DESIGN TECHNOLOGY

Overall grade boundaries

Higher level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 15	16 - 29	30 - 40	41 - 53	54 - 65	66 - 78	79 - 100

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 14	15 - 28	29 - 38	39 - 51	52 - 63	64 - 76	77 - 100

Grade boundaries are determined by matching the Grade Descriptors for Group Four (see OCC) to the evidence available from marked scripts. Each paper is set in a way that ensures that it provides enough evidence to enable the use of the Grade Descriptors and also to ensure that there is appropriate syllabus coverage and that the papers are appropriately discriminating. Grade award meetings first determine the 3/4 boundary by inspection of the scripts for each component and matching with the Grade Descriptors, moving on to the 6/7 boundary and then the 2/3 boundary. Other grade boundaries are determined by interpolation from these three boundaries. The boundaries for Paper 1 are set with reference to the Paper 2 boundaries as the Papers 1 and 2 have the same syllabus coverage.

Introduction

The examining team continues to hope that the examination papers and this subject report will be useful for preparing candidates for future examination sessions, and will add to the material available to support teachers in their work.

Overall numbers of candidates and the number of schools has increased again compared with November 2007. There were 66 candidates (52 in 2007) from 9 schools at Higher Level and 20 candidates (same as 2007) at Standard Level from 7 schools. Candidates were entered at both Standard and Higher Level in 5 schools. So the numbers of DT candidates continue to increase.

Six G2 forms were received for this examination, which is better than the one received in 2007, but they were all from the one teacher. Thank you to that teacher for his responsiveness. The examining team anticipates and hopes for a higher response in 2009 which will provide the opportunity to settle in the new syllabus. The G2 forms are extremely valuable in providing feedback to the examining team and are always studied carefully during grade award meetings.

The examining team continues to request teachers to feedback both positive and negative comments to inform the development of Design Technology. Where teacher comments are informed by candidate reaction to the papers after the examination this would be particularly useful.

Higher level and Standard level Internal assessment

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 5	6 - 11	12 - 15	16 - 19	20 - 23	24 - 27	28 - 36

The range and suitability of the work submitted

Moderation for November 2008 sampled the work of eight schools. Work ranged from small design and make activities through to laboratory based experiments, as well as some challenging project work. Those schools that are established in the teaching of IB Design Technology tend to do better when developing a course structure for IA, but all schools must take note of new changes to assessment criteria for examinations in 2009. Most schools continue to adopt the design and make route for small investigations, but schools are to be reminded that they do not have to assess each of the criterion for each task. It is advised to use coursework as a support exercise in order to help students understand the theoretical nature of the subject and students will develop project skills by concentrating on one or two assessment criteria. For instance a teacher could provide a brief, specification and research material so as to enable the students to develop and model ideas to be assessed for DPP. Small lab based investigations tend to require less time than design and make tasks (normally no more than 3-4 hours) and the integration of such assignments in to the course structure is to be encouraged. Some schools do not adopt this approach.

The topics covered by coursework must be entered on the form 4PSOW along with the time taken for each investigation. Teachers support materials/project briefs should be attached to the sample of work.

As marks need to be highlighted on the form for each assessment heading, one of the marks must be for the design project and the other for any of the other investigations. All work that has been highlighted, along with evidence of the group 4 project, should be sent for moderation. Other elements of coursework are not required for moderation unless a teacher deems it appropriate.

In a number of schools there is still some confusion over what should be contained within the project report and logbook. The logbook is not formally assessed, but reference should be made to numbered pages throughout the folio if work is integral to the final report. To avoid such confusion log books will not be required from May 2009; all work should be evident in the report. Most samples were presented in an organized structure, but teachers are reminded that work for each criterion needs to be flagged.

Teachers are encouraged to send an individual student sample per folder/folio with the form 4 PSOW attached. Dividers should be used to indicate the start of different investigations and work sent to moderators should be in A4 format.

Candidate performance against each criterion

PI (a): The majority of candidates were able to achieve a minimum of at least a Partial for this criterion. However, some students did not perform so well especially when repeating a common problem set by the class teacher and the omission of any reference to constraints. When using the design project assessment criteria, students should consider the feasibility of the study and produce a detailed specification. When completing a lab based investigation variables must be identified.

