DESIGN TECHNOLOGY

Overall grade boundaries

Higher level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 16	17 - 33	34 - 44	45 - 56	57 - 66	67 - 78	79 - 100

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 16	17 - 31	32 - 43	44 - 54	55 - 67	68 - 78	79 - 100

Introduction

This is the last May examination on the old syllabus, so the usefulness of this report is limited in terms of specifics, but the general principles of educating students to structure their questions appropriately remains important.

While the numbers of candidates continues to increase in Design Technology, the number of G2 response forms has decreased this year. This may also be because this is the last examination on the current syllabus, but we hope it is not a general trend. When the first examinations are conducted in 2009 on the new syllabus, feedback from schools and teachers will be particularly important to ensure that constructive communication flows between the schools and the examining team.

For those schools who did complete G2 forms, thank you for your involvement and feedback in this way. The number of forms received was as follows:

G2 Comments		
	HL	SL
P1	7	5
P2	5	4
P3	2	4

The G2 forms are extremely valuable in providing feedback to the examining team and are always studied carefully and discussed extensively during grade award meetings. Comments from the G2s are fed back to other teachers via this subject report.

As always, the examining team would welcome more G2 responses to help ensure that the feedback is representative. It is occasionally the case that there is an error on a paper question or a marks scheme that has slipped through the rigorous multiple stages of checking that papers proceed through as part of the IBO system. In these cases a G2 comment may help identify the error. This is another important reason for teachers to complete G2 forms.

PLEASE COMPLETE A G2 FORM AFTER EACH EXAMINATION, EVEN IF YOU HAVE NO COMMENTS TO PROVIDE BUT JUST TO LET THE EXAMINING TEAM KNOW THAT THERE WERE NO PROBLEMS.

This session has seen 407 candidates in 58 schools (23 new schools) being examined at SL, a 10% increase over May 2007; and 375 candidates in 45 schools (42 new candidates in 11 new schools) at HL, a 7% increase over May 2007. The maximum number of candidates from any one school is 33 and there are 26 schools with either one or two candidates. These numbers represent continued significant growth in Design Technology.

When there are significant numbers of new schools beginning Design Technology for the first time, the examining team studies the effect of these new schools on the overall paper results. While it is true that some schools perform poorly in their first attempt and take a few years to approximate the mean scores and distributions, this is not always the case. This year a number of new schools scored above the mean of all schools in both SL and HL, and are to be congratulated for their performance.

Grade boundaries are determined by matching the Grade Descriptors for Group 4 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 three/four boundary by inspection of the scripts for each component, moving on to the six/seven boundary and then the two/three boundary. Other grade boundaries are determined by interpolation from these three boundaries. Paper 1 boundaries are set with reference to the Paper 2 boundaries as the Papers 1 and 2 have the same syllabus coverage.

Internal assessment

Component grade boundaries

Higher level

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

Standard level

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

The number of schools opting to teach Design Technology continues to increase, whilst the number of candidate entries in existing centres also continues to grow. Most new schools submitted work of a suitable nature. 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, however some schools fail to act on advice given the year before. Schools are advised to read the feedback provided as this may provide some useful advice on how to develop the structure of teaching investigations and assessment. 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. It is advised to use coursework as a support exercise in order to help students understand the theoretical nature of the subject. 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. The topics covered by coursework should 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. More care is required by teachers who make up there own assessment grids as these did not always match criteria provided in the subject guide.

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. Most samples were presented in an organized structure and clearly labelled.

Some of the work submitted was disorganized and presented in an inappropriate format. To avoid this 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. Work sent to moderators should be in A4 format.

Candidate performance against each criterion

P1 (a): Most candidates seem to do well in this section, but some candidates had lost marks where all of the criteria had not been addressed under each aspect. Common errors included a repetition of a 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. There had been a noticeable improvement in the quality of specifications this year.

P1 (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 heading. Gantt charts are to be encouraged, but the breakdown of processes and time allocated must be realistic. Those who had written their plan in retrospect or simply provide a diary failed to address some of the assessment criteria. Evidence of ongoing work should be evident in the form of photographs and annotation should include details as to where problems were encountered. 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 Pl(b).

DC: Smaller investigations where candidates had to collect 'raw' quantitative data offered ample opportunity to address the assessment criteria, but too much teacher input is to be discouraged. Empty tables in which to input data should not be provided, as students are expected to complete this on their own. 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 Pl(a) if they are prioritize strategies in which to identify wider issues to be researched. Planning the collection of research data and identifying suitable sources of data is to be encouraged. 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 and answer an analysis of the brief. Not all candidates design ideas were supported by an initial evaluation.

