

EXAMINERS' REPORTS 2008

[Abridged version for Ox-only website]

MATERIALS SCIENCE (MS)

MATERIALS, ECONOMICS & MANAGEMENT

(MEM)

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REPORT ON PRELIMINARY EXAMINATION IN MATERIAL SCIENCE

Part I

A. STATISTICS

Category	Number			Percentage		
	2007/08	2006/07	2005/06	2007/08	2006/07	2005/06
Distinction	7	12	13	25	43	43
Pass	20	15	17	71	53	57
Fail	1*	1	0	4	4	0

(* This candidate passed the re-sit examination in September)

Marking of scripts

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

B. NEW EXAMINING METHODS AND PROCEDURES

None in this year

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.

None

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

28 students were registered for the examination.

20 candidates passed all papers, without the necessity for compensation. Four candidates were awarded compensated passes. Of the total of 24 successful candidates in June, 7 achieved a marks average above 70 and were awarded Distinctions.

3 candidates failed the Mathematics paper in June, but were re-examined successfully in September. One candidate failed outright in June, was required to re-sit the whole examination in September and successfully passed all papers at the second attempt. Thus there were no overall failures amongst the 28 candidates.

The prize for the best overall performance in Prelims was awarded to David Lloyd, from Corpus Christi College, [REDACTED]. The prize for the best performance in Practicals was awarded to Katharine MacArthur, also from Corpus Christi College. Additional prizes for outstanding performance were awarded to Joe Bennett, from St. Catherine's College, and Robert Clough, from Mansfield College.

The examiners wish to voice their concerns about two matters:

(i) The lack of provision for candidates with special needs at the Ewart House examination centre. This caused considerable logistic problems when a question arose regarding an examination question on one paper, and when a last-minute correction was required to another paper. 27 of our candidates were at Ewart House, as were all of the examiners and invigilators, while one solitary candidate was working at the Examination Schools. We recommend that these arrangements be reviewed and that, at the very least, basic provision for the more straightforward cases of special need (e.g. dyslexia) should be made forthwith at Ewart House.

(ii) We are concerned by the rule which allows candidates to apply for permission to bring their own bilingual dictionaries into the examination room. This seems to us to go against the more general principle of forbidding extraneous materials from being brought into examinations. We recommend that EITHER this provision should be abolished (our preferred course of action), OR the relevant dictionaries should be provided by the University's own examination administration service.

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

1 candidate was notified to the Examiners as having Dyslexia and ADHD, and was given extra time.

3 further candidates were allowed by the Proctors the use of dictionaries for the written papers.

Gender Issues:

Of the 28 candidates 6 were women and 22 men.

All 7 of the distinctions were awarded to men.

In view of the small overall number of candidates, it is not possible to draw statistically significant conclusions from these data.

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



F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Professor G.D.W Smith (Chairman)

Dr C.M. Bishop

Dr N. Grobert

Dr J.L. Hutchison

Attachments: Examination Conventions 2008

Comments on Materials Science 1: Structure of Materials

Comments on Materials Science 2: Properties of Materials

Comments on Materials Science 3: Transforming Materials

Comments on Maths for Materials and Earth Scientists

MS1: Structure of Materials

Examiner: Dr JL Hutchison

Candidates: 28

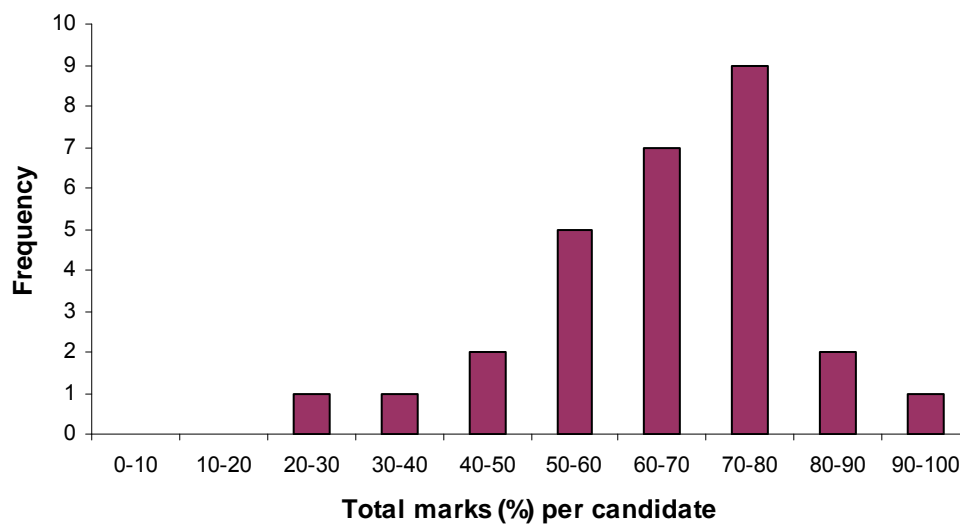
Mean mark: 64.4%

Maximum mark: 90.5%

Minimum mark: 27%

Question	No of answers	Average mark	Highest mark	Lowest mark
1	25	12.5	20	5
2	25	15.5	18	11
3	6	9.1	12	7
4	27	13.9	17.5	8
5	6	10.5	18	5
6	9	11.5	13.5	9.5
7	26	12.1	18.5	1.5
8	16	12.2	17.5	12.2

Materials Prelims 2008 MS1 Structure of Materials



General Comments

Every student attempted 5 questions.

1. Popular question on crystal defects, attempted by 25 candidates. Standard descriptive question. based on energy of dislocations. Wide range of scores, from 20 (full marks) down to 5, with average score 12.5. Most know roughly how to derive the basic equation for self-energy of a screw dislocation, but several failed to do this properly.
2. Descriptive question on iron and alloys, based entirely on course material. Again popular, with 25 attempts, scoring from 18 down to 11. Mainly answered well, with average score of 15.5.
3. Multi-part crystallography/diffraction question, mainly about waves. Not popular, with only 6 attempts and low scores, from 12 to 7, and an average 9.1. Very few got parts d) and e) on wave interference, correct.
4. Popular question on bonding and ionic structures. 27 attempts, with scores 17.5 down to 8 and an average 13.9. Surprising number showed basic misunderstanding of Pauling's first rule. Description of ionic and covalent bonding provided scope for vague answers, as well as some excellent accounts.
5. Electronic structure, base on Heisenberg's Uncertainty Principle. Not popular with only 6 attempts. Scores ranged from 18 to 5, with average score 10.5. Note: this question contained an uncorrected typo with \hbar instead of h for Planck's constant given in the General Information. This was pointed out by a candidate and noted. Marking took this into account, but in the end no student's mark was affected by this.
6. Polymers question, asked for examples of crystalline, semi-crystalline and amorphous polymers, then for description the "Rule of Mixtures", with an application to a glass-reinforced plastic. Surprising lack of knowledge or understanding displayed by those who attempted it. Not popular with 9 attempts. Scores from 13.5 to 9.5, average 11.5.
7. Crystallography question (lots of small parts) – Based on Bravais lattice and crystallographic symmetry concepts. This was very popular, with 26 attempts but a surprisingly broad range of scores from 18.5 down to 1.5. Average score 12.1.
8. Crystallography question, mainly on electron and X-ray diffraction. Fairly popular with 16 attempts. Scores from 17.5 down to 5, with average 12.2. A few students appeared to misunderstand the concept of Bravais Lattice in this and the previous question.

MS2: Properties of Materials

Examiner: Dr CM Bishop

Candidates: 28

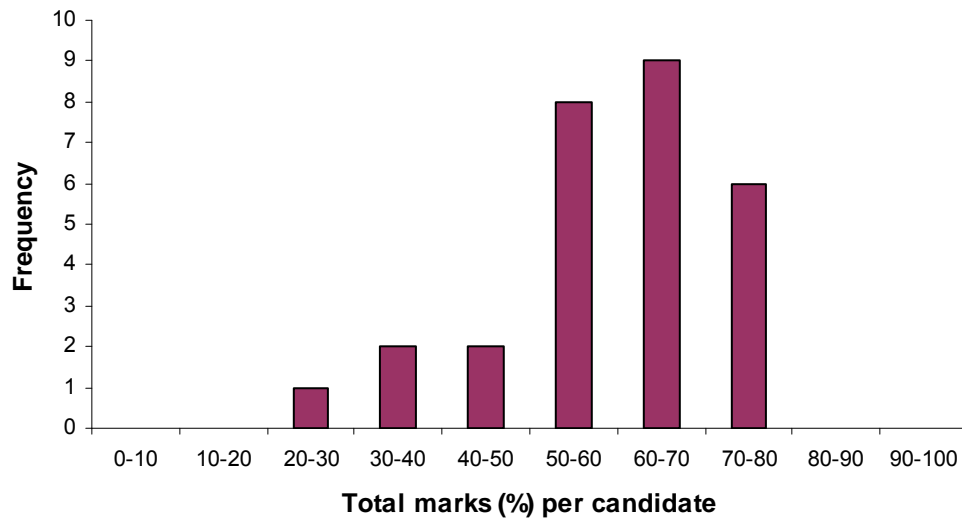
Mean mark: 59.8%

Maximum mark: 78%

Minimum mark: 26%

Question	No of answers	Average mark	Highest mark	Lowest mark
1	20	11	18	2
2	26	13	19	5
3	2	9	12	5
4	0	0	0	0
5	11	12	18	4
6	26	13	18	6
7	28	10	17	2
8	27	13	19	6

Materials Prelims 2008 MS2 Properties of Materials



General Comments

Every student attempted 5 questions.

1. (20 attempts): This standard question on beam statics was generally poorly answered. Students were confused by the shear force and bending moment diagrams but probably mostly by the sign convention for the internal reactions.
2. (26 attempts): Generally, definitions for stress and strain did not mention applied forces. The standard Mohr's circle question was spottily answered. The final part of the question garnered only two correct answers but was just an application of Mohr's circle.
3. (2 attempts): This circuit question had only 2 fairly poor attempts.
4. (0 attempts): There were no attempts for this question on electric fields near conductors.
5. (11 attempts): This standard question asked students to state the assumptions of the kinetic theory of gases, calculate the mean, modal, and rms speeds given the Maxwell-Boltzman distribution function and to calculate the rate of effusion from a sphere. Some students had difficulty with the definitions and integrals for the calculation. The rest of the question was quite well done.
6. (26 attempts): The definition of UTS was poorly answered as students did not differentiate between true and engineering stress. Students performed very poorly on c) which was standard bookwork on recovery, recrystallisation and grain growth in Al. The role of low angle grain boundaries and high angle boundaries was not differentiated in answers.
7. (28 attempts): Students neglected to discuss Cottrell atmospheres at screw dislocations. A very common unit error occurred in the estimate of Young's modulus where students used %strain rather than strain. The discussion of Lüder's strain, Lüder's bands and their effect and cure in sheet forming was poorly answered. But the examiner notes that this topic is not well covered in elementary texts.
8. (27 attempts): While many students completed the mathematical derivation of the Griffith criterion for brittle fracture, few stated assumptions as asked in the text. Students' notes on precipitation strengthening were mainly a specific discussion of the Cu-Al system. Students' notes on fracture toughness were poor on the whole although there were two excellent answers with good discussions of methods of engineering toughness. Few students discussed the practical importance of either topic.

MS3: Transforming Materials

Examiner: Prof. GDW Smith

Candidates: 28

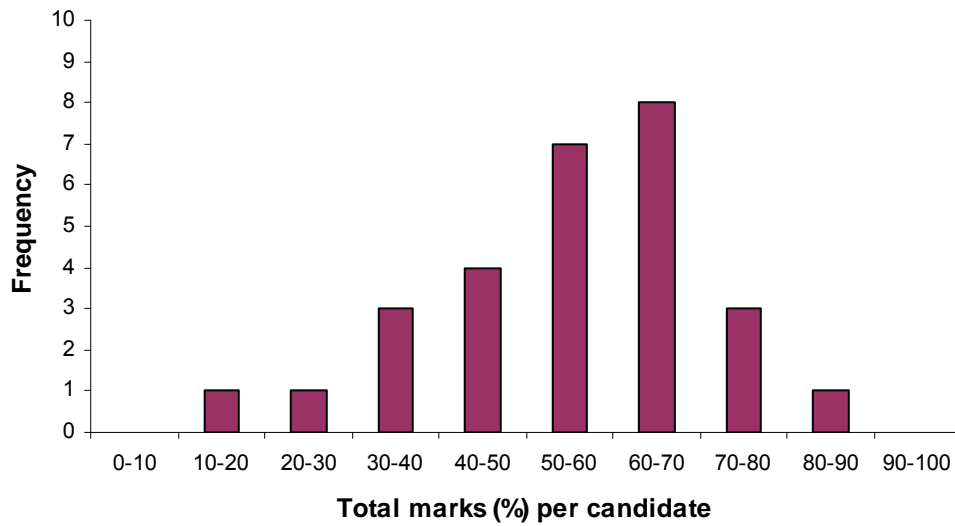
Mean mark: 55.6%

Maximum mark: 86%

Minimum mark: 19%

Question	No of answers	Average mark	Highest mark	Lowest mark
1	15	12.4	18	3
2	11	12.5	19	7
3	23	10.8	16	4
4	26	12.3	20	0
5	18	10.1	20	2
6	6	9	16	2
7	14	10.1	20	3
8	27	10.6	19	3

Materials Prelims 2008 MS3 Transforming Materials



General Comments

1. Casting methods. Reasonably good descriptions of basic casting methods. Poorer on advantages and disadvantages of each method (notably with regard to surface finish and dimensional tolerances).
2. Polymer synthesis. A number of good answers. Strong on polymerisation reactions, weakest on molecular weight calculation.
3. Solid state phase transformations. Several very good answers. Knowledge of G.P. zone formation was surprisingly limited.
4. Peritectic phase diagram. Popular question. Most candidates could draw the free energy curves reasonably correctly, but few had any clear idea of what peritectic microstructures look like. Many described eutectic structures instead.
5. Phase Rule. A surprising number of candidates were unable to derive the Phase Rule from first principles, or to carry out a simple calculation of vapour pressure versus temperature.
6. Extraction metallurgy. Remarkably few attempts at this basic “bread and butter” question, which also gave rise to the lowest average marks for any question on this paper. Knowledge of iron blast furnace very sketchy. Understanding of the treatment of sulphide ores inaccurate and incomplete. Almost no appreciation of possible strategies for treatment of halide ores (and a tendency to misinterpret this latter part of the question, which was targeted on highly electropositive metals; some candidates even suggested electrolysis of aqueous solutions).
7. Kinetics of reaction. Some very good answers to this question on sequential reactions, but a number of candidates were unable to analyse the sequence of individual reaction steps in a logical manner.
8. Electrochemistry. A very popular question, but the answers were of disappointing quality. The main difficulty was in the calculation of thermodynamic parameters from electrochemical data. Many candidates did not realise that it is not possible to calculate the free energy change in the final part of the question simply by adding together the two electrode potentials. One of these relates to a one-electron process, while the other relates to a two-electron process. Hence the free energy changes for each stage must be calculated separately and then combined, not vice versa.

Maths for Materials and Earth Scientists

Examiner: Dr N Grobert

Candidates: 28

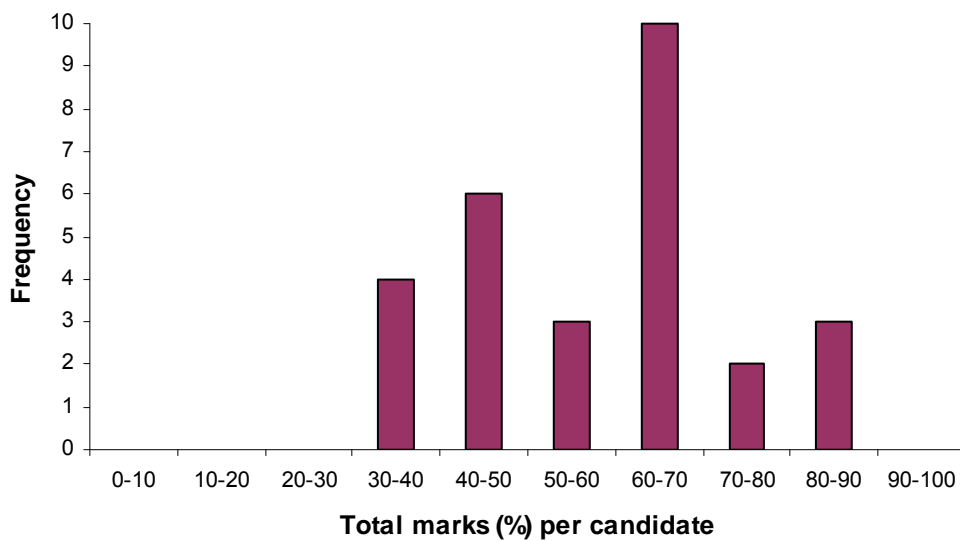
Mean mark: 58.6%

Maximum mark: 88%

Minimum mark: 33%

Question	No of answers	Average mark	Highest mark	Lowest mark
1	28	7	8	6
2	22	6	8	0
3	28	6	8	0
4	27	5	8	1
5	9	2	8	0
6	28	6	8	0
7	27	4	8	0
8	28	3	8	0
9	26	6	8	0
10	26	5	8	0
11	24	13	21	4
12	28	21	25	8
13	2	22	25	20
14	24	14	28	0
15	4	10	25	4
16	27	13	25	2

Materials Prelims 2008 MMES



General Comments:

9 students attempted 10 Part A questions.

14 students attempted 9 Part A questions.

2 students attempted 8 Part A questions.

2 students attempted 7 Part A questions.

1 student attempted 6 Part A questions.

22 students attempted 4 Part B questions.

5 students attempted 3 Part B questions.

Question 5 on partial derivatives was rather unpopular and the few who attempted it have done it poorly; only 2 students achieved full marks.

Question 8: The students seemed to be confused, various relatively unrelated attempts were made to find the power series of a function.

Questions 13 (calculating the total differential of a function and sketching the tangent plane) and 15 (Chebyshev polynomials) were totally unpopular, however, the few students who attempted Q13 did very well. For Q15 there was a large spread of marks.

Overall comment: The handwriting of many students was rather sloppy and sometimes illegible! Most students wrote on the first page clearly marked "for examiners only".

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		
	2007/08	2006/07	2005/06	2007/08	2006/07	2005/06
Distinction	n/a	n/a	n/a	n/a	n/a	n/a
Pass	25	19	12	100	100	100
Fail	0	0	0	0	0	0

(2) If vivas are used

The Board of Examiners decided at the start of the examination process that Part I students would only be given a viva in borderline cases (Pass/Fail or Honours/Pass). Students were informed of this possibility both by e-mail and by letter on 6th March 2008. In the event there were no borderline candidates, so no vivas were given.

(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

(1) On the suggestion of the External Examiners, the two External Examiners were asked to share responsibility for both Part I and Part II. This allowed the written papers to be divided between them, according to their particular expertise. The new arrangement was deemed to have been successful, and will be continued in future years. A single Chairman also shared responsibility for Part I and Part II examinations, and this too will be continued.

