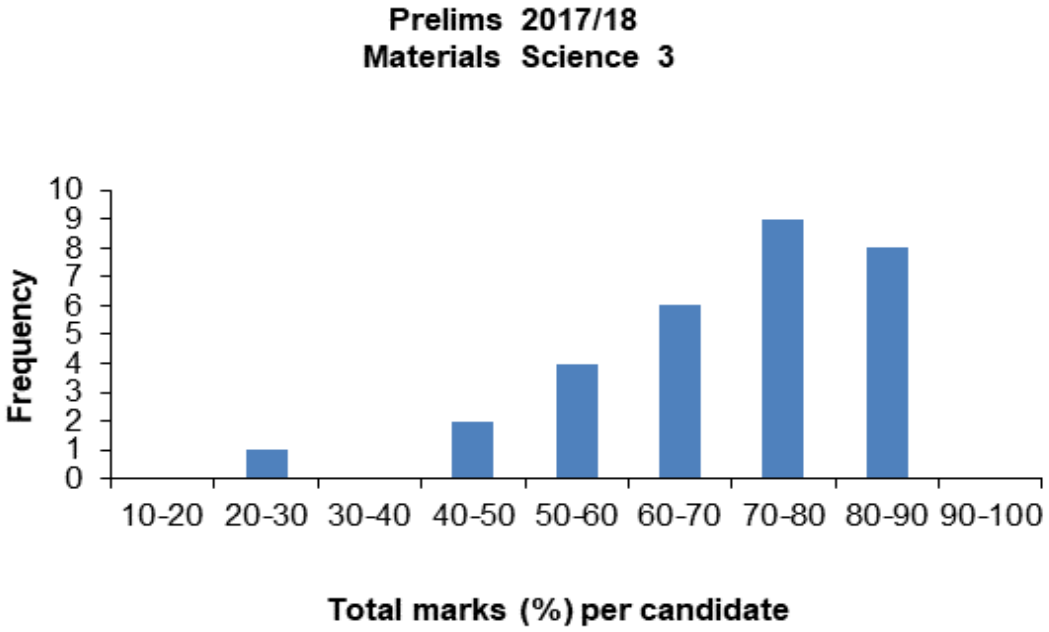
8) The Kinetic Theory of Gases question was popular this year, answered by 27/30 students. The standard derivations were reproduced well, although some students lost marks for recalling $p(\theta)d\theta = \frac{1}{2}\sin(\theta)$ rather than deriving it. There were a surprising number of minor errors in the hydrogen effusion calculation, usually as a result of forgetting the factor of 2 in the mass of a hydrogen molecule. None of the students successfully figured out how to calculate the percentage enrichment in uranium and many made simple errors in the calculation of relative effusion rate.

MS3 – Transforming Materials

Examiner(s): **Professor Kyriakos Porfyrakis**
Candidates: **30**
Mean mark: **69.30%**
Maximum mark: **89%**
Minimum mark: **30%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	23	14.30	20	9	Polymer Synthesis
2	3	14.67	18	10	Microstructures
3	17	13.47	18	8	Microstructures
4	17	15.53	19	6	Microstructures
5	21	11.24	18	6	Thermodynamics
6	25	14.72	20	5	Thermodynamics
7	23	15.09	20	4	Thermodynamics
8	20	13.10	19	3	Reaction Kinetics



General Comments

This is a relatively high scoring paper. Most students scored high marks, there was however a rather large spread of marks from 20-30% all the way up to 80-90%. The average value is around the 69% mark. It is pleasing to see that all questions were attempted by at least 3 or more candidates. Indeed, all but one questions were answered by the majority of the cohort. About 76% of the cohort achieved a mark above 60%. This is a lower percentage than last year; hence it is a move in the right direction in terms of achieving differentiation between students.

Specific Comments

1) The question on polymer synthesis was one of the most popular ones. The students did well in identifying the polymerization process and in calculating molecular weights. They struggled somewhat in giving a good description of the injection moulding process.

2) The question on precipitation of Co from a supersaturated solution of Co in Cu was by far the least popular one. Only 3 students attempted it. Those who did though did generally well and the question had the fourth highest average mark.

3) This was a classic thermodynamic equilibrium question. The students generally did well in deriving the Gibbs phase rule equation. They struggled mostly with the quality of the eutectic phase diagrams, such as getting the right α and β phases in the diagram.

4) This was a question on nucleation. Overall the students did well. This had the highest average mark. Most students got the calculations for the critical nucleus size and the work of nucleation right.

5) This was a thermodynamics question using the Ellingham and Predominance diagrams. Most students struggled with this question. It had the lowest average mark overall. Very few students managed to get right the second part of the question, where they had to identify the most thermodynamically favourable form of metal in each region of the diagram.

6) This was the most popular question. It was on thermodynamics. Overall the students did well. They coped well with the entropy calculations for a single crystal. Some struggled with the change in Gibbs free energy upon mixing of gases, so it was a rather polarizing question.

7) This was also a popular question on thermodynamics. Again, it was a polarizing question, but generally the students like to solve equilibrium questions, involving phase changes.

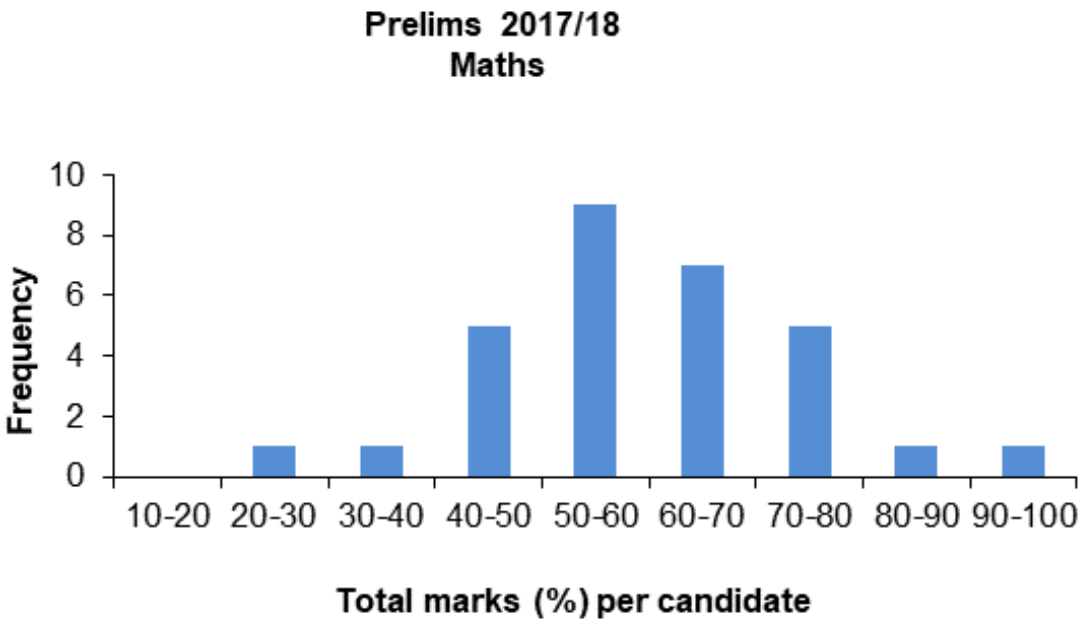
8) This was a popular question on reaction kinetics, but the students struggled with it. This achieved the second lowest average mark. Generally, they did well with the definitions of terms such as reaction order. They coped with deriving the Arrhenius parameters, but very few students managed to calculate correctly the rate of consumption for the specific example that was given.

Mathematics for Materials Science

Examiner(s): **Dr Ed Tarleton**
Candidates: **30**
Mean mark: **60.03%**
Maximum mark: **91%**
Minimum mark: **23%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	30	4.77	8	1
2	30	4.87	8	1
3	30	3.13	6	0
4	30	5.10	8	0
5	30	7.40	8	1
6	30	3.83	8	0
7	30	3.27	8	0
8	30	7.37	8	5
9	30	4.27	8	0
10	30	7.20	8	0
11	23	11.43	20	4
12	5	2.40	4	2
13	10	9.00	16	3
14	30	17.47	25	2
15	27	15.81	24	4
16	25	14.56	25	0



General comments:

The average mark was 60%, significantly lower than in recent years where the average mark has exceeded 80%. This was due to both section A and section B being made more challenging in order to push and distinguish the most able students. The range of marks was good with several students obtaining very high marks. The average mark was more in line with finals and therefore gives students a more accurate indication of their performance and what to expect going forward. The most popular questions in section B were on vectors, very few students attempted question 12 which was on quantum mechanics. The exam paper was free of errors and no questions or ambiguities were raised during or after the examination.

Specific Comments:

1) Standard question on exact differentials. Good range of marks.

2) A question on stationary points and curve sketching. The function was quite a tricky one to sketch but many students did a good job.

3) This questions was challenging although students have seen a similar question on one of the tutorial problem sheets. No one obtained full marks as the students did not simplify the answer. In future the students should be given more guidance, for example, “express the solutions in terms of a constant and a trigonometric function”.

4) Students had to sketch a cone and use the sketch to obtain the surface area and volume. Several candidates did consider the area of the base and others did not use the sketch to help develop the correct integrals. Overall students did quite well on this question.

5) Standard Maclaurin series question. The solution can be obtained very quickly by a substitution although only a few students did this, the majority formally calculated it. High average mark.

6) A limits questions only the limit was 1 instead 0. This proved challenging to many students although several candidates obtained full marks on this question.

7) This required using a suitable substitution to perform an integral which few students were able to do, hence the low average.

8) Standard Eigensystem problem on a 3x3 matrix. The average mark was high.

9) Students had to resolve forces. Several did not normalise the direction and others ignored gravity.

10) Students did well on this question on transformation matrices. The last [3] marks were probably too easy to obtain as they only required a basic knowledge of pure shear rather than any thinking.

11) The first of the long questions. This was quite a popular question and required solving a second order ODE. The average mark was low, several students did well, but no one obtained full marks. A similar problem with the RHS = tan(x) was in the lecture notes. Here a hyperbolic tanh(x) was used. Students needed to evaluate Maclarin series of tanh(x) correctly which few managed to do.

12) Very few students attempted this question and the few that did attempt it did poorly. Possibly the notation confused students. The question consisted of 3 parts, however each part required several calculations and perhaps a similar question should be broken down further in future.

13) This required integrating a Gaussian function and was not very popular. No one achieved full marks due to part (d) being challenging.

14) Every student attempted this question on reciprocal lattice vectors. The average mark was the highest in section B; only a few students obtained full marks due to part (f) being more challenging.

15) This was the second most popular long question and had the second highest average mark. Students were required to use 3D sketching, rotation matrices, and the equation of a plane. Several students ignored their results from previous parts of the question which was designed to make the question easier although still obtained the correct solution using alternative methods.

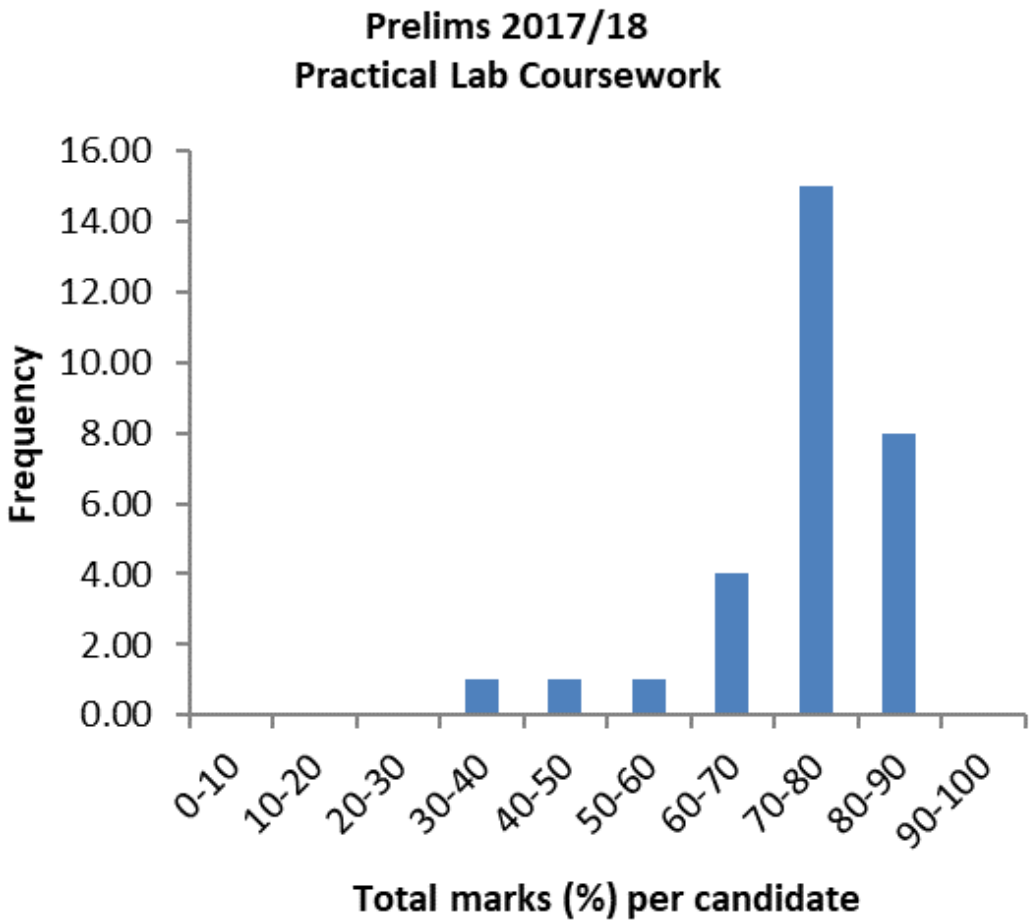
16) This was a standard question on partial differentiation. It was the third most popular long question and had the third highest average mark.

Practical Lab Coursework

Candidates: **30**
Mean mark: **73.6%**
Maximum mark: **88%**
Minimum mark: **36%**

Detailed comments on the coursework are as follows:

Lab No	Average Mark	Highest Mark	Lowest Mark
1P2	8.0	10	4
1P3	8.2	10	3
1P4	6.7	9	4
1P5	7.4	8.6	5
1P6	6.6	8.7	0
1P7	6.3	8.9	0
1P8	7.9	10	5
1P9	7.6	9	1



Report from the Practical Class Organiser for 1st year Practicals 2017-18

I have reviewed the marks from the 1st year Practicals 2017-18. There is a very broad range of overall average marks ranging from 29.5 to 87.6%. The range of marks for an individual practical vary from practical to practical, with 1P7 and 1P9 having a particularly wide range of marks and 1P5 having the narrowest ranges (note, 1P7 was noted as having a wide range last year too). One candidate did not complete one of the practicals. Following the process used last year, the mark assigned to this missed practical was such as to maintain the student's overall ranking in practicals within the cohort.

Gender: I have assessed the marks for gender imbalance by looking to see who has received the highest and lowest marks for each practical and have not found any evidence of bias. The lowest marks have consistently gone to males and the highest marks have, on average, gone to females more than males, however these marks are consistent with the rankings of the individuals overall, i.e. it appears to me that these are underperforming and high performing individuals overall.