DPP: The best work addressed the majority of the assessment criteria, with evidence of detailed annotation and careful presentation of improvements using a wide range of techniques. One final drawing on its own is not sufficient; as it provides very little, or any, refinement of the chosen idea. Drawings and evidence of modelling should be presented in an appropriate format (sketches, orthographic drawings, photographs and CAD images) and detailing should be sufficient for the product to be realized. The use of CAD and 2d/3d modelling is to be encouraged. Teachers should consider how card, manufactured boards, CAD, Styrofoam, etc can be used to aid model development.

CE: More time needs to be devoted to this part of a design and make project if students are to achieve higher marks. Lack of time in most cases meant that some candidates only offered superficial personal evaluations with no consideration being made to address the specification and suggest realistic improvements. Students should be encouraged to test their outcomes in the area for which they had been designed and suggest improvements in sketches. Students should also identify any modifications required for scaling up production. The more organised candidates did leave adequate time to address the criteria to a satisfactory standard. Unrealistic projects which offer no particular outcome do not lend themselves well to addressing this assessment criterion.

For lab-based investigations most students were able to draw a conclusion to the stated hypothesis, but the evaluation of procedures and recommendations were often superficial.

IA should be integral to the teaching of subject content and students should be given appropriate time to complete work to a satisfactory standard. Teachers are advised not to try and conduct investigations where they have limited resources or they know an outcome cannot be realized. Where workshop equipment is limited students may be better placed to consider a problem that addresses a need that will not need specialized resources. Graphic based projects need very little specialized equipment, yet will offer ample opportunity for development, planning and realization. Small design and make activities generally require more time than lab based experiments, but are necessary if students are to develop the necessary skills to undertake the design project. The teaching of modelling skills required to improve the marks of DPP is to be encouraged.

Recommendations for the teaching of future candidates

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.

The use of the OCC and attendance at teacher training workshops is to be encouraged if teachers and students are to become more confident in the teaching of design technology. New Teacher Support Material (TSM) is now available on the OCC.

Higher level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 9	10 - 15	16 - 21	22 - 25	26 - 28	29 - 32	33 - 38

The mean marks for HL Paper 1 are summarized in the table below.

Examination Session	**HL P1 Mean mark**
May 2005	26.4
May 2006	27.8
May 2007	26.2
May 2008	25.7

Of the seven G2 responses received, four teachers thought that the paper was of a similar standard to last year. All teachers indicated that they felt the level of difficulty was appropriate.

With the increase in candidates in 2008 compared with 2007, the examining team considered the influence of the new schools on the mean scores, and was gratified to note that the candidates from new schools performed just slightly better than candidates from schools who had done Design Technology HL before. So congratulations to the new schools for a strong beginning in offering Design Technology.

General comments

Seven teachers completed G2's for this component, four of whom judged the paper as a similar standard to last year. All seven suggested it was an appropriate level of difficulty, one said syllabus coverage was satisfactory and six said it was good; one said clarity of wording was poor, three satisfactory and three said it was good; one said the presentation of the paper was satisfactory and six said it was good.

One teacher made a general comment that it was consistent with established goals. Three teachers made no comments and the others commented in detail on questions which are discussed below.

One teacher commented on Q5, related to ergonomes, that it is confusing given the inaccuracy of the definition in the glossary of the Guide which refers to an ergonome as a 3-dimensional model. This is a fair comment and has been addressed in the new Guide. The statistics for Q5 indicated the item was a low discriminator with a moderate to high difficulty index as the majority of candidates selected the correct response.

Through the G2 a teacher commented on Q 8 related to the properties of ceramics which is based on the properties matrix on p71 of the Guide. In the Guide the stiffness property of ceramics is stated as being 'v. high' and the teacher felt that the language used in the Guide should be the same as that on the examination, which used the term 'high'.

While this is a fair comment, the majority of candidates selected the correct option, and for all the alternative answers the correct response is ‘v. low’, so there would seem to be no chance of confusion between ‘high’ and ‘v. high’.

In answering Q6, more candidates selected option C than the correct option B, resulting in a fairly low difficulty index. This seems to be a case of students not knowing the answer as a performance test provides quantitative data (most commonly numerical) through a record of observations of the performance of a product.