PI (b): Most candidates displayed evidence of planning, but methods did not always control the variables. When considering the design project some candidates omitted a detailed plan of action and material list. Materials and processes, to include risk assessment, must be included if students are to achieve a high mark under this criterion. Gantt charts or tables of procedures are to be encouraged but the breakdown of processes needs detail and time allocated should ideally be outlined as hours and minutes instead of days and weeks. Some candidates continue to write plans in retrospect and omit the need to change their plan to meet ever changing issues throughout the making process. Gantt charts that are used as an overview of planning student time for the complete design and make project are not sufficiently detailed for assessing PI(b).

DC: Smaller investigations where candidates had to collect raw quantitative data offered ample opportunity to address the assessment criteria. The design project allows candidates to address research through identifying materials, ergonomics, existing products, user needs, environmental concerns and problem specific data, but some candidates had omitted essential data in order to solve the problem. Students should fully analyze the brief in PI(a) if they are prioritize strategies in which to identify wider issues to be researched. Those that achieved a high mark in this section displayed evidence of focused research that had been annotated to indicate its relevance in order to solve the design problem. Printed web pages or copies from text books provide little use if their relevance is not explained. Ideas were generally presented using appropriate techniques.

DPP: The best work addressed the majority of the assessment criteria, with evidence of. The use of CAD and 2d/3d modelling is to be encouraged. Teachers should consider how card, manufactured boards, CAD and Styrofoam can be used to aid model development. Teacher led investigations which focus on this criterion alone will aid candidates in developing the necessary skills to tackle a design and make project.

CE: Lack of time at the end of a project can only offer limited evaluation or superficial personal evaluations. Students should be encouraged to test their outcomes in the area or with the user for whom they had been designed. The more organised candidates did leave adequate time to address the criteria to a satisfactory standard. Projects which offer a limited outcome do not lend themselves well to addressing this assessment criterion.

Recommendations for the teaching of future candidates

As stated in the May 2008 Subject Report, teachers need to make themselves familiar with the new subject guide for 2009 so as to identify the differences in assessment criteria and coursework requirements before submitting samples next year. The new weightings for IA - Investigations and the IA - Design Project are 18% each, giving equal weighting to both aspects of internal assessment.

The duration of IA‟s has also changed, to give the Design Project more time. It should be noted that, the level of student work will need to be adjusted to show the increase in weighting and time allocated. The Group 4 Project is now assessed for Personal Skills only, and Manipulative skills are only to be assessed in the Design Project.

When deciding on possible Design Project ideas teachers and students should, where possible, consider the option that has or will be studied. Tying the project and option together in some way, will reduce the workload of students and should allow some of the option to be taught through practical work. This would be deemed as best practice, as due to lack of knowledge and experience it could be disadvantageous for students to study an option then attempt to tackle a project that is more suited to another area. For instance, if studying Textiles, as the option students would be ill prepared to complete a project based around electronics or food, however this does not restrict students to carry out a project that may just be linked to one option. If studying CAD CAM as the option students may still want some form of textiles/food in their final project outcome. The manner in which they tackle this could include cutting the textiles on a laser cutter, or making vacuum forming moulds for food packaging on a CNC router. Another example may be a student studying Electronics but needs to use CAM to make the packaging to house the PCB or even machine the circuit layout.

Please note that when assessing IA – Investigations it may not be possible to use all of the assessment criteria for each investigation. The *development* criterion is suited to IA – Investigations that adopt a design and make approach.

Higher level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 9	10 - 14	15 - 20	21 - 25	26 - 29	30 - 34	35 - 37

General comments

One G2 was received related to HL Paper 1. It indicated that the paper was felt to be an appropriate level of difficulty compared with last year. The syllabus coverage was good, clarity of wording was deemed to be satisfactory, and the presentation of the paper was classified as good. A comment was made with regard to Q27 which is addressed in the discussion below.

The examining team is aware of the need to achieve the correct balance in setting multiple choice questions in Paper 1's. The questions must discriminate well between levels of knowledge of students, but not be so obvious as to be open to guessing. This means there is often only subtle differences between the responses, and sometimes there is more than one correct response, but one is 'more correct' than another. So while the questions may seem tricky, the goal is not to trick the students but to test their knowledge. Feedback from teachers about their perceptions of the questions are important.

The examining team also appreciates the reminder that many students do not have English as their first language. We often search for words and phrases that are the easiest to interpret and understand which is sometimes difficult in technology, but it remains a priority.

The mean for Paper 1 has been noted in past reports, and is included below in order to indicate the changes in means. The mean for this year was within an acceptable range of variation from year to year.