(2) The structure of the Options courses was changed this year, and this affected the structure of the two Option papers. In place of 8 questions, one on each of the lecture courses, the papers were divided into 3 blocks each of which had 3 questions. Candidates were given a choice of 3 questions, 2 from one block and the third from one of the other 2 blocks. In principle, this allows for questions to be set which test knowledge more broadly across an area, but in practice the questions in this first year were limited to covering a single lecture course. A sample paper was sent to candidates in Hilary Term, and the structure of the Option papers followed closely that of the sample paper.

(3) This year, additional coursework was introduced into the third year, in the form of 2 modules: Characterisation of Materials and Modelling of Materials. Candidates selected which of the modules they wished to take, and attended lectures and completed written coursework during the first 2 weeks of Hilary Term. In general, the coursework for each module will be marked by 2 Assessors, but on this occasion the Chairman of Examiners was involved in marking the Characterisation module, and also triple marked a limited number of scripts from the Modelling module to assure consistency.

(4) Three candidates who withdrew from the Part I Examination last year returned this year to take the written papers. The three returning candidates were not required to do the additional coursework module on Characterisation or Modelling, and so their grade was based on a different total mark to the rest of the candidates. However, due to the change in the Options course, two special Option Papers had to be set for these candidates, following the previous Regulations and paper structure. To avoid having to write a full set of extra questions, most questions on the Special Option papers were taken from the standard Option papers. However, the lack of an exact correspondence between the content of the two sets of papers required the returning candidates to be isolated from the rest of the cohort between their papers. In order that these should be for the shortest possible time, the two Option papers and the two Special Option papers were all held on the same day, rather than on subsequent days as is usual. The overall averages from Option Paper 1 and Option Paper 2 were not significantly different, so there is no indication that candidates were disadvantaged by having the 2 papers on the same day, rather than on different days as in previous years. Even with these arrangements, the Special Option papers created a significant additional load on the Examiners.

(5) A more formal system was implemented this year to define what was deemed to be non-examinable, in order to avoid the confusion that arose last year. The Faculty has moved to a system where non-examinable material must always be clearly marked in the notes, rather than being stated verbally, so that the students can never be in any doubt. In order to deal with course material that had been delivered before the change, lecturers were asked to specify what parts of their courses they had told the students were non examinable, and this information was collated and sent to the students in Trinity Term. A statement was made to the students that anything on the course (as defined by lecture synopses, and covered either in lectures or lecture handouts), and not on the list, was deemed to be examinable.

(6) A new system was implemented for double checking the individual marks on questions, to avoid the errors which arose last year. Adding up of marks for individual questions was cross-checked by the two markers, and the mark sheets countersigned to confirm this. Mark sheets for each question were also designed to allow simple checking that marks had been transcribed correctly onto the final mark sheet, but these were not always used correctly. Marks for individual questions were entered onto a master spreadsheet and the final mark for the paper checked against that calculated by the markers. Final marks for the candidates as calculated by the spreadsheet were cross-checked by the Chairman.

(7) As one of the Examiners had to resign at a relatively late stage, at short notice and for family reasons, the unusual step was taken of appointing an Assessor to assist with marking of one of the General Papers, to lighten the load on the remaining Examiners. The Chairman would like to thank Dr. Pete Nellist for agreeing to help out with the examination process at such short notice.

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

(1) There was discussion between the Examiners as to whether an Honours pass should be awarded in cases where candidates had not achieved Honours, or had even failed, one or more of the papers. In the end it was decided that since the Examination Conventions dictate that grades are awarded on the basis of the average mark, candidates could not be penalised for failing one of the papers, and this is indeed the approach used by Examiners in previous years. However, the Faculty should consider whether it is content that candidates achieve Honours without passing (or achieving Honours) on all the papers. The Examination Conventions should be revised to make the situation explicit, based on the decision of Faculty.

(2) For this first year of the new coursework modules, the Chairman of Examiners was involved in the marking and able to ensure consistency between the marking of the Assessors of the 2 modules. This co-incidental situation made the job of the Chairman more straightforward, and shows that it would be useful in the future to always have one of the Examiners appointed to be one of the module markers. However, it is recognised that this may not always be possible, in which case the Chairman (or other Examiner) will need to spot mark some of the coursework, as stated in the Conventions.

(3) To date, anonymity has not been maintained in the marking of any coursework, since this is submitted with the candidates' names. In some cases, such as the team design project, it would not be possible to maintain anonymity of the candidates, as the assessment involves an oral presentation to the markers. However, we recommend that mechanisms be put in place to ensure candidate anonymity wherever possible, such as for the business plan, and the characterisation and modelling modules.

(4) Some complications arose in the marking of the business plan and the language option, completed by candidates last year, which were made more difficult by the fact that written procedures were not followed. Work should be marked in the year it is completed, but this did not happen last year. The Chairman is grateful to Prof. Peter Dobson and Dr. Ian Towle of the Begbroke Directorate for agreeing to mark 2 sets of coursework this year. We recommend that the Faculty take steps to ensure that the agreed written procedures are followed. A particular difficulty arises for the language option, for which assessment needs to be arranged specially with the Language Centre. A suggestion would therefore be that candidates wishing to take this option be required to apply to the Materials Faculty in their 2nd year, and be told that it is their responsibility to ensure that a suitable assessment is arranged at the end of the course, and the mark reported to the Chairman of Examiners.

(5) It was noted this year that some of the candidates were given special dispensations based on applications made during their Preliminary Examinations, without the Chairman being sent a copy of the original permission from the Proctors. This led to some confusion as to why dispensation was being given. It would seem reasonable to expect copies of any permissions to be issued to the Chairman of each examination, but since this is not done, the Faculty needs to make sure that any such permissions are kept centrally, so that they can be referred to by the successive Chairmen for Preliminary, Part I and Part II Examinations.

D. EXAMINATION CONVENTIONS

The previous year's Examination Conventions were included in the Course Handbook that was distributed to all candidates in hard-copy and was also made available on the Departmental website, to which candidates' attention was drawn by e-mail. The current year's Conventions (2008, attached) were put on the Departmental website and sent in hard-copy and electronically to all candidates on 6th March 2008. The Examination Conventions were assessed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There were 25 candidates for the examination, and all were awarded Honours. The examination consisted of 6 written papers plus coursework that for most candidates included a team design project, a business plan, industrial visit reports and practical work carried out during the 2nd year.

Two candidates opted to take the language option, which replaces the business plan. This was marked by the Language School to the same guidelines as the business plan. One candidate opted to take the supplementary subject in History and Philosophy of Science, again in place of the business plan, and took a separate written paper during the 2nd year. In addition, most candidates completed further coursework in the 3rd year in the form of either a module on Materials Characterisation (13 candidates) or one on Materials Modelling (9 candidates). Three candidates who withdrew from the Part I Examination last year returned this year to take only the written papers, and were not required to complete this additional coursework module.

Each written paper lasted 3 hours. For the General papers, candidates were required to answer 5 questions out of 8, as in previous years. Option papers followed a new format, where candidates were offered 9 questions in 3 sections of 3 questions. Candidates were required to answer 3 questions, 2 from one section and 1 from either of the remaining sections. Special Option papers were set for the 3 returning candidates, following the pattern of past years in which 3 questions had to be answered out of 8. Team design projects were marked by one Examiner and one Assessor, with the Chairman assisting with the deciding of agreed marks. Teams were marked as groups, but allocation of bonus or penalty marks is permitted under the Conventions, and was used in 1 instance. The business plans were marked by Assessors appointed from the staff at the Begbroke Directorate, again with teams being marked as a group. Candidates' work on the 2 new coursework modules were marked either by 2 Assessors (modelling) or 2 Examiners and 1 Assessor (characterisation). Reports for each of the Industrial Visits were assessed as pass/fail by the Industrial Visits Organiser, appointed as Assessor.

The overall mean mark for Part I was near the middle of the 2(i) range. For the first time, the mean marks for all of the written papers in the examination were in the 2(i) band (60-70%) and so no scaling needed to be considered. This shows that the year-on-year efforts of Examiners in setting papers at an appropriate level have now achieved the goal of making scaling unnecessary. Mean marks for the practical work were higher than for the papers, being in the 1st class band but this is in line with the results from previous years. It will be noted that the mean mark for the two Option papers are similar to one another, and to the other written papers, and thus there is no indication that the students performed less well from having the two papers held on the same day.

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. Both male and female groups of candidates performed better in the coursework than in written examinations.

A non-serif font was used for examination papers for the first time this year, in order to make them comply with SENDA/ADA guidelines. No specific requests were received for enlarged copies. Candidates were allowed extra time on account of dyslexia/dyspraxia, where necessary, and the outcomes seemed satisfactory.

mark (%)	Overall mark		Written Examinations		Coursework	
	Male	Female	Male	Female	Male	Female
40–50	1	-	5	1	-	-
50–60	6	2	5	2	-	-
60–70	4	2	2	1	7	1
70–80	6	2	5	2	10	5
80–90	2	-	2	-	2	-
Totals	19	6	19	6	19	6

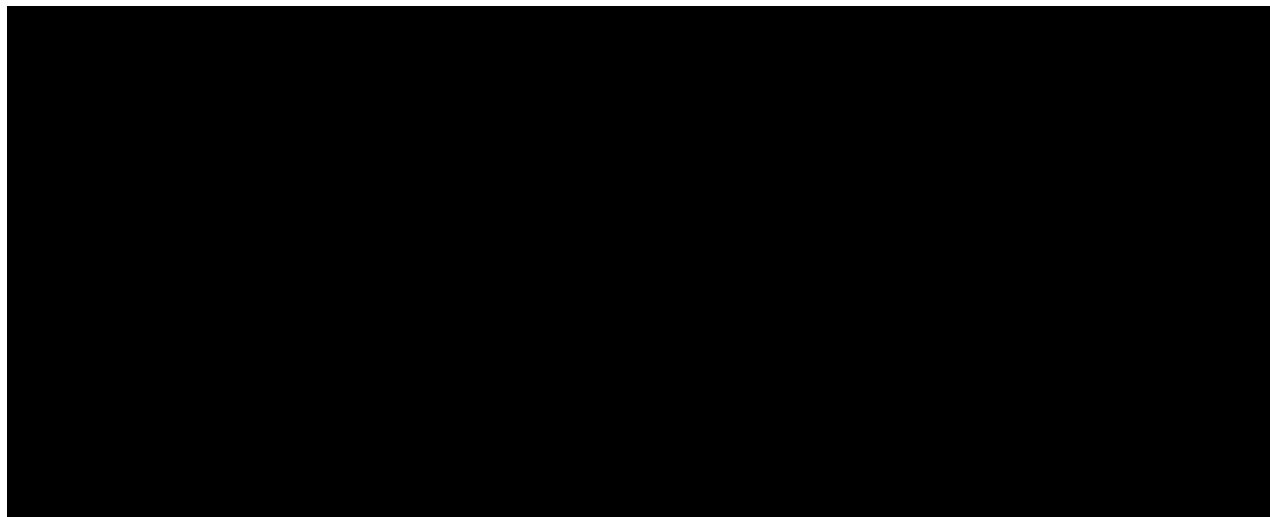
C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same papers for the whole examination, in that there were no optional written papers. The 3 candidates who withdrew from Part I Examination in 2007, and returned to take Part I Examination this year, took Special Option Papers that followed previous regulations.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Detailed comments on the written examination papers and overall candidates' performance on individual questions are attached. Note that given the small number of candidates taking the special options papers, comments on these papers are confidential.

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



F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. A. Cerezo (Chairman)
 Dr. M.L. Jenkins
 Prof. S.G. Roberts
 Prof. B. Derby (external)

Dr. K.A.Q. O'Reilly
 Dr. A.J. Wilkinson
 Prof. A.L. Greer (external)

Attachments: Examination Conventions 2008
 Comments on General Paper 1

Comments on General Paper 2
Comments on General Paper 3
Comments on General Paper 4
Comments on Option Paper 1
Comments on Option Paper 2
Comments on Special Option Paper 1 (Confidential)
Comments on Special Option Paper 2 (Confidential)

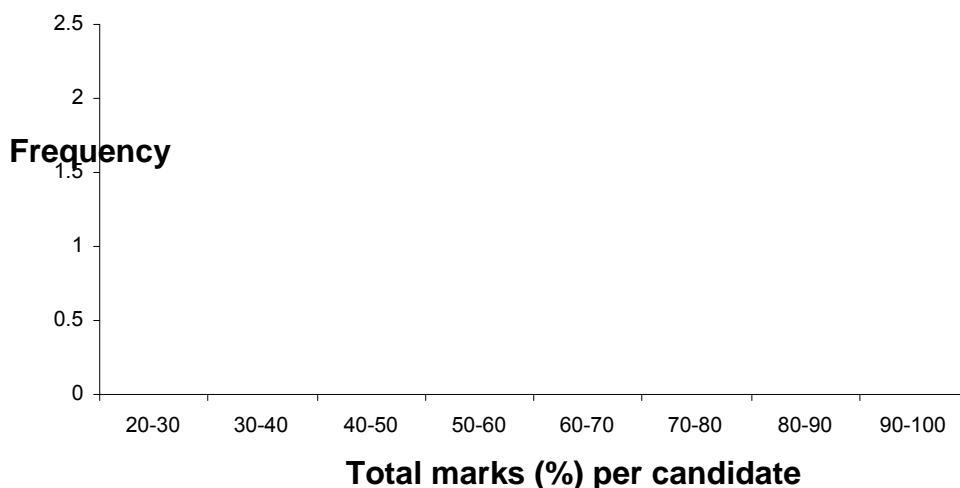
Materials Special Option Paper 1
(Old Regulations)

Examiner: Dr Keyna O'Reilly
Candidates: 3

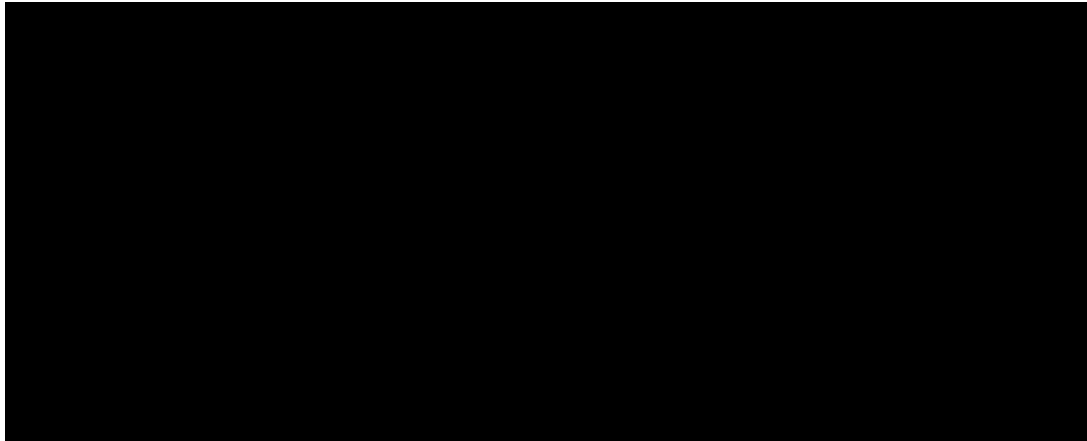


Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Characterisation Techniques	█	█	█	█
2	Melt Processing	█	█	█	█
3	Electroceramics	█	█	█	█
4	Origins and Stability of Microstructure	█	█	█	█
5	Fatigue	█	█	█	█
6	Advanced Engineering Alloys	█	█	█	█
7	Biomaterials	█	█	█	█
8	Nanomaterials	█	█	█	█

Part I 2008 Materials Science
Special Option Paper 1



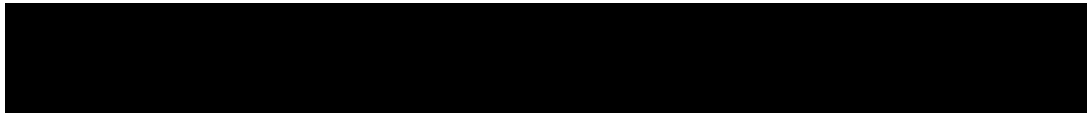
General Comments:



Materials Special Option Paper 2
(Old Regulations)

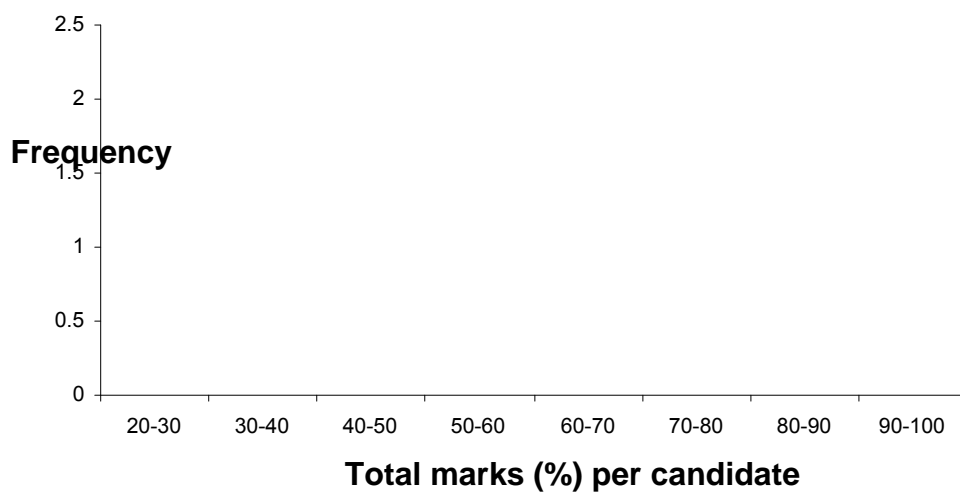
Examiner: Prof. Steve Roberts

Candidates: 3

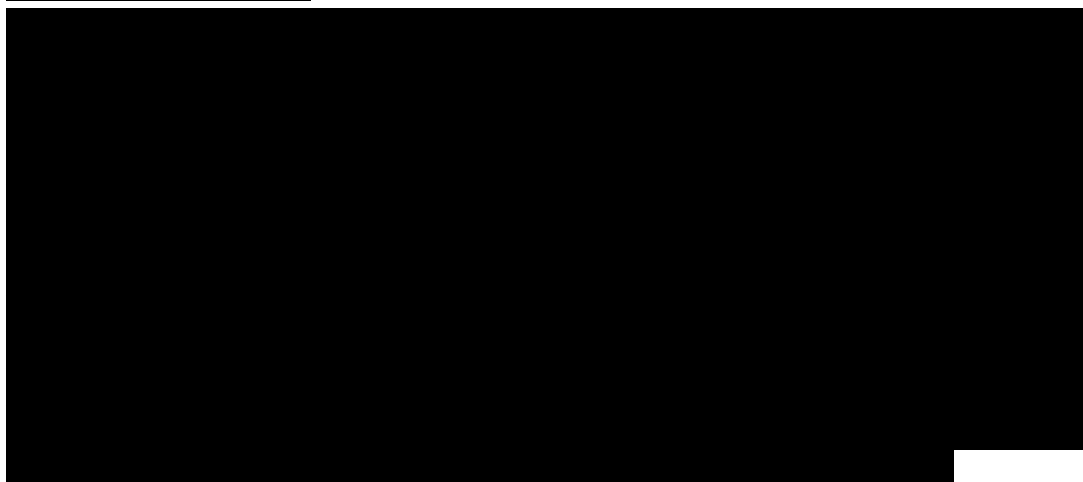


Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Information Storage	■	■	■	■
2	Semiconductor Device Technology	■	■	■	■
3	Physics of Nanomaterials	■	■	■	■
4	Advanced Polymers	■	■	■	■
5	Optoelectronic Devices	■	■	■	■
6	Bonding and Structure	■	■	■	■
7	Design with Ceramics	■	■	■	■
8	Processing of Ceramics	■	■	■	■