In response to the physical property that should be considered to improve the portability of a product in Q9, one teacher felt that both hardness and toughness would also be appropriate answers. The examining team agreed that these were both possible answers, but not the best answer, and density and consequent lightness of a portable product would be a paramount consideration. The question statistics indicated that most students selected density as the correct option.

Q13 attracted the attention of the examining team because of a very low discrimination index. The stated correct answer indicated that changes are most likely to be made to the design of a product in its early and mature life cycle stages. However the teacher’s notes for AS 5.1.4 imply that designs do not change much during the mature stage. Although the correct answer was the one most commonly chosen by candidates, the examining team decided to delete this question from the grade computation.

The very low discrimination index for Q14 meant that the examiners analysed this question to determine why so few candidates selected the correct option. The question is based on the historical aspects of topic 5.2 in the Guide and required a careful reading of the question in order to choose the correct answer – automation. The key word in the question was ‘after’ the Industrial Revolution, which excluded craft, mechanization and assembly line as they occurred before or during the Industrial Revolution.

One teacher asked if the term ‘landfill’ which is used in Q20 is in the syllabus. While the term is not used in the syllabus guide, the examining team felt that it is a common usage term across cultures and that students would be aware of its meaning. The difficulty index for this question would seem to indicate that this is the case with most students selecting the correct answer.

Another teacher in a G2 made the point that cast iron is not in the syllabus, which is related to Q24 where cast iron is the correct option to the question as to which metal is least tough. The logic of the examiners here was that students would have developed an understanding of the process of refining iron related to carbon content from section 7.3 of the Guide, and so could make judgements about toughness. However it remains a valid point that ‘cast iron’ is not mentioned in the Guide, and this seems to be reinforced by many candidates selecting option B, ‘wrought iron’ as the correct answer. It was therefore decided to accept both A and B as correct answers to this question and the paper was re-marked accordingly.

Candidates found Q30 difficult, but upon re-analysis option D remains the best answer as both elastic and plastic deformation are caused by a load on a thermoplastic. One teacher commented that because the question did not indicate a time span, C could also be a correct option because only elastic deformation occurs initially. However, as no time span was stated, both types of deformation would occur.

A typographical error occurred in Q31, which should have read ‘What is a composite material?’ rather than ‘What is **not** a composite material?’ For this reason this question was deleted from the computation of the candidate’s marks. It was a G2 comment that highlighted this error.

A teacher commented that the energy conversion efficiency of different resources is not specifically in the syllabus. While this is the case, it was felt by the examining team that after having studied section 9.3 of the Guide, candidates should be able to make a judgement about the efficiency of energy conversion, and the data indicate that this is the case with most candidates selecting the correct answer of C 'Hydroelectric'. Another teacher commented that no consideration is given to the appropriateness of the resource conversion, stating that, for example, in a desert a tidal resource would not function well. While this is true, Q35 is a different type of question relating to general efficiency rather than contextual appropriateness.

A comment was made on a G2 about Q36: that AS 6.2.5 relates to the question, but does not state the most effective method to promote increased recycling by consumers and so does not directly provide an answer to the question. This is true, and indicates that the purpose of the examination is not so much to test candidate's ability to recall information from the Guide, but to provide the opportunity to apply information they have learnt into a new context. The expectation in this question was that candidates would deduce that because legislation was the most compelling strategy listed, it would be the most likely answer.

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.

In addition, a discrimination index is 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 such a small candidacy the discrimination index is a less useful tool than it is in large entry subjects. Although the discrimination indices are not published as part of the subject report, all questions achieving a low or negative discrimination index are discussed at the grade award meeting.

The examining team analysed the statistics on all the questions, and while none had a negative discrimination index, those questions where a significant number of candidates selected an incorrect option were more closely scrutinized. These are incorporated into the discussion above.

Question	A	B	C	D	Difficulty Index
1	272*	35	31	36	72.73
2	140	19	213*	2	56.95
3	303*	0	6	65	81.02
4	21	292*	53	7	78.07
5	70	247*	38	18	66.04
6	9	143*	188	34	38.24
7	354*	7	6	7	94.65
8	65	84	27	198*	52.94
9	278*	62	16	18	74.33
10	6	174*	138	56	46.52
11	72	12	68	222*	59.36
12	21	240*	98	15	64.17
13	150	135	52	37	0
14	6	188	60*	120	16.04
15	19	328*	16	11	87.70
16	7	2	35	330*	88.24
17	299*	10	38	27	79.95
18	7	8	328*	31	87.70
19	295*	56	12	10	78.88
20	19	323*	2	30	86.36
21	178*	110	45	41	47.59
22	77	60	231*	6	61.76
23	69	31	139	134*	35.83
24	116*	133*	81	44	66.58
25	121	184*	50	19	49.20
26	317*	17	24	16	84.76
27	36	56	37	245*	65.51
28	62	212*	81	19	56.68
29	17	36	312*	9	83.42
30	10	136	111	117*	31.28
31	21	44	183	126	0
32	37	37	285*	15	76.20
33	6	4	8	356*	95.19
34	15	13	42	304*	81.28
35	123	56	179*	16	47.86
36	53	76	193*	52	51.60
37	23	70	275*	6	73.53
38	6	77	6	285*	76.20
39	15	298*	35	26	76.68
40	343*	3	22	6	91.71