Mean	Year
23.4	2003
27.1	2004
27.2	2005
22.2	2006
23.2	2007
28.7	2008

The table below indicates, in question order, how difficult questions were perceived to be as determined by candidate performance – the higher the difficulty index, the easier the question! The * shows the correct answer and the numbers represent the number of candidates providing each individual response. A discrimination index is also calculated. This compares the performance of the top 25% of candidates on a particular question with the top 25% of candidates overall and can vary between 0.00 and 1.00. With a small candidature the discrimination index is a less useful tool than it is in large entry subjects. All questions achieving a negative or low discrimination index are discussed at the grade award meeting.

Question	A	B	C	D	Difficulty Index
1	2	0	62 *	2	93.94
2	1	1	0	64 *	96.97
3	13	37	10	6 *	9.09
4	2	2	56 *	6	84.85
5	51 *	14	0	1	77.27
6	1	4	57 *	4	86.36
7	8	55 *	2	1	83.33
8	8	48 *	2	8	72.73
9	37	3	3 *	23	4.55
10	33 *	10	22	1	50
11	7	0	1	58 *	87.88
12	3	52 *	3	8	78.79
13	40	8	6 *	12	9.09
14	0	0	66 *	0	100
15	51 *	7	5	3	77.27
16	7	0	57 *	2	86.36
17	64 *	0	0	2	96.97
18	57 *	0	4	5	86.36
19	62 *	0	1	3	93.94
20	3	27	28	8	0
21	6	7	44 *	9	66.67
22	12	1	49 *	4	74.24
23	4	6	3	53 *	80.30
24	1	17	2	46 *	69.70
25	38 *	14	5	9	57.58
26	1	3	60 *	2	90.91
27	30	20	11	5	0
28	7	0	11	48 *	72.73
29	15	4	2	45 *	68.18
30	13	14	28	10	0
31	43 *	5	3	15	65.15
32	9	35 *	9	13	53.03
33	17	43 *	6	0	65.15
34	10	2	6	48 *	72.73
35	0	2	22	42 *	63.64
36	0	58 *	5	3	87.88
37	0	65 *	1	0	98.48
38	4	54 *	1	7	81.82
39	14	9	0	43 *	65.15
40	41 *	0	24	1	62.12

As is normal practice, the questions with the lowest Difficulty Index, and a low Discrimination Index were analysed by the examining team. For a number of the questions, a low Discrimination Index was because the question was an easy question and the majority of candidates chose the correct response, for example Q 2, 14, 17 and 37. Other questions are discussed below.

Q10: while the majority of candidates selected the correct answer, A Ceramics, a significant number also chose C Timber. The IB Properties/bonding matrix on page 111 of the Guide lists textiles and timber as also having very low thermal conductivity, consequently B and C are also correct answers and in the paper marking and analysis were accepted as such.

Q20: both Difficulty and Discrimination Indices were low for this question and the majority of candidates selected an option (C) other than the one indicated to be correct (B). The confusion stems from the use of the term 'manufacturing' in answer II, while the guide uses the term 'production' on page 82. The examining team accepts that it could be argued that these terms are interchangeable, which would make option I, II and II all correct, but neither A, B, C or D include all these options. Because of this confusion the examining team decided to delete this question from the grades analysis and awarding process.

Q27: the G2 comment about this question was that it should be speculative rather than a statement of fact because no superconductors have yet been developed which can operate at room temperature. An additional difficulty is that AS 7.5.9 in the Guide indicates that I, II and II are all correct answers, but none of the optional answers available include all these. Because of these difficulties, the examining team decided to delete this question from the grades analysis and awarding process.

Q30: a number of issues have arisen related to this question. One is that the Guide does not include Recyclability and Melting point as materials properties. Secondly candidates are not expected to have specifically studied medical equipment and so may not have an understanding of its requirements. So while AS8.5.6 includes some understanding of polypropylene, it may not extend to this question. As a result the examining team decided to delete this question.

Higher level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 6	7 - 13	14 - 19	20 - 27	28 - 35	36 - 43	44 - 60

General comments

One G2 was received related to HL Paper 2. It indicated that the paper was felt to be an appropriate level of difficulty compared with last year. The syllabus coverage was good, clarity of wording was deemed to be satisfactory, and the presentation of the paper was classified as good. A comment was made about the northern hemisphere example used in Section A of the paper, and while student could still answer the question, it was less appropriate for the mainly southern hemisphere candidature in the November examination session. The examining team accepts this as a valid comment and will attempt to ensure accessible contexts for candidates.