**Part I 2008 Materials Science
Special Option Paper 2**



General Comments:

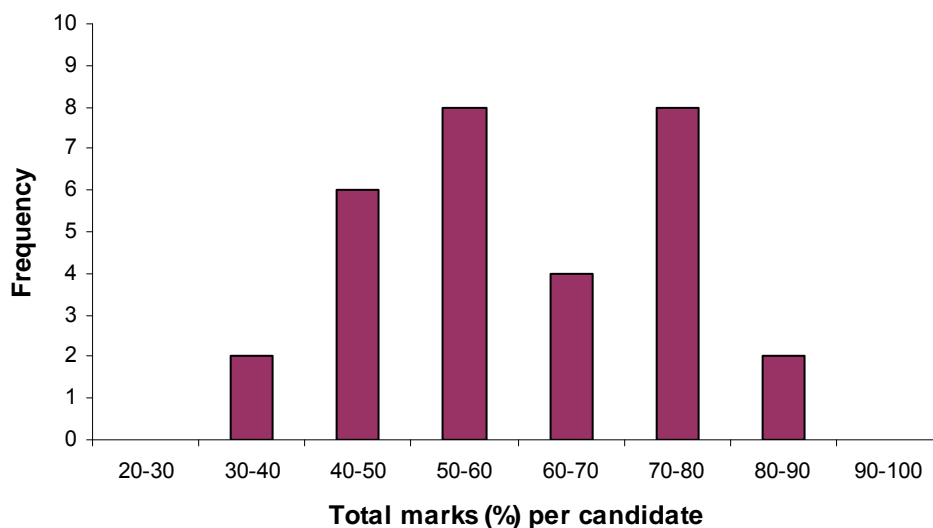


General Paper 1 – Structure and Transformations

Examiner: Prof. Alfred Cerezo
Candidates: 30 (25 MS / 5 MEM)
Mean mark: 61.5%
Maximum mark: 88%
Minimum mark: 37%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Diffusion	15	10.8	18	3
2	Powder Processing	16	11.4	16	6
3	Nucleation	20	13.2	18	7
4	Corrosion	14	11.6	20	7
5	Ostwald ripening	21	11.6	18	5
6	Surface energies	23	14.0	19	9
7	Polymers	17	11.9	16	6
8	Ternary phase diagrams	23	13.3	19	4

Part I 2008 MS/MEM General Paper 1



General Comments:

1. Application of Fick's 2nd Law. Surprisingly low marks for a relatively simple bookwork question. Several candidates approached last part as a Fourier expansion, rather than realising it could be approximated to an error function solution as in the previous part.
2. Description of methods for production of metallic powders and fabrication of tungsten filaments and copper-lead bearings. Many details missing from answers but generally good attempts. Some candidates missed point that production methods produce liquid droplets that solidify to powder.
3. Standard bookwork question on nucleation, but still candidate showed some confusion, e.g. using $\Delta G=0$ as condition for critical radius, or using RT instead of kT in calculation of nucleation rate.
4. Construction and application of Pourbaix diagrams. This question had a sign error in the tabulated data, but few people knew how to set up the Nernst equations correctly so the error affected very few candidates, and those were marked accordingly.
5. Description and derivation of Ostwald ripening, mostly from bookwork. Some confusion over different radii being referred to in question. Most candidates used the variation of strength in aged Al-Cu as the example of overageing, despite this not being due to Ostwald ripening.
6. Young-Dupré equation and variation of shape of liquid gold particle as it solidifies. Good answers in general, but many candidates were confused on last part, discussing coherency and growth rates rather than describing crystallographic variation in surface energies.
7. X-ray diffraction for characterisation of polymer structure, formation and structure of spherulites and relationship between melting point and glass transition of polymers. Answers generally lacking in details.
8. Candidates asked to explain features of, and complete, a partially drawn ternary phase diagram. Most candidates could correctly answer many of the points and a few were able to correctly complete the phase diagram.

General Paper 2 – Electronic Properties of Materials

Examiner: Dr Mike Jenkins

Candidates: 30 (25 MS / 5 MEM)

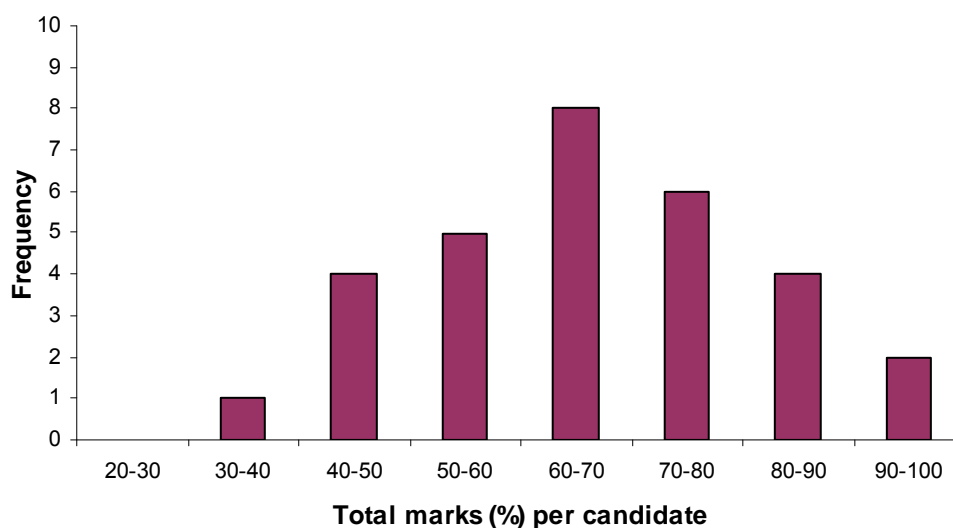
Mean mark: 67.2%

Maximum mark: 97%

Minimum mark: 37%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Tensors	27	16.4	20	10
2	Quantum mechanics	22	11.2	19	5
3	Statistical mechanics	23	13.1	20	4
4	Free electron and nearly free electron theory	27	13.6	19	5
5	Tight-binding theory	3	12.3	20	3
6	Properties of dielectrics	7	12.9	16	5
7	Semiconductor materials	17	8.8	19	2
8	Magnetic properties	24	15.8	19	7

Part I 2008 MS/MEM General Paper 2



General Comments:

1. Manipulation of tensors and application to heat flow. This was a popular, well-structured question, which was answered well by most candidates, with several near-perfect answers.
2. Particle in a box. Most students did the first part of the question well; the second part proved difficult for many students, although there were several very good answers. Many students did not recognize that the wavefunction in part (b) was not an energy eigenfunction.
3. A well-structured question on two-level atoms. Most candidates scored well on parts (a)-(c). Marks were lower on parts (d)-(e), with most candidates unable to use the result in part (d) to prove the relationship of part (e). Nevertheless there were several near-perfect answers.
4. A popular question. Surprisingly, the first part of the question (a) i) was answered badly by many candidates (several of whom quoted the Bloch theorem, which is irrelevant here). Even so, most candidates could derive the expressions for the Fermi wavevector and Fermi energy, and many correctly evaluated the Fermi energy of Al. Part (b) on nearly-free electron theory was well answered by most.
5. Only 3 answers to this very standard question - one near-perfect, one good and one very poor.
6. Power dissipation and permittivity of dielectrics. Not a popular question, but most answers to this mostly essay-type question were of good quality. The last part of the question (on the relative permittivity of diamond) was answered reasonably well by most.
7. A fairly popular question on Schottky barriers, but answers were of very variable quality, and several were very poor. Most candidates could sketch the band diagram. Explanations of the asymmetric I-V behaviour were of variable quality, with several candidates giving completely incorrect answers. Marks on sections (c) (deriving an expression for the depletion width) and section (d) (calculation) were often very low, although there were several very good answers.
8. This fairly easy question was answered well by a majority of candidates. In the last part, most candidates recognized that the choice for a permanent magnet to operate at 1000°C lay between the ferromagnetic materials C and D. However, several candidates wrongly chose material C despite recognizing that it would be above its Curie temperature at 1000°C .

General Paper 3 – Mechanical Properties

Examiner: Dr Angus Wilkinson

Candidates: 30 (25 MS, 5 MEM)

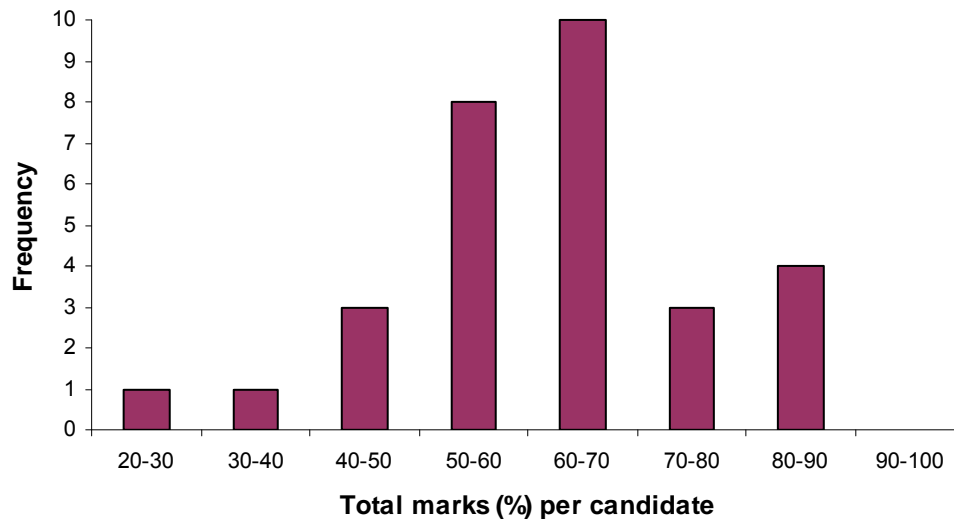
Mean mark: 61.6%

Maximum mark: 87%

Minimum mark: 27%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Mechanical Properties of Polymers	16	12.1	18	4
2	Elasticity of Isotropic Materials	18	12.6	19	5
3	Macroplasticity and mechanical working	17	13.7	18	8
4	Microplasticity	15	8.9	16	3
5	Microplasticity	26	13.2	19	2
6	Mechanical Properties of Composites	23	12.0	18	4
7	Fracture	20	12.5	20	9
8	Creep and Superplasticity	15	13.1	20	4

Part I 2008 MS/MEM General Paper 3



General Comments:

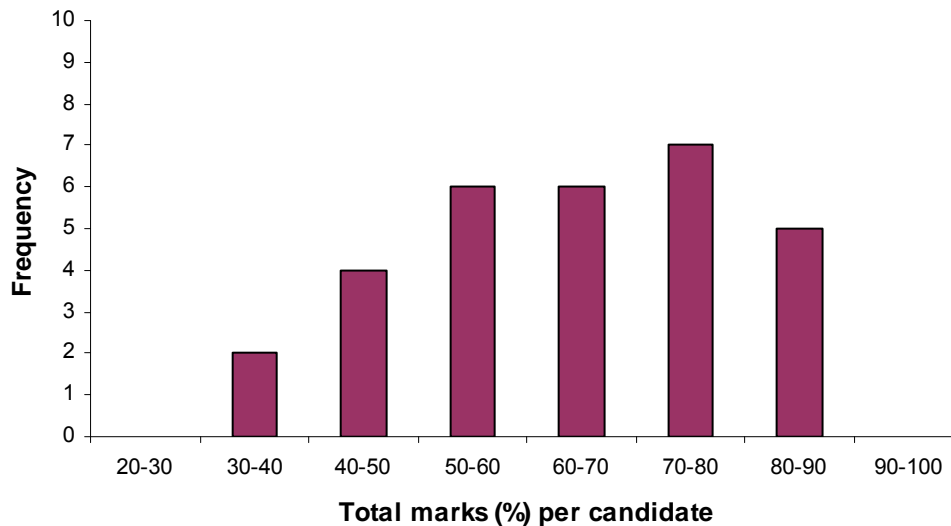
1. Descriptive parts (a) and (b) generally well done, but very few correct answers for analysis in part (c), with most not identifying constant volume condition.
2. A good number of high marks for this question, showing good understanding. However, a third of answers scored under 50% indicating weaker students struggle with mathematical aspects of elasticity.
3. A descriptive question on extrusion processes which was answered well in most cases, resulting in the highest average mark and lowest spread of marks.
4. Movement of dislocations. Relatively low number of answers for this question, with a mean mark distinctly lower than other questions on the paper. A disturbing number of scripts (7) returned a mark of 6 or less (i.e. $\leq 30\%$) indicating very little understanding of subject matter.
5. Dislocation mechanisms and their effects on properties. Most popular question, with only 4 candidates not answering. The significant level of choice within question probably contributed to popularity. The question was generally well answered resulting in a relatively high mean mark.
6. Popular question on short fibre composites. In part (a) there was some tendency to discuss effect of transfer length on strength rather than stiffness. Weaker candidates struggled with part (c).
7. Reasonable answers to descriptive parts (a) and (b), however most struggled with part (c) where labeling of diagrams suggested many had attempted to learn by rote. One excellent script earned full marks.
8. Creep failure and the Larson-Miller parameter. Many answers to part (a) discussed creep deformation in general and not mechanisms of failure. One excellent script earned full marks.

General Paper 4 – Engineering Applications of Materials

Examiner: Prof. Alfred Cerezo
Candidates: 30 (25 MS, 5 MEM)
Mean mark: 64.1%
Maximum mark: 86%
Minimum mark: 32%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Properties of polymers	13	12.7	17	7
2	Ni-based superalloys	22	14.3	19	9
3	Ti alloys	19	12.4	16	6
4	Steels	15	11.3	16	6
5	Ceramics	21	13.3	18	6
6	Semiconductor devices	17	12.9	19	2
7	Materials characterization	25	13.4	18	7
8	Transmission electron microscopy	18	11.3	18	4

Part I 2008 MS/MEM General Paper 4



General Comments:

1. Orientation of polymer molecules and its effect on properties. Few candidates knew what was meant by extensional flow, or could manage the relatively simple calculation in the last part of the question, but overall the marks were good.
2. Microstructure, chemistry, and high temperature and oxidation resistance of nickel superalloy single-crystal turbine blade. Surprisingly unpopular question.
3. Descriptive question on microstructure of Ti-6Al-4V, reinforcement with carbon fibre and reasons for high cost of Ti alloys in general. Most candidates could provide the general points and so good marks overall.
4. Role of alloying elements in tool steels and maraging steels, and applications. Many candidates made general points about solutes in steels, rather than addressing question directly. Few answers addressed the fundamentals of how microstructures form, the importance of thermal stability, etc.
5. Description of sintering processes and control of grain size in ceramic components. The use of dopants in sintering and the effect of grain size on functional properties not often mentioned. Few candidates specifically addressed advantages/disadvantages of different sintering techniques.
6. Transferred-electron oscillator and heterostructure laser diode. Former answered well, but for latter there were many answers that gave device description but no fundamental concepts.
7. Candidates asked to select appropriate characterisation techniques to address specific materials questions. Good answers, given relatively high level of judgement required, with standard errors being made, e.g. WDX on a TEM, or using EDX when the spatial resolution is not sufficient.
8. Diffraction and imaging in TEM. Many relatively poor answers, given much of question was standard book work. Many candidates made error of using half angle (not deflection) from Bragg. Some answers showed very poor recollection of basic crystallography.

Materials Option Paper 1

Examiner: Dr Keyna O'Reilly

Candidates: 22 (MS)

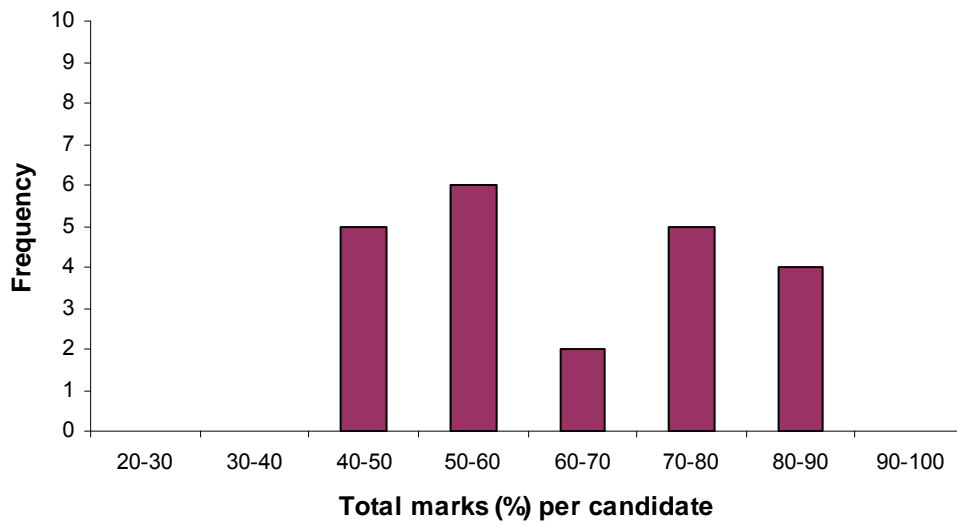
Mean mark: 63.7%

Maximum mark: 89%

Minimum mark: 42%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Melt processing	12	19.1	29	8
2	Fatigue	6	21.7	29	12
3	Strength and failure	6	14.2	24	7
4	Functional Nanomaterials	2	30.5	32	29
5	Functional Nanomaterials	9	23.4	28	16
6	Electroceramics	2	22.0	27	17
7	Engineering Ceramics	13	21.6	33	14
8	Biomaterials	9	21.2	27	16
9	Biomaterials	7	21.1	32	16

Part I 2008 Materials Science Option Paper 1



General Comments:

1. A popular question on competitive growth during melt processing. Part (a) was generally very well answered. In part (b) a few candidates thought competitive growth was growth of preferred crystallographic directions, which meant that their explanations for part (c) were misdirected. Of the remaining candidates, several missed the point as to the effect of increasing the concentration of alloy additions, but nearly all correctly described the effect of stirring. Only two candidates used the correct heat balance approach to part (d). In part (e) most candidates did not adequately explain why equiaxed morphologies are preferred, but did describe the use of grain refiners satisfactorily.
2. Not a particularly popular question on microstructural development during fatigue. Part (a) was generally well answered with detailed descriptions of the microstructures formed. Those candidates who scored less well generally displayed a lack of appreciation of how the microstructure developed through stages I and II. Part (b) was generally well answered, though some candidates were let down by not knowing the burger's vector. Answers to part (c) were generally along the correct lines, but lacking sufficient detail.
3. Properties of alloys. This question has a significantly lower mean mark than others on the paper. Part (a) was generally the best answered, though some candidates described completely different alloys than given in the question. Consider's construction in part (b) was poorly done with several candidates even failing to correctly extract the yield stress. Part (c) on abrasive wear was again generally poorly done with few candidates identifying that only some contributions to hardness would be effective in increasing wear resistance.
4. An unpopular question yielding only two answers. However, the candidates that did choose this question scored highly (32 and 29 out of 33), showing that the questions was relatively straightforward.
5. Fabrication and properties of Quantum Dots. A relatively popular question, returning a relatively high mean mark. Parts (a) and (b) were generally well answered. Answers to part (c) were more varied, with some candidates giving two good examples but struggling with the third. Logic in suggesting preferred route for laser fabrication was often flawed. In part (d) the main failing was not spotting that both conduction and valance bands are altered, leading to calculation of only half the change in band gap.
6. An unpopular question on solid oxide fuel cells, yielding only two answers. Mean mark was in line with other questions on the paper, indicating that question was fair.