Higher level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 9	10 - 19	20 - 22	23 - 30	31 - 38	39 - 46	47 - 60

General comments

Paper 2 is divided into two sections: Section A and Section B. Section A is worth 40 marks and comprises six questions – a data-based question (question 1) worth 20 marks and five questions worth 4 marks each to provide syllabus coverage. Students are required to answer all six questions in Section A. Section B comprises three questions each worth 20 marks, of which students are required to answer one question. Each question in Section B comprises three parts with each part divided into two or three sub-sections. The questions are contextualized by the provision of stimulus material – generally a photograph reflecting a particular design scenario and the questions posed explore different aspects of the design context to provide syllabus coverage. The three questions in Section B should be of equal difficulty to provide parity for candidates. The design contexts are selected to be as diverse as possible. Throughout the paper the examining team tries to ensure that evidence will be available to enable the determination of the grade boundaries through the application of the Group 4 Grade Descriptors.

Of the five G2 comments received for this paper, three were from schools who had taken this subject in previous sessions. Two commented that the paper was of a similar standard to the previous year, one commented that it was a little easier. The mean mark for this paper (M2008) was 32.68 compared with 34.8 (M2007), 32.1 (M2006), 36.4 (M2005) and 34.5 (M2004). The mean mark for new schools was 32.97 and for existing schools was 32.65 so the new schools outperformed the existing schools (marginally!) for Paper 2. This good performance by new schools is extremely pleasing - a special word of congratulations to them. The mean of 32.68 compared with 34.8 last year would suggest that the students did not find the paper easier but, if anything, slightly more difficult. There was patchy performance in different ways by different candidates but there were no questions on the paper which completely flummoxed the students. When there is a rogue question this can have a major impact on the mean mark. Notwithstanding comparisons with previous sessions, all five G2s said the paper was an appropriate level of difficulty, that the paper was either satisfactory (1) or good syllabus coverage (4), that the clarity of wording was satisfactory (1) or good (4) and that the presentation of the paper was satisfactory (1) or good (4). There was only one specific G2 comment about the paper and that was that it was a ‘good test’.

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

Section A

It is probably worth reminding teachers that the point of Paper 2 Question 1 is that it is to provide the opportunity for students to demonstrate data analysis and problem-solving skills and should be something that is off syllabus providing an unfamiliar context for candidates.

Most of the average and above average students coped well with the various sections of the question. There were no obvious problems.

Question 1 provided a kitchen layout and explored the issue of the work triangle between hob/oven, sink and refrigerator in kitchen design. Question 1 (a) (i) required students to annotate the kitchen layout provided in Figure 1 to show the work triangle. The markscheme shows the triangle going from the midpoint of the front of each of the major work areas. Candidates drawing the triangle from the centre of the work areas were also accepted however this did pose some problems for (a) (ii) for the candidates. Question (a) (ii) required candidates to estimate the minimum distance between the sink, the hob/oven and the refrigerator. This was a challenge for many students. The question required them to measure the distance (in cm or mm) between the work areas on the line and to convert this to a distance in metres using the scale included on the kitchen layout. Question (a) (iii) asked candidates to state how the positioning of the hob/oven could be modified to enhance the efficiency of the kitchen layout. Most candidates were able to suggest an appropriate relocation of the kitchen layout to maximize its efficiency.

Question 1 (b) (i) asked candidates to outline one benefit for the refrigerator manufacturer of designing the refrigerator so that the hinges on the doors can easily be repositioned to the left or right hand side of the door/refrigerator by the customer. That this would require the manufacturer to produce only one model rather than two models (left and right handed models) with concomitant cost savings was recognized by less than half the candidates. Some candidates discussed benefits for the consumer. It is important that candidates answer the question that is asked. Questions are often made more discriminating by being specific about what is being asked so it is important that candidates read the questions carefully. The side of the door that the hinge should be placed on by the customer to best fit into this kitchen layout, i.e. the right hand side as the user faces the fridge, was identified correctly by most candidates.