The strengths and weaknesses of the candidates in the treatment of individual questions

Section A

Each question within Section A is separate and does not assume understanding from previous questions. The use of parts (a), (b), (c) and sub-sections (i) (ii) and (iii) should provide some sign-posting to candidates about the structure of the question and the shift from one focus to the next. It is by no means clear that all candidates understand the significance of this. Teachers must continue to emphasise this to candidates and encourage them that if they falter on one part of Section A for whatever reason they should carry on with other parts which will explore different issues.

Question 1

Question 1 is a data question about house design and energy use.

Parts 1 a (i) posed no significant problems for candidates. The most common error in a (ii) was not taking the number of windows into account in the calculations. Many candidates lost marks in a (iii) because of a failure to account for the 2 east facing windows and their 75% gain.

Most candidates received full marks for both question 1 b (i) and (ii), the most common answer for (i) being related to the location of the house.

Most candidates received full marks in 1 c (i) and (ii), with (i) being a simple addition question. Most candidates seemed to know the answer in 1 c (iii), those who last marks did so because they did not include 3 specific points in their explanation.

The 2 questions in d dealing with house design were both well done with most candidates receiving full marks.

A number of candidates in question 2 stated a reason for the use of polyurethane but failed to elaborate on the reason in order to receive the extra mark, or alternatively listed 2 reasons for which they would only receive 1 mark.

Question 3 a and b were not answered well, with candidates providing a range of incorrect answers to both questions, reflecting a lack of understanding about the data, or in the case of 3 a, not reading the question correctly to include ‘existing’.

Most candidates were able to apply sustainable development principles to the workforce context in question 4a, and to explain how sustainable development can be promoted by a market pull situation in 4b.

Most candidates were able to describe the idea of laminations in laminated glass, but not all included the layer of plastic in between the laminations for the full 2 marks in 5a. The most common response in 5 b was related to the ability to develop aesthetic curved shapes, but many candidates found it difficult to make 3 substantive points for the full 3 marks.

Candidates seemed to have an adequate understanding of the food contexts in question 6, outlining low cholesterol in 6a and describing smell as an important aesthetic characteristic in 6 b.

Section B

Parity of Section B questions and syllabus coverage remain conflicting constraints. The examining team continues to try hard to produce equally difficult questions whilst achieving syllabus coverage. The majority of candidates chose to answer Question 9.

The extended response question in Section B continues to be a good discriminator. With some candidates it remains clear that they do not approach their answer in a logical and structured manner. If three points are requested, then three subheadings or paragraphs should be clear in the answer. Even candidates who do well in the shorter answer questions but do not provide an organized answer to this question lose marks. Teachers need to provide students with guidance in this area.

Question 7

All candidates received at least 1 mark for question 7a(i) and most achieve full marks for the most common discussion related to reliability. Most candidates understood visibility as the main aesthetic consideration and so achieved 2 marks for 7a(ii).

Question 7b was reasonably well answered, although few candidates received the full 3 marks.

The most common error in the answer to 7c(i) was to list two points rather than outline one, however many received the full 3 marks. Question 7c(ii) was not well answered with few outlining cost effectiveness.

Many candidates were able to list three considerations but found it difficult to elaborate in order to receive the full 9 marks for 7d.

Question 8

Most candidates understanding of hardwoods enabled them to receive good marks in question 8 a (i) and (ii) and b (i). There was less success with question 8 b (ii) with few receiving the full 3 marks.

There were some difficulties with the answers for the longer question, 8d, with candidates having to address both Fashion and Planned obsolescence in terms of product life cycle.

Question 9

Candidates generally performed well in both questions in 9 a.

In question 9b not all candidates were able to make two points regarding an advantage of using carbon fibre for the air tanks. Candidates also struggled with question 9c in thinking about carbon emissions.

A broad range of answers were received to 9d, the R&D costs associated with the car at this stage of its life cycle.

Few candidates received full marks for 9e, explain how science, technology and philosophy contributed to the design of the car. As is usually the case, those with well structured answers clearly indicated the points they were making in their explanation.

Higher level paper three

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 5	6 - 10	11 - 14	15 - 19	20 - 25	26 - 30	31 - 40

General comments

One G2 was received related to HL Paper 3. It indicated that the paper was felt to be an appropriate level of difficulty compared with last year. The syllabus coverage was good, clarity of wording was deemed to be good, and the presentation of the paper was classified as good.