7. Most popular question on paper. There were some very good answers including one obtaining full marks. Some answers to part (a) relied too much on expression for figures of merit learnt by rote rather than physical reasoning. In part (b) some candidates attributed incorrect microstructures to the two materials and consequently struggled with the question. In part (c) the physical reasoning for differences in tensile and bend strengths was good, and many candidates made some progress with the Weibull analysis.
8. A reasonably popular question on the implantation of biomaterials into the body, and the body's subsequent response. Very few students drew a bioreactivity spectrum in part (a) and others described it rather poorly. In order to tailor bioreactivity, most students suggested coating with HA or modifying porosity, but few went any further. Part (b) was rather weakly answered. Few candidates correctly described the use of the materials, and discussion of body response was limited. More use of diagrams would have been appropriate. Part (c) was generally well answered, though more use of diagrams would again have been appropriate.
9. A less popular biomaterials question on polymers and their use as medical devices. In part (a) answers would have benefitted by more use of appropriate diagrams and more precise descriptions of the bonding involved. In part (b) there was a lot of emphasis given to describing the examples, and insufficient discussion about how some conformations lead to structural hierarchy. Part (c) was generally well answered. Where candidates lost significant marks it was generally for only giving one example.

Overall Comments

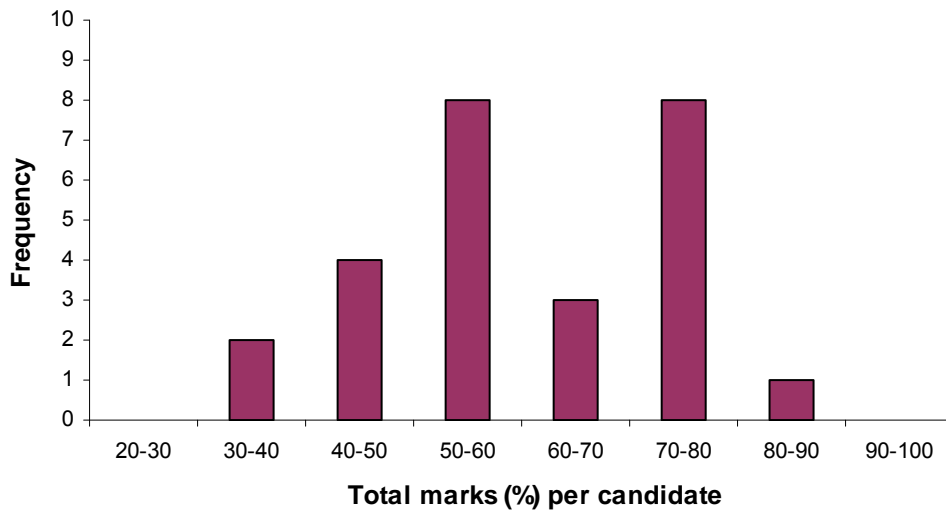
The paper showed quite a good spread in the questions attempted. Section A (metals and alloys) had 24 attempts, section B (functional and nanocomposite materials) 13, and section C (non-metallic materials) 29.

Materials Option Paper 2

Examiner: Prof. Steve Roberts
Candidates: 26 (22 MS / 4 MEM)
Mean mark: 61.0%
Maximum mark: 81%
Minimum mark: 35%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Advanced engineering alloys	18	17.3	26	9
2	Advanced engineering alloys	8	18.4	28	12
3	Manufacture	12	23.5	29	14
4	Materials and Devices for Information Technology	6	17.8	23	12
5	Materials and Devices for Information Technology	6	22.7	28	0
6	Materials and Devices for Information Technology	5	21.6	26	9
7	Ceramics materials	12	19.0	28	0
8	Advanced polymers	11	22.0	30	17
9	Advanced polymers	0	-	-	-

Part I MS / Part II MEM 2008 Option Paper 2



General Comments:

1. High temperature alloys. Popular question, but apart from a few very good answers, not that well done. The poorer answers on the whole tended to be rather unspecific: in the first part about the required special features for high temperature alloys; in the second, in not knowing anything very detailed about more than one of the alloy types.
2. Martensitic transformations. Not very popular, and quite a spread of answers. Weaker candidates didn't say much about the thermodynamic aspects of the martensitic transformations, and were also weak on the specifics of shape changes on crystallography. Many just stuck in an "all I know about martensite" type of answer instead of answering what was asked for.
3. Joining methods. Popular and generally well answered. The first part on soldering, brazing and welding was answered quite well by all; the second section on weld defects sometimes less so.
4. Semiconductor growth methods. Not popular: answers from moderate to good. The growth processes were on the whole well-described (bookwork). The last section, on requirement for a particular device type, was not well done: MBE was identified and justified as the likely technique by many, but no-one recognised that the layers had different crystal structures.
5. Optoelectronic materials and devices. The few who did this question on the whole showed a good knowledge of all the material in question. Weaker candidates just had fewer, and less specific, things to say.
6. Magnetic device materials. With one woeful exception, this was generally well answered by the few who attempted it. Some were not clear about the distinctive features of GMR and TMR devices. The calculation was well done by most.
7. Ceramic materials: synthesis. Very popular, but often not very well done. The weaker answers were generally just poorer across all sections, but this often showed up more in the first section, as there was more here to discuss in detail.
8. Polymers: rotaxanes and co-polymers. Popular and quite well done by most. Some rather vague answers as to the use of polyrotaxanes, and also the detection of phase separation by light scattering.
9. Polymers: neutron scattering. No one attempted this question.

Overall:

The paper showed quite a good spread in the questions attempted. Section A (metals and alloys) had 38 attempts, section B (functional and nanocomposite materials) 17, and section C (non-metallic materials) 23. However, one question, on neutron scattering of polymers, was not answered by anyone.

There was no significant difference in performance between the MS candidates and the small number of MEM candidates.

The weaker candidates generally lost marks through answering most parts of questions but with a lack of detail, especially detail specific to what the question asked, rather than by not attempting parts of questions. Some of the better answers were quite brief: other answers were sometimes 2 or 3 times as long, but without necessarily scoring higher. Candidates were generally reluctant to use diagrams or illustrations unless specifically asked for, and even so these were frequently scrappy and not very informative.

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 (%)		
	2007/08	2006/07	2005/06	2007/08	2006/07	2005/06
I	5	5	6	26.3	41.7	35.3
II.I	11	4	7	57.9	33.3	41.2
II.II	3	2	4	15.8	16.7	23.5
III	0	1	0	0	8.3	0
Pass	0	0	0	0	0	0
Fail	0	0	0	0	0	0

(2) If vivas are used

The Part II examination in Materials Science consists only of a research project, for which a thesis of 15,000 words is produced. Each thesis was read by two internal examiners/assessor and one external and the final thesis mark was then agreed. All candidates were given a viva but numerical marks are not given for viva performance. The viva was used to clarify points of detail and to ensure that the thesis presented has been prepared by the candidate being examined.

(3) Marking of scripts

All theses were triple blind marked by the internal Examiners/Assessor, and one external Examiner. (Due to the small number of candidates, which makes it easy to identify who is working on a particular research topic, anonymous marking was not possible.) Provisional marks were exchanged in advance of the viva, and to allow a brief discussion of differences of assessment, which could be explored further during the viva. Following the viva, a final agreed mark was decided between the three markers.

B. NEW EXAMINING METHODS AND PROCEDURES

(1) Following the recommendation of the Part II Examiners for 2006/7, a more explicit formal requirement was introduced for a short (not more than 1,500 words) reflective account of the project management aspects of the research project. This is in addition to the limit of 15,000 words for the main body of the thesis, excluding appendices. There was no reduction to the word limit, as had been recommended by the Part II Examiners for 2006/7, but a specific limit of 120 pages was placed on the main body of the thesis. A clarification was also issued by the Chairman (28th May 2008) that figure captions were to be included within the limit of 15,000 words.

(2) On the suggestion of the external Examiners, the two external Examiners were asked to share responsibility for both Part I and Part II. This allowed the Part II theses to be divided between them, according to their particular expertise. The new arrangement was deemed to have been successful, and will be continued in future years. A single Chairman also shared responsibility for Part I and Part II examinations, and this too will be continued.

(3) Due to one of the Examiners having to resign at a relatively late stage, the unusual step was taken of appointing an Assessor to assist with marking Part II theses, to lighten the load on the remaining Examiners. The Chairman would like to thank Dr. Jason Smith for agreeing to help out with the examination process at short notice.

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

(1) A clarification was issued by the Chairman during the examination process that figure captions were to be included within the limit of 15,000 words for the length of the thesis. The Examination Conventions for subsequent years should be modified to make this explicit.

(2) The students are required to include in the thesis a signed declaration that the work is their own. However, there is no standard format for this declaration. EPSC and the Proctors have approved the use of a standard University 'Declaration of Authorship' to accompany the submission of theses and other similar course work submitted for examination. This Declaration contains also six core statements on plagiarism, and can be adapted to include declarations on word count. We recommend that a version of this Declaration be produced that would be appropriate for the Part II thesis, and that inclusion of the standard statement be made a formal requirement of the Part II examination.

(3) The marking of Part II theses represents a significant workload for Part II Examiners, at the same time that they have to mark scripts from Part I examinations. The problem was highlighted this year by the resignation, at short notice and for family reasons, of one of the Examiners. The remaining Examiners were helped out by the extraordinary appointment of an Assessor, Dr. Jason Smith. The number of candidates taking the Part II examination next year will be even greater, and it will be particularly hard for the Examiners. A recommendation was made by the 2007 Part II Examiners to reduce the length of the Part II thesis, which would have made the situation less difficult, but this was not accepted by the Faculty. We therefore recommend that at least one Assessor be appointed to assist the Examiners in marking the Part II theses for the 2009 examination, and the practice be followed whenever there are more than 20 candidates for the examination.

D. EXAMINATION CONVENTIONS

The previous year's Examination Conventions were included in the Course Handbook that was distributed to all candidates in hard-copy and was also made available on the Departmental website, to which candidates' attention was drawn by e-mail. The current year's Conventions (2008, attached) were put on the Departmental website

and sent in hard-copy and electronically to all candidates on 6th March 2008. The Examination Conventions were assessed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There were 19 candidates for the examination, and all were awarded Honours. The examination required the candidates to submit a thesis (maximum 15,000 words) on a research project carried out by candidates during the year, usually in the Department of Materials. Two research projects were carried out overseas, one in Princeton University and one in Sydney University. The theses were marked by the Examiners and one Assessor, using pre-defined guidelines that aimed to make use of the full range of marks. Candidates were then given a 20 minute viva, during which they were asked detailed questions on their research work.

The theses were generally of a high quality, and the candidates were able to explain their work well in the vivas. In some cases the vivas became short but in-depth scientific discussions with the candidates. The marks for the Part II examination ranged from 55% to 78%, with an overall mean mark near the middle of the 2(i) range. The external Examiners played a crucial role in deciding the final marks for the candidates, and the Chairman would like to express his thanks to both of them for their hard work in marking so many Part II theses and contributing greatly to the vivas.

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.

mark (%)	Overall mark		Part 2 Project		Part I Mark	
	Male	Female	Male	Female	Male	Female
40–50	-	-	-	-	-	-
50–60	5	-	3	2	5	1
60–70	5	4	5	2	5	2
70–80	3	2	4	2	2	2
80–90	-	-	1	-	1	1
Totals	13	6	13	6	13	6

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 (2008) and Part II for these candidates is given above.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Not relevant for this examination.

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

None.

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. A. Cerezo (Chairman)
Dr. M.L. Jenkins
Dr. K.A.Q. O'Reilly
Prof. S.G. Roberts
Dr. A.J. Wilkinson
Prof. B. Derby (external)
Prof. A.L. Greer (external)

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS ECONOMICS AND MANAGEMENT, PART I EXAMINATION

Part I

A. STATISTICS

(1) Numbers and percentages in each category

The Part I Examination in Materials Economics and Management is unclassified. No distinctions are awarded. Since the number of candidates in this and previous years is less than 6, numerical data is confidential (see section E, below).

(2) If vivas are used

The Board of Examiners decided at the start of the examination process that Part I students would only be given a viva in borderline cases (Pass/Fail or Honours/Pass). Students were informed of this possibility both by e-mail and by letter on 6th March 2008. In the event there were no borderline candidates, so no vivas were given.

(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

(1) On the suggestion of the External Examiners for Materials, the two External Examiners were asked to share responsibility for both Part I and Part II. This allowed the written papers to be divided between them, according to their particular expertise. The new arrangement was deemed to have been successful, and will be continued in future years. A single Chairman also shared responsibility for Part I and Part II examinations, and this too will be continued.

(2) A more formal system was implemented this year to define what was deemed to be non-examinable, in order to avoid the confusion that arose last year. The Faculty has moved to a system where non-examinable material must always be clearly marked in the notes, rather than being stated verbally, so that the students can never be in any doubt. In order to deal with course material that had been delivered before the change, lecturers were asked to specify what parts of their courses they had told the students were non examinable, and this information was collated and sent to the students in Trinity Term. A statement was made to the students that anything on the course (as defined by lecture synopses, and covered either in lectures or lecture handouts), and not on the list, was deemed to be examinable.

(3) A new system was implemented for double checking the individual marks on questions, to avoid the errors which arose last year. Adding up of marks for individual questions was cross-checked by the two markers, and the mark sheets countersigned to confirm this. Mark sheets for each question were also designed to allow simple checking that marks had been transcribed correctly onto the final mark sheet, but these were not always used correctly. Marks for individual questions were entered onto a master spreadsheet and the final mark for the paper checked against that calculated by the markers. Final marks for the candidates as calculated by the spreadsheet were cross-checked by the Chairman.

(4) As one of the Examiners had to resign at a relatively late stage, at short notice and for family reasons, the unusual step was taken of appointing an Assessor to assist with marking of one of the General Papers, to lighten the load on the remaining Examiners. The Chairman would like to thank Dr. Pete Nellist for agreeing to help out with the examination process at such short notice.

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

(1) There was discussion between the Examiners as to whether an Honours pass should be awarded in cases where candidates had not achieved Honours, or had even failed, one or more of the papers. In the end it was decided that since the Examination Conventions dictate that grades are awarded on the basis of the average mark, candidates could not be penalised for failing one of the papers, and this is indeed the approach used by Examiners in previous years. However, the Faculty should consider whether it is content that candidates achieve Honours without passing (or achieving Honours) on all the papers. The Examination Conventions should be revised to make the situation explicit, based on the decision of Faculty.

(2) It was noted this year that some of the candidates were given special dispensations based on applications made during their Preliminary Examinations, without the Chairman being sent a copy of the original permission from the Proctors. This led to some confusion as to why dispensation was being given. It would seem reasonable to expect copies of any permissions to be issued to the Chairman of each examination, but since this is not done, the Faculty needs to make sure that any such permissions are kept centrally, so that they can be referred to by the successive Chairman for Preliminary, Part I and Part II Examinations.

D. EXAMINATION CONVENTIONS

The previous year's Examination Conventions were included in the Course Handbook that was distributed to all candidates in hard-copy and was also made available on the Departmental website, to which candidates' attention was drawn by e-mail. The current year's Conventions (2008, attached) were put on the Departmental website and sent in hard-copy and electronically to all candidates on 6th March 2008. The Examination Conventions were assessed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There were 5 candidates for the examination. The examination consisted of 7 written papers plus coursework that included a team design project, industrial visit reports and practical work carried out during the 2nd year. One written paper (Introductory Economics) is taken in the 2nd year.

The written papers consisted of 4 Materials papers, 2 Economics papers and 1 Management paper, each of which lasted 3 hours. For the General Materials papers, candidates were required to answer 5 questions out of 8, as in previous years. The Economics and Management Examiners followed their usual procedures. Team design projects were marked by one Examiner and one Assessor, with the Chairman assisting with the deciding of agreed marks. Teams were marked as groups, but allocation of bonus or penalty marks is permitted under the Conventions, and was used in 1 instance. Reports for each of the Industrial Visits were assessed as pass/fail by the Industrial Visits Organiser, appointed as Assessor.

The overall mean mark for Part I was [REDACTED]. For the first time, the mean marks for all of the written papers in the examination were in the 2(i) band (60-70%) and so no scaling needed to be considered. This shows that the year-on-year efforts of Examiners in setting papers at an appropriate level have now achieved the goal of making scaling unnecessary. Mean marks for the practical work were higher than for the papers, being in the 1st class band but this is in line with the results from previous years.

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. Both male and female groups of candidates performed better in the coursework than in written examinations. Due to the small number of candidates for this examination, the numerical data is confidential (see section E, below).

A non-serif font was used for Materials examination papers for the first time this year, in order to make them comply with SENDA/ADA guidelines. No specific requests were received for enlarged copies. Candidates were allowed extra time on account of dyslexia/dyspraxia, where necessary, and the outcomes seemed satisfactory.

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

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

(1) Numbers and percentages in each category

The Part I Examination in Materials Economics and Management is unclassified. No distinctions are awarded. There were 5 candidates for the examination, [REDACTED].