Penalties: I have looked at the suggested penalties and am recommending that these are accepted in their entirety. There is one student whose work was submitted too late to allow it to be marked before the end-of-year submission-to-Examiners date. I leave it to the Examiners to decide how to deal with this. I would however like to bring to the attention of the Moderators that one individual incurred a total of 8 penalty marks for late submission

Problems which occurred in the labs during the course of the year which the Moderators should be aware of as potentially affecting candidates' marks: there have been a number of issues which have impacted the practicals this year:

(i) The first practicals for which there is formative feedback given are 1P10 and 1P9. This year the SD for both 1P10 and 1P9 was ill, and feedback was delayed. The SD for 1P2, the next practical, was informed of this. He requested to be allowed to delay the marking of 1P2 in order to allow him to extend the specific feedback on 1P2 he was planning to do, to include more generic matters connected to lab write-ups. Unfortunately, the SD for 1P2 became very ill and the marking sessions had to be further postponed. The SD for 1P5, the next practical, was informed of the situation. All of these delays will have significantly impacted on the students' ability to learn from feedback on their write-ups and hence to improve their performance. However, all of the students underwent the same delays, and so were equally impacted.

(ii) The SD for 1P2 arrived about 30 mins late for his SD briefing, so reducing the time available to Group B to do their practical.

(iii) The SD for 1P5 did not attend the SD briefing for Group A, but instead made a video which was played to the students. The SD was therefore not available to answer the students' questions.

(iv) A higher than usual number of the glass test-tubes that contained the metal alloys used in the 1P6 practical broke and so further data collection was not possible. Where necessary, alternative data-sets were provided to the students who could then use these for their write-ups. They were therefore not disadvantaged. The SD was aware of the situation. A new alloy had been used this year for the practical due to health and safety concerns raised last year. It is believed that it is the new alloy that is the problem and this will be changed for next year.

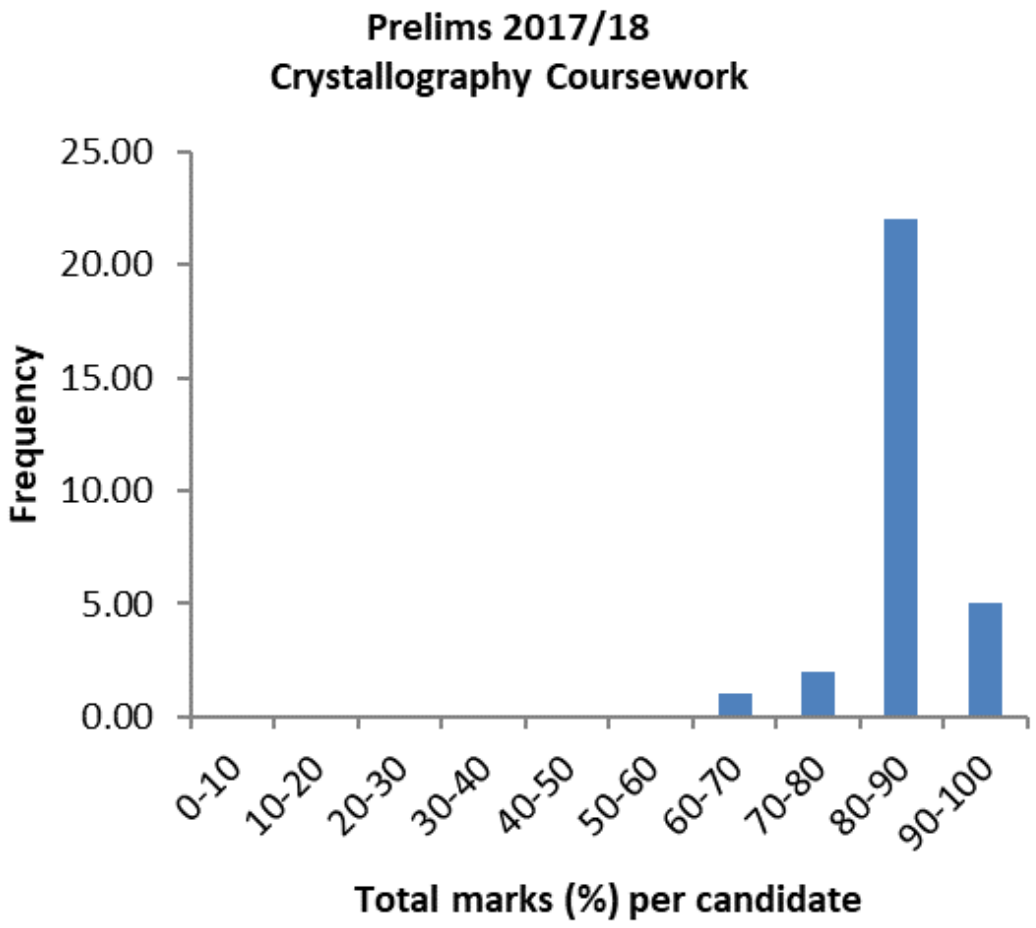
Keyna O'Reilly
Practical Class Organiser
June 2018

Crystallography Class Coursework

Candidates: **30**
Mean mark: **85%**
Maximum mark: **92%**
Minimum mark: **66%**

Detailed comments on the coursework are as follows:

Demo No	Average Mark	Highest Mark	Lowest Mark
D2	8.2	9.5	6.5
D3	8.3	10	5.5
D4	8.8	10	7
D5	8.1	9.5	6.0
D6	9.2	10	6.5
D7	8.6	9.5	7.0
D8	9.0	9.5	8.0
D9	8.9	10	7.5
D10	7.1	9.5	2.5
D11	8.2	10	2.5
D12	9.4	10	8.5



Report from the 1st year Crystallography Class Organiser for 2017-18

All students achieved good marks in the classes, with a final average grade of 84% across the year group.

This year the students were provided a new set of question sheets that had been significantly modified from prior years by a previous demonstrator. Unfortunately many of the questions were ambiguous, to both the students and the demonstrators, making teaching and marking problematic in some cases. This was particularly acute for class 12, where the ambiguity was resolved by allowing for the multiple valid interpretations to be eligible for marks. The failure was reflected in the student feedback for the class.

In the Excel file the final grade is expressed as a percentage calculated as the sum of all the marks divided by the total mark available for the number of classes the student was present in, i.e., discounting absentee classes due to sickness from their final mark. There were two students who were sick for one day each.

Each practical is worth 10 marks, and a half mark is removed for each error so that a maximum mark of 10 is possible. The guided nature of the class means a score of 7 or below (6 or more mistakes) on any one practical indicates that the student struggled with that practical.

The average marks per student ranged from 6.5 to 9.3, with a mean of 8.4. For context, in the year 2016/17 the average marks ranged from 8.2 to 9.7, with a mean of 9.2, and for the year 2015/16 the average marks ranged from 8.2 to 9.2, with a mean of 8.7.

Alex Robertson
Crystallography Class Organiser
2017-18

Examination Conventions 2017/18
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 2017-18. The Department of Materials' Academic 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: http://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 model answers if so requested by the moderators. There are no external examiners for Prelims. The assessed work for the practicals and the crystallography classes 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.

The Prelims paper on Maths for Materials Science 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.

Coursework paper

The Coursework Paper comprises two elements of coursework: a set of eight reports of practical work as specified in the MS Prelims Handbook (normally each individual report within the set has been marked already as the laboratory course progresses); and a set of reports for crystallography (completed under the class schedule).

For formal submission of the practical coursework, the Examination Regulations stipulate that candidates are required to submit the Materials Practical Class reports 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 Materials Prelims Handbook.

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

* for the 2017-18 examinations the Nominating Committee comprised Prof Grant & Dr Taylor.

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

Candidates are not permitted calculators in the Mathematics for Materials examination. SMP tables are provided in all Preliminary examinations.

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.

First year practicals are assessed on a continual basis by the senior demonstrators. The work for the twelve crystallography classes is assessed by the Crystallography Class Organiser(s), the first of these classes being assessed formatively only. Satisfactory performance in the practical work and in the crystallography classes is defined in the MS Prelims Handbook. The Practical Class 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 crystallography and practical 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 their 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 the cover slip is not completed 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 eleven reports of crystallography coursework as specified in the Course 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 Course Handbook and are applied prior to any additional penalties incurred under the provision of the present Conventions.); 2. A set of eight 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. Rules governing late submission of these two 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 2017/18 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 14.4 to 14.9. 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 14.4 to 14.9 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 14.10. In the case of submission on the prescribed day for the submission but after the prescribed time on that day for the submission and without prior permission from the Proctors: 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, taking into account any circumstances communicated to the moderators by the Proctors should they approve a request by the candidate, submitted to the Proctors via the Senior Tutor of their college within five working* days of notification of non-submission, that the moderators take into account the circumstances of the late submission.

(c) Under para 14.11. In the case of submission 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%.

(d) Under Para 14.12. 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 the Preliminary Examination as a whole, as stated in the Special Regulations for the Preliminary Examination in Materials Science.

Where an element of coursework is not submitted or is proffered more than 14 days after notification of non-submission the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Moderators, permit the candidate to remain in the examination. In this case for the element of coursework in question (i) the Moderators will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires a minimum mark of 40% if the candidate is not to fail the examination as a whole.

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 2017/18 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 9.6 and 10 of the 2017/18 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 Chairman 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). He or she will make one of three decisions

(http://www.admin.ox.ac.uk/media/global/wwwadminoxacuk/localsites/educationcommittee/documents/policyguidance/Plagiarism_procedures_guidance.pdf):

(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. 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).

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.

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.

6. FACTORS AFFECTING PERFORMANCE (FAP)

[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.]

Where a candidate or candidates have made a submission, under Part 13 of the Regulations for Conduct of University Examinations, that unforeseen factors may have had an impact on their performance in an examination, the moderators 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.

Normally, this FAP 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 FAP impact level, the moderators will take into consideration 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 FAP meeting: in Part B a candidate's results are discussed in the light of the impact of each FAP and recommendations formulated regarding any action(s) to be taken in respect of each FAP.

Further information on the procedure is provided in the *Policy and Guidance for examiners, Annex C* and information for students is provided at www.ox.ac.uk/students/academic/exams/guidance. It is very important that a candidate's FAP 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 2018 are: Prof Michael Moody, Prof. Kyriakos Porfyrakis (Chair), Prof. Susie Speller and Dr Ed Tarleton. 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 Chairman of Prelims.

ANNEX

Summary of maximum marks available to be awarded for different components of the MS Preliminary Examination in 2018:

Component	Mark
Materials Science 1: Structure of Materials	100
Materials Science 2: Properties of Materials	100
Materials Science 3: Transforming Materials	100
Mathematics for Materials Science	100
Coursework Paper:	
Crystallography Classes	50
Practicals	50
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		
	2017/18	2016/17	2015/16	2017/18	2016/17	2015/16
Distinction	n/a	n/a	n/a	n/a	n/a	n/a
Pass	32	28	33*	100	100	100*
Fail	0	0	0	0	0	0

* One of these candidates failed to achieve honours pass (and had previously also failed to achieve honours in 2014/15) and so will not progress to part II.

(2) **If vivas are used**
As stated in the Examination Conventions, vivas are no longer 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

There were no new procedures or examining methods introduced this year.

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

The current procedure is that for the four general papers the lecturers propose draft questions to the examiners, but the papers are marked by the examiners only (2 examiners per paper, double blind). In contrast the two option papers are marked by the lecturer and by one examiner (again double blind). The Chair feels that the department should consider whether all exam papers should be marked by the lecturer and an examiner. There will be some administrative cost to adapting this model, but potential advantages include: reduced load on the examiners as the number of on course students is rising, providing feedback to the lecturers on the performance of students on their course.

D. EXAMINATION CONVENTIONS

The current year's Conventions were put on the Departmental website and sent electronically, along with other information in a letter from the Chair of Examiners to all candidates on 2 March 2018. 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 32 candidates for the examination, all of whom were awarded Honours. 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. Four candidates opted to take a supplementary subject; one candidate 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 either a module on Materials Characterisation (six candidates) or one on Materials Modelling (twenty-six 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 Options Paper 1, 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. For Options Paper 2, candidates were offered twelve questions in six 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.

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, but, after consideration of the candidates, this was not applied by the examiners this year for any of the candidates.

The Business Plans, submitted in the second year, were marked by an Assessor from the Knowledge Exchange and Impact Team of Research Services and an Assessor appointed to represent the Faculty of Materials, again with teams being marked as a group.

Candidates' work on the two coursework modules was marked by two Assessors. One of the examiners further examined a number of representative scripts from both modules, 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.

The overall mean mark for Part I was a little above the mid-range of the 2(i) band. All general papers and option papers results were considered. After extensive deliberation, and in accord with the Conventions, the examiners decided that no scaling was necessary. GP1, GP2 and GP4 were toward the middle of the 2(i) band, with OP1 at the bottom of the 2(i) band, and OP2 at the top of the 2(ii) band. GP3 was at the lower end of the 1st class band. All MS and MEM General Paper and Option Paper results were considered by the examiners and it was agreed that the papers were fair.

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 66.01%, F 63.59% (Overall 65.33%)
Coursework Averages – M 68.60%, F 70.93% (Overall 69.25%)
Overall Part I Averages – M 66.65%, F 65.43% (Overall 66.31%)

Insofar as can be judged from the small sample size, the performance of male and female candidates was not significantly different. This statement is based on the standard deviation of the written paper averages, which was ±9.08% points for the male candidates and ±11.6% points for the female candidates. Both male and female groups of candidates performed better in the coursework than in written examinations.

	Overall mark		Written Examinations		Coursework	
mark (%)	Male	Female	Male	Female	Male	Female
30-40	-	-	-	-	-	-
40–50	-	1	1	1	-	-
50–60	4	1	4	2	1	-
60–70	11	4	12	3	13	3
70–80	8	2	5	2	9	5
80–90	-	1	1	1	-	1
Totals	23	9	23	9	23	9

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

Seven applications for consideration of Factors Affecting Performance were received. In five cases these included medical certificates: all concerned performance during the main set of written papers in Trinity term. One case consisted of the candidate's statement only and the other case consisted of the candidate's statement and a statement from the college. Cases ii, iv, and vi were considered to have had serious impact, case v was considered to have had moderate impact while cases iii and vii were deemed to have generated only minor impact. The examiners considered each case carefully and a fair course of action was agreed. This was documented in FAP reports to be made available to examiners for Part II.