Candidates seemed well prepared for the extended response questions and provided balanced and well organized answers. For those candidates who knew their content reasonably well, marks were lost for two main reasons:

- not reading and understanding the question well,
- not structuring their extended answers.

It was noticed again that where candidates go onto an additional sheet to answer the extended response question that it is only those candidates who were using a framework to structure their answers who were picking up marks on the additional sheets. Again, volume is no indicator of quality!

There was no indication of any differences in performance across the two most popular options, particularly in the extended response question, which is pleasing. Overall the Paper 3s produced a good spread of marks and reasonable discrimination was achieved.

In teaching the options teachers are advised not to leave the options to last but to incorporate the option into the core and particularly into the practical work so candidates have some ‘hands on’ experience of the option in order to both broaden and deepen their understanding, and more effectively enable their application of content to a range of contexts.

The trend continued in this paper with most candidates choosing Options E and F. Options D and G were selected by few candidates and Option H by none.

The strengths and weaknesses of the candidates in the treatment of individual questions

Option D

Most candidates selected taste as the organoleptic property effected by the production of Jerky in 1(a). In 1(b), few candidates received the full 2 marks for an outline, although many received 1 mark for being able to state a reason. As is typical in a 3 mark question, few candidates received full marks although many receive 2 marks for stating 2 point in an explanation of how dehydration extends the shelf life of meat.

Question 2(a) was well answered, with many candidates knowing the definition of food spoilage. In 2(b) most candidates were able to outline a lifestyle factor that led to the development of dried foods.

Most candidates were able to outline a factor which has led to the development of an international cuisine in question 3.

As is usually the case in the longer answer questions, those with a well structured answer received more marks, and most candidates were able to discuss 2 issues for farmers. Some candidates discussed issues related to GMO's, but did not relate them explicitly to farmers.

Option E

Question 1(a) was answered well. Not all candidates understood the nature of the links between CAD and CAM in order to be able to receive full marks for 1(b). In 1(c) some candidates did not focus on the impacts on consumers but explained more general impacts.

Question 2(a) was well answered, with many candidates knowing the definition of mass customization. Those candidates who lost marks in 2 (b) did not apply the advantage to the manufacturer.

Question 3 was not answered well, with candidates finding it difficult to outline why manufacturers find it difficult to adapt to lean production

Few candidates answered question 4 well, with most struggling to recall the three strategies of design for manufacture. The problem did not seem to be any confusion with the question or disorganization with the answer, but rather simply a lack of knowledge about the issue.

Option F

Question 1(a) was well answered, with many candidates knowing the definition of invention. 1(b) was not well answered with many candidates making an historical judgment about dominant design of the lamp rather than reasons that existed at the time. Many candidates received 2 marks for 1(c) but were not able to provide 3 points in an explanation for full marks.

The majority of candidates achieved good marks in questions 2(a) and (b).

Candidates who lost marks in question 3 outlined market segmentation without relating it to specific lifestyles, or to the bicycle context.

Many candidates had a confusing answer to question 4, being unable to identify three specific and differentiated strategies for innovation, so it was a difficult search for specific points in the answer.

Option G

About half the candidates were able to correctly state one of the pollutants present in car exhausts in 1(a). Of the few students who attempted this option, most understood the function of the catalytic converter in 1(b). Most candidates received 2 marks for 1(c).

Questions 2 and 3 were well done with no consistent inaccurate patterns of answers being obvious.

Despite a number of disorganized answers, mast candidates did quite well in question 4 begin able to discuss a number of issues related to the impact of the global marketplace on disabled people.

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 11	12 - 15	16 - 18	19 - 22	23 - 25	26 - 28

General comments

One G2 was received for this paper. The paper was judged to be of a similar standard to last year's paper, the level of difficulty was appropriate, and the syllabus coverage, clarity of wording and presentation were all good. A comment was made about Q25 which will be addressed below.

The mean for Standard Level Paper 1 has been noted in past reports, and is included below in order to indicate the trend in means, the 2007 mean being within an acceptable range compared with the last few years.

Mean	**Year**
15.6	2003
18.8	2004
19.8	2005
18.3	2006
19.8	2007
21.6	2008

The table below indicates, in question order, how difficult questions were perceived to be as determined by candidate performance – the higher the difficulty index, the easier the question! The * shows the correct answer and the numbers represent the number of candidates providing each individual response. A discrimination index is also calculated. This compares the performance of the top 25% of candidates on a particular question with the top 25% of candidates overall and can vary between 0.00 and 1.00. With a small candidature the discrimination index is a less useful tool than it is in large entry subjects. All questions achieving a negative or low discrimination index are discussed at the grade award meeting.