Question 1 (c) (i) asked candidates to state one advantage of positioning the sink under the window in the kitchen layout was answered correctly by all but the weakest candidates. Question 1 (c) (ii) asked candidates to explain why the kitchen designer needs to consider the relationship between the position of any doors leading into the kitchen area and the kitchen triangle. Many candidates discussed safety issues of people moving through the kitchen triangle when the kitchen was in use. Depth of response determined whether candidates achieved 1, 2 or 3 marks – it is important that teachers make clear to candidates that they need to make three distinct points to achieve three marks.

Turning over the page some new data was introduced relating to kitchen cabinets. Question 1 (d) (i) asked students to state the total height of the cabinets shown in Figure 3. Most students correctly calculated this as 2.030 metres or 2030 mm. Question 1 (d) (ii) asked for an explanation of how the standard cabinet combinations contribute to the aesthetics of the final kitchen design. This was poorly answered by many candidates.

Question 1 (e) (i) asked candidates to outline one benefit of making the kitchen cabinets and appliances in standard sizes. This was generally answered well by candidates. Question 1 (e) (ii) asked for an outline of one reason for designing the width of the space for the refrigerator 20 mm wider than the standard refrigerator width. Circulation of air and allowing space to move the refrigerator into and out of the space for cleaning, maintenance and repair was correctly mentioned by many candidates.

Question 2 (a) required candidates to define plastic deformation. This was very poorly answered. Question 2 (b) was similarly badly answered. Most students were unable to demonstrate an understanding of the relevance of plastic deformation in the shaping of mild steel for car bodies.

Question 3 (a) required students to describe the structure of a thermoplastic and was very badly answered. Question 3 (b) asked candidates to describe the effect of a load on a thermoplastic. Good answers mentioned elastic and plastic deformation as a result of smaller and larger loads.

Question 4 (a) required students to state one advantage of developing different physical models of a car. Models represent selected features of a design so a physical model might represent shape, performance or other aspects of a design. Question 4 (b) required an explanation of the design cycle stage when clay models would be used. Most candidates identified the correct design cycle stage but provided little or no explanation of why clay models would be used at this stage.

Question 5 (a) asked candidates to define fixed costs and was generally answered correctly. Question 5 (b) was very easy for most candidates and asked them to state one example of a variable cost. Question 5 (c) asked for a description of how fixed costs are incorporated into the final cost of volume produced products. Fixed costs are divided by the breakeven number selected by the manufacturer and this cost added to the variable costs for each product and an uplift for profit added.

Question 6 (a) required for a definition of literature search. Most candidates were able to provide an appropriate definition. Question 6 (b) requiring a discussion of the relevance of information and communications technology in literature searching was generally well answered.

Section B

The design context for Question 7 focused on T-shirt manufactured from Green Cotton®. Question 7 (a) (i) asked students to define sustainable development and was generally badly answered by candidates. Question 7 (a) (ii) went on to ask for a list of two of the categories into which people can be classified according to the attitudes to green issues. Again this was badly answered. Question 7 (a) (iii) asked for an outline of one advantage of achieving an eco-label for a company. Many students provided good answers to this question. Question 7 (b) (i) asked for a description of a shaping technique to the production of the cotton T-shirt. Weaving was correctly offered as a shaping technique. Question 7 (b) (ii) similarly asked for a description, this time of a wasting technique that contributes to the production of the cotton T-shirt. Most candidates answering this question volunteered cutting as the wasting technique. Question 7 (c) (i) asked candidates to compare the absorbency of cotton and nylon threads. Some students struggled to clearly articulate this. Question 7 (c) (ii) about three issues in relation to cotton production which need to be modified to meet the design objectives for green products. There was a range of quality of answers for this question.

To achieve 3 marks for each issue candidates needed to provide three clear distinct points in their answer.

The focus for Question 8 was a washing machine. Question 8 (a) (i) asked students to define constructive discontent. This was answered well by many candidates. Question 8 (a) (ii) asked a description of the product life cycle stage of the washing machine and was correctly identified as the mature stage of the product life cycle as it was well-diffused into the marketplace and was still selling well.