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

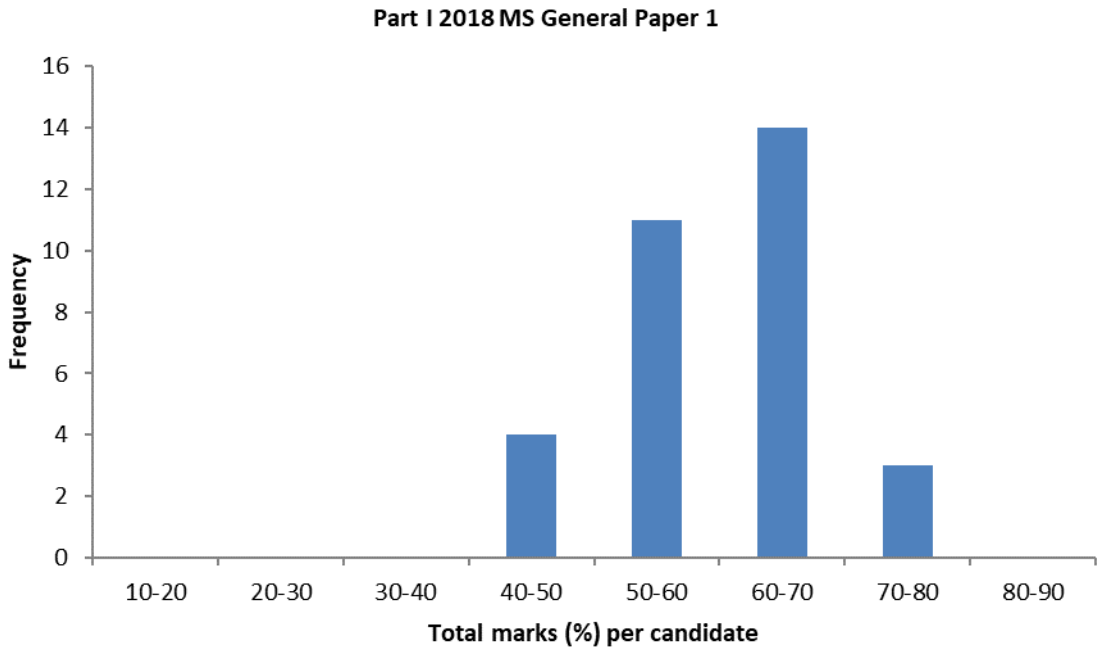
Prof. M.R. Castell	Prof. P.S. Grant
Prof. S. Lozano-Perez	Prof. T.J. Marrow
Prof. R.I. Todd	Prof. J.R. Yates (Chair)
Prof. A.J. Davenport (external)	Prof. M.J. Reece (external)

General Paper 1 – Structure and Transformations

Examiner: **Professor Sergio Lozano-Perez**
Candidates: **32**
Mean mark: **60.91%**
Maximum mark: **77%**
Minimum mark: **41%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	20	13.73	18.5	8.5	Microstructure of Polymers
2	24	11.48	17	7	Surfaces and Interfaces
3	22	11.57	17.5	7	Phase Transformations
4	16	12.38	19	5	Ternary phase diagrams
5	19	11.50	17	7	Corrosion and Protection
6	24	12.29	16	7.5	Corrosion and Protection
7	16	10.94	15	5	Powder Processing
8	19	12.37	18	7	Phase Transformations



General Comments

GP1 had an average of 60.9%, which is somewhat lower to the last two years (63.4 and 62.5%), but higher than three years ago (59.2%). The candidates displayed a good understanding of the topics involved, with no candidates scoring below 40, although none scored above 80 either. The most significant difference with respect to last year's performance is that many more candidates got marks in the 60-70 range, which is a clear improvement. All questions had an average score above 50%, which is also better than last year, with 2 questions below that.

Specific Comments

1) This question covered some basic topics on polymers, with the final sections giving the candidates the chance to demonstrate their knowledge on Newman projections and polyehthylene. It was relatively popular, with 62% of the candidates choosing it. The average score was 68%, the highest in GP1.

2) Question 2 covered the influence of surface on materials properties. It started with some basic questions which were answered correctly by most of the candidates. Section b) required some knowledge on Wulff plots and how to use them to calculate surface energies. This proved more challenging and only a handful of candidates got it right. It was chosen by 75% of the candidates, the most popular question, together with question 6. The average score was 57%.

3) Question 3 covered the topic of diffusion in solids and, in particular, the case where in occurs through alternating layers of different composition. The first sections were relatively easy, covered in various lectures and most students got them right. The final sections, where the mathematical formulation of the multilayer diffusion had to be explained and used was relatively harder and not many students reach the final point required for section e). It was attempted by 69% of the students, with an average score of 58%.

4) Question 4 covered ternary phase diagrams. A ternary system was sketched and the type of reactions plus the extraction of binary phase diagrams was requested in the first sections. This was achieved quite satisfactorily by most candidates. The final section, where the lever rule was required to extract some quantitative compositions, was found to be harder, although many candidates improvised an answer which still gave them some marks. This question was attempted by 50% of the candidates, the least popular one together with question 7. The average score was 62%.

5) Question 5, one of two on Corrosion and Protection, described a real case study where the students had to make use of the key concepts learned in the course to explain what was the cause of an accident in a plant and considered alternative scenarios. The first task was relatively successful, but not the second, where most of the students forgot that the key parameters provided for the materials had to be re-adjusted for the operating conditions of the plant. It was chosen by 70% of the candidates, the most popular question, together with question 2. The average score was 57%.

6) Question 6 was the 2nd Corrosion and Protection question and was mostly a textbook question where the candidates also had to propose practical applications for the protection methods involved. The theory part was done relatively well, but some of the practical applications proposed where not very realistic. It was chosen by 75% of the candidates, the most popular question, together with question 2. The average score was 61%.

7) This question covered the topic of powder processing. The candidates had to describe the process in general terms and justify its application for specific cases. Then, they had to provide details on how to use it for a high-quality turbine component. Most candidates described the process correctly, but then didn't make their answers specific to the type of materials/situations described in the question. This prevented them from achieving high scores. This question was attempted by 50% of the candidates, the least popular one together with question 4. The average score was 55%, the lowest of all the questions.

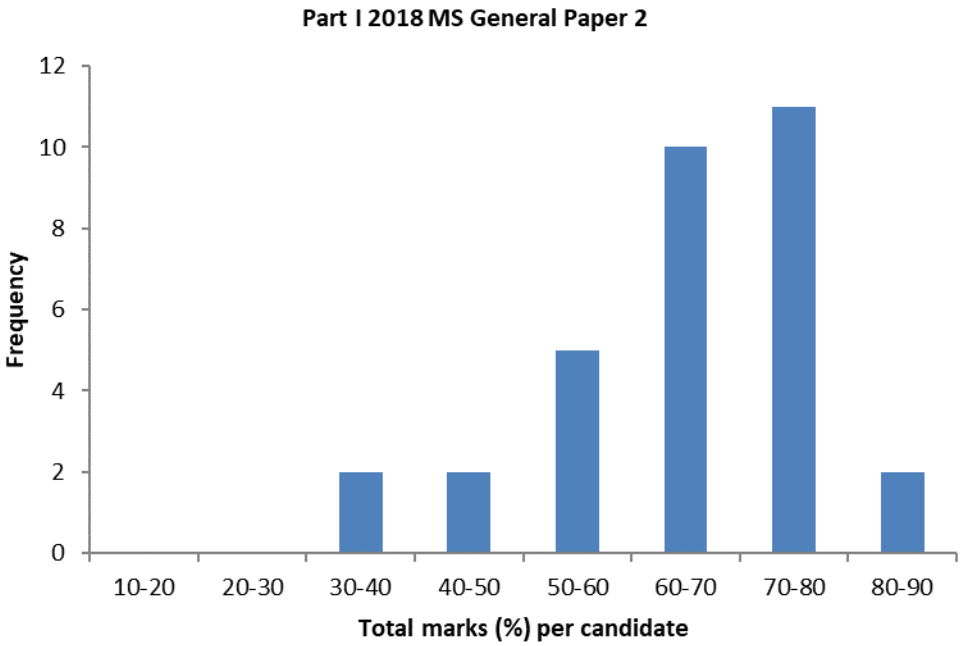
8) This question required the students to identify microstructures from real images provided (6 of them). Then, they were asked to explain how they had been processed. Most of the students got all the images right, and the interpretation of the processing details was also very successful. It was attempted by 59% of the students with an average score of 62%.

General Paper 2 – Electronic Properties of Materials

Examiner: **Professor Jonathan Yates**
Candidates: **32**
Mean mark: **65.44%**
Maximum mark: **86%**
Minimum mark: **36%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	30	12.22	16	2.5	Quantum & Statistical Mechanics
2	32	14.72	19.5	1.5	Quantum & Statistical Mechanics
3	14	10.39	17.5	2.5	Electronic Structure of Materials
4	12	12.46	18	4.5	Electronic Structure of Materials
5	23	12.20	16	7.5	Magnetic Properties
6	12	12.96	18.5	6	Tensor Properties of Materials
7	11	13.82	17.5	11	Electrical & Optical Properties
8	25	14.06	19	6	Semiconductor Materials



General Comments

Overall a good distribution of marks around a mid-2:1 average. The distribution was not even with more marks in the 1st category, and a long tail of low marks. The take up of questions are quite uniform this year. Many of the questions had a final challenging section - and while some candidate made good attempts, no candidate obtained full marks for any question. As might be expected, bookwork questions where well answered. Numerical and analytic questions were less well answered when they differed from previous years examples. Students need to be prepared to tackle unfamiliar problems - using the knowledge gained from the course.

Specific Comments

1) This was a well-structured question on wave functions and their interpretation. The first parts were routine bookwork and scored high marks. The final sections demanded a good grasp of the concepts of eigenstates, wave functions and measurement. There were few good answers to these parts.

2) This was a well-structured question. It was popular, attempted by almost all candidates. Many of the sections required a formula to be derived. Good candidates laid this out clearly, explaining each step and assumption. Unfortunately some candidates jumped too quickly to the given answer - even when there where mistakes in their derivation. Such answers did not score highly.

3) This question on Bloch's theorem and bands in solids was attempted by half of the candidates. The early sections were bookwork. Few candidates produced a correct band structure in (f) - typically let down by simple errors. This meant the question was relatively low scoring.

4) This question concerns a 2D tight binding model. Many candidates failed to plot the band structure correctly in (c) however, they were still able to compute the effective mass and so gained marks in (d). Only one candidate produced a correct answer for (e) although this only required candidates to substitute numbers into the expression obtained in (d).

5) The section on domain formation was very standard, and typically answered well, as was the discussion of the AC susceptometer. Many candidates correctly plotted the graph of 1/susceptibility vs T, but not all interpreted the data correctly - some candidates reported the magnetic ordering temperature to be less than zero Kelvin. Some credible attempts were made at suggesting the electronic configuration.

6) This was a relatively straight-forward tensors question. Many of the candidates who attempted it managed to set up the appropriate rotation and find the capacitance. Surprisingly (c) did not score well. Candidates typically failed to construct a logical argument to address the question. One successful approach is to start with Neumann's principal and consider the shape of the representation surface.

7) This question on dielectric loss was mostly bookwork. It was well answered. Few candidates understood how a microwave oven functions.

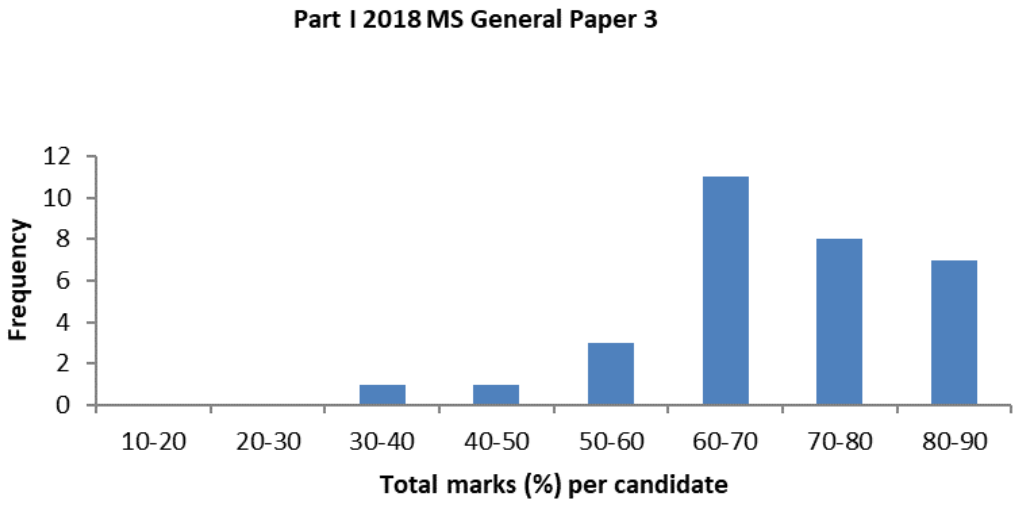
8) Sections (a) and (b) of this question covered carrier concentration in semiconductors. It was mostly bookwork and consequently score highly. The final section on a "hot probe" experiment did not score so highly - candidates often proposed spurious mechanisms behind the experiment.

General Paper 3 – Mechanical Properties

Examiner: **Professor James Marrow**
Candidates: **32**
Mean mark: **70.81%**
Maximum mark: **91%**
Minimum mark: **40%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	21	14.05	17	10	Elastic Behaviour in Isotropic Solids
2	27	15.24	19.5	8.5	Microplasticity
3	29	13.48	19	6.5	Microplasticity
4	15	14.17	18	10	Creep
5	19	17.34	20	0.5	Macroplasticity
6	21	12.29	18	8.5	Fracture
7	14	9.54	15	1	Mechanical Properties of Polymers
8	14	15.14	19	10.5	Mechanical Properties of Composites



General Comments

A generally uniform selection of questions of similar difficulty. Marks were generally lost through lack of detail that was relevant to the point that the question was addressing, and errors or lack of clarity in derivations. In the latter, there were quite a few solutions where marks were lost as steps taken to achieve the algebraic solution were quite unclear. Candidates are encouraged to explain all the steps that they are taking, including substitutions, cancelling out of common factors and approximations.

Specific Comments

1) Part a) was answered correctly by all, as was b) i), though not all explicitly excluded the plane strain as a possible state. b) ii) was also answered correctly by almost all (with some minor errors inserting values into solutions). Part c) was generally well answered. Part d) required candidates to identify that the displacements were equivalent to a rigid body rotation (covered in notes and lectures), but none were able to do this.

2) Part a) mostly correct, but some did not clearly use notation to identify the stress as a tensor or the line vector as a unit vector, and some did not clearly show that a dot product was required. Part b) was generally well done, but some did not identify the need to calculate the component of force in the slip plane and some used creative algebra to achieve the intended result. Part c) some did not correct identify the equivalent relationship between force/unit length and stacking fault energy. Part d) mostly correct, though not all emphases the requirement for recombination of the partials to achieve cross-slip.

3) Part a) many did not consider the fact that the y distance is constant as the dislocation is confined to the slip plane. Part b) generally all parts well done, but most needed to more clearly explain their derivations and the assumptions made. Part c) Generally very well done, although some confusion where candidates incorrectly described cutting as a bypass mechanism. Diagrams needed to more clearly show how the different strengthening mechanisms were combined to give the total effect.

4) Part a) not all emphasised the time dependence and permanent nature of creep strain, not the temperature and stress regime required. Part b) most identified the importance of grain shape change, but few explained clearly the mechanisms by which this occurred (diagrams were drawn, but not explained well). Part c) mostly well answered although some neglected to discuss either stress or temperature as controlling parameters (and their limits). Part d) well answered, but most did not consider in much detail the alternative processes, nor the microstructure of Ti64 and the absorption of oxygen by Ti alloys that is beneficial for diffusion bonding.

5) Very well done by almost all who attempted the question. Some did not clearly explain the redundant work in part c).

6) Part a) generally well done, but not all clear on what is actually meant by stress intensity. Part b) mostly correct, but few were clear on why the plastic zone led to tensile stresses that drive stable crack propagation, and not all gave a sufficient set of clear advantages and disadvantages. Part c) few obtained correct solution, due to unit errors, mis-measurement of crack length and incorrect calculation of hardness. d) most did not understand how the thermal treatment would lead to compressive residual stresses, with many thinking that it changed the properties of the glass.