Question	A	B	C	D	Difficulty Index
1	0	0	19 *	0	100
2	0	1	0	18 *	94.74
3	4	10 *	4	1	52.63
4	0	19 *	0	0	100
5	0	1	17 *	1	89.47
6	3	14 *	0	2	73.68
7	0	3	0	16 *	84.21
8	16 *	3	0	0	84.21
9	1	0	17 *	1	89.47
10	19 *	0	0	0	100
11	3	15 *	1	0	78.95
12	1	0	0	18 *	94.74
13	4	14 *	0	1	73.68
14	4	7	4 *	4 *	42.11
15	8 *	3 *	6 *	2	89.47
16	17 *	1	1	0	89.47
17	1	0	0	18 *	94.74
18	12 *	2	2	3	63.16
19	1	4	13 *	1	68.42
20	19 *	0	0	0	100
21	8 *	3	2	6	41.11
22	0	2	8	9 *	47.37
23	2	1	15 *	1	78.95
24	4	1	12 *	2	63.16
25	6	10 *	3	0	52.63
26	18 *	1	0	0	94.74
27	1	9	5	4	0
28	3	16 *	0	0	84.21
29	2	3	9	5	0
30	4	6	7 *	2	36.84

It is obvious that with such a small number of candidates that the Difficulty Index and the Discrimination index are of limited use. This is at least partly evidenced by the high number of questions (14) with a low discrimination index. However for many of these questions, the index is low because it was an easy question, that is, a high proportion of candidates selected the correct answer, for example in Questions 1, 4, 10 and 20. A number of the other questions are commented on below.

Q14: D was stated as the correct answer for this question. The majority of candidates selected B as the correct answer, but stiffness in this context would not be an important property. However it could be argued that answer C: Tensile strength in a door hinge would help withstand wear and tear so the examination team consequently decided to accept both C. and D. as correct answers.

Q15: while the majority of candidates selected the correct answer, A Ceramics, a significant number also chose C Timber. The IB Properties/bonding matrix on page 111 of the Guide lists textiles and timber as also having very low thermal conductivity, consequently B and C are also correct answers and in the paper marking and analysis were accepted as such.

Q25: the G2 submission raised a query about this question. Deforestation is the removal of forests for land use such as pasture or urban use, and so as such is not necessarily an environmentally damaging by-product of the use of technology; so B. is the correct answer.

Q27: this question had a low Discrimination Index and a low Difficulty Index and focused on the labeling of plastics, based on AS 6.2.5. It was realized however that the Guide does not indicate that candidates should have a knowledge of the specific abbreviations for all plastic products and so this question was deleted from the grades analysis and awarding process.

Q29: both Difficulty and Discrimination Indices were low for this question and the majority of candidates selected an option (C) other than the one indicated to be correct (B). The confusion stems from the use of the term 'manufacturing' in answer II, while the guide uses the term 'production' on page 82. The examining team accepts that it could be argued that these terms are interchangeable, which would make option I, II and II all correct, but neither A, B, C or D include all these options. Because of this confusion the examining team decided to delete this question from the grades analysis and awarding process.

Question setters use a grid to develop Paper 1 and allocate questions to topics according to the hour weightings as identified in the Guide (see Appendix 1).

Standard level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 4	5 - 9	10 - 12	13 - 18	19 - 23	24 - 29	30 - 40

General comments

One G2 was received related to SL Paper 2. It indicated that the paper was felt to be an appropriate level of difficulty compared with last year. The syllabus coverage was good, clarity of wording was deemed to be good, and the presentation of the paper was classified as good. The detailed comment was 'all good'.

The examining team is conscious of the importance of ensuring that all the language used in all papers is accessible to all candidates to ensure paper validity, and we will continue to have that focus.

Although teachers cannot directly 'teach' the contexts covered in Section A Question 1, they can use past papers to expose students to this type of question and emphasize the importance of attention to detail, e.g. always including units with the answer to calculations and showing essential working.

Teachers need to continue to encourage candidates to persist with all sections of each question. A number of weaker candidates appeared to have difficulty with the first parts of a question and then not persist with the remainder of the question.

Mark allocations and the action verbs are important indicators of the nature and extent of expected answers. It is worth teachers emphasising this to candidates.