Category	Number			Percentage		
	2007/08	2006/07	2005/06	2007/08	2006/07	2005/06
Distinction	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Pass	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Fail	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

(2) Breakdown of the results by gender

mark (%)	Overall mark		Written Examinations		Coursework	
	Male	Female	Male	Female	Male	Female
40–50	■	■	■	■	■	■
50–60	■	■	■	■	■	■
60–70	■	■	■	■	■	■
70–80	■	■	■	■	■	■
80–90	■	■	■	■	■	■
Totals	■	■	■	■	■	■

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. A. Cerezo (Chairman)

Dr. M.L. Jenkins

Dr. K.A.Q. O'Reilly

Prof. S.G. Roberts

Dr. A.J. Wilkinson

Prof. B. Derby (external, Materials)

Prof. A.L. Greer (external, Materials)

Dr. D.N. Barron

Dr. S.E. Dopson

Dr G. Bitsakakis

Dr T. Coury

Dr. D. Tsomocos

Prof. G. Lanot (external, Economics)

Dr. M.I. Barrett (external, Management)

Attachments: Examination Conventions 2008

Comments on General Paper 1

Comments on General Paper 2

Comments on General Paper 3

Comments on General Paper 4

Comments on Introduction to Management paper

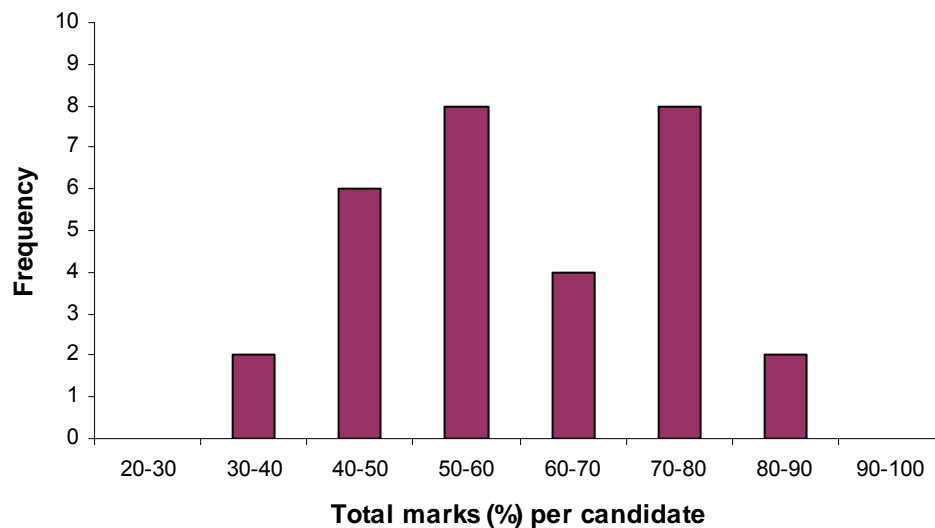
Comments on Economics papers (not received)

General Paper 1 – Structure and Transformations

Examiner: Prof. Alfred Cerezo
Candidates: 30 (25 MS / 5 MEM)
Mean mark: 61.5%
Maximum mark: 88%
Minimum mark: 37%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Diffusion	15	10.8	18	3
2	Powder Processing	16	11.4	16	6
3	Nucleation	20	13.2	18	7
4	Corrosion	14	11.6	20	7
5	Ostwald ripening	21	11.6	18	5
6	Surface energies	23	14.0	19	9
7	Polymers	17	11.9	16	6
8	Ternary phase diagrams	23	13.3	19	4

**Part I 2008 MS/MEM
General Paper 1**



General Comments:

1. Application of Fick's 2nd Law. Surprisingly low marks for a relatively simple bookwork question. Several candidates approached last part as a Fourier expansion, rather than realising it could be approximated to an error function solution as in the previous part.
2. Description of methods for production of metallic powders and fabrication of tungsten filaments and copper-lead bearings. Many details missing from answers but generally good attempts. Some candidates missed point that production methods produce liquid droplets that solidify to powder.
3. Standard bookwork question on nucleation, but still candidate showed some confusion, e.g. using $\Delta G=0$ as condition for critical radius, or using RT instead of kT in calculation of nucleation rate.
4. Construction and application of Pourbaix diagrams. This question had a sign error in the tabulated data, but few people knew how to set up the Nernst equations correctly so the error affected very few candidates, and those were marked accordingly.
5. Description and derivation of Ostwald ripening, mostly from bookwork. Some confusion over different radii being referred to in question. Most candidates used the variation of strength in aged Al-Cu as the example of overageing, despite this not being due to Ostwald ripening.
6. Young-Dupré equation and variation of shape of liquid gold particle as it solidifies. Good answers in general, but many candidates were confused on last part, discussing coherency and growth rates rather than describing crystallographic variation in surface energies.
7. X-ray diffraction for characterisation of polymer structure, formation and structure of spherulites and relationship between melting point and glass transition of polymers. Answers generally lacking in details.
8. Candidates asked to explain features of, and complete, a partially drawn ternary phase diagram. Most candidates could correctly answer many of the points and a few were able to correctly complete the phase diagram.

General Paper 2 – Electronic Properties of Materials

Examiner: Dr Mike Jenkins

Candidates: 30 (25 MS / 5 MEM)

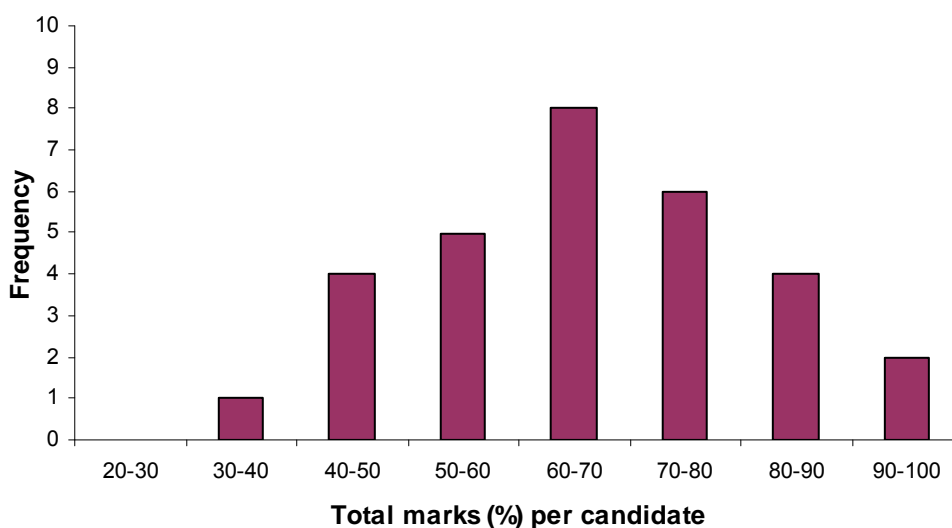
Mean mark: 67.2%

Maximum mark: 97%

Minimum mark: 37%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Tensors	27	16.4	20	10
2	Quantum mechanics	22	11.2	19	5
3	Statistical mechanics	23	13.1	20	4
4	Free electron and nearly free electron theory	27	13.6	19	5
5	Tight-binding theory	3	12.3	20	3
6	Properties of dielectrics	7	12.9	16	5
7	Semiconductor materials	17	8.8	19	2
8	Magnetic properties	24	15.8	19	7

Part I 2008 MS/MEM General Paper 2



General Comments:

1. Manipulation of tensors and application to heat flow. This was a popular, well-structured question, which was answered well by most candidates, with several near-perfect answers.
2. Particle in a box. Most students did the first part of the question well; the second part proved difficult for many students, although there were several very good answers. Many students did not recognize that the wavefunction in part (b) was not an energy eigenfunction.
3. A well-structured question on two-level atoms. Most candidates scored well on parts (a)-(c). Marks were lower on parts (d)-(e), with most candidates unable to use the result in part (d) to prove the relationship of part (e). Nevertheless there were several near-perfect answers.
4. A popular question. Surprisingly, the first part of the question (a) i) was answered badly by many candidates (several of whom quoted the Bloch theorem, which is irrelevant here). Even so, most candidates could derive the expressions for the Fermi wavevector and Fermi energy, and many correctly evaluated the Fermi energy of Al. Part (b) on nearly-free electron theory was well answered by most.
5. Only 3 answers to this very standard question - one near-perfect, one good and one very poor.
6. Power dissipation and permittivity of dielectrics. Not a popular question, but most answers to this mostly essay-type question were of good quality. The last part of the question (on the relative permittivity of diamond) was answered reasonably well by most.
7. A fairly popular question on Schottky barriers, but answers were of very variable quality, and several were very poor. Most candidates could sketch the band diagram. Explanations of the asymmetric I-V behaviour were of variable quality, with several candidates giving completely incorrect answers. Marks on sections (c) (deriving an expression for the depletion width) and section (d) (calculation) were often very low, although there were several very good answers.
8. This fairly easy question was answered well by a majority of candidates. In the last part, most candidates recognized that the choice for a permanent magnet to operate at 1000°C lay between the ferromagnetic materials C and D. However, several candidates wrongly chose material C despite recognizing that it would be above its Curie temperature at 1000°C .

General Paper 3 – Mechanical Properties

Examiner: Dr Angus Wilkinson

Candidates: 30 (25 MS, 5 MEM)

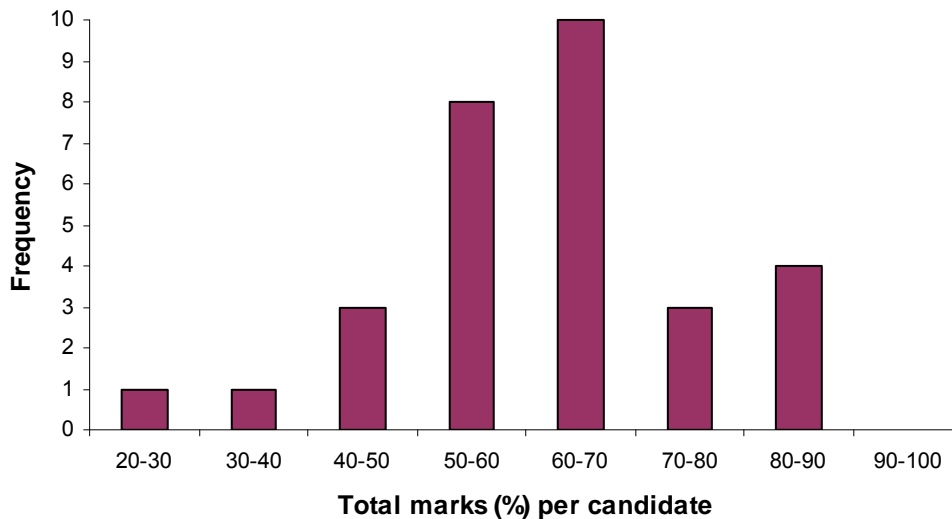
Mean mark: 61.6%

Maximum mark: 87%

Minimum mark: 27%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Mechanical Properties of Polymers	16	12.1	18	4
2	Elasticity of Isotropic Materials	18	12.6	19	5
3	Macroplasticity and mechanical working	17	13.7	18	8
4	Microplasticity	15	8.9	16	3
5	Microplasticity	26	13.2	19	2
6	Mechanical Properties of Composites	23	12.0	18	4
7	Fracture	20	12.5	20	9
8	Creep and Superplasticity	15	13.1	20	4

Part I 2008 MS/MEM General Paper 3



General Comments:

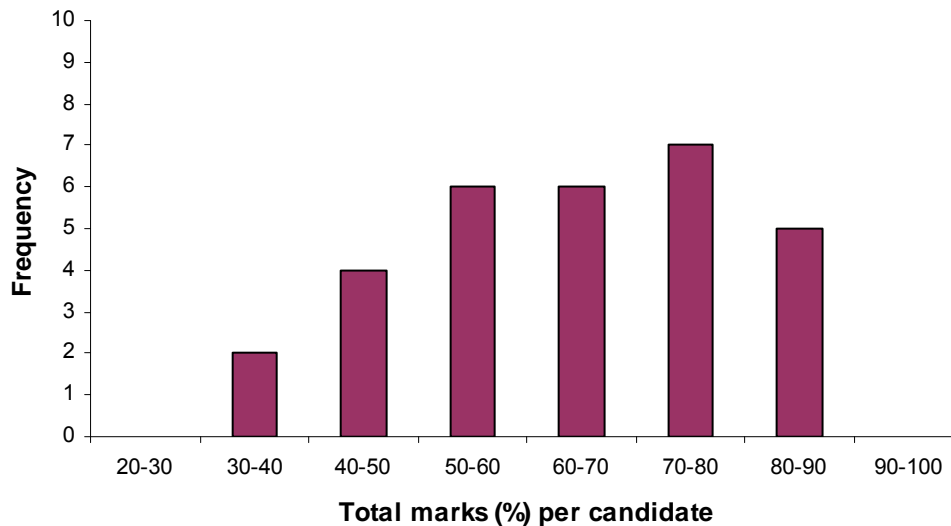
1. Descriptive parts (a) and (b) generally well done, but very few correct answers for analysis in part (c), with most not identifying constant volume condition.
2. A good number of high marks for this question, showing good understanding. However, a third of answers scored under 50% indicating weaker students struggle with mathematical aspects of elasticity.
3. A descriptive question on extrusion processes which was answered well in most cases, resulting in the highest average mark and lowest spread of marks.
4. Movement of dislocations. Relatively low number of answers for this question, with a mean mark distinctly lower than other questions on the paper. A disturbing number of scripts (7) returned a mark of 6 or less (i.e. $\leq 30\%$) indicating very little understanding of subject matter.
5. Dislocation mechanisms and their effects on properties. Most popular question, with only 4 candidates not answering. The significant level of choice within question probably contributed to popularity. The question was generally well answered resulting in a relatively high mean mark.
6. Popular question on short fibre composites. In part (a) there was some tendency to discuss effect of transfer length on strength rather than stiffness. Weaker candidates struggled with part (c).
7. Reasonable answers to descriptive parts (a) and (b), however most struggled with part (c) where labeling of diagrams suggested many had attempted to learn by rote. One excellent script earned full marks.
8. Creep failure and the Larson-Miller parameter. Many answers to part (a) discussed creep deformation in general and not mechanisms of failure. One excellent script earned full marks.

General Paper 4 – Engineering Applications of Materials

Examiner: Prof. Alfred Cerezo
Candidates: 30 (25 MS, 5 MEM)
Mean mark: 64.1%
Maximum mark: 86%
Minimum mark: 32%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Properties of polymers	13	12.7	17	7
2	Ni-based superalloys	22	14.3	19	9
3	Ti alloys	19	12.4	16	6
4	Steels	15	11.3	16	6
5	Ceramics	21	13.3	18	6
6	Semiconductor devices	17	12.9	19	2
7	Materials characterization	25	13.4	18	7
8	Transmission electron microscopy	18	11.3	18	4

Part I 2008 MS/MEM General Paper 4



General Comments:

1. Orientation of polymer molecules and its effect on properties. Few candidates knew what was meant by extensional flow, or could manage the relatively simple calculation in the last part of the question, but overall the marks were good.
2. Microstructure, chemistry, and high temperature and oxidation resistance of nickel superalloy single-crystal turbine blade. Surprisingly unpopular question.
3. Descriptive question on microstructure of Ti-6Al-4V, reinforcement with carbon fibre and reasons for high cost of Ti alloys in general. Most candidates could provide the general points and so good marks overall.
4. Role of alloying elements in tool steels and maraging steels, and applications. Many candidates made general points about solutes in steels, rather than addressing question directly. Few answers addressed the fundamentals of how microstructures form, the importance of thermal stability, etc.
5. Description of sintering processes and control of grain size in ceramic components. The use of dopants in sintering and the effect of grain size on functional properties not often mentioned. Few candidates specifically addressed advantages/disadvantages of different sintering techniques.
6. Transferred-electron oscillator and heterostructure laser diode. Former answered well, but for latter there were many answers that gave device description but no fundamental concepts.
7. Candidates asked to select appropriate characterisation techniques to address specific materials questions. Good answers, given relatively high level of judgement required, with standard errors being made, e.g. WDX on a TEM, or using EDX when the spatial resolution is not sufficient.
8. Diffraction and imaging in TEM. Many relatively poor answers, given much of question was standard book work. Many candidates made error of using half angle (not deflection) from Bragg. Some answers showed very poor recollection of basic crystallography.

DMMA 4316 INTRODUCTION TO MANAGEMENT

5 Students sat this paper, three male and two female.

Marks	Number	Percentage
70+		
60-69		
50-59		
40-49		
Total		

There were no gender differences.

1. Answers to this question were typically of a high standard. Most answers were critical of the statement that the internet had necessarily created an efficient market, and were sensitive to the product/ service specificity of different marketing strategies.
2. This was not a popular question though candidates that did choose it provided good answers. Explanations of the differences between cultural and psychological approaches to branding were well thought through, though only the highest scoring answers developed the implications of this for marketers adequately.
3. This was the fourth most popular question and showed a wide range of marks. The stronger answers engaged theoretical frameworks such as transaction cost economics and Chandlers three-prong investment strategies to structure their answers. Weaker answers attempted a chronological account, or described the role of a limited number of factors such as transport or communication technology.
4. This was the second most popular question. The best answers showed a sophisticated understanding of both Ford and Taylor's ideas and critically evaluated the extent to which these ideas were relevant today. Further, they questioned the assumptions that Ford and Taylor made about human motivation drawing upon using more recent work by organizational behavior theorists. Weaker answers tended towards falling into description of Ford and Taylor as people, and therefore failed to adequately address the question of whether their ideas were relevant today.
5. This was a relatively unpopular question with a number of very strong answers that showed understanding of the various reasons why firms hire consultants, and in particular focusing on the costs involved with developing specific knowledge and expertise 'in-house'. Weaker answers tended to focus on a limited number of factors, or were overly supportive of the critique of consultants as 'snake-oil salesmen' *[sic]*.

6. This was the least popular question, with candidates who chose it achieving the lowest average mark. Good answers showed some knowledge of the relevant social constructivist theory and linked this to contemporary examples. The weaker answers engaged examples but failed to sufficiently evaluate the statement as required.
7. This was one of the least popular questions and displayed a range of marks. The best answers provided a thorough description and analysis of the Balanced Scorecard technique, as well as drawing on critiques from the literature to identify its limitations. Weaker answers tended towards description rather than analysis.
8. This was the most popular question and displayed a range of marks. The best answers engaged theoretical resources from motivation theory and discussed the principal-agent problem in the context of different governance structures. Weaker answers were normative in character, as if they believed they were being asked whether CEO pay was too high.
9. This was also a popular question showing a range of results, with only two particularly weak answers. Candidates seemed confident in linking project financing to national styles of banking relationships and aware of the role of relevant considerations such as ownership structure, corporate governance and regulation.
10. Answers to this question were generally strong and showed that candidates were able to take a critical and balanced view of the statement. The difference between stronger and weaker answers lay in the extent to which they engaged relevant material from the literature and argued a balanced view.
11. This question was generally well answered with the better answers discussing organizational culture and the employment contract in different types of jobs and work environments and the less strong answers being biased towards evaluating the effect of long or short term contracts on employee morale.
12. This was the second least popular question. The best answers were structured through examples and questioned the basis for the distinction between services and manufacturing. The weaker answers resorted to descriptive generalizations about sectors.

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 in this and previous years is less than 6, numerical data is confidential (see section E, below).

(2) If vivas are used

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

(1) On the suggestion of the External Examiners for Materials, the two External Examiners were asked to share responsibility for both Part I and Part II. This allowed the Materials written papers to be divided between them, according to their particular expertise. The new arrangement was deemed to have been successful, and will be continued in future years.

(2) A more formal system was implemented this year to define what was deemed to be non-examinable, in order to avoid the confusion that arose last year. The Faculty has moved to a system where non-examinable material must always be clearly marked in the notes, rather than being stated verbally, so that the students can never be in any doubt. In order to deal with course material that had been delivered before the change, lecturers were asked to specify what parts of their courses they had told the students were non-examinable, and this information was collated and sent to the students in Trinity Term. A statement was made to the students that anything on the course (as defined by lecture synopses, and covered either in lectures or lecture handouts), and not on the list, was deemed to be examinable.

(3) The structure of the Options courses was changed this year, and this affected the structure of the Materials Option paper. In place of 8 questions, one on each of the lecture courses, the papers were divided into 3 blocks each of which had 3 questions. Candidates were given a choice of 3 questions, 2 from one block and the third from one of the other 2 blocks. In principle, this allows for questions to be set which test knowledge more broadly across an area, but in practice the questions in this first year were limited to covering a single lecture course. A sample paper was sent to candidates in Hilary Term, and the structure of the Materials Option paper followed closely that of the sample paper.