7) Part a): Quite a few candidates incorrectly calculated the moduli (including units), and did not sensibly compare using a ratio. Part b) mostly correct, but needed cleared explanations in terms or glass transition and composite theory. Part c) most gave a good account of crazing, but not all mentioned the contributions from crack blunting and deflection. Part d) few described the tensile criteria for crazing, which cannot occur in compression, and none correctly included the pressure dependent yield criteria into the von Mises equation to calculate the uniaxial compressive strength. Part e) generally well done, but not all explained that the whitening was due to light scattering and the connection with the size of the scattering features.

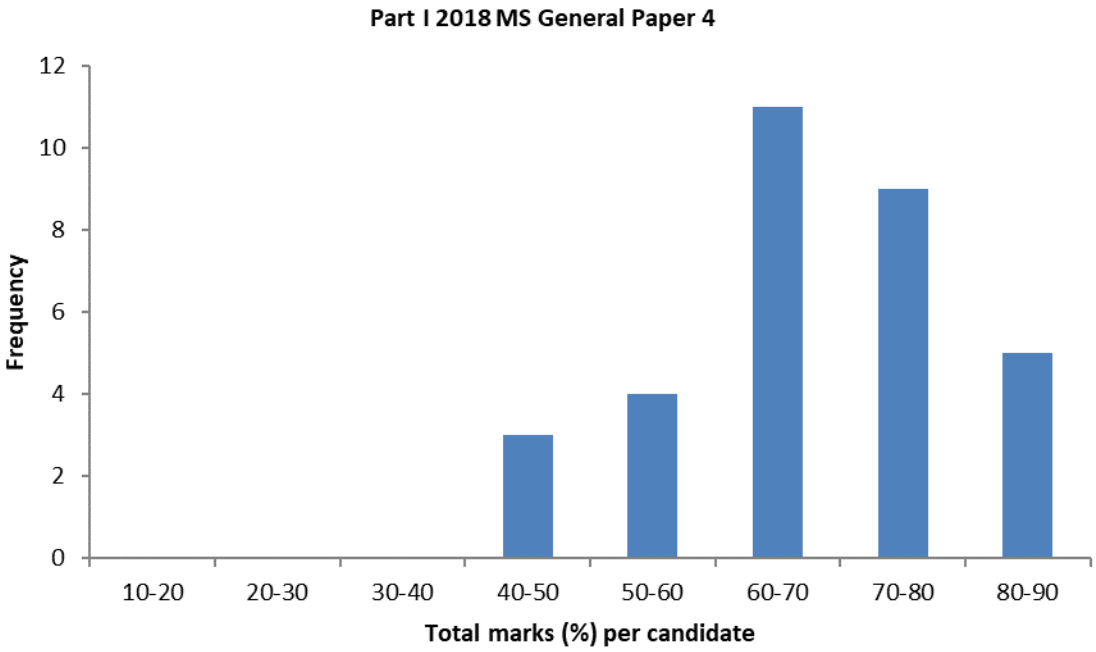
8) Part a) few discussed the work of fibre and matrix fracture but most did identify fibre debonding and its effect on crack path. Part b) i) generally well done, but not all explicitly explained how the shorted fibres limited the toughness, ii) well done by all who attempted it. Part c) generally well done, apart from numerical and unit errors, though quite a few did not derive the correct interface strength from the matrix yield strength and so obtained incorrect solutions.

General Paper 4 – Engineering Applications of Materials

Examiner: **Professor Richard Todd**
Candidates: **32**
Mean mark: **68.1%**
Maximum mark: **87%**
Minimum mark: **46%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	18	12.97	17.0	4.5	Applications of Polymers
2	23	13.20	17.5	5.5	Semiconductor Devices
3	12	7.96	17.5	4.5	Microstructural Characterisation
4	28	13.82	18.5	7.0	Microstructural Characterisation
5	7	12.93	16.5	8.5	Engineering Alloys
6	13	14.73	18.0	9.5	Engineering Alloys
7	31	15.89	18.5	11.5	Ceramics and Glasses
8	28	12.96	20.0	5.5	Ceramics and Glasses



General Comments

The mean mark for the paper corresponds to a high 2(i) and a significant proportion of candidates scored high 1st class marks overall. Given the wide range of topics covered, this is a demonstration of the impressive and comprehensive knowledge of many of the candidates. At the same time, the fact that some students had 3rd class and 2(ii) marks overall shows that there was a reasonable spread of difficulty and that the paper distinguished satisfactorily between the most able and best prepared candidates on the one hand, and those who were less proficient on the other. The lowest scoring question (3) was perhaps difficult because of the involvement of several matters requiring detailed analysis, but the highest score of 17.5 demonstrates that it was a fair question which allowed the best to parade their skills. At the other end of the scale, the highest scoring question (7) perhaps allowed candidates to benefit from their multiple encounters with sintering, but the ability of most candidates to answer this discursive question with sufficient precision to accrue high scores suggests that they were worthy of the marks. The mean marks for the other six questions were all within 1.1 of the mean for the paper and there was no correlation between the popularity of these questions and the mean mark.

Specific Comments

1) **Engineering Applications of Polymers.** A nicely graded question regarding mechanical anisotropy in polymers and its relation to processing. A few candidates scored very low marks owing to a lack of basic knowledge but most candidates grasped the main points, and a good proportion of the answers had sufficient detail to attract 1st class marks. The marks could have been higher had more candidates correctly addressed the part of the question relating to specific stiffness.

2) **Semiconductor Devices.** Question concerning the operation of bipolar transistors. Few candidates were completely convincing about the mechanism of voltage amplification, which is perhaps the most important point, but there were plenty of opportunities to pick up sufficient marks in the rest of the question.

3) **Microstructural Characterisation of Materials.** Elegant question attempted by a minority of candidates on diffraction contrast in the TEM. One candidate scored highly but the other marks were low ($\leq$ 11) and tended to show a lack of knowledge and understanding about basic matters such as the geometry of a standard TEM, the crystal structure of aluminium and the rules for systematic absences. This seems to have been the question of last resort for many.

4) **Microstructural Characterisation of Materials.** Very popular question on SEM in comparison to optical microscopy. There were many high scoring answers but a few candidates struggled to distinguish between magnification and resolution, and to understand the concept of depth-of-field.

5) **Engineering Alloys.** Only 7 candidates attempted this question but most of those who did, knew enough to accrue good marks. Few candidates fully appreciated the crystal structures best suited to the particular applications examined in part (b).

6) **Engineering Alloys.** Question on Al alloys done by a little under half the candidates. Most displayed good knowledge and were marked accordingly.

7) **Ceramics & Glasses.** Question mainly on the sintering of ceramics, attempted by all candidates bar one. There was clear input to many answers from overlapping courses, notably the OP1 course on Engineering Ceramics and the GP1 course on Powder Processing. Since the latter concerns metals, some answers contained inappropriate answers concerning plastic deformation and dislocations. The overall average for the question was high nonetheless.

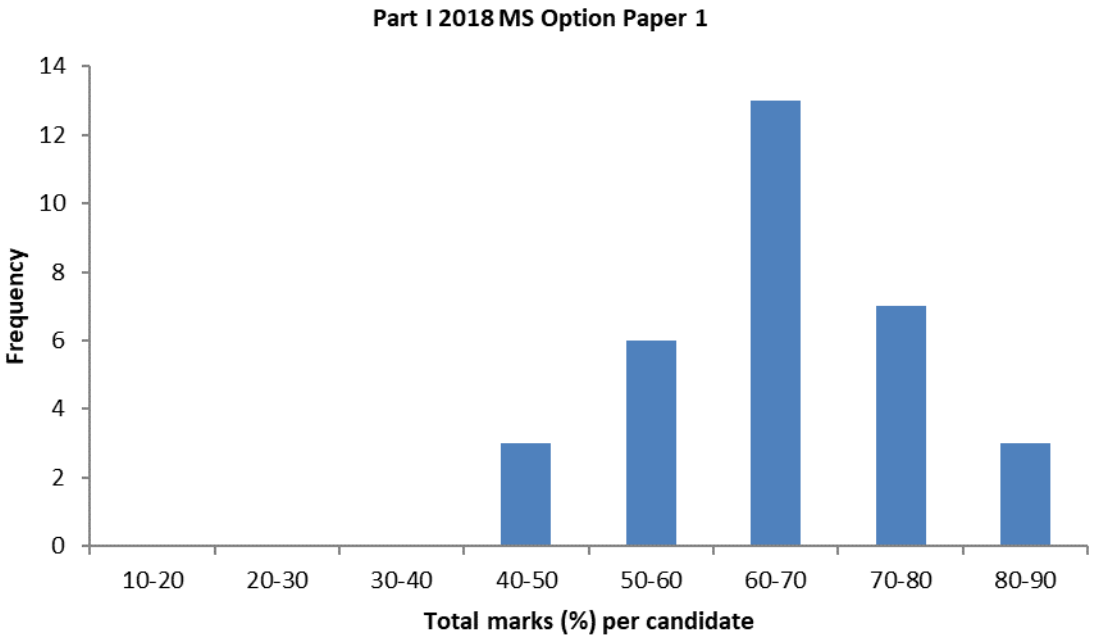
8) **Ceramics & Glasses.** Defect structures in ceramics. Another popular question, with many good answers. Most candidates appreciated the main points though a few struggled with the rules of Kröger-Vink defect equations.

Materials Options Paper 1

Examiner: **Professor Martin Castell**
Candidates: **32**
Mean mark: **65.16%**
Maximum mark: **90%**
Minimum mark: **43%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	18	14.64	19	9.5	Strength and Failure
2	11	14.95	21.5	7.5	Strength and Failure
3	2	17.25	21	13.5	Nanomaterials
4	4	17.25	21	12.5	Nanomaterials
5	13	17.04	24	11	Prediction of Materials Properties
6	7	16.71	25	8	Prediction of Materials Properties
7	19	17.55	23	9.5	Optics and Optoelectronics
8	16	17.13	22.5	11.5	Optics and Optoelectronics
9	13	14.81	20	10.5	Engineering Ceramics
10	25	15.66	21	6	Engineering Ceramics



General Comments

The average for this paper was 65%, which falls in the middle of the aspirational range for finals papers, and indicates that the paper was set at an appropriate level of difficulty. There was a broad range of marks, from 43% to 90%, allowing the stronger students to distinguish themselves. As in previous years, the *Nanomaterials* questions were particularly unpopular and were answered by few students, namely Q3 (2 answers) and Q4 (4 answer). This again reflects poorly on the *Nanomaterials* course, and this issue should be addressed by the department.

Specific Comments

1) This question on *Strength and Failure of Materials* covered the topic of cyclic deformation under strain control. The students had to determine primary slip systems for Cu (a fcc material) in the first section and, surprisingly, mostly got it wrong, probably because although the theory is very easy, they had never attempted it by themselves before. Then they had to provide details about the testing strategy and explain how the microstructure evolves during the test. Most of them did this satisfactorily, although not relating the answer to the particular material mentioned in the question. This question was attempted by 56% of the candidates, with an average score of 59%, and was the lowest scoring question.

2) The second question on *Strength and Failure of Materials* was related to the principles of linear elastic fracture mechanics and involved a bit of textbook theory and some relatively easy calculations. This was achieved by most of the students, although the analytical part of the question unexpectedly often resulted in the wrong numerical answer, mostly due to very basic errors. This question was attempted by 34% of the candidates, with an average score of 60%.

3) *Nanomaterials*: This question encompassed a variety of elements related to properties of materials at the nanoscale. It was answered by only two students, which is a general reflection on the popularity of this course.

4) *Nanomaterials*: This question concerned the synthesis and properties of fullerenes and the NMR spectrum of an organic molecule. Four students answered the question. The question was of an appropriate breadth and depth.

5) *Prediction of materials properties*: This was a relatively standard question on manipulating the theoretical description of a H_2^+ molecular cation. It was attempted by just under half the students and was generally answered quite well. The question was appropriately structured and had a good range of elements including descriptions, mathematical manipulations, and plotting a graph.

6) *Prediction of materials properties*: This question was answered by 7 students, with a very broad range of results. The question was actually rather easy, involving mainly straightforward mathematical manipulations related to the theoretical treatment of excitons in a semiconductor, and could have been successfully tackled by a student who had not attended the lectures but was clear-headed enough to manipulate the equations without making errors. Perhaps it was the complexity of the equations that put off some of the students from attempting this question. Part (e) was a trivial substitution and all the students scored full marks [5] for this part. Questions in future years should rely more heavily on exploring elements of the taught course.

7) *Materials for devices for optics and optoelectronics*: This question was on light emitting diodes. It was popular and answered by 19 students, most of whom did well. The majority of the question was seeking descriptive answers, with only a few relatively simple calculations that did however require an understanding of the subject matter. The question was appropriately graded in that the final elements were least successfully answered. This was the highest scoring question with an average of 70%.

8) *Materials for devices for optics and optoelectronics*: The question was on various aspects of optical waveguides and optical fibres and was attempted by half the students. The elements of the question did not increase in difficulty with the result that some of the later parts were

answered more successfully than some early parts. This really was mainly a reflection of the three parts being rather separate questions. Generally the students answers were good. There was a little simple maths at the beginning, with most of the question being of a descriptive nature.

9) This question on *Engineering Ceramics* referred to the Bayer process on alumina powder. The candidates were expected to explain some of the processes along the processing route, which, although identified correctly, lack any detail description for the majority of the answers. Because of this, the scores where one of the lowest on average in OP1. This question was attempted by 40% of the candidates, with an average score of 59%.

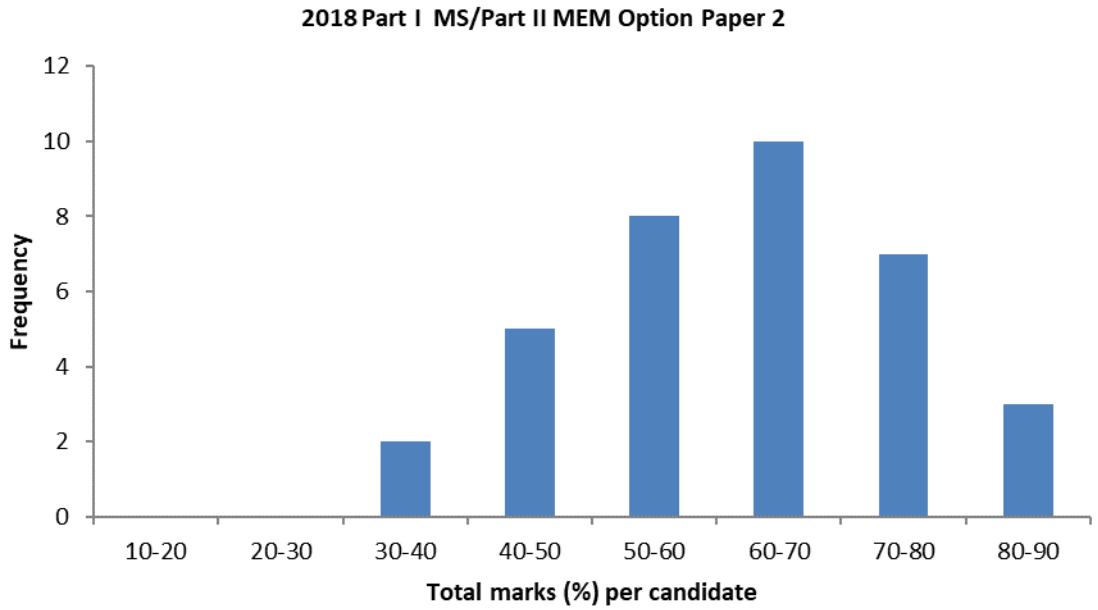
10) The 2nd question on *Engineering Ceramics* dealt with crack growth rate testing for ceramic oxides. A plot was provided and the candidates were expected to identify and explain all the relevant parts and provide an analytical expression for one of them. These sections were relatively well answered and candidates got most of the marks. Then, another plot was provided where the specific surface area of the powered had to be estimated, together with the mean particle diameter. This was easily achieved by fitting the equation of a line to the plot and looking at the intercepts with axes and slopes. Even when the equation of the line was provided, there were a relatively low number of candidates who answered this part correctly. Finally, a 3rd plot showing a Strength-Probability-Time diagram was given in section c) and the candidates were expected to estimate stresses for probabilities of survivals, explain the answer and estimate some median strengths for specific situations. This part was not very successful and most of the candidates didn't follow the procedure to calculate probabilities correctly. This question was attempted by 78% of the candidates (the most popular in OP1), with an average score of 62%.