In general candidates made a good attempt at the paper. As has been the case in the past, it was pleasing to see that better candidates had structured their answers according to an understanding of the action verbs and the marks awarded for the question.

The strengths and weaknesses of the candidates in the treatment of individual questions

Section A

Question 1

Most candidates correctly completed 1a(i) and were able to list 2 reasons why coal remains popular in 1a(ii).

A number of candidates were confused by 1b(i) by apparently not noting that the policy was abandoning nuclear fuel and not advocating it – a case of not having read the question well. Most candidates were able to outline one factor which would contribute to a fluctuating market in 1b(ii).

The general pattern most commonly identified by candidates in 1b(iii) was the increase in costs from non-renewable to renewable sources of energy.

In question 1c most candidates were able to make 3 points in an explanation of why offshore generated wind power is more expensive than onshore.

Question 2

In question 2a not all candidates were able to state the 2 aspects in the definition of a robot to achieve the one mark in defining a robot – computer control and human-like tasks.

Question 2b was not answered well, with many students not able to make 2 points about one disadvantage, and some listing 2 disadvantages.

Question 3

Most candidates correctly outlined the enforceable nature of legislation as the impetus for clean technology in 3a, and received one mark for stating one of the advantages of energy labeling for consumers.

Question 4

In question 4 candidates tended to know more about ductility than malleability and consequently received 1 rather than the full 2 marks.

Section B

In this section, the extended response question is the most significant and a major challenge to many candidates and some preparation is needed for this. A framework for answers helps guide candidates towards a balanced answer and the achievement of a good mark. Planning helps and, for candidates who clearly thought about their answer and jotted down some notes on the question paper, there was the reward of a well-structured answer. Many candidates answer as ideas come to mind rather than answering the questions as set.

Such answers are extremely difficult to mark and whilst examiners search hard for anything relevant, it is often very difficult to find anything that corresponds to the required material.

Bullet points rather than an essay helps organise a response and candidates using such devices generally achieve higher marks by being able to identify clearly different points in their responses related to the marks available.

Unlike the formatted answer sheets in Section A, candidates have no guidance provided for the length of answer, and long answers rarely achieve more marks. There seems to be an optimum length of answer for the marks achieved of 1-3 lines for each mark, the shorter answers being dot points rather than prose, which is quite acceptable.

Question 5

While most candidates correctly responded to a(i), and a(ii), fewer were able to develop three points in an explanation of the limited colour range.

Candidates were generally able to outline the life cycle stage of the radio inn b(i), but in b(ii) many developed descriptions related to the thermoset contrasted to thermoplastic, which was not an appropriate answer.

5c was answered reasonably well, but a number of candidates still find it difficult to organize their answer into 2 points each for 3 reasons.

Question 6

Only 2 candidates selected this option, and both achieved reasonable marks.

Question 7

This question was the most commonly answered by candidates.

Questions a(i) and (ii) were answered well, most achieving full marks.

In b(i) most candidates were able to outline one consideration in the finish of the chair, though more had difficulty explaining the concept of repair in b(ii).

Most candidates in question (c) were able to state batch for one mark and outline why for a further mark.

Apart from some candidates focusing on aesthetic rather than ergonomic considerations, most were able to receive good marks for an ergonomics discussion.

Standard level paper three

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 3	4 - 6	7 - 8	9 - 12	13 - 16	17 - 20	21 - 30

General comments

Again the format for each of the Paper 3 options is that question 1 is a database question providing a stimulus and context for the question. The last question in each option is an extended response question worth 6 marks to provide a better opportunity for candidates to demonstrate their understanding.

It is through the extended response question in particular that the more able candidates can demonstrate their ability and discrimination between levels of candidates can be determined.

One G2 was received related to SL Paper 3. It indicated that the paper was felt to be an appropriate level of difficulty compared with last year. The syllabus coverage was good, clarity of wording was deemed to be satisfactory, and the presentation of the paper was classified as good. No detailed comments were made.

Options A, C, E and F were most commonly attempted by the candidates. Options D and G were attempted by very few, and no candidates again attempted Options B and H.

The strengths and weaknesses of the candidates in the treatment of individual questions

Option A

Most candidates were successful in 1(a), mentioning the toughness of the property of glass. Those candidates who had an understanding of nylon did well in (b), relating their answer to its non-absorbency. Those candidates who did not receive the full 3 marks for 1(c) did not discuss BOTH structure and use.