Question 8 (b) (i) asked candidates to describe how iron is converted into steel for the mild steel body of the washing machine and was fairly straightforward. Question 8 (b) (ii) asked for a list of two reasons why the mild steel body of the washing machine has a surface finish and was again fairly easy for many candidates. Question 8 (c) (i) asked for an outline of one way in which using a detergent effective at lower temperatures could reduce the environmental impact of the washing machine and was answered well by many candidates who identified the lower energy requirements associated with operating at a lower temperature. Question 8 (c) (ii) asked for an explanation of the roles and responsibilities of the designer, the manufacturer and the user in reducing the environmental impact of the washing machine on disposal. Candidates offering answers not associated with the implications of disposal did not earn marks. It is important that candidates do focus on answering the question on the question paper not a question that they would have preferred the examiners to ask. As in all these 9 mark questions which require three by three marks it is good organisation in the presentation of the answer that helps students to score highly. Students who scribble some notes in pencil to organise their thought and use bullets under headings or a table to organise their answer invariably score better. Those that go into a stream of consciousness and just pour words onto the paper often repeat themselves and while they may have written considerable amounts, sometimes several pages, are not notching up marks. This is the reason for the Grade descriptor at Grade 7 commenting 'Communicated logically and concisely using appropriate terminology and conventions'. Student achieving Grade 7s are often (not always) noticeably more concise.

Question 9 focused on a plastic chess piece manufactured by injection moulding. Question 9 (a) (i) asked candidates to define cost-effectiveness. This was relatively well done. Question 9 (a) (ii) asked candidates to describe how CAD/CAM contributes to the cost-effectiveness of the injection-moulding process. The flexibility of the injection-moulding machine was identified by many candidates. Question 9 (a) (iii) asked how one-off production contributes to the injection moulding process and the ability to produce different products in volume by merely changing the mould/die using CAD/CAM was identified by many candidates. Question 9 (b) (i) asked candidates to describe the technique of injection moulding and was answered well by many but not all candidates. Question 9 (b) (ii) asked for a statement of one advantage and one disadvantage of injection moulding. This was answered well by all but the weakest candidates. Question 9 (c) (i) asked for two ways in which injection moulding could be considered a clean technology and was answered well. Question 9 c (ii) asked for an evaluation of three characteristics of the chess piece that are consistent with sustainable development. This proved the most difficult (c) (ii) of all the three Section B questions and was not answered well by any but the strongest candidates. It does not seem an unfair question but was certainly more challenging.

Summary

The Higher Level Paper 2 structure will not be changed in assessing material in the new Guide. The new Higher Level Paper 2s will continue to comprise two sections: A and B. Section A worth 40 marks – 12 marks relating to a data-based question and a first set of data, 8 marks relating to second set of data plus 20 marks relating to syllabus coverage. Section B will comprise three questions relating to different design contexts.

Higher level paper three

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 6	7 - 13	14 - 18	19 - 23	24 - 27	28 - 32	33 - 40

General comments

G2 forms were received from two teachers who both stated that the paper was of a similar standard to the previous year and suggested that the level of difficulty was appropriate. One suggested that syllabus coverage was satisfactory and one said it was good. Both suggested that clarity of wording was satisfactory; and one teacher felt that the presentation of the paper was satisfactory and one that it was good.

Two teachers made comments on the paper. One comment was that D2 was too easy. While the majority of candidates were able to list 2 methods of food preservation, not all were successful and so to some extent the question did discriminate.

A teacher commented that students did not like the abbreviation ‘GMO’ used on question D4. While this abbreviation is used in the Guide (AS D.7.7) it is a valid point that abbreviations should not be used in questions and the examining team will attempt to ensure this does not reoccur.

Another comment was that E1(a) and (b) were too similar. While for some answers this was the case, students had to relate their answer to the designer in (a) and to the needs of individual consumers in (b).

A final comment was that candidates found F5 very confusing. It was a more complex structured question and required students to apply their knowledge in a new context, but the breadth of the answer scheme accommodated the variety of answers that candidates developed.

The main difficulties for candidates appeared to be with examination technique and knowledge. The range of knowledge and understanding did vary from excellent to very poor. It was clear that some candidates had rote learnt definitions but had difficulty applying them to a context or did not realize that the answer required understanding with examples.

It would be beneficial for all students to practice examination techniques, especially how to answer Question 5 in each option. Some students highlighted or underlined key elements of the questions, and these candidates seemed to do well. The marks allocated for each of the action verbs should be clear to candidates so they can structure answers appropriately.