Materials Options Paper 2

Examiner: **Professor Patrick Grant**
Candidates: **35 (32 MS / 3 MEM)**
Mean mark: **62.09%**
Maximum mark: **85%**
Minimum mark: **37%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	19	17.11	22.5	11.5	Advanced Polymers
2	22	15.07	21	6	Advanced Polymers
3	14	18.00	23.5	8	Manufacture with Metals and Alloys
4	3	13.50	16.5	11.5	Manufacture with Metals and Alloys
5	12	11.17	14.5	6	Materials for energy prod^{n}, distrib^{n} & storage
6	8	14.75	18	6.5	Materials for energy prod^{n}, distrib^{n} & storage
7	4	17.25	20	14	Advanced Engineering Alloys and Composites
8	7	14.07	19.5	9.5	Advanced Engineering Alloys and Composites
9	20	15.73	21.5	8.5	Biomaterials and natural materials
10	17	13.76	19	9	Biomaterials and natural materials
11	9	16.67	24	5	Devices
12	5	16.70	21.5	9.5	Devices



General Comments

A satisfactory paper with a good spread of marks selection, range of individual question scores and overall paper average. Biomaterials and Advanced Polymers questions very popular; one each of the Devices and Manufacture with Metals and Alloys least popular.

Specific Comments

1. Polymer characterisation and reptation.
   Very good understanding/differentiation of information available from coherent/incoherent small angle neutron scattering; good sketches and understanding of basic components of a SANS instrument, momentum transfer and the elastic wave vector; a few candidates had details of the SANS instrument missing. Mostly good answers on why the angular position of the detector relative to the straight through beam direction in a SANS instrument should be relatively shallow, using a simple manipulation of Bragg's law. Ideas of how to provide contrast of the material of interest in SANS had some misunderstanding of the question and considered the nanospheres, rather than the chains grafted onto their surface. Good qualitative answers on reptation mechanisms and constraints.

2. Random walk in polymers and characterisation.
   (a) Very good answers on random walk and interpretation of tabulated data on the effect of monomer number in the Kuhn segment length. Very good definitions of key descriptors of polymers such as radius of gyration and others. However, considerable confusion in calculating these descriptors based on the schematic cellulose diacetate monomer unit (and a mistake in the model answer, for which account was made). Poor answers in applying the arising insights to the formation of polymer films from the same monomer unit. (b) Good understanding and answers on the factors affecting polymer solubility.

3. Cast irons and the control of microstructure.
   (a) generally well done, but not all identified that graphite was the equilibrium phase and the relative properties of graphite and cementite, while some were unclear on the mechanism by which FeSi produced SiO2. (b) generally well done, but not all were clear on how S affected the pyramidal plane energy nor the structure of spherulites. (c) generally well done, but most did not provide detailed explanations and some were incorrect on the properties of the molten iron oxide. (d); generally well done, though not all expressed clear understanding of the importance of undercooling on the nucleation rate as well as the growth mechanism.

4. Welding processes and bonding
   An unpopular question despite being relatively straightforward requiring qualitative answers and schematic drawings only. (a) Very good description of differences between solid state and fusion welding processes. (b) Some confusion on the details of magnetically impelled arc butt welding. (c) Reasonable but sometimes garbled answers on the welding of rail sections. (d) Difficulty in identifying/differentiating modern methods of rail joining.

5. The turbine cycle, hydrogen production and energy storage.
   (a) Quite a few gave poor diagrams/charts and few described the isobaric and isoentropic stages correctly. (b) (i) Very few described the chemistry or the endo/exothermic processes correctly; (ii) most did not provide technical advantages/disadvantages (e.g. technology maturity, scale, endothermic reactions, produce purity) and discussed in terms of carbon emissions; (iii) most did not describe the correct reaction or identified that the reaction is not reversible. (c) (i) Descriptions of supercapacitors were mostly superficial; (ii) most battery/supercapacitor differences were identified, but few commented on the voltage vs time of the outputs of Li-ion batteries and super capacitors.

6. Nuclear power and materials.
   (a) Most gave an account of various ageing mechanisms, but few considered how these affected the load factors, maintenance and power output over lifetime. (b) Some accounts of the ageing mechanism were confused, and some failed to identify that embrittlement reduced

toughness, which would allow propagation of cracks that exist in welds. (c) (i) Some confusion over terms, particularly thermal nuclear reactor (one operating with thermal energy neutrons) and reactivity coefficient (variation of reactivity with temperature); (ii) most accounts were essentially complete.

7. Titanium alloys.
   (a) Essentially well done, with most providing sufficient detail on the effects of the elements on microstructure. (b) Most sketches were adequate. (c) Generally correct in the heat treatment though details on conditions of operation (fatigue/temp) were sometimes vague and lacked confidence.

8. Nucleation and growth in alloys, martensite and composites.
   (a) Good answers differentiating between nucleation and growth and spinodal decomposition, including composition versus distance graphs, and similarly for free energy versus composition diagrams. Much less competent on, and occasionally skipped, temperature versus composition plots showing the coherent spinodal region over a range of temperatures and compositions. (b) Good thermodynamic description of the austenite to martensite transformation. (c) Basic descriptions of GLARE composites, few understood the interaction of residual stress patterns and fatigue.

9. Hierachical structure of bone.
   (a) Very few identified reasons that include the small amount of material that cells can produce and the mechancical/biochemical interactions that organise the tissue. (b) Mostly well answered, with some lacking correct details. (c) (i) Quite a few did not identify the value as that of fully dense cortical bone; (ii) confusion of the emphasis on scatter in density, whereas it is the variations in structure that cause variation in modulus for measured density; (iii) most recalled correctly the structure/property relations, but few explained why uniaxial prisms are not observed in bone. (d) Most identified the mechanical effects and fibrous encapsulation, but most neglected other short term effects (protein adsorption, phagocytes) and Cr ion release.

10. The mechanics of biomaterials.
    (a) (i) While many explained how the J-curve occurs, few explained why or how it affected fracture resistance (strain energy release rate); (ii) some confusion about thickening and thinning, with few explaining how the elastic instability occurs as stiffness increases towards rubbery behaviour; (iii) while most identified the polymers, few gave full explanations in terms of properties (include J curve). (b) Mostly well answered, except where there was confusion between lubrication and cushioning. (c) (i) Most accounts of micelle and liposome formation were complete; (ii) many did not discuss the locations where water or fat-soluble drugs would be held, nor functionalisation of liposome walls.

11. Functional ceramics.
    (a) Good interpretation of tabulated data of ionic radii of elements and how they perform as dopants in titanates. (b) Mostly good qualitative understanding of ageing of ferroelectric oxides; slightly slight less knowledge regarding aliovalent substitution. (c) Most able to identify good elemental candidates for p-doping from the table, less confidence in applying the given equation to obtain then maximum superconducting transition temperature. (d) Difficulty in relating microstructural features arising from the specific phase transformation given to superconducting performance.

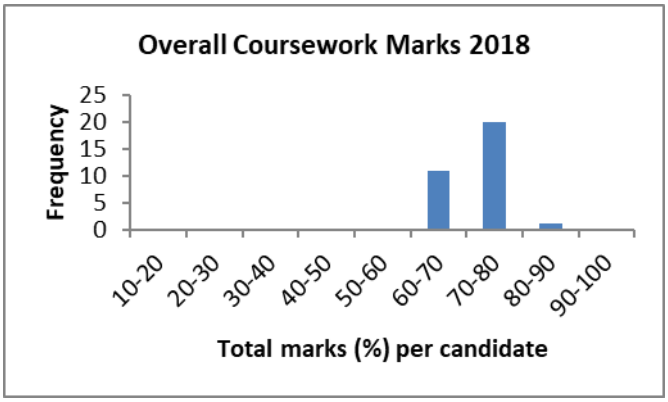
12. Integrated circuits.
    (a) Most did not provide a sufficiently general discussion of the problem that addressed both transit and RC time constant effects. (b) Most did not provide sufficiently general discussion of the main factors (resistive loss from interconnect, limiting voltages of depletion zone and oxide thickness).

COURSEWORK

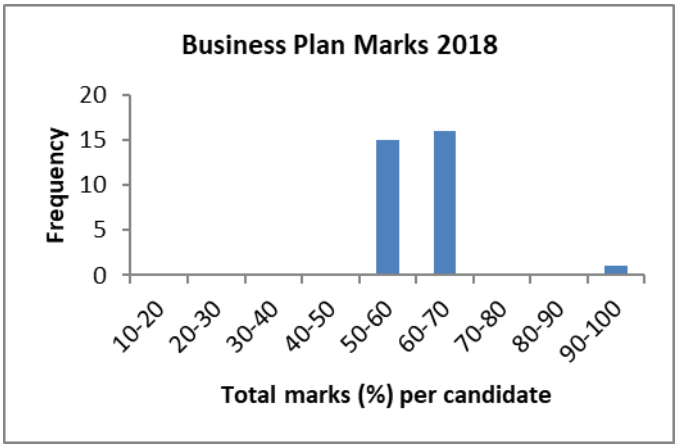
A maximum of 200 marks are available for Part I coursework which comprises:

- Y2 Entrepreneurship & New Ventures: Business Plan – 20 marks
- Y2 Industrial Visit Reports – 20 marks
- Y2 Practical Lab Reports – 60 marks
- Y3 Option Modules: Advanced Characterisation / Introduction to Modelling in Materials – 50 marks
- Y3 Team Design Projects – 50 marks

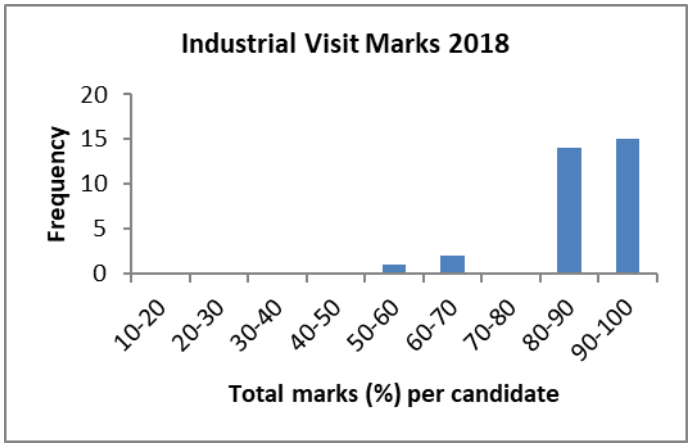
Overall coursework marks were good, and in the range expected for what is generally continuously assessed work.



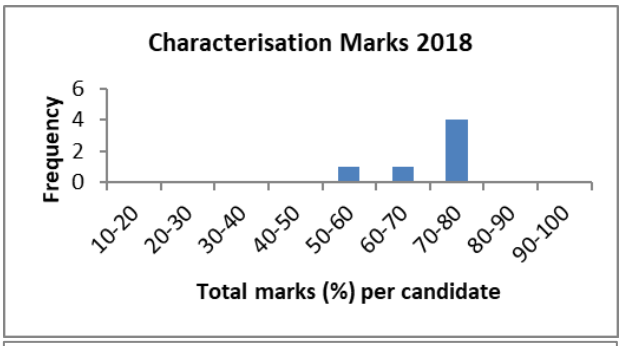
The **Business Plan** marks (average 67.46%) are in a narrow range except for the outlier high mark that is for optional examined course taken by one student. This mark is also high compared to the non-materials students that took this course, and reflect individual excellent performance.

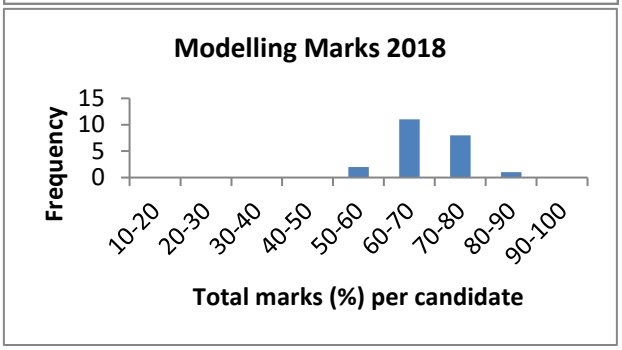


The **Industrial Visits** mark (average 90.16%) are high, as full marks can be obtained by producing a good report; the small number of reports that are only satisfactory or late are strongly penalised.

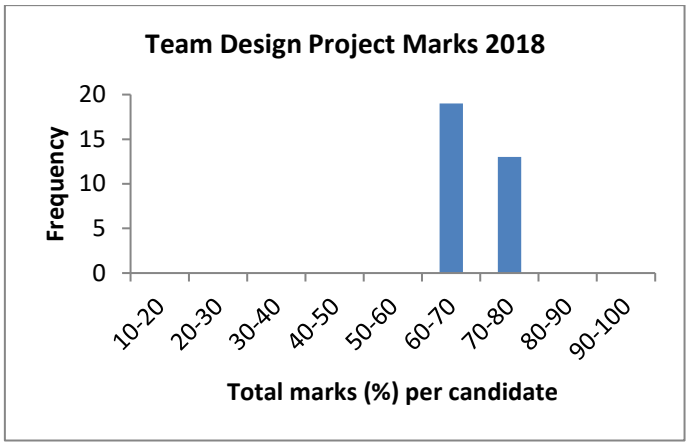


The **Advanced Characterisation** module (average 70.33%) and **Introduction to Modelling in Materials** (average 66.04%) both show a good range from lower second to good first class; the work done has been reviewed independently by the examiners.