(4) A new system was implemented for double checking the individual marks on questions, to avoid the errors which arose last year. Adding up of marks for individual questions was cross-checked by the two markers, and the mark sheets countersigned to confirm this. Mark sheets for each question were also designed to allow simple checking that marks had been transcribed correctly onto the final mark sheet, but these were not always used correctly. Marks for individual questions were entered onto a master spreadsheet and the final mark for the paper checked against that calculated by the markers. Final marks for the candidates as calculated by the spreadsheet were cross-checked by the Chairman.

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

There was discussion between the Examiners as to whether an Honours pass should be awarded in cases where candidates had not achieved Honours, or had even failed, one or more of the papers. In the end it was decided that since the Examination Conventions dictate that grades are awarded on the basis of the average mark, candidates could not be penalised for failing one of the papers, and this is indeed the approach used by Examiners in previous years. However, the Faculty should consider whether it is content that candidates achieve Honours without passing (or achieving Honours) on all the papers. The Examination Conventions should be revised to make the situation explicit, based on the decision of Faculty.

D. EXAMINATION CONVENTIONS

The previous year's Examination Conventions were included in the Course Handbook that was distributed to all candidates in hard-copy and was also made available on the Departmental website, to which candidates' attention was drawn by e-mail. The current year's Conventions (2008, attached) were put on the Departmental website and sent in hard-copy and electronically to all candidates on 6th March 2008. The Examination Conventions were assessed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There were 4 candidates for the examination. The examination consisted of 2 written papers, one being a compulsory Materials Option paper, and the other paper being selected from a range of Economics and Management options. The Materials Option paper followed a new format, where candidates were offered 9 questions in 3 sections of 3 questions. Candidates were required to answer 3 questions, 2 from one section and 1 from either of the remaining 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 2 written papers. The reports on these 24-week Management projects are marked by staff at the Said Business School. The overall mean mark for Part II was in the 2(i) range.

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. Both male and female groups of candidates performed better in the coursework than in written examinations. Due to the small number of candidates for this examination, the numerical data is confidential (see section E, below).

A non-serif font was used for Materials examination papers for the first time this year, in order to make them comply with SENDA/ADA guidelines. No specific requests were received for enlarged copies. Candidates were allowed extra time on account of dyslexia/dyspraxia, where necessary, and the outcomes seemed satisfactory.

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

Since the number of candidates in this and previous years is less than 6, numerical data is 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

(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. There were 4 candidates for the examination,

Class	Number			Percentage (%)		
	2007/08	2006/07	2005/06	2007/08	2006/07	2005/06
I						
II.I						
II.II						
III						
Pass						
Fail						

(2) Breakdown of the results by gender

mark (%)	Overall mark		Part 2 Mark		Part 1 Mark	
	Male	Female	Male	Female	Male	Female
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 Option paper, [REDACTED]. In addition, candidates sat [papers drawn from] the Finance paper, the paper on Economic Decisions within the Firm and the Marketing paper, [REDACTED].

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. A. Cerezo (Chairman)	Dr. D.N. Barron
Dr. M.L. Jenkins	Dr. S.E. Dopson
Dr. K.A.Q. O'Reilly	Dr G. Bitsakakis
Prof. S.G. Roberts	Dr T. Coury
Dr. A.J. Wilkinson	Dr. D. Tsomocos
Prof. B. Derby (external, Materials)	Prof. G. Lanot (external, Economics)
Prof. A.L. Greer (external, Materials)	Dr. M.I. Barrett (external, Management)

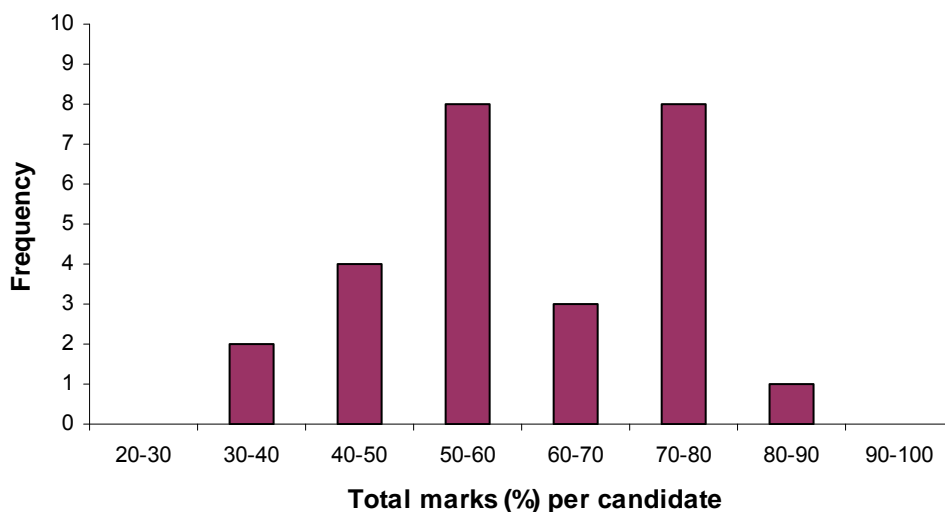
Attachments: Examination Conventions 2008
Comments on Materials Option Paper
Comments on Management papers
Comments on Economics papers

Materials Option Paper 2

Examiner: Prof. Steve Roberts
Candidates: 26 (22 MS / 4 MEM)
Mean mark: 61.0%
Maximum mark: 81%
Minimum mark: 35%

Question	Topic	No of Answers	Average Mark	Highest Mark	Lowest mark
1	Advanced engineering alloys	18	17.3	26	9
2	Advanced engineering alloys	8	18.4	28	12
3	Manufacture	12	23.5	29	14
4	Materials and Devices for Information Technology	6	17.8	23	12
5	Materials and Devices for Information Technology	6	22.7	28	0
6	Materials and Devices for Information Technology	5	21.6	26	9
7	Ceramics materials	12	19.0	28	0
8	Advanced polymers	11	22.0	30	17
9	Advanced polymers	0	-	-	-

Part I MS / Part II MEM 2008 Option Paper 2



General Comments:

1. High temperature alloys. Popular question, but apart from a few very good answers, not that well done. The poorer answers on the whole tended to be rather unspecific: in the first part about the required special features for high temperature alloys; in the second, in not knowing anything very detailed about more than one of the alloy types.
2. Martensitic transformations. Not very popular, and quite a spread of answers. Weaker candidates didn't say much about the thermodynamic aspects of the martensitic transformations, and were also weak on the specifics of shape changes on crystallography. Many just stuck in an "all I know about martensite" type of answer instead of answering what was asked for.
3. Joining methods. Popular and generally well answered. The first part on soldering, brazing and welding was answered quite well by all; the second section on weld defects sometimes less so.
4. Semiconductor growth methods. Not popular: answers from moderate to good. The growth processes were on the whole well-described (bookwork). The last section, on requirement for a particular device type, was not well done: MBE was identified and justified as the likely technique by many, but no-one recognised that the layers had different crystal structures.
5. Optoelectronic materials and devices. The few who did this question on the whole showed a good knowledge of all the material in question. Weaker candidates just had fewer, and less specific, things to say.
6. Magnetic device materials. With one woeful exception, this was generally well answered by the few who attempted it. Some were not clear about the distinctive features of GMR and TMR devices. The calculation was well done by most.
7. Ceramic materials: synthesis. Very popular, but often not very well done. The weaker answers were generally just poorer across all sections, but this often showed up more in the first section, as there was more here to discuss in detail.
8. Polymers: rotaxanes and co-polymers. Popular and quite well done by most. Some rather vague answers as to the use of polyrotaxanes, and also the detection of phase separation by light scattering.
9. Polymers: neutron scattering. No one attempted this question.

Overall:

The paper showed quite a good spread in the questions attempted. Section A (metals and alloys) had 38 attempts, section B (functional and nanocomposite materials) 17, and section C (non-metallic materials) 23. However, one question, on neutron scattering of polymers, was not answered by anyone.

There was no significant difference in performance between the MS candidates and the small number of MEM candidates.

The weaker candidates generally lost marks through answering most parts of questions but with a lack of detail, especially detail specific to what the question asked, rather than by not attempting parts of questions. Some of the better answers were quite brief: other answers were sometimes 2 or 3 times as long, but without necessarily scoring higher. Candidates were generally reluctant to use diagrams or illustrations unless specifically asked for, and even so these were frequently scrappy and not very informative.

Economic Decisions with the Firm

Alan Beggs

21 candidates sat the paper, of whom 16 were EEM students, 1 MEM and 4 EM students. The paper was designed to be straightforward, and most candidates found it so, but some weaker candidates still found it challenging. This is reflected in the dispersion of the marks with overall 9 Firsts, 4 Upper Seconds, 5 Lower Seconds, 2 Thirds and 1 Pass. EM candidates had a particularly broad distribution with two Firsts and two Thirds.

Comments on Individual Questions

1. (Duality) (13 Attempts) A bookwork question which was on the whole reasonably well answered. Candidates were, however, not always able to state standard results accurately.
2. (Simplex) (19 Attempts) Standard simplex algorithm question, answered well.
3. (Transportation) (20 Attempts) Again a standard question, answered well.
4. (Assignment/Shortest Paths) (21 Attempts) This was on the whole answered well, although candidates were not always able to expound standard results accurately in the bookwork parts.
5. (Decision Trees) (20 Attempts) A very straightforward problem which produced very good answers.
6. (Queues) (6 Attempts) Few attempts but most were good.
7. (Dynamic Programming) (2 Attempts) A very easy question but surprisingly few attempts.
8. (Markov Chains/Inventories) (2 Attempts) A slightly non-standard question and few attempts.

DEAM 0376 Marketing 2008

Subject report

General Comments:

A relatively strong year in which there were some commendable answers which dealt creatively and intelligently with the issues. Relatively few candidates fell into the trap of slavishly revisiting their tutorial essays in an examination answer. The eventual number of 1st class answers does not do justice to the year. A number of candidates missed achieving distinctive papers by the narrowest of margins.

Comments on answers to individual questions:

Question 1 (9 answers). Better answers were culturally constructed as well as drawing upon conventional statistical analyses, such as Interbrand. There were some examples and descriptions of local brands, but often not enough analysis. It was slightly disappointing that poorer answers got caught up in definitional issues and used conventional examples (such as Coca Cola, Pepsi Cola and HSBC) by way of illustration.

Question 2 (5 answers). There were a small number of relatively good answers. The better answers went beyond reliance on the key O'Malley & Tynan article in their consideration of relationship marketing and were creative and thoughtful.

Question 3 (15 answers). There were some generally excellent and enthusiastic answers. Candidates who used original examples, such as the candidate who used the example of a duct tape firm and its users, provided a welcome change from all the essays discussing Apple and Harley-Davidson. These are not the only brand communities... The better answers also focused on mitigating some of the negative aspects of BCs.

Question 4 (25 answers). All candidates answered this question in respect of business-to-consumer markets. Some candidates answered this with a general essay on the advantages of the internet, rather than answering the question and presenting any evidence of what predictions might have been at the end of the twentieth century. Such answers were not awarded high marks and future candidates are advised, as ever, to focus on answering the question and to avoid writing a one-general-essay-fits-the-question essay. There was also a tendency to focus on one author: either Anderson or Brynjolfsson & Smith. Weaker answers did not go beyond these or were substantially anecdotal or assertive. Better answers were structured in relation to the consumer buying process, well evidenced, or employed a broader literature to support their arguments.

Question 5 (23 answers). Many struggled with this answer, particularly in the context of the effects of the two concepts on product quality and buying behaviour. Few were comfortable with definitions of consumer nationalism, which in general were used in an overly restrictive way, and few reflected the complexity of the COO concept. There were some original answers, however. The examiners were particularly impressed by answers that showed 'outside the box thinking', such as answers which included the work of Miller on consumption and identity.

Question 6 (21 answers). Some impassioned answers, but also some impressive, sophisticated and critical analyses. Somewhat worryingly, some candidates answered this question with virtually no references to marketing. The question required candidates to reflect on whether misconceived claims could be made to market Fair Trade, in view its worthy long-term ends (poverty reduction). Candidates sometimes mistook the sense of the question. Those who simply wrote essays on whether they thought Fair Trade was a good thing were not answering the question that was being asked. In questions relying on indeterminate terms (such as 'means' and 'ends'), future candidates are advised to outline their understanding/definition of the terms in their introduction. Examiners showed flexibility in how these terms were understood, provided the candidate had outlined what they understood this to mean at an early stage. In answering this question, relatively few candidates made links with other topics such as marketing accountability, which was a shame.

Question 7 (11 answers). Many answers to this question were too similar to the tutorial essay set and, even so, were somewhat disjointed. Some candidates focused heavily on whether marketing works, rather than on what its negative associations are and on the implications of these. The best answers examined the impact of marketing both upon consumers and society as well as within the firm.

Question 8 (28 answers). In general, full and critical answers were provided. The question itself was open-ended and it was therefore tempting for candidates to write 'all I know about loyalty schemes' rather than structuring an effective answer to the question. Some gave into temptation and were not rewarded for their resulting flows of consciousness.

Question 9 (10 answers). A number of impressive and dispassionate answers which dealt in a subtle and nuanced way with the ethical issues facing marketers in different jurisdictions in marketing to children. This was heartening given that the topic was new this year. The relevant literature was handled generally well. Answers to this question (based on a genuine quote from a marketer) drew a wide range of examples, which was refreshing, given the tendency to overuse examples identified above in Questions 3 and 1. Many answers used examples ranging from toys, games, TV channels, food/drink/confectionary, clothing etc. to support a clear line of argument. Some candidates argued very strongly that it was defensible to market products to children which are 'downright offensive and disgusting' while others defended the opposite view. Either position, if well-argued and well-evidenced, scored high marks. Poorer answers were insufficiently evidenced and tended to rant.

Question 10 (8 answers). The quote from Levitt provided a basis for the strongest answers to counterpoint the sentiment with material from the cultures of consumption literature.

Question 11 (21 answers). A number of strong answers were offered, much more so in relation to brand equity than advertising effectiveness. It was good to see references cited in the course blog being pressed into service. Sadly, in option (b) several people used the opportunity to tell the examiners how advertising might work, rather than assuming that they might already know and instead were inviting candidates to reflect on the effectiveness of measurement techniques.

Question 12 (8 answers). Relatively few answers were provided to this question, despite the fact that there was a modest relationship to a tutorial essay. The better answers dealt dispassionately with the two perspectives and provided effective evidence, grounded in the pricing literature.

(M)EM Examiner's Report – Finance (2008)

66 E&M and 2 MEM candidates took the Finance paper. 23% achieved First, 56% achieved 2:1, and 21% achieved 2:2. All candidates passed. Every question was attempted by the students. In particular, the computational questions proved to be quite popular.

Comments on answers to individual questions:

Section A

Question 1: This question was answered by 18 students. The question required a good understanding of portfolio diversification and risk-return trade-off. To answer part (e) of this question, students needed to elaborate on the hedging capability of options.

Question 2: This question was answered by 22 students. The question required a good understanding of CAPM and multi-factor pricing models. Few students provided strong answers for parts (d) and (e).

Question 3: This question was answered by 18 students. The question required a good understanding of options. Poor answers to part (b) failed to recognize that holding equity in a levered company is akin to holding a call option on that company.

Question 4: This question was answered by only 1 student. A strong answer for part (b) required an elaboration on how liquidity can have different welfare implications for different types of investors, such as informed speculators, uninformed retail investors and hedgers.

Question 5: This question was answered by 19 students. The question required a good understanding of capital budgeting techniques. There was no clear pattern to the answers.

Question 6: This question was answered by 4 students. The question required a good understanding of capital structure. In particular, poor answers to part (b) featured misinterpretations of trade-off theory (regarding the optimal firm capital structure).

Question 7: This question was answered by 23 students and was the most popular question in Section A. Most of the answers for part (a) were poor: Good answers referred to agency theory and elaborated on the disciplining role of debt on management.

Question 8: This question was answered by 5 students. Strong answers revealed a good understanding of dividend policies, in particular, their signaling role and tax implications.

Section B

Question 9: This question was answered by 51 students. The following were the common mistakes:

- Working capital was not treated properly in the cash flow analysis.
- The opportunity cost of the depreciation of the old machine was not taken into consideration.
- The tax implications of capital gains and losses were not taken into consideration.
- Cost of debt was calculated as if the interest payments on debt were perpetual.

Question 10: This question was answered by 43 students. The following were the common mistakes:

- In part (a)-(ii), many wrongly assumed that the cost of equity would not change after the proposed change in capital structure took place.
- In part (a)-(iii), many misinterpreted market capitalization as the firm value.
- In part (a)-(iv), many failed to recognize that increasing the dividend yield would increase the share price.
- In part (b)-(ii), some discussed the effect of risk-free interest rate on the call option value rather than the put option value.

DRAFT Examination Conventions 2008/09

Common Preliminary Examination

Materials Science and Materials, Economics & Management

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 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 are independent both of the Department and of those who lecture. The paragraphs below give an indication of the conventions to which the moderators 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 EPSC and the Proctors who may offer advice or make recommendations to the moderators.

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 the Senior Tutor of your college, who will, if he or she deems the matter of importance, contact the Proctors. The Proctors in turn communicate with the Chairman of Prelims.

(1) *Setting of papers*

The moderators set the papers, but are advised to consult the course lecturers. The Prelims paper on Maths for Materials and Earth Sciences is set jointly by the Departments of Earth Sciences and Materials. There are no external examiners for Prelims.

(2) *Paper Format*

The Materials Science papers 1 - 3 comprise eight questions from which candidates must attempt five. Each question is worth 20 marks. The total marks available for each of these papers are 100. The Prelims paper on Maths for Materials and Earth Sciences consists of two sections, candidates are required to answer all questions in Part A and 4 from Part B.

(3) *Marking of papers*

For prelims double marking is not necessarily double “blind” marking. It is usually considered sufficient for the second marker merely to check the first marker’s marks.

(4) *Marking of course practicals and crystallography classes*

First year practicals are assessed regularly by senior demonstrators in the teaching laboratory. The work done for crystallography classes is assessed by the Crystallography Class Organiser. The assessed work for both practicals and crystallography classes constitutes the Coursework Paper. Each of the five papers in Prelims, comprising the 3 Materials Science papers, Maths for Materials and Earth Sciences, and the Coursework Paper, carry equal total marks. Satisfactory performance in the practical work is defined in the MS/MEM Prelims Handbook. Penalties for late submission of practical reports are set out in this handbook. The moderators have the authority to set a practical examination or a written examination on crystallography.

(5) *Classification*

The pass/fail border is at 40%. Distinctions are usually awarded for average marks of at least 70%. Failure in one or two of the written papers may be compensated by better performance in other written papers provided the candidate obtains at least 35% on the failed paper. Only marks in excess of 160 in total may be used for compensation and the rate required is normally 2 compensation marks for each deficit mark. For example, if a mark of 36% is obtained in one paper then the total for the four written papers must be at least 168

* for 2007-08 the Nominating Committee comprises Dr Czernuszka (Chair), Professor Grovenor and Dr Taylor.

($4 \times 40 + 2 \times 4$) for the failure to be compensated. Failure of three papers precludes compensation.

Candidates who fail 1 or 2 written papers will be asked to resit only those papers. Candidates who fail more than 2 written papers will be asked to resit all 4 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 prevented from continuing to Part I. Exceptionally, a college may allow a student to go down for a year and take Prelims a second time the following June.