Some candidates appear to structure their answers, particularly the Question 5’s as an essay with an introduction and a conclusion. This generally does not gain them any marks, as marks are only awarded for the relevant points made. It should be emphasized to candidates that the lines provided for the answers are considered to be adequate as long as the answer is concise.

The low take up of Options G and H continues and is being addressed in the new guide.

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

OPTION D – FOOD TECHNOLOGY

This option was undertaken by very few candidates.

Question D1

(a) Most candidates made a successful attempt at this for 2 marks, being able to at least name the method of collection.

(b) Most candidates received at least two marks for this by using the sensory ratings that were listed in the stem of the question, and at least saying something about it.(c) This was a challenging question for many students; those who were successful described bacteria as the answer.

Question D2

The majority of candidates who answered this question did so successfully by listing two alternative methods of food preservation. Some used the word preservation in their answer without really understanding its meaning.

Question D3

The majority of candidates were able to elaborate on one way in which food poisoning could be avoided.

Question D4

Answers to this question were often not well organized in a 3x3 type of structure. Some candidates stated their own ethical position rather than more dispassionately discussing a range of issues.

OPTION E – COMPUTER AIDED DESIGN AND MANUFACTURING

Question E1

(a) Candidates who did not get full marks in this ` may have been able to list 2 advantages, but failed to relate them to the designer.

(b) Some candidates seemed confused by the similarity between this question about consumers and 1(a) which was oriented toward designers.

Question E2

This was a challenging question for candidates. It was not clear that candidates understood the differences between NC and CNC or why CNC would be used.

Question E3

This question was answered well with most candidates able to make 2 points in a description of the impact on a traditional workforce.

Question E4

Most candidates were able to list two ways in which the internet can assist designers with market research. Some candidates who did not receive full marks for this question did not relate their answer to market research.

Question E5

The answer to this question was quite easy to organize and most candidates were able to do so. Many included an introduction and summary conclusion which was not necessary and consumed time and space. The answer to these questions is not expected to be an essay, and those candidates who used headings and dot points to provide a clear structure generally did well and ensured the examination markers could easily identify all the relevant points.

OPTION F – INVENTION, INNOVATION AND DESIGN

This option continues to be by far the most popular selected by students.

Question F1

(a) Most candidates were able to list two reasons why the bicycle did not become an innovation.

(b) Again, as is common in an "Explain" question worth three marks, a number of candidates listed three reasons rather than explaining ONE. A deeper response is required in this type of question, and candidates should be aware of that requirement. Few candidates successfully made the deductions necessary for a complete answer.

Question F2

Many candidates received full marks for this question and were able to identify incremental as the type of design. Some candidates received just 1 mark by identifying the type of design but not elaborating on it for the extra mark.

Question F3

The majority of candidates successfully identified one technological development, and many received the full 2 marks by elaborating on the technological development they had identified.

Question F4

Most candidates were able to outline an innovation strategy to achieve market penetration.

Question F5

This question was not well answered, partly because of the more complex structure required. Candidates had to first explain global shopping and then discuss two issues. Many structured their whole answer around shopping, rather than broadening it to consumerism

OPTION G – HEALTH BY DESIGN

Very few students selected to do this option, and those that did seemed not to have been taught the Option or had spent little time in preparation. The answers were mainly anecdotal for Q3, and the answers that were well structured in Q4 achieved much better results.

OPTION H – ELECTRONIC PRODUCTS

The very few candidates who attempted this Option performed poorly.

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

The average scores for SL Paper 1 are summarized in the table below.

Examination Session	**SL P1 Mean score**
May 2005	19.6
May 2006	21.7
May 2007	18.3
May 2008	18.97

Fifty-five more candidates (16%) sat this examination in 2008 than in 2007, and mean score for the paper from the new schools was exactly the same as the mean for all schools – 18.97.

Five G2 forms were received. Three stated that this year's paper was of a similar standard to last year's, and one thought it was a little easier. This perception is reflected in the mean scores. All felt that the level of difficulty was appropriate. One thought the syllabus coverage was satisfactory and four that it was good, two that the clarity of wording was satisfactory and three that it was good, and one that the presentation of the paper was satisfactory and four that it was good. There were no specific comments made about the clarity of wording.

Three teachers made general comments about the exam in the G2's, one indicating that it was 'just fine', and two with comments related to specific questions which are discussed below.

The examining team analysed the statistics on all the questions, and those questions where a significant number of candidates selected an incorrect option were more closely scrutinized and are discussed below.