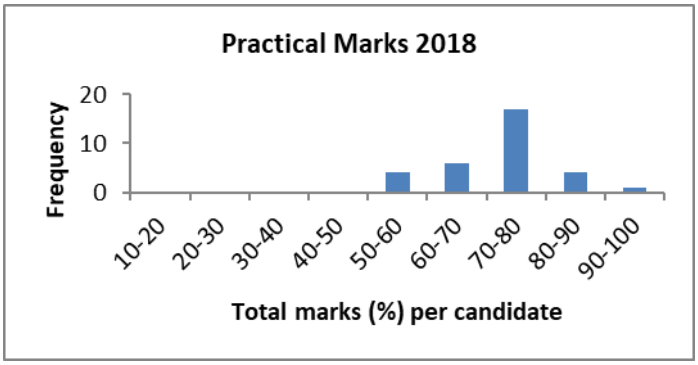




The **Team Design Project** marks (average 70.0%) show a quite narrow range, close to the upper second/first class level, which is reasonable given the sustained effort in a group task.



The marks for **Practical Classes** (average 73.8%) 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. The practical marks are quite narrowly distributed, and reflect the sustained effort and engagement by students across the practical classes and in their reporting.



Practical No	Average Mark	Highest Mark	Lowest Mark
2P1	7.38	9.5	6.0
2P2	6.63	9.0	5.0
2P3	6.05	9.5	0.0
2P4	7.20	9.5	0.0
2P5	8.34	9.5	6.0
2P6	6.64	8.5	4.5
2P7	8.06	10.0	6.0
2P8	7.13	10.0	3.0
2P9	6.22	7.5	5.0
2P10	7.28	8.5	4.0
2P11	8.30	9.8	5.0
2P12	N/A	N/A	N/A

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 (%)		
	2017/18	2016/17	2015/16	2017/18	2016/17	2015/16
I	9	8	8	31.0	25.0	34.7
II.I	16	21	11	55.2	65.63	47.8
II.II	3	1	3	10.4	3.1	13.0
III	1	1	0	3.4	3.1	0.0
Pass	0	0	1	0	0	4.3
Fail	0	0	0	0	0	0.0
Total	29	31	23	-	-	-

(2) **The use of vivas**
The Part II examination in Materials Science consists only of a research project, for which a thesis not exceeding 12,000 words, or 100 pages, is produced. 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 the vivas was led by the internal Examiners or Assessors who had read the thesis fully but the other examiners, including an external examiner, also had the opportunity to ask questions.

(3) **Marking of theses**
All theses were double blind marked by two internal Examiners or Assessors, and were inspected by one external. Due to the small 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 all the examiners. The two internal Examiners/Assessors who read the thesis provided the greatest input to the decision making process.

B. NEW EXAMINING METHODS AND PROCEDURES

None

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 (2018, attached) were put on the Departmental website and sent electronically to all candidates on 2 March 2018. 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 29 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 25 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 40% to 79% with an overall mean mark towards the top of the 2(i) range. The external Examiners played an important role in the discussions that lead 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.

Due to the larger number of students to be examined at Part II this year, one assessor were appointed in addition to the six examiners.

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

Insofar as can be judged from the small sample size, the performance of male and female candidates was not significantly different.

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

	Overall mark		Part 2 Project		Part I Mark	
mark (%)	Male	Female	Male	Female	Male	Female
30-40	-	-	-	-	-	-
40–50	1	-	1	-	1	-
50–60	2	2	3	1	4	2
60–70	10	7	9	4	6	7
70–80	2	4	3	8	3	4
80–90	1	-	-	-	2	-
Totals	16	13	16	13	16	13

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 (2017) 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

(1) Factors affecting performance.

Six applications for consideration of Factors Affecting Performance were submitted. The examiners considered each case carefully and a fair course of action was agreed. This was documented in FAP reports. Cases i and iii were considered to have had serious impact, while the other cases were deemed to have generated moderate impact.

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(2) Comment on table in part IIB.

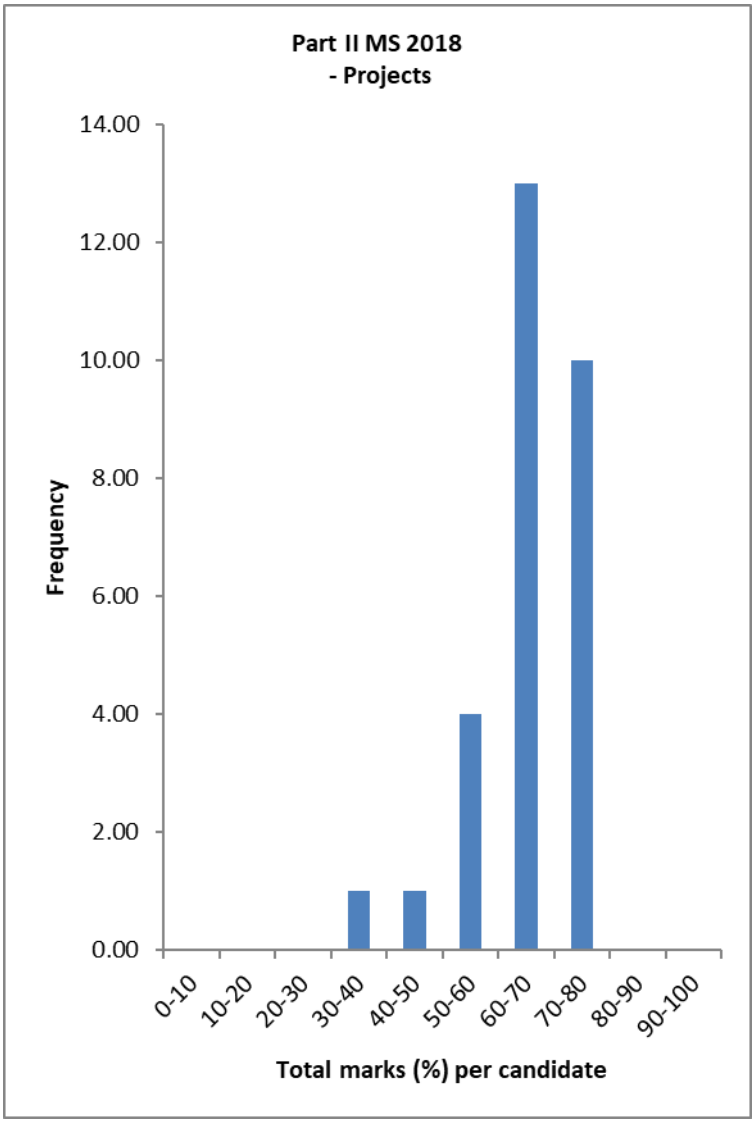
F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. M.R. Castell	Prof. P.S. Grant
Prof. S. Lozano-Perez	Prof. T.J. Marrow
Prof. R.I. Todd	Prof. J.R. Yates (Chair)
Prof. A.J. Davenport (external)	Prof. M.J. Reece (external)

Report on Part II Projects

Candidates: **29**
Mean mark: **66.03%**
Maximum mark: **79%**
Minimum mark: **40%**

Detailed comments on the paper are as follows:



General Comments

The majority of the part II theses were of a very high standard, engaging well with the fundamental science of the project, and some were of exceptional quality. The assessment of the theses followed closely the marking guidelines published in the Part II handbook. However, some theses were deficient in factors that are clearly identified there and all students are recommended to pay close attention to this. It was evident that some students had not allowed sufficient time for writing, reviewing and proof-reading, with parts of their thesis being less well written and presented than others. Some particular points are noted in the following.

Candidates should remember that they are examined on the submitted paper thesis. In several cases figures, particularly micrographs, where poorly reproduced in the printed copy. It might have been that these rendered fine on a computer screen. Students are advised to print test copies of their figures in sufficient time so as to be able to fix any problems.
In a small number of cases it was clear that while a student had done excellent laboratory work and had had a significant creative input to their project, the examiners could not fully reward this due to major deficiencies in the thesis. This was disappointing. The criteria for a good thesis are clearly set out in the PtII handbook.

Overall, the examiners found the viva's to be a positive experience in which students spoke about the science they had done in a clear and convincing way. We hope the students enjoyed the opportunity to debate and discuss the work they had done in the previous 8 months. However, the examiners' were concerned that a couple of students arrived incorrectly dressed for the viva i.e. not wearing sub-fusc correctly. The viva is a university exam to which sub-fusc must be worn.

Examination Conventions 2017/18
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 2017-18. The Department of Materials' Academic 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 Course Handbook are the editions published in the year in which the candidate embarked on the FHS programme. The Examination Regulations may be found at: http://www.admin.ox.ac.uk/examregs/.

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

General Papers 1 – 4 are set by the examiners in consultation with course lecturers. The responsibility for the setting of each examination paper is assigned to an examiner, and a second examiner is assigned as a checker. Option papers are set by lecturers of the option courses and two examiners, the examiners acting as checkers.

The examiners, in consultation with lecturers, produce complete model answers 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 model answers, are scrutinised by all examiners, including, in particular, 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.

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.

Materials Option papers comprise one section for each twelve-hour Options lecture course, each section containing two questions: 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.

[1] for the 2017-18 examinations the Nominating Committee comprised Prof Grant & Dr Taylor.

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 examiners 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 model answers.

All scripts are double marked, blind, by the setter and the checker each awarding an integer mark for each question. After individual marking the two examiners 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 examiners identify the discrepancy and read the answer again, either in whole or in part, to reconcile the differences. If after this process the examiners still cannot agree, they seek the help of the Chairman, or another examiner as appropriate, to adjudicate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this.

Options papers are marked by course lecturers acting as assessors and an examiner acting as a checker.

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 he or she has recorded his or her 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*

Four industrial visit reports should be submitted during Part I. Reports are assessed by the Industrial Visits Academic Organiser on a good / satisfactory / non-satisfactory basis, and are allocated a maximum of 20 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 four reports.

(3) *Engineering and Society Essays*

The business plan for "Entrepreneurship and new ventures" 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 at the 'Building a Business' tutorials, the slides from which are published on WebLearn.

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 the Teaching pages of the Oxford Materials website.

(5) *Advanced Characterisation of Materials and Introduction to Materials 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 organizer. 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 organizer 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 during the two-week module and (ii) any other pertinent information. An analogous report is provided by the lead organizer for the Modelling Module in respect of the software & hardware required for each mini-project. The Report for the Characterisation Module is allocated a maximum of 50 marks and each of the two reports for the Modelling Module is allocated a maximum of 25 marks. For each module, guidance on the requirements for the reports and an outline marking scheme are published on WebLearn.

Part II Coursework

The Part II project is assessed by means of a thesis which is submitted 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 her/his 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 project management chapter, 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. An examiners' discussion is held after the viva, involving all Part II examiners, excepting any who have supervised the candidate's Part II project or are their college tutor. During this discussion 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 students 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 Class 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 the cover slip is not completed 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 cover slip. If the cover slip is not completed 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; Engineering & Society Coursework (or substitution); Team Design Project; Advanced Characterisation of Materials or Introduction to Modelling in Materials. For the Practical Classes and Industrial Visits, the element of coursework comprises a set of reports: reports on four Industrial Visits and reports on twelve Practical Classes. In these cases, a candidate must submit a report for each visit/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 Engineering & Society Coursework; 2. A set of twelve 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 four Industrial Visit Reports as specified in the course handbook; 5. A report on the work carried out in either the Advanced Characterisation of Materials module or the Introduction to Modelling in Materials module; and 6. A Part II Thesis).
Rules governing late submission of these six 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 2017/18 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 14.4 to 14.9. 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 14.4 to 14.9 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 14.10. In the case of submission on the prescribed day for the submission but after the prescribed time on that day for the submission and without prior permission from the Proctors: 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, taking into account any circumstances communicated to the examiners by the Proctors should they approve a request by the candidate, submitted to the Proctors via the Senior Tutor of their college within five working days of notification of non-submission, that the examiners take into account the circumstances of the late submission.

(c) Under para 14.11. In the case of submission 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%.

(d) Under Para 14.12. 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.

Where an element of coursework is not submitted or is proffered more than 14 days after notification of non-submission the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Examiners, permit the candidate to remain in the examination. In this case *for the element of coursework in question* (i) the Examiners will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires a minimum mark of 40% if the candidate is not to fail the examination as a whole.

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 2016/17 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 2016/17 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 Chairman 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 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). He or she will make one of three decisions (http://www.admin.ox.ac.uk/media/global/wwwadminoxacuk/localsites/educationcommittee/documents/policyguidance/Plagiarism_procedures_guidance.pdf):

(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. 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).

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 her/his 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 he/she has 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 his/her 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 him or herself for examination in Part II unless he or she has (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 five 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 year following the examiners' original decision. The examination will be identical to that taken by the other Part I candidates in said academic year. 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. FACTORS AFFECTING PERFORMANCE (FAP)

[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.]

Where a candidate or candidates have made a submission, under Part 13 of the Regulations for Conduct of University Examinations, that unforeseen factors may have had an impact on their performance in an examination, 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 FAP 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 FAP impact level, the internal examiners will take into consideration the severity and relevance of the circumstances, and the strength of the evidence. 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 FAP and recommendations to the Finals Board formulated regarding any action(s) to be taken in respect of each FAP.

For Part II, the internal examiners will meet to band the seriousness of each application 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 FAP impact level, the internal examiners will take into consideration 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 FAP.

Further information on the procedure is provided in the *Policy and Guidance for examiners, Annex C* and information for students is provided at www.ox.ac.uk/students/academic/exams/guidance. It is very important that a candidate's FAP 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.

7. DETAILS OF EXAMINERS AND RULES ON COMMUNICATING WITH EXAMINERS

The Materials Science Examiners in Trinity 2018 are: Prof. Martin Castell, Prof. Patrick Grant, Prof. Sergio Lozano-Perez, Prof. James Marrow, Prof. Richard Todd and Prof. Jonathan Yates (Chair). The external examiners are Prof. Alison Davenport, University of Birmingham, and Prof. Mike Reece, Queen Mary, University of London.

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 Chairman of Examiners.

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

ANNEX

Summary of maximum marks available to be awarded for different components of the MS Final Examination in 2018 (For Part I and Part II students who embarked on the FHS respectively in 2016/17 and 2015/16)

	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	20
	Engineering and Society coursework	20
	Team Design Project	50
	Characterisation or Modelling module	50
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 be identical to that taken by the other B.A. candidates in said academic year. 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 2018

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	20
	Engineering and Society coursework	20
	Team Design Project	50
	Characterisation or Modelling module	50
	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	20
	Engineering and Society coursework	20
	Team Design Project	50
	Characterisation or Modelling module	50
	Literature-based research module	50
Overall Total		**850**

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS ECONOMICS AND MANAGEMENT, 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. Since the number of candidates is fewer than six, numerical data are confidential (see section E, below).

Class	Number			Percentage (%)		
	2017/18	2016/17	2015/16	2017/18	2016/17	2015/16
I	n/a	n/a	n/a	n/a	n/a	n/a
II.I	n/a	n/a	n/a	n/a	n/a	n/a
II.II	n/a	n/a	n/a	n/a	n/a	n/a
III	n/a	n/a	n/a	n/a	n/a	n/a
Pass	n/a	n/a	n/a	n/a	n/a	n/a
Fail	n/a	n/a	n/a	n/a	n/a	n/a
Total	3	1	2	-	-	-

(2) **The use of vivas**
Vivas were not used for this 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

None

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, along with other information in a letter from the Chair of Examiners to all candidates, on 2 March 2018. 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 three candidates for the examination. The examination consisted of two written papers, one being a compulsory Materials Options paper, and the other paper being selected from a range of Economics and Management options. For the Materials Options paper, candidates were offered twelve questions in six 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.
In addition to the written papers, candidates are required to submit a report on a 24-week industrial placement, which has the weight of two written papers. The reports on these 24-week Management projects are marked by staff at the Said Business School. For reasons of anonymity, the details of the overall mean marks are discussed in Section E, below.