If a candidate fails the coursework paper then the moderators may require the candidate to present such evidence as they require that the candidate has successfully completed, before the resit examination in September, coursework prescribed by the moderators.

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

DRAFT Examination Conventions 2008/09

Final Honours School

Materials Science

1. INTRODUCTION

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 examiners are nominated by the Nominating Committee* in the Department and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. Formally, examiners are independent of the Department and of those who lecture courses. However, for written papers on Materials Science in Part I the examiners are expected to consult with course lecturers in the process of setting questions. 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. 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 Senior Tutor of your college, who will, if he or she deems the matter of importance, contact the Proctors. The Proctors in turn communicate with the Chairman of Examiners.

During the marking process the scripts of all written papers remain anonymous to the markers. [In some of the descriptions of marking for individual elements of coursework that are given later in this document 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 has recorded his own assessment, and does not indicate that the candidate is anonymous to the markers.]

Marking criteria for the Business Plan, Team Design Project and Part II project are published in the relevant course handbook.

Late Submission of or Failure to Submit Coursework

The Examination Regulations stipulate specific dates for submission of the required pieces of coursework to the Examiners (1. One piece of Engineering & Society Coursework; 2. A set of detailed reports of practical work; 3. A Team Design Project Report; 4. Industrial Visit Reports as specified in the course handbook; 5. A report on the work carried out in either the Characterisation of Materials module or the Introduction to Modelling in Materials module; and 6. A Part II Thesis). Rules governing late submission and any consequent penalties are set out in the 'Late submission of work' sub-section of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations (pp45-46 of the 2006, 2007 & 2008 Regulations)..

Under the provisions permitted by the regulation, late submission of coursework for Materials Science or Materials, Economics & Management examinations will normally result in the following penalties:

- (a) With permission from the Proctors under clause (1) of para 16.8, page 45, no penalty.
- (b) With permission from the Proctors under clauses (3) + (4) of para 16.8, 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

* for 2008-09 the Nominating Committee comprises Dr Czernuszka (Chair), Professor Grovenor and Dr Taylor.

exact penalty to be set by the Examiners with due consideration given to any advice given in the Proctors' "Notes for the Guidance of Examiners and Chairmen of Examiners".

- (c) Where the candidate is not permitted by the Proctors to remain in the examination he or she will be deemed to have failed the examination as a whole.

Where no work is submitted or it is proffered so late that it would be impractical to accept it for assessment the Proctors may, 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 the Examiners will award a mark of zero for the piece of coursework in question.

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

2. PART I

(1) *Setting of papers*

Part I 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 model answers for every question set. The wording and content of all examination questions set, and the model answers, are scrutinised by all examiners, including, in particular, the external examiners.

(2) *Paper Format*

All General papers comprise eight questions from which candidates attempt five. Each question is worth 20 marks. The total number of marks available on each general paper is 100. Materials Option papers comprise three sections, each section containing three questions: candidates attempt three questions, two from one section and the third from either of the remaining sections. The total number of marks available on each option paper is 100, and all questions carry equal marks. Questions are often divided into sections, with the approximate marks for each section indicated on the question paper.

(3) *Marking of papers*

All scripts are double marked, blind, by the setter and the checker. After individual marking the two examiners meet to agree marks question by question. If the differences in marks are small (~10% of the total available for the question, 2-3 marks for most questions), the two marks are averaged. 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.

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.

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 first five questions in numerical order by question number. 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(2) above will be awarded and (iii) the mark for the paper will still be calculated out of 100.

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 examiner to adjust all marks for those papers. Such adjustment is referred to as 'scaling' and the normal procedure will be as follows:

- (i) 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.
- (ii) For papers with a mean in the ranges either of 55-60% or 70-75%, including those scaled under (i) 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.
- (iii) 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.

(4) *Marking of Second Year Practicals for Part I*

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

(5) *Marking Industrial Visits*

Four industrial visit reports should be submitted during Part I. Reports are assessed by the Industrial Visit Coordinator on a satisfactory / non-satisfactory basis, and are allocated a total of 20 marks.

(6) *Marking Engineering and Society Essays*

The business plan for "Entrepreneurship and new ventures" is double marked, blind, by two assessors; last year one assessor was from the Said Business School and one from the Begbroke Science Park. The business plan is allocated a total of 20 marks.

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.

(7) *Marking the 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 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.

(8) *Marking the Characterisation of Materials and the Introduction to Materials Modelling modules*

The reports for these modules are double marked, blind, by the module organisers who are appointed as Assessors. They then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each report. The Chairman of Examiners oversees this process, sampling reports to ensure consistency between the different pairs of assessors. The Report for the Characterisation module is allocated 50 marks and each of the two reports for the Modelling module are allocated 25 marks.

(9) *Part I vivas*

The Examiners have the right to call students to a Part I viva after the Part I Examinations. Examination Regulations provide that a candidate who fails to appear for any part of a University Examination (including a *viva voce* examination), except in the case of acute illness or other urgent cause, will be deemed to have failed the entire Examination or, in the case of a public examination taken over more than one year, the entire Part of the Examination. Hence candidates must see that they are available until the end of 9th week Trinity Term, unless informed otherwise by the Chair of Examiners.

3. PART II

The Part II thesis is allocated 400 marks, one third of the total marks for Parts I and II. Two Part II examiners read each thesis, and each of them independently gives a provisional mark based on the guidelines published in an appendix of the course handbook. These guidelines may change and candidates are notified of any such changes before the end of Hilary Term of their 4th year. In addition, the external examiner may read all Part II theses. 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, and at which the report from the candidate's supervisor is tabled. The outcome of the discussion is an agreed mark for the project. It is stressed that it is the scientific content of the thesis that is being examined *not* the candidate's performance during the viva. In the overwhelming majority of cases, the viva has only a small influence on the agreed mark awarded to a Part II thesis.

4. CLASSIFICATION

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 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 Iiii 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 borderline cases the examiners use their discretion and consider the overall quality of the work the candidate has presented for examination. The external examiner often plays a key role in such cases.

Part I:

Unclassified Honours – 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. 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. The examiners do not divide the categories further but tutors and students may infer how well they have done from their marks. Candidates adjudged worthy of honours normally proceed to Part II but they may, if they wish, 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 only be waived in exceptional circumstances, with permission from the EPSC.

Annex: Summary of marks to be awarded for different components of the MS Final Examination in 2009 (For Part I and Part II students who embarked on the FHS respectively in 2007/08 and 2006/07)

Component	Mark
Part I	
General Paper 1	100
General Paper 2	100
General Paper 3	100
General Paper 4	100
Options Paper 1	100
Options Paper 2	100
Practicals & Industrial visits	80
Engineering and Society	
Coursework	20
Team Design Project	50
Characterisation or Modelling	
options module	50
<i>Part I Total</i>	<i>800</i>
Part II	
Thesis	400
Overall Total	1200

DRAFT Examination Conventions 2008/09

Final Honours School

Materials, Economics and Management

1. INTRODUCTION

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 examiners are nominated by the Nominating Committee* in the Department of Materials and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. Formally, examiners are independent of the Department and of those who lecture courses. However for written papers on Materials Science in Part I and Part II, examiners are expected to consult with course lecturers in the process of setting questions. The paragraphs below indicate of 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 E(M)EM Standing Committee, 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. 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 Senior Tutor of your college, who will, if he or she deems the matter of importance, contact the Proctors. The Proctors in turn communicate with the Chairman of Examiners.

Marking criteria for the Team Design Project are published in the FHS Course Handbook.

During the marking process the scripts of all written papers remain anonymous to the markers. [In some of the descriptions of marking for individual elements of coursework that are given later in this document 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 has recorded his own assessment, and does not indicate that the candidate is anonymous to the markers.]

Late Submission of or Failure to Submit Coursework

The Examination Regulations stipulate specific dates for submission of the required pieces of coursework to the Examiners (1. A set of detailed reports of practical work; 2. A Team Design Project Report; 3. Industrial Visit Reports as specified in the course handbook; and 4. A Part II Management Project Report). Rules governing late submission and any consequent penalties are set out in the 'Late submission of work' sub-section of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations (pp45-46 of the 2006, 2007 & 2008 Regulations).

Under the provisions permitted by the 2006 regulation, late submission of coursework for Materials Science or Materials, Economics & Management examinations will normally result in the following penalties:

- (a) With permission from the Proctors under clause (1) of para 16.8, page 45, no penalty.
- (b) With permission from the Proctors under clauses (3) + (4) of para 16.8, 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

* for 2008-09 the Nominating Committee comprises Dr Czernuszka (Chair), Professor Grovenor and Dr Taylor.

exact penalty to be set by the Examiners with due consideration given to any advice given in the Proctors' "Notes for the Guidance of Examiners and Chairmen of Examiners".

- (c) Where the candidate is not permitted by the Proctors to remain in the examination he or she will be deemed to have failed the examination as a whole.

Where no work is submitted or it is proffered so late that it would be impractical to accept it for assessment the Proctors may, 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 the Examiners will award a mark of zero for the piece of coursework in question.

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

2. PARTS I & II

Candidates taking Ec1: Introductory Economics in the 2nd year.

MEM candidates sit the compulsory Ec1: Introductory Economics paper in Trinity Term of their second year. This paper will be set and examined as for all other Part I and Part II Economics papers (see below) and contributes to the Part I mark. The marks for this paper will be formally ratified by the Board of examiners for Part I examinations held in the Trinity Term following that in which the Ec1 paper is sat.

Candidates for Part I (3rd year)

Part I candidates take four compulsory Materials papers (General Papers 1 – 4); one compulsory Economics paper; and one compulsory Management paper. In addition, candidates are assessed on their Materials coursework (practical work, the team design project, and industrial visits). Marks from the Ec1 paper sat in Trinity Term of the 2nd year are included in the Part I total.

Candidates for Part II (4th year)

Part II candidates take one compulsory Materials Options paper and one paper from a range of Management and Economics options. In addition they are assessed on their report of a six-month industrial placement, which carries the weight of two papers.

(1) *Setting of papers*

Part I Materials 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. The Materials Option paper in Part II is set by lecturers of option courses and two examiners, the examiners acting as checkers. For the Materials papers, the examiners, in consultation with lecturers, produce model answers for every question set and the wording and content of all examination questions set, and the model answers, are scrutinised by all examiners, including, in particular, the external examiners.

(2) *Paper format*

Materials Papers

All Materials general papers comprise eight questions from which candidates attempt five and are taken in Part I. Each question is worth 20 marks. The total number of marks available on each general paper is 100. The Materials Option paper, taken in Part II, comprises three sections, each section containing three questions: candidates attempt three questions, two from one section and the third from either of the remaining sections. The total number of marks available on the option paper is 100, and all questions carry equal marks. Questions are often divided into sections, with the approximate marks for each section indicated on the question paper.

(3) *Marking of papers*

Materials Papers

All scripts are double marked, blind, by the setter and the checker. After individual marking the two examiners meet to agree marks question by question. If the differences in marks are small (~10%, 2-3 marks for most questions), the two marks are averaged. 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.

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

The Materials external examiner provides an independent check on the whole process of setting and marking.

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 first five questions in numerical order by question number. 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(2) above will be awarded and (iii) the mark for the paper will still be calculated out of 100.

As the total number of students sitting some papers 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 examiner to adjust all marks for those papers. For the Materials papers such adjustment is referred to as 'scaling' and the normal procedure will be as follows:

- (i) 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.
- (ii) For papers with a mean in the ranges either of 55-60% or 70-75%, including those scaled under (i) 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.
- (iii) 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

The rubrics on Management and Economics papers differ slightly from the above, but numerical marking is used and all examiners mark to the standard class boundaries [see section on classification] and range of marks (0-100). All scripts in Economics and Management are double-marked. Management examiners mark on a question-by-question basis, whereas in Economics a mark is awarded for the performance on the paper as a whole. Economics and Management examiners mark papers and then consider the marks distribution for the whole cohort taking the paper (including candidates from other joint schools). After careful consideration of such factors as: the marks, the candidate's overall performance and the level of difficulty of the questions, they

may make adjustments for each candidate. The adjusted marks for papers and half papers are then forwarded to the Chairman of the MEM Examination Board.

(4) *Marking of Practicals for Part I*

Practicals are assessed continually by senior demonstrators in the teaching laboratory and are allocated 50 marks. Part I examiners have the authority to set a practical examination.

(5) *Marking Industrial Visits*

Four industrial visit reports should be submitted during Part I. Reports are assessed by the Industrial Visit Coordinator on a satisfactory / non-satisfactory basis, and are allocated a total of 20 marks.

(6) *Marking the Team Design Projects*

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 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.

(7) *Part I and II vivas*

The Examiners have the right to call students to a Part I viva after the Part I Examinations and/or a Part II viva after the Part II Examinations.

Examination Regulations provide that a candidate who fails to appear for any part of a University Examination (including a *viva voce* examination), except in the case of acute illness or other urgent cause, will be deemed to have failed the entire Examination or, in the case of a public examination taken over more than one year, the entire Part of the Examination. Hence (i) Part I candidates must see that they are available until the end of 9th week, unless informed otherwise by the Chair of Examiners and (ii) Part II candidates must see that they are available until the end of 10th week, unless informed otherwise by the Chair of Examiners.

(8) *Marking the 4th Year Management Project*

The management project is allocated 200 marks and is marked by examiners in the Saïd Business School.

3. CLASSIFICATION

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 Iii 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 Iiii 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 borderline cases the examiners use their discretion and consider the overall quality of the work the candidate has presented for examination. The external examiner often plays a key role in such cases.

Part I:

Unclassified Honours – 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. 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. The examiners do not divide the categories further but tutors and students may infer how well they have done from their marks. 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 only be waived in exceptional circumstances, with permission from the EPSC.

Annex: Summary of marks awarded for different components of the Final Examination in MEM (For Part I and Part II students who embarked on the FHS respectively in 2007/08 and 2006/07)

Component	Mark
Part I	
General Paper 1	100
General Paper 2	100
General Paper 3	100
General Paper 4	100
Introductory Economics (Ec1)	100
Paper M1	100
Microeconomics	100
Practicals & Industrial visits	70
Team Design Project	50
<i>Part I Total</i>	<i>820</i>
Part II	
Management Project	200
Options Paper 1	100
one of Economics or Management option	100
<i>Part II Total</i>	<i>400</i>
Overall Total	1220

EXTERNAL EXAMINER'S REPORT

Professor A Lindsay Greer
Head of Department

Department of
Materials Science & Metallurgy

The Vice-Chancellor
c/o Mrs. Sally Powell
Assistant Registrar
University of Oxford
University Offices
Wellington Square
Oxford, OX1 2JD

12th February 2009

Dear Vice-Chancellor

Report of the External Examiner for Part I and Part II Materials Science, Engineering & Materials Science, and Materials Economics & Management Degrees, 2008

I make my comments under the headings suggested in the Guidance Notes sent out by your Examinations Appointments Manager on 15 January 2009, and close with more general comments. In contrast with previous years, the two External Examiners were this year jointly responsible for oversight of both Part I and Part II.

Academic standards

As found in previous years, the standards are high, entirely suitable for final-degree qualifications at a leading UK university. As noted last year, the level is well into what would be a Masters level course in the very top US institutions. The topics cover a good range of the subject and furthermore include some of the latest developments.

Assessment Processes

I find the assessment to be rigorous. The Part I papers are well designed, with a mixture of quantitative and non-quantitative exercises. Everything was conducted adhering to the regulations and guidance, which were clear. The students are treated fairly and equitably. Indeed, the care taken throughout the examining process was most impressive.

Student Performance

The standard of student performance is high — certainly a credit to the University. It is particularly impressive how some students have managed to organise things so well in overseas placements for their Part II project work.

Comparability of Standards

The academic standards and student performance are at the highest level, easily at the very top levels to be found in the UK.

Issues

There are no issues to raise. This is in contrast to last year's report where there were concerns about the adding up of marks. My 2007 report noted "it is essential that the Department of

Materials puts in place a system to prevent a recurrence of this serious flaw in their 2008 processes". It is pleasing to note that this problem has been comprehensively addressed, with no hint of recurrence.

In the 2007 report it was noted that with the (pleasing) rise in numbers of Part II projects it would be better for the two External Examiners to share oversight of both Part I and Part II. The new arrangement was applied for the first time in 2008. It worked well and should be retained. For detailed reading and assessment, the Part II project reports were divided between the two examiners on the basis of subject and examiners' expertise. The visas were held in the presence of both examiners. No problems were encountered through the use of two External Examiners.

Good Practice

I have been impressed by the straightforward organisation of the Part I written examination, the subject matter being divided into separate papers. In contrast, the equivalent examination in Cambridge (Part II Materials Science & Metallurgy) has had a considerably more complex division of topics. In September 2008, the Department of Materials Science & Metallurgy in Cambridge undertook a comprehensive revision of its Part II examination format, and the 2009 papers will be structured similarly to the Part I papers in Oxford. Our Teaching Committee is sure that this will be an improvement!

We have also learnt lessons from the rigorous management of the Part II project work at Oxford, (albeit for much shorter projects at Cambridge) and now have improved procedures for interim reports, to some degree derived from Oxford procedures.

Closing Comments

It is a pleasure to record my thanks to the Chairman of Examiners in the Department of Materials, to administrative and academic staff in the Department, and to my co-examiner Professor Derby. There was excellent communication and support at every stage of the process.

Yours sincerely

Lindsay Greer

EXTERNAL EXAMINER'S REPORT

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External Examiner's Report FHS in Materials, FHS in Materials, Economics and Management, FHS in Engineering and Materials, 2008

This is the fourth and final year of my appointment as External Examiner for the FHS in Materials, FHS in Materials Economics and Management (MEM) and FHS in Engineering and Materials (EMS). I therefore think it appropriate that I make some comments on the evolution of the examination process in these FHS during my tenure, before making my formal comments on the examinations that took place in 2008.

I would first like to thank all the Chairmen of Examiners and Appointed Examiners who I have worked with over the past 4 years during my appointment. I can safely say that in all cases they carried out their duties in a professional manner and that it was evident that they always had the well being of students in mind during the examination process. As is inevitable, unforeseen circumstances occurred in some years, and in each case the Chairman, guided if necessary by the Proctors, took appropriate action. Each year I have been pleased to confirm that a fair and proper examination process took place.

One advantage of being in post as an External Examiner for a relatively long period of 4 years is that I have been able to observe the action taken in response to my comments and recommendations. I am pleased to report that in all cases my comments and recommendations have been actioned upon and in the most part new procedures formulated where recommended. I am particularly pleased that the two examiners now observe both Part 1 and Part 2 of the examination jointly, rather than being responsible for only one Part of the examination in each year. This joint responsibility makes it easier to see how one's recommendations are being dealt with. I believe that the procedures in place are now robust and that the examination process in these FHS continues to be of the highest standard.

For the examination that was held in 2008 I was pleased to receive early communication from the Chairman and I was provided with a full timetable of the process early in the academic year. As I alluded to in my comments on my overall tenure as an Examiner, this year I read the formal written examination papers in Part 1 prior to their final approval as well as taking part and overseeing the examination of the thesis that is Part 2 of the FHS in Materials.