Many candidates did not receive the mark for 2(a), obviously not understanding the pig iron to wrought iron developments. In 2(b) most candidates understood the reasons for treating mild steel.

There was a dichotomy of answers to question 3, with those candidates who obviously had an understanding of superconductors receiving high marks for a well organized answer.

Option C

Question 1(a) was well answered, with many candidates knowing the definition of non-renewable resources.

The majority of candidates received the 2 marks for 1(b), providing evidence of an understanding of the use of non-renewable resources. Few candidates received the full 3marks for 1(c), which seems to be often the case for 3-mark questions, candidates find it difficult to make the 3 points necessary for full marks.

Question 2(a) was well answered, with many candidates knowing the definition of sustainable development.

In question 2(b) most candidates were able to apply their knowledge of market pull to the context of heavy industry and sustainability.

In answering question 3 many candidates developed a general discussion, rather than a well organized discussion of two characteristics rendering smokestack industries as appropriate technologies.

Option D

Most candidates selected taste as the organoleptic property effected by the production of Jerky in 1(a). In 1(b), few candidates received the full 2 marks for an outline, although many received 1 mark for being able to state a reason. As is typical in a 3 mark question, few candidates received full marks although many receive 2 marks for stating 2 point in an explanation of how dehydration extends the shelf life of meat.

Question 2(a) was well answered, with many candidates knowing the definition of food spoilage. In 2(b) most candidates were able to outline a lifestyle factor that led to the development of dried foods.

As is usually the case in the longer answer questions, those with a well structured answer received more marks, and most candidates were able to list two benefits of packaging.

Option E

Question 1(a) was answered well. Not all candidates understood the nature of the links between CAD and CAM in order to be able to receive full marks for 1(b). In 1(c) some candidates did not focus on the impacts on consumers but explained more general impacts.

Question 2(a) was well answered, with many candidates knowing the definition of mass customization. Those candidates who lost marks in 2(b) did not apply the advantage to the manufacturer.

Candidates generally received high marks for question 3, selecting financial and labour issues as those to discuss.

Option F

Question 1(a) was well answered, with many candidates knowing the definition of invention. 1(b) was not well answered with many candidates making an historical judgment about dominant design of the lamp rather than reasons that existed at the time. Many candidates received 2 marks for 1(c) but were not able to provide 3 points in an explanation for full marks.

The majority of candidates achieved good marks in questions 2(a) and (b).

Candidates were quite familiar with technophobes and technophiles in question 3 and so scored quite well, those not scoring well tended to explain the general characteristics rather than relating them specifically to the adoption of new technologies.

Option G

About half the candidates were able to correctly state one of the pollutants present in car exhausts in 1(a). Of the few students who attempted this option, most understood the function of the catalytic converter in 1(b). Most candidates received 2 marks for 1(c).

The remaining questions in option G were well done with no consistent inaccurate patterns of answers being obvious.

Conclusion

The increase in the candidature for the subject continues to be a pleasing feature. Congratulations to all candidates on their success and to teachers in facilitating this success.

The understanding of the action verbs (e.g. state, list, outline, describe, explain – see pages 8 and 9 of the Guide) seems to be continuing to increase in relation to required responses to questions. It also seems that more candidates are recognising the significance of the mark weighting in relation to the expectations of the answer, though there are still some candidates who do not use this link. Familiarity with the way that the paper is constructed and particularly the way that action verbs signal expectations is an important part of candidate preparation and cannot be over-emphasised.

Teachers should continue to stress the importance of 'sign-posting' answers with headings and bullet points or using tables to identify distinct points. Candidates should also be encouraged to confirm their understanding of the extent of the answer required by checking the mark allocation for the question.

Teachers should continue to familiarise themselves with the Group 4 Grade Descriptors (see OCC). The examining team continues to strive to:

- ensure appropriate syllabus coverage;
- use accessible design contexts understandable around the globe;
- ensure parity between optional questions;
- make the expression of questions as straightforward as possible (particularly for second language candidates);
- ensure that the various examination elements discriminate appropriately between stronger and weaker candidates
- ensure that there are opportunities for candidates to provide evidence for the different aspects of the Group 4 Grade Descriptors within the examination papers to enable the Grade Descriptors to be used in the setting of the grade boundaries at the Grade Award meeting.

Teachers are encouraged again to contribute comments on the papers through the G2 Form and so assist in the continued development of DT as a relevant, practical and worthwhile subject within the curriculum.