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

Due to the small number of candidates for this examination, the numerical data are confidential (see section E, below).

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

Due to the small number of candidates numerical data are confidential (see section E, below).

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 reasons of anonymity, the details of the overall mean marks are discussed in this section.

(2) **Breakdown of the results by gender**

	Overall mark		Part 2 Mark		Part 1 Mark	
mark (%)	Male	Female	Male	Female	Male	Female
0 - 40						
40–50						
50–60						
60–70						
70–80						
80–90						
Totals						

(3) **Candidates' Performance in each part of the examination**

All candidates sat the Materials Options paper, for which the mean mark (MEM only) was %. In addition, two candidates sat the Finance paper, achieving an average of %; the other candidate sat Entrepreneurship & Innovation, achieving %.

(4) **Equal Opportunities issues**
Insofar as can be judged from the small sample size, the performance of male and female candidates was not significantly different.

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. J.R. Yates (Chair)
Prof. M.R. Castell
Prof. P.S. Grant
Prof. S. Lozano-Perez.
Prof. T.J. Marrow
Prof. R.I. Todd
Dr. K. Okamura (Management)
Prof. G.R. Keller (Economics)

Prof. A.J. Davenport (External)
Prof. M.J. Reece (External)
Prof. B. MacCarthy (External, Management)
Prof. A. Banerjee (External, Economics)

Materials Options Paper 2

See report under Materials Science Part I

Examiners' Report for MEM Part II 2018 – Economics Papers

Written Papers

No Economics papers were selected by the 2018 MEM Part II candidates from the suite of Economics & Management options

Examiners' Report for MEM Part II 2018 – Management Papers

Written Papers

Entrepreneurship and Innovation

Assessors' Report, Trinity Term 2018

The Entrepreneurship and Innovation option was jointly available to the E&M and Engineering degree programmes, and offered for the first time in Hilary Term, 2017. This was the second year of the option, in which we implemented a few small changes to the assessment regime in response to feedback from the first year: mainly, ensuring that the examination questions were very explicitly linked to material from the reading list, classroom discussions, and tutorial exercises, so that students could expect that their revision would prepare them optimally for the exam.

The examination posed a series of questions combining various aspects of the course: theoretical models from the lectures and readings, practical case material from the term, worked examples of financial calculations, and short essays on basic concepts of entrepreneurship and innovation. The choice of the examination questions aimed to provide students with opportunities for thinking about the challenges of conceiving, evaluating and implementing entrepreneurial ventures. Students were able to choose from a variety of questions and question types, giving each student the chance to play to his or her stronger skills.

Most students recognized that good answers required careful discussion and application of the relevant materials, models and frameworks from the E&I module, including cases, readings, exercises, and lectures. The very best answers recognized the importance of analysing and figuring out how to structure business and related activities coherently, particularly in the earliest phases of ideation, opportunity assessment, financial and business modelling, and starting up. The stronger answers focused on a handful of essential frameworks and arguments—building on class materials and discussions—and systematically applied them to the questions asked, along with carefully considering implications for the venture's performance and the entrepreneurial mind-set of the founders and other stakeholders. Less successful answers simply recounted facts from the case and/or focused more on discussion or summary of the frameworks and theoretical ideas themselves, rather than using and applying (or even criticising) these frameworks in the context of the questions posed.

The financial calculations were completed without significant errors by almost all students.

In general, the examiners were impressed by the quality of the students' answers and the careful thought that they had put into preparing for the exam. It was particularly impressive to see the best answers balance insights on entrepreneurial theory and practice, perspectives on engineering as well as management, and positions relating to founders as well as external stakeholders. Students answers also displayed their ability to wrestle with the broader issues relating to innovation, including factors such as the social context and consequences of technical change. Given constraints of exam conditions and the challenging questions posed, most students performed very well overall.

Finance

Assessors' Report, Trinity Term 2018

The course has been in transition for some years, and this year, 2018, is the first in which the exam included only essay questions. In total there were 12 questions to choose from covering all areas of the course. This change of exam structure was announced well in advance, so that students were aware of the change.

In general, the examiners were impressed by the quality of the students' answers and exam results were strong. The average mark was 65.9. 14 students achieved a first-class mark, 32 achieved a 2.1, and 1 achieved a 2.2.

There was a reasonably even distribution of marks across questions, but there was a clear unevenness on questions answered. Three questions were answered by at least half of the students: the equity premium and excess volatility puzzles; the financial crisis; and the trade-off and pecking order theories of firms' capital structure. All of these are questions that deal with rather broad topics. In contrast, there were three questions that not a single student answered, and two questions that were answered by only one or two students. These questions dealt with tax issues, why banks exist, what a firm is, and differences between expected utility and mean variance approaches to portfolio theory. Tax is a self-contained topic that students may have chosen not to prepare, and the others might have been viewed as difficult to answer comprehensively during the exam.

Most students recognized that good answers required careful, coherent, and critical discussion of the relevant theories as well as providing empirical evidence to support their arguments. The very best answers were well structured, carefully weighed benefits and drawbacks of various approaches and often brought in unique perspectives. The less successful answers simply recounted facts or summarized the theoretical ideas themselves, often discussing only either the benefits or drawbacks of a particular theory.

Management Project

No report is produced

Examination Conventions 2017/18
Materials, Economics and Management - 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, Economics & Management for the academic year 2017-18. The E(M)EM Standing Committee 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 Course Handbook are the editions published in the year in which the candidate embarked on the FHS programme. The Examination Regulations may be found at: http://www.admin.ox.ac.uk/examregs/.

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 E(M)EM Standing Committee, the Academic Committee in the Department of Materials, the Mathematical, Physical and Life Sciences Division, the Social Sciences Division, the Education Committee of the University and the Proctors who may offer advice or make recommendations to examiners.

The Materials examiners are nominated by the Nominating Committee[2] of the Department of Materials 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 of Materials, the colleges and of those who teach the MEM M.Eng. programme. However, for written papers on Materials Science examiners are expected to consult with course lecturers in the process of setting questions.

2. RUBRICS AND STRUCTURE FOR INDIVIDUAL PAPERS

Part II candidates take one compulsory Materials Options paper and one paper from a range of Management and Economics options.

Materials Papers:

The Materials Options paper in Part II is set by lecturers of the option courses and two examiners, the examiners acting as checkers.

The Materials examiners, in consultation with lecturers, produce complete model answers 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 model answers, are scrutinised by all examiners, including, in particular, the external examiners. The marking schemes are approved by the examining board alongside the papers. Materials Examiners check that questions are of a consistent difficulty within each paper and between Materials papers.

The Materials Option paper comprises one section for each twelve-hour Options lecture course, each section containing two questions: 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 the 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.

[2] for the 2017-18 examinations the Nominating Committee comprised Prof. Grant & Dr Taylor.

For the Materials papers in Part II, 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 examiners may inspect any calculator during the course of an exam.

Economics and Management papers:

Below are the links to both subjects' WebLearn sites where further details relating to individual papers can be found:

Economics
Management

The Economics and Management papers are set by examiners nominated respectively by the Economics Faculty and the Saïd Business School. Candidates are advised to read particularly carefully the specific instructions on the front of each paper as to the number of questions they should submit, since the rubrics on Economics and Management papers differ slightly from those for the Materials papers.

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

For the Materials assessments, 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.

For Economics and Management papers, please refer to both subjects' WebLearn sites where further details relating to individual papers can be found:

Economics
Management

3.3 Verification and reconciliation of marks

Materials Written Papers:

During the marking process the scripts of all written papers remain anonymous to the markers. The markers are guided by the model answers.

All scripts are double marked, blind, by the setter and the checker each awarding an integer mark for each question. After individual marking the two examiners 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 examiners identify the discrepancy and read the answer again, either in whole or in part, to reconcile the differences. If after this process the examiners still cannot agree, they seek the help of the Chairman, or another examiner as appropriate, to adjudicate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this.

The Materials Options paper is marked by course lecturers acting as assessors and a Materials examiner acting as a checker.

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

Economics & Management Written Papers:

Please refer to both subjects' WebLearn sites where further details relating to individual papers can be found:

Economics
Management

Coursework

(6) *4th Year Management Project*

The management project is allocated a maximum of 200 marks and is marked by the Saïd Business School.

The projects are assessed and graded independently by two Assessors. The supervisor's comments on the performance of the candidate are provided to the Assessors. The marks provided by the Assessors are moderated by an Examiner, and the final mark is ratified by the Board of Examiners.

The process is:

- Supervisors provide a report on the performance of the student, indicating any special circumstances that could have affected the student's performance on the project and report preparation.
- The project reports are graded blind by two Assessors, taking account of the Supervisor's comments. At least one of the Assessors will have knowledge of the area of the project.
- The Supervisor's report, and Assessors' reports and marks are provided to an Examiner, who moderates the marks and provides a final mark for ratification by the Board of Examiners.
- Supervisors may not act as Assessor or Examiner for a project they have supervised.

An Assessor may also act as Examiner for a project. The Assessor should assess and mark the report before having sight of the other Assessor's report and marks.

3.4 Scaling

Written Papers

As the total number of MEM students 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.

Materials Papers:

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'. The normal procedure for 'scaling' of the Materials written papers 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.

Economics and Management Papers:

Please refer to both subjects' WebLearn sites where further details relating to individual papers can be found:

Economics
Management

In deciding what 'scaling', if any, to apply normally the examiners will take into account the following additional information:

(a) For each paper, comments from the MEM examiners representing the Economics or Management Faculty as appropriate
(b) The performance of the MEM cohort on the other Economics and Management papers
(c) The performance of the MEM cohort on the Materials papers

3.5 Short-weight convention and departure from rubric

Materials 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 the cover slip is not completed 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 cover slip. If the cover slip is not completed then the examiners will mark the sections in alphabetical order by section delineator (section A, section B, etc.).

Economics and Management Written Papers:

Please refer to both subjects' WebLearn sites where further details relating to individual papers can be found:

Economics
Management

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 nine 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.); 2. A Team Design Project Report and associated oral presentation; 3. A set of four Industrial Visit Reports as specified in the course handbook; and 4. A Part II Management Project). Rules governing late submission of these four 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 2017/18 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, Economics and Management examinations will normally result in one of the following:

(a) Under paras 14.4 to 14.9. 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 14.4 to 14.9 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 14.10. In the case of submission on the prescribed day for the submission but after the prescribed time on that day for the submission and without prior permission from the Proctors: 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, taking into account any circumstances communicated to the examiners by the Proctors should they approve a request by the candidate, submitted to the Proctors via the Senior Tutor of their college within five working days of notification of non-submission, that the examiners take into account the circumstances of the late submission.

(c) Under para 14.11. In the case of submission 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%.

(d) Under Para 14.12. 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.

Where an element of coursework is not submitted or is proffered more than 14 days after notification of non-submission the Proctors may, exceptionally, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Examiners, permit the candidate to remain in the examination. In this case *for the element of coursework in question* (i) the Examiners will award a mark of zero and (ii) dispensation will be granted from the Regulation that requires a minimum mark of 40% 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 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). He or she will make one of three decisions (http://www.admin.ox.ac.uk/media/global/wwwadminoxacuk/localsites/educationcommittee/documents/policyguidance/Plagiarism_procedures_guidance.pdf):

(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 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:

(i) Impose a penalty of 10% of the maximum mark available for the piece of work in question. 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).

(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?wssl=1).

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 her/his 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 he/she has been adjudged worthy of honours by the examiners in Part I.

Candidates adjudged worthy of honours 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.

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 his/her 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 6 and 7 of Section A and clause 3 under Part I of Section B of the Special Regulations for the Honour School of Materials, Economics and Management:

> Section A. 6. ...no candidate may present him or herself for examination in Part II unless he or she has been adjudged worthy of Honours by the Examiners in Part I.
>
> Section A. 7. 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 three 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 either Part I or Part II of the examination.

5. RESITS

Part II may be entered on one occasion only.

6. FACTORS AFFECTING PERFORMANCE (FAP)

Where a candidate or candidates have made a submission, under Part 13 of the Regulations for Conduct of University Examinations, that unforeseen factors may have had an impact on their performance in an examination, 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. Normally, this FAP meeting will take place before Part A of the meeting of the internal examiners at which the raw examination results are reviewed. When reaching these FAP meeting decisions on impact level, the internal examiners will take into consideration the severity and relevance of the circumstances, and the strength of the evidence. Examiners will also note whether all or a subset of papers were affected, being aware that it is possible for circumstances to have different levels of impact on different papers. The banding information will be used at Part B of the meeting of the internal examiners at which the raw examination results are reviewed and recommendations to the Finals Board are formulated regarding any action(s) to be taken in respect of each FAP. Further information on the procedure is provided in the *Policy and Guidance for examiners, Annex C* and information for students is provided at www.ox.ac.uk/students/academic/exams/guidance. It is very important that a candidate's FAP 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.

7. DETAILS OF EXAMINERS AND RULES ON COMMUNICATING WITH EXAMINERS

The Materials, Economics and Management Examiners in Trinity 2018 are: Prof. Martin Castell, Prof. Patrick Grant, Prof. Sergio Lozano-Perez, Prof. James Marrow, Prof. Richard Todd and Prof. Jonathan Yates (Chair) (examiners from the Department of Materials); Prof. Godfrey Keller (examiner from the Department of Economics); and Dr Ken Okamura, Prof. Chris McKenna, Prof. Hiram Samel (examiners from the Saïd Business School). The external examiners are Prof. Alison Davenport (Materials, University of Birmingham), Prof. Mike Reece (Materials, Queen Mary, University of London), Prof. Anindya Banerjee (Economics, University of Essex) and Prof. Bart MacCarthy (Management, Nottingham University Business School).

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 Chairman of Examiners.

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

Annexe

Summary of maximum marks available to be awarded for different components of the MS Final Examination in 2018 (For Part I and Part II students who embarked on the FHS respectively in 2017/18 and 2016/17)

	Component	Mark
Part I	General Paper 1	100
	General Paper 2	100
	General Paper 3	100
	General Paper 4	100
	Introductory Economics (Ec1)	100
	General Management	100
	Microeconomics	100
	Practicals	50
	Industrial visits	20
	Team Design Project	50
Part I Total		*820*
Part II	Management Project	200
	Materials Options Paper 2	100
	One paper from a choice of Economics and Management Papers.	100
Part II Total		*400*
Overall Total		*1220*

Reports from the External Examiners for Materials

External examiner name:	Professor Alison Davenport	
External examiner home institution:	University of Birmingham	
Course examined:	Materials Science	
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?	✓		
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 6 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.*** *Further comments may also be given in Part B, if desired, if you answer "Yes" or "N/A / Other".*

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 academic standards achieved by most students generally compare favourably with those achieved by students in other Universities. This applies across the board in examinations, coursework and projects.

b. *Please comment on student performance and achievement across the relevant programmes or parts of programmes (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

Students generally performed well in all materials modules. There were very few failed modules, and many student showed excellent performance, particularly in project reports and vivas. The breadth and depth and breadth of the courses was excellent.