The examination questions in Part 1 of the FHS in Materials and MEM were of a high standard and contain substantially more in the way of numerical and derivation style questions that is customary elsewhere in the UK. However, it is clear that this is the Oxford house style and the students are well aware of this and tailor their learning experience accordingly. In a few instances, I believed the questions initially proposed were rather long but after discussions with the examiners my fears were either allayed or the questions were modified. I was satisfied that the final examination papers were fair and appropriate for assessment. The papers set for the FHS of EMS were distinct from those of Materials and MEM. These too were appropriate.

After the papers were marked by the internal examiners I, and the other External Examiner Prof. A.L. Greer, read through example papers and I was satisfied that the marks allocated were fair and appropriate. This year there appeared to be remarkable consistency in the performance of the

cohort of students across all of the examination papers sat and it was not necessary to discuss whether the performance of the students in any individual exam required adjustment in the assessment to provide statistical homogeneity. I congratulate the examiners in achieving such a consistency in assessment. This year there was a clearer track of the transfer of marks from the scripts to the spreadsheet and, to the best of my knowledge, this led to a smooth operation of the process and clearer audit to ensure no errors occurred in transit. This new system appears to be sufficiently robust. The examiners had decided to not require any students to be interviewed by the external examiners after the Part 1 examination and I agreed with their analysis.

Taking part in the examination of Part 2 of the FHS in Materials is always an enjoyable experience, given the general high quality of the research work carried out by the students and of the theses submitted. This year was no exception and I was impressed by the very high standard set by the best reports. There were no theses that were a severe disappointment and I congratulate the School of Materials on this part of the examination and the learning process. I was pleased to note that my comments in earlier years that the theses were tending to expand to an unmanageable size (at least for an external examiner expected to read all of them!) had been noted, and that new limits were now enforced. The procedures followed to ensure absence of bias by tutors and supervisors during examination were well observed and I am satisfied that this aspect of the examination was carried out satisfactorily. There was remarkable agreement in most cases between the two assessors of each thesis. However, I still find the assessment of project management to be weak. I have mentioned this in previous years and it remains a concern. The students submit a number of project management forms with the thesis and examiners are asked to take these into account during their assessment of the thesis. I do not believe this is easy to do and I would be happier to see a formal assessment procedure operated during the year and contributing in a very small way to the final mark. However, I have been told that the department of Materials wishes to maintain the primacy of the thesis as the examination tool.

My observations of the examination process in Part 2 of the FHS of MEM and EMS were also satisfactory. Both these FHS have substantial teaching (in the case of EMS the majority) taken outside the Department of Materials. However, for both of these FHS the examination of a complex multidisciplinary course was undertaken professionally and to my satisfaction.

In general I was very happy with the examination process this year and I have no specific recommendations as to how improvements could be made except as concerning the assessment of project management during the Part 2 research project. I do understand the loyalty the examiners hold as regards the thesis as an examination tool but if they wish to formally assess project management some other mechanism of assessment may be required.

Brian Derby

Professor of Materials Science, University of Manchester.

**Faculty of Materials
Department of Materials Academic Committee**

RESPONSE TO EXAMINERS' REPORTS 2008

Honour School of Materials Science (MS) Parts I & II

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

Honour School of Engineering & Materials Part II – response will be made by the EMS Standing Committee

Following a preparatory meeting between the Chair of DMAC and the incoming & outgoing Chairs of FHS Examiners, the FHS Chairman's report and internal reports on all of the individual Materials papers were considered by the Department of Materials Academic Committee (DMAC). Reports are awaited from the External Examiners for Materials components and from the External for certain Economics papers, as are the internal examiners reports for two of the Economics papers: delayed reports will be considered by DMAC in due course, but will not now influence procedures for the 2008/09 examinations. Based on discussions at the time of the Examination Boards these missing reports are not expected to raise any major issues.

[Note added 13/2/09: The delayed reports were received in Hilary Term and section two of this response has been updated accordingly. Since, as expected, the reports did not raise any issues of major concern in respect of the MS or MEM programmes this update was carried out by Chairman's action on behalf of DMAC].

1. Summary of major points

(i) After considerable efforts over recent years to this end, it was noted with satisfaction that no scaling was necessary this year.

(ii) Although not making a strong recommendation for change, the Chairman of Examiners has proposed that Faculty consider if it is content with the current Examination Convention whereby, subject to the discretion of the Examiners in borderline cases, the final degree class is decided by the overall mark only. Specifically, is Faculty content that a candidate who fails one or more written papers might still gain an honours degree if the other written papers and coursework score highly enough? Faculty has indicated that it is content with the status quo and this has been made more explicit in the updated conventions.

(iii) The Chairman of Examiners has proposed that where practicable we move towards anonymous marking of coursework. At present the candidate's name is known to the markers for all elements of coursework. DMAC has concluded that such anonymity would be practicable only for the Business Plan and, given that all other coursework is not anonymous, sees little value in this one minor element being so treated. In any case at present the tutor for the Business Plans is also appointed as one of the assessors. Faculty has confirmed that for all coursework a candidate's name should remain known to the marker.

(iv) This year, as a pilot, the Examiners decided that they would hold viva voce examinations for any candidate who was borderline at Part I (ie. pass/fail or pass/hons). In the event no candidates were borderline but it became apparent that the timing of the Introduction to Management paper and its subsequent marking would have made it very difficult to arrange such a viva for a borderline MEM candidate. After lengthy and careful discussion, during which it was recognised that it was untenable that in some years we decide in principle to use **vivas for borderline cases** and in other years decide not to use them, a large majority on DMAC

voted that we should recommend to Faculty that the regulation permitting such vivas be dropped - borderline cases being decided instead by a careful consideration by the Examiners of a student's profile over all assessments accrued over the 2 or 3 years FHS work. Faculty has endorsed DMAC's recommendation and hence an appropriate change in regulations will be proposed, to take effect for those embarking on the FHS in 2009.

2. Points for inclusion in Responses to the External Examiners

MS & MEM Parts I & II: Professor B. Derby

We warmly thank Prof Derby for his thoughtful & constructive contributions during the four years of his service as an external examiner for our degree programmes. Regarding his report on the 2008 examinations we are pleased to read his wholly positive comments. On the issue of the Part II project management and its assessment, although we differ from Prof Derby on this point we value the fact that his comments in earlier years prompted us to examine this issue and to modify the way in which the project management is reported on in the Part II thesis. We note that his fellow External Examiner reports that, prompted by our 'rigorous' project management scheme, Cambridge are introducing interim reporting for their final year Materials projects.

MS & MEM Parts I & II: Professor L. Greer

We thank Prof Greer for his careful oversight of our examinations, which our internal examiners found to be very helpful. We were delighted to read his ringing endorsement of our degree programmes, standards and examinations process.

MEM, Management Papers: Dr M.I. Barrett

There are no issues requiring response. We thank Dr Barrett for his service as an External Examiner and his positive comments on our examinations process, on the rigour of our programmes and on the quality of our students.

MEM, Economics Papers: Prof G. Lanot

We thank Prof Lanot for his comments, to which the E(M)EM Standing Committee and the Economics Faculty will reply as appropriate. We were concerned that he omitted to report on the Microeconomics which is compulsory for the MEM students and asked Division to follow up on this. The outcome was that the Microeconomics paper was not under the auspices of Prof Lanot and the appropriate report from Prof Clark was received in Hilary Term.

MEM, Economics Papers: Prof S. Clark

We thank Prof Clark for his comments, to which the E(M)EM Standing Committee and the Economics Faculty will reply as appropriate. We are however concerned to note that it appears that the Economics Faculty have further to go in their efforts to change practice with regard to utilising the full range of marks available.

3. Further Points

- (a) We have no major comments to make on trends in FHS statistics. Noting the importance of considering averages over five or six years when dealing with small cohorts of students we observe that the proportions of first class and upper second class degrees awarded do not differ greatly from the MPLSD averages; if one 2ii per

year in Materials was instead a 2i there would be no difference. We are also pleased to report that in Materials there continues to be no significant gender gap in the proportions of male and female candidates who gain first class degrees, with female candidates slightly more likely to gain a first.

- (b) The Chairman of Examiners has suggested a number of minor improvements in procedure and these will all be acted on.

4. Examination Conventions

We confirm that DMAC is satisfied that in revising our Examination Conventions we have considered the points in the EdC notes of guidance on Examinations & Assessment, para 3.12, as consulted on the EdC web-pages on 21st Oct 2008. DMAC and the incoming Board of Examiners have jointly approved the updated conventions.

One major change to the conventions has been made for 2008/09. This is the introduction of a new scale of penalties for late submission of coursework in response to the 2006 regulation on this matter. Until 2008/09 there were students on course who had a vested interest in the earlier regulation on this matter, thus constraining the scale of penalties.

A.O. Taylor, Chairman of DMAC, 21/11/08
Updated 13/5/09

MEM Management Components

External Examiner's Report

School of Economics and Management

Meeting Date: July 7, 2008

Dear Vice-Chancellor,

This is my third and final year in serving as external examiner for the management components of the FHS of Economics and Management during the academic year 2007-2008. The process was a very well structured and coordinated. I commend the administrators and the internal examiners for their diligence and support throughout the year. It is clear that these programs continue to attract and educate an excellent cadre of students.

Early in the year, my review of the examination papers was straightforward with little requirement for change in their content or structure. The questions reflected a range of topics and students were given good choice. The programs are rigorous with proper learning assessment and an overall high quality of education.

I reviewed a significant number of examination papers across the different classification levels, in particular at each of the thresholds of bands (e.g. II.I and I etc.) Consistent with past years, the quality of the students' answers continues to be impressive. The marking of the scripts was fair and of high quality with students at the higher end displaying a very good understanding of the course material and able to apply concepts in a superior manner. There was a noticeable improvement in the spread of marks between first and second markers across the board except in strategic management, though reconciliation of marks was relatively unproblematic.

The final meeting of the exam board was well chaired with good space provided to discuss and agree classifications. As a board, we were able to effectively coordinate and conclude on overall grades across Economics and Management components. I believe there has been a fair and equitable process in the final grading and classification of students on this program. The number of students achieving the different classifications of I, II.1 etc. was close to the expected average. It was noted that there was a variance of female students with fewer getting I and more getting II.2, but this is not significant though it should be examined in future years to see if there is a trend.

In sum, I believe the management component of the FHS has been very successful this year.

As I conclude my tenure as external examiner, I would like to express once again my appreciation for the opportunity to serve as external examiner over the last few years on these programs.

Yours Truly,

Michael Barrett
Director of Programmes
Judge Business School
University of Cambridge

MEM Economics Components

External Examiner's Report

PAPERS:

Introductory Economics (part 1)

Economic Decision within The Firm (part 2)

For each paper I was asked to confirm/moderate the marks for scripts of variable quality (4 and 3 scripts respectively). This was organised efficiently. I would have preferred a slightly larger sample of scripts (6 of each?) and slightly more time to go over them.

I attended two separate examination meetings (one for Materials, Economics and Management and one for Engineering Economics Management) on 26/06/08.

(I) WHETHER THE ACADEMIC STANDARDS SET FOR ITS AWARDS, OR PART THEREOF, ARE APPROPRIATE;

For the two modules I was dealing with the standards are appropriate.

(II) THE EXTENT TO WHICH ITS ASSESSMENT PROCESSES ARE RIGOROUS, ENSURE EQUITY OF TREATMENT FOR STUDENTS AND HAVE BEEN FAIRLY CONDUCTED WITHIN INSTITUTIONAL REGULATIONS AND GUIDANCE;

AS they were last year, the meetings were conducted efficiently and fairly. Students were treated equitably. Examiners were making sure that the decisions for final classification were consistent with decisions taken earlier for students in related programmes.

One issue which I think comes under this section concerns the marking “culture” between the engineering/material science examiners and the examiners of the economics papers. Interventions during the examination meetings pointed to the fact that the variability of marks is much larger in engineering/material science than it is in economic subjects. The view of the engineering examiners is that this diminishes the contribution of the economics subjects to the final classification of the EEM and MEM students. I wonder whether the economists have considered setting more discriminating examination paper, i.e. examination papers which would create a larger spread of marks and reward very good students much more than they currently do. In particular, would it be possible to structure the Introductory Economics (part 1) paper to allow very good students an opportunity to shine. Possibly this would demand that EEM and MEM student complete a different paper than other economic students.

One final issue which may be relevant here, I noted that a substantial fraction of students completing their part 2 are not taking Economic Decision within The Firm as their economics paper, although I have not doubt that their performance is moderated by an external examiner for the courses they take instead, I still worry that their performance is not moderated as much as the performance of students taking Economic Decision within The Firm.

(III) THE STANDARDS OF STUDENT PERFORMANCE IN THE PROGRAMMES OR PARTS OF PROGRAMMES WHICH THEY HAVE BEEN APPOINTED TO EXAMINE; AND WHERE APPROPRIATE, THE COMPARABILITY OF THE STANDARDS AND STUDENT ACHIEVEMENTS WITH THOSE IN SOME OTHER HIGHER EDUCATION INSTITUTIONS;

Since, as far as I am aware, the syllabus covered by the two courses has not changed and the structure of the examination papers is broadly the same, my comments here repeat my comments from last year.

Introductory Economics (part 1):

The performance of the students for this paper was comparable to the performance one would expect from students elsewhere following an economics degree at the end of their second year. Given that the students on MEM and EEM are not specialists in economics this signals a good performance.

Economic Decision within the Firm (part 2)

This course is taught at a relatively high level relative to course with a similar syllabus taught elsewhere as part of an economics degree. The students are of course relatively more advanced than the usual finalist in my own institution since they have already completed 3 years of undergraduate study.

(V) ISSUES WHICH SHOULD BE BROUGHT TO THE ATTENTION OF SUPERVISING COMMITTEES IN THE FACULTY/DEPARTMENT, DIVISION OR WIDER UNIVERSITY:

Introductory Economics (part 1):

I was consulted on the structure of this paper and my comments were taken into account.

Once again, I was not sent the marking guidelines for this paper. I wonder whether in the future the paper could come with some indication concerning the expected answers.

The paper contains two parts. The first section contains six questions, three on microeconomics and three on macroeconomics. The students are expected to answer three questions out of the six with the added requirement that candidates must answer at least one microeconomic and one macroeconomic question. The second section proposes four essay questions of various level of generality out of which students must select one. Hence candidates are expected to answer four questions each carrying 25 marks.

This year the exam paper is balanced in term of coverage: microeconomic and macroeconomic questions have an equal share.

The questions were distinct.

Because of the limited amount of scripts I saw this year I can not ascertain which questions were popular and which were not.

Economic Decision within the Firm (part 2)

I was consulted when the paper was set.

The comments I made last year concerning this paper still apply this year. This is a good exam paper which is tightly marked according to the guidelines I was given when I reviewed the paper. I do not have any further comments to make about this paper.

(VI) GOOD PRACTICE THAT SHOULD BE NOTED AND DISSEMINATED MORE WIDELY AS APPROPRIATE.

The examination meetings are very efficiently organised and chaired.

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MEM Economics Components

External Examiner's Report

The Vice-Chancellor
University of Oxford

External Examiner's Report

Final Honours School of Economics and Management

Economics Papers: 2008

Examination Board: 7 July 2008

(i) Having read a range of scripts, I am satisfied that the outcome in terms of the classification was fair, and conformed to standards in comparable institutions. In particular, I am in no doubt that to get a First in E&M it is necessary to show highly developed analytical power, and to organise arguments with clarity, insight and efficiency.

(ii) Student performance was generally very good, with a very small proportion of weak students. At the top end, the students were outstanding.

(iii) My main reservation concerns the range of marks given to individual papers, and the criteria for classifying degrees. I think the marks given to the best papers were unduly conservative, and the classification scheme is somewhat liberal. These two effects cancel out, so the final class outcomes are still fair and appropriate. As I wrote in my report last year, I have reservations about the preponderance requirements of the classification criteria. The criteria have not changed, and I still have these reservations. Regarding marks for individual papers, the marking conventions for E&M state that about 17% of First Class marks should be expected to be 80 or more. With 94 candidates each taking 8 papers, one might expect about 25 papers with marks of at least 80; I found 5. There seems to be a reluctance to use the full range available; the marking conventions do state that where the criteria for a First are evident throughout a paper, the mark should be 80 or more. I am not sure if this rule is being applied. I read some outstanding papers, and although the candidates always got the degree class I thought they deserved, there must be some doubt as to whether this is reflected in the actual marks for each paper.

Some support for this can be found in the marks given to the papers of the best candidate, and the best scripts in Macroeconomics and Microeconomics. These got marks of 71.75 (an average mark but no individual marks in the 80s), 73, and 74 respectively.

(iv) Finally, the general administration of the examination process, insofar as it affected me, ran very smoothly. Susan Barrington, at the Business School, and Dr Chawluk were efficient and helpful.

Simon Clark
Edinburgh, July 2008

STANDING COMMITTEE FOR EEM AND RELATED STUDIES

Extract from: Part II – Reserved Minutes of the meeting held on 30 October 2008

12. Examiners' Reports for 2008

12.1 Internal Examiners' Reports

The Standing Committee received the internal examiners' reports for EEM Parts I and II, Engineering Science Parts I and II, and MEM Parts I and II

The following points were raised in discussion of the reports:

- The number of EEM candidates achieving first class honours in 2008 was 29%. This was considerably lower than in the previous two years: 39% in 2007 and 46% in 2006. It was also noted that for this cohort the number of provisional firsts in Part I 2007 had been 38%. This was in contrast to candidates in the FHS of Engineering Science where the proportion of firsts had increased between Parts I and II. The situation would be monitored in future years.
- It was noted that Part I MEM candidates had performed less well in the materials papers than candidates in the FHS of Materials Science.
- It was agreed that with regard to papers M1 and Ec1, the performance of EEM candidates in relation to Economics and Management candidates should be considered at the next meeting of the Standing Committee. Relevant data would be made available to Dr Field who agreed to undertake the analysis.

RWF

12.2 External Examiners' Reports

The Standing Committee was concerned to note that a number of the 2008 reports from the external examiners were not yet available (see below). They were however being chased.

The following points were raised in discussion of the submitted reports:

Engineering

Professor Collings had been unwell at the time of the classification meetings and had therefore not submitted a report. He had, however, commented on draft papers.

The report from Professor Brown had not yet been received but was currently being chased.

Materials

No reports had been received.

Economics

Professor Lanot had acted as external examiner for Introduction to Economics (Ec1) and Economic Decisions within the Firm.

The Standing Committee was pleased to note that the external examiner had considered that the meetings of the Examination Boards had been conducted efficiently and fairly. However, he had expressed some concern about the marking 'culture' between the engineering/material science examiners and the examiners of the economics papers. The variability of marks had been much larger in engineering/material science than it had been in economics subjects. The external examiner had wondered whether the economists had considered setting more discriminating examiner papers, which would produce a larger spread of marks and reward very good students

much more than they currently did. This would be a matter for consideration by the Faculty of Economics.

Management

The Standing Committee was pleased to note the overall complimentary comments of Professor Barrett in his final year as external examiner for the management components of EEM and MEM. The external examiner had noted that the relative frequency of significant spread between first and second markers had improved over past years. It was the view of Professor Barrett that the practice of requiring paper setters to provide a high level guide of expected solutions would improve the grading process.