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 assessment process was conducted rigorously and in a fair manner consistent with the University's regulations and guidance to ensure equitable treatment of students.

I was given ample time to review the examination papers in advance. The consistency of the questions across the papers was very fair, and led to generally consistent student performance both in terms of the numbers of students selecting each question within papers, and the range of marks for each question.

The double marking was very thorough, and was presented in a clear and transparent manner.

The project marking process was thorough and fair, and vivas were conducted in a manner that enabled the students to perform well.

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?

There are no significant issues.

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 projects generally provide an excellent opportunity for students to carry out cutting-edge research, and many students perform at a level that might be expected of a 1st year PhD student, in some cases producing work that could be developed into publications. It is very

encouraging to see that the approach to quantitative analytical and modelling approaches in the coursework is often used to excellent effect in the project reports.

Students generally appeared to have a high level support in their projects, often from Research Fellows and PhD students. However, there appears to be some variability in the level of contact with academic supervisors: in some cases, students might have benefited from more academic input when planning their project reports, and in a few cases in relation to including more theoretical and quantitative approaches to analysing experimental data.

There was some significant variability in the way that the experimental method section of project reports was written, with some students not adhering to the expected standard (such that an experienced researcher could repeat the experiment and reach the same conclusions). I took a close look at the write-up of Part I labs, and there appears to be considerable variability in the way in which experimental method sections are written, and in the way in which lab books are used (from little or no use, or the use of more than one lab book over the course of the labs). There is perhaps a missed opportunity here to use the labs to give some more formal training in keeping lab books and writing up work in a way that could enhance subsequent research project performance.

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.

Signed:	
Date:	1/7/18

Please ensure you have completed parts A & B, and email your completed form to: external-examiners@admin.ox.ac.uk, and copy it to the applicable divisional contact set out in the guidelines.

Title of Examination(s):		Materials Science
External Examiner Details	**Title:**	Prof
	Name:	Mike Reece
	Position:	
	Home Institution:	Queen Mary University of London

Please complete both Parts A and B.

Part A

	*Please (✓) as applicable**	**Yes**	**No**	**N/A / Other**
A1.	Did you receive sufficient information and evidence in a timely manner to be able to carry out the role of External Examiner effectively?	✓		
A2.	Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience?	✓		
A3.	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 3(b) of the Guidelines for External Examiner Reports].*	✓		
A4.	Does the assessment process measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?	✓		
A5.	Is the assessment process conducted in line with the University's policies and regulations?	✓		
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, please provide further comments in Part B.** Further comments may also be given in Part B, if desired, if you answer "Yes" or "N/A / Other".*

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 students demonstrated high academic standards as evidenced by their coursework (broad range of activities), examination scripts, project reports and viva. They compare very favourably with other institutes.

b. *Please comment on student performance and achievement across the relevant programmes or parts of programmes (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

The majority of the students were on the Materials Meng programme. There were a three students on the Materials Economics and Management Programme. The marks for the students on both programmes were good, with only a couple of students just failing courses, and all students progressing or graduating. This is the final year of the Materials Economics and Management Programme.

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 from the writing of the papers through to the final exam board was very thorough and fair. The papers were well written and challenging. The assessment of the Part II reports and viva were very thorough and fair. The scripts, reports, and coursework were very nicely organised to make the examiners work easier.

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?

None. The new FAP process now runs very effectively.

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 programmes are well tried and tested and deliver an excellent education. As I have commented in previous years, the Part II projects provide the students with excellent research training and experience.

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.

This is the last of my four years as external examiner. Here is a summary of my observations for this year.

PART I

The examination papers were challenging. The model solutions were detailed. The marking was thorough, and the double marking was evident. The average of the papers ranged from ~60% to 70%, which seems reasonable. The data provided on the assessment of the exam papers is very thorough. This enabled us to looking into correlations, such as the number of people answering a particular question and its average mark, and we found little correlation. I looked at the six questions that had the lowest average mark. The questions seemed reasonable and there was no obvious reason why they were lower. My feeling is that there was probably a misunderstanding between what the examiner was expecting to see and what the students thought was wanted.

It might be informative to include the names of the examiners beneath their questions. It also has the advantage of recording who set the questions for posterity.

The coursework covered a good range of activities, including a good amount of experimental work that should help them to prepare for the Part II project. The lab reports were submitted on lose sheets stapled together. Many of the lab books were barely used, while some were well used. It is an important skill to use a lab book. I therefore recommend that you consider giving the students guidance on the use of a lab book. While it might not be appropriate to mark it, there should be an expectation that they should be in good order. All of this also suggests that they may not properly using lab books during their projects.

Part II

The management of the research projects from start to finish was excellent. There was a good range of timely and interesting topics. The students were well supported during the projects. There seemed to be a similar and fair level of support from doctoral and post-doctoral researchers, even though the contact time with individual project supervisors may have varied. This ensures that the students were able to make good progress throughout the year, but at the same time they had the opportunity to show independence and initiative. This was captured by the Part A and B supervisor reports. The differences in the marks, particularly where there were large discrepancies was well dealt with by taking into consideration the Part A and B reports and the viva performance. The part B provided confidence in the decision on the final project mark. The students were able to use state-of-the-art processing and characterisation techniques. The marking of the project reports by two independent examiners is very thorough as evidenced by the assessment reports. The vivas were very challenging but measured in order to allow the students to demonstrate their ability.

The vivas takes a considerably amount of staff time, running over three days. With increasing student numbers the department is considering other ways to achieve the assessment, which might include only giving vivas to students at the borderline or where there is a large discrepancy in the marking. This seems reasonably considering that the viva did not actually make a major difference to the classification of most of the students. However, if the department does go this way it will need to consider how it will identify the borderline cases bearing in mind that FAP come in late, and could even arrive on the day of an exam board.

The students are expected to cover Engineering context in their reports. In some cases it was presented as a clear section in the report and in others it is not explicitly covered, although it may be effectively covered.

The final students represented you very well at their vivas. They were confident and articulate. The scientific discussions were at a high level. The feedback from them was that they enjoyed their projects. They gave a good impression that are ready to start productive careers.

I would like to thank all of the exam board staff over the last four years for their professionalism and diligence. I would like to especially thank Philippa Moss for her hard work, attention to detail and great care. It has been a pleasure to work with all of them.

Signature:	Mike Reece
Date:	29.06.18

Please email your completed form (preferably as a word document attachment) to: external-examiners@admin.ox.ac.uk and copied to the applicable divisional contact.

Alternatively, please return a copy by post to: The Vice-Chancellor c/o Catherine Whalley, Head of Education Planning & Quality Review, Education Policy Support, University Offices, Wellington Square, Oxford OX1 2JD.

Faculty of Materials
Department of Materials Academic Committee

RESPONSE TO EXAMINERS' REPORTS 2018

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

Honour School of Materials, Economics & Management (MEM) Part II – Materials elements only, main response will be made by the E(M)EM Standing Committee

The External Examiners' reports, the FHS Chairperson's report, the Prelims Chairperson's report and internal reports on all of the individual Materials papers, FHS and prelims, were considered by the Department of Materials Academic Committee (DMAC) and were reported to the Faculty of Materials.

1. Summary of major points

There were no major issues arising from the 2018 Examinations.

2. Points for inclusion in Responses to the External Examiners

MS Parts I & II and MEM Part II: Professor A. Davenport

We again thank Professor Davenport for her very positive report and the time and effort devoted to her role as an External Examiner, not least in the substantial task of examining the Part II MS theses.

Professor Davenport commented, "there appears to be some variability in the level of contact with academic supervisors: in some cases, students might have benefited from more academic input when planning their project reports, and in a few cases in relation to including more theoretical and quantitative approaches to analysing experimental data." Our Head of Department, our Part II Organiser and the Chairmen of both our Academic Committee and the Faculty of Materials will all re-emphasize to academic supervisors what is the appropriate and expected input.

Professor Davenport also observed significant variability in the way that the experimental methods section of project reports was written and suggested that greater attention to both the keeping of laboratory notebooks and the writing of the 'methods' section for lab reports for the practicals carried out by our students earlier in the programme might impact positively on the Part II theses, as well as being worthwhile in its own right.

> The Department agrees with Professor Davenport that there is a need to improve the use of laboratory notebooks by our students. We had already taken some steps in this direction, with, following appropriate training, an explicit requirement on the Teaching Assistants for our Y1 & Y2 Practical Courses to observe and comment on the students' use of lab notebooks during each practical class. We have taken this further in the revised Prelims Programme which will be first delivered in 2019/20; additional training will be provided on the purpose and effective use of lab notebooks, and for each practical each student will receive from the Senior Demonstrator feedback and a mark based on the content of their laboratory notebook.

Furthermore in the revised Prelims Programme fewer of the practicals will be written up as full reports and summatively assessed, but those that are will involve a more thorough report, which will be in the format of an Acta Materialia paper. A workshop will be held in which explicit guidance on write-ups will be given to the students and the first of their 'Acta' style reports will be formatively assessed only, with each student receiving thorough face-to-face feedback.

We anticipate that this revised approach to the Prelims Practical Course will be phased-in in the following year for the Part I Practical Course too.

MS Parts I & II and MEM Part II: Professor M.J. Reece

We again thank Professor Reece for his very positive report and the time and effort devoted to his role as an External Examiner in 2018 and in the previous three years. This was his final year as one of our External Examiners and we are most grateful for his input over the last four years.

The Department agrees with Professor Reece that there is a need to improve the use of laboratory notebooks by our students. We had already taken some steps in this direction, with, following appropriate training, an explicit requirement on the Teaching Assistants for our Y1 & Y2 Practical Courses to observe and comment on the students' use of lab notebooks during each practical class. We have taken this further in the revised Prelims Programme which will be first delivered in 2019/20; additional training will be provided on the purpose and effective use of lab notebooks, and for each practical each student will receive from the Senior Demonstrator feedback and a mark based on the content of their laboratory notebook.

In commenting on the increasing load associated with holding vivas for all Part II students in the face of the increasing cohort size, Professor Reece mentions that we might in future hold vivas only for certain candidates – I suspect this possibility was mentioned to him informally by one of the internal examiners. However it is not in fact our intention to do this – there are a number of reasons for this position, one being the need to assure ourselves that the student is indeed the author of a thesis that carries one third of the total marks that make up the final degree mark. However, we are indeed considering how to alleviate the average load per examiner as our cohort size increases.

MEM Part II, Management Papers: Professor B. MacCarthy

We thank Professor MacCarthy for his positive report and for his careful scrutiny of scripts, and share his regret over the phasing-out of the MEM & EEM programmes, which he describes correctly as innovative joint courses. Sadly, given the numbers of students involved, our colleagues in the Economics Faculty and the Saïd Business School felt, correctly one must admit, that it was uneconomic to run these programmes.

3. Further Points

The suggestion of the Chair of FHS that the Department should consider whether all exam papers should be marked by the lecturer and an examiner, rather than our current practice of two examiners (except for case of the two specialist Part I Materials Options Papers) has been considered in principal by our Teaching Committee and is scheduled for a full discussion at the Hilary Term 2019 meeting of the Faculty of Materials.

4. Examination Conventions

We confirm that when updating our Examination Conventions we consider the points in the Guidance on Examination Conventions issued by the MPLS Division.

A.O. Taylor, Chairman of DMAC, 24/1/19

E(M)EM Standing Committee

Reports from the External Examiners for the Economics & Management Components of MEM Part II

EXTERNAL EXAMINER REPORT FORM 2018

External examiner name:	Anindya Banerjee	
External examiner home institution:	University of Birmingham	
Course examined:	MEM	
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?	✓		
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 6 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.*** *Further comments may also be given in Part B, if desired, if you answer "Yes" or "N/A / Other".*

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?*

Please refer to my 2017 report. As there were no MEM candidates who sat papers in Economics this year, I did not have any fresh observations to make.

b. *Please comment on student performance and achievement across the relevant programmes or parts of programmes (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

Please refer to my 2017 report. As there were no MEM candidates who sat papers in Economics this year, I did not have any fresh observations to make.

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.

Please refer to my 2017 report. As there were no MEM candidates who sat papers in Economics this year, I did not have any fresh observations to make.

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?

None.

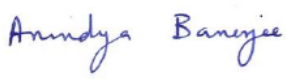
B4. Good practice and enhancement opportunities

*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.*

Nothing to report.

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.

Signed:	
Date:	18 July 2018

Please ensure you have completed parts A & B, and email your completed form to: external-examiners@admin.ox.ac.uk, and copy it to the applicable divisional contact set out in the guidelines.

EXTERNAL EXAMINER REPORT FORM 2017

External examiner name:	Professor Bart MacCarthy	
External examiner home institution:	University of Nottingham, Business School.	
Course examined:	Economics and Management; Engineering, Economics & Management; Materials, Economics & Management.	
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?	✓		
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 6 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, please provide further comments in Part B.*** *Further comments may also be given in Part B, if desired, if you answer "Yes" or "N/A / Other".*

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 standards achieved by students are comparable with the top-tier universities in the UK. The breadth of topics on which students are examined (and on which many excel) is impressive.

b. *Please comment on student performance and achievement across the relevant programmes or parts of programmes (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

In general students on the Economics and Management programme performed very well with a relatively high proportion of firsts. Notwithstanding, I was happy that students merited the awards made based on their performance across a demanding set of papers. Only a small number of candidates were examined for the joint Engineering, Economics & Management and Materials, Economics & Management. Their performance appeared to be similar to the main cohort. It is a pity that these innovative joint courses are being discontinued.

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.

Great care and attention to detail were demonstrated in the assessment processes. The pre-Board meeting had looked at any anomalies in marks awarded and had identified specific issues for the External Examiners to consider. Full consideration was given to students with extenuating circumstances that could have affected performance and I felt that appropriate decisions were made in all these cases. The formal Exam Board reviewed the recommended awards thoroughly and gave detailed consideration to borderline cases. An issue had arisen with one of the papers taken by a large number of candidates. I was particularly impressed at the level of scrutiny and pre-consultation given by the Chief Examiner in dealing with the issue in order to ensure fairness and equitable treatment for all candidates who took the paper. Problems do arise in university assessment processes from time to time. When they do it is important that they are dealt with appropriately. The attention given to this issue in this case was commendable.

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?

None.

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.*

Students are exposed to an impressively wide range of relevant cases and reading across most of the modules taken and this is to be encouraged.

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.

The introduction of a final year dissertation in lieu of one or more taught modules might be considered in the future for the Economics and Management programme. Although it can raise significant issues in terms of supervision load, it can also enhance a student's overall undergraduate educational experience. An approach used in some places is to ask interested students to write a proposal for a research topic - only those students with well-crafted proposals for which there is appropriate supervision available are offered the opportunity to undertake a dissertation. This might be done at the end of the second year.

Signed:	B L MacCarthy
Date:	14/8/2017

Extract from the UNCONFIRMED Minutes of the discussion of Examiners' Reports at the EMEM Standing Committee held on 25th October 2018

STANDING COMMITTEE FOR E(M)EM

The Committee reviewed the examiners' reports for the last candidates on the MEM programme. All candidates had been successful and there were no problems identified that needed to be addressed. The Committee thanked all those who had been involved with the programme.