Two teachers commented on Q5 which stated that isometric drawing is constructed to an angle of 60 degrees to the horizontal, which reflects the Guide, but is incorrect. As a result the examining team decided to change the statement of the question to read '… 30 degrees to the horizontal' in the post examination published paper.

About the same number of candidates selected options C and D for Q6 related to physical and mathematical models. Option C was conceptualized to be the correct answer, but it was

clear that many candidates had interpreted 'realistic' in option D in a manner not anticipated by the question setters. The examining team decided to accept both C and D as correct answers when computing candidates' marks.

In answering Q7, more candidates selected option C than the correct option B. This seems to be a case of students not knowing the answer as a performance test provides quantitative data (most commonly numerical) through a record of observations of the performance of a product.

One teacher commented on Q8, related to ergonomes, that it is confusing given the inaccuracy of the definition in the glossary of the Guide which refers to an ergonome as a 3-dimensional model. This is a fair comment and has been addressed in the new Guide. The statistics for Q8 indicated the item was a low discriminator with a moderate to high Difficulty Index as the majority of candidates selected the correct response.

Q12 had a low difficulty index and also a low discrimination index because the answers were generally split across three of the options. Closer analysis of the question indicated that the answers are ambiguous and as a result the examination team decided to delete this question from the computation of the candidates' results.

In response to the physical property that should be considered to improve the portability of a product in Q13, one teacher felt that both hardness and toughness would also be appropriate answers. The examining team agreed that these were both possible answers, but not the best answer, and density and consequent lightness of a portable product would be a paramount consideration. The question statistics indicated that most students selected density as the correct option.

Through the G2 a teacher commented on Q 14 related to the properties of ceramics which is based on the properties matrix on p71 of the Guide. In the Guide the stiffness property of ceramics is stated as being 'v. high' and the teacher felt that the language used in the Guide should be the same as that on the examination, which used the term 'high'. While this is a fair comment, the majority of candidates selected the correct option, and for all the alternative answers the correct response is 'v. low', so there would seem to be no chance of confusion between 'high' and 'v. high'.

Q20 attracted the attention of the examining team because of a very low discrimination index. The stated correct answer indicated that changes are most likely to be made to the design of a product in its early and mature life cycle stages. However the teacher's notes for AS 5.1.4 imply that designs do not change much during the mature stage.

Although the correct answer was the one most commonly chosen by candidates, the examining team decided to delete this question from the grade computation.

The very low discrimination index for Q21 meant that the examiners analysed this question to determine why so few candidates selected the correct option. The question is based on the historical aspects of AS 5.2 in the Guide and required a careful reading of the question in order to choose the correct answer – automation. The key word in the question was 'after' the Industrial Revolution, which excluded craft, mechanization and assembly line as they occurred before or during the Industrial Revolution.

One teacher asked if the term 'landfill' which is used in Q25 is in the syllabus. While the term is not used in the syllabus guide, the examining team felt that it is a common usage term across cultures and that students would be aware of its meaning. The difficulty index for this question would seem to indicate that this is the case with most students selecting the correct answer.

Q30 also had a very low discrimination index and also a low difficulty index. C, life cycle analysis, was stated as being the correct answer to they type of design that takes into account its environmental impact at each stage of the design cycle, but was selected by only a small proportion of candidates, the most popular answer being A, green design, chosen by the vast majority of candidates. On analysis it was realized that A is in fact the correct answer, so the scripts were re-marked to reflect A as the correct answer.

The table below indicates in question order the difficulty index of each question. A lower difficulty index indicates a harder question. The * indicates the correct response and the values represent the number of candidates providing each individual response.

In addition, 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 such a small candidacy the discrimination index is a less useful tool than it is in large entry subjects. Although the discrimination indices are not published as part of the subject report, all questions achieving a low or negative discrimination index are discussed at the grade award meeting.

Question	A	B	C	D	Difficulty Index
1	245*	47	24	87	60.79
2	160	24	207*	12	51.36
3	272*	2	20	109	67.49
4	28	328*	21	26	81.39
5	39	30	239*	95	59.31
6	33	32	167*	170*	83.62
7	20	138*	193	52	34.24
8	126	225*	34	18	55.83
9	368*	9	10	16	91.32
10	8	11	348*	36	86.35
11	15	97	7	284*	70.47
12	50	115	142	96	0
13	261*	91	22	29	64.76
14	77	84	32	209*	51.86
15	35	301*	29	38	74.69
16	13	165*	163	62	40.94
17	16	107	279*	1	69.23
18	125	17	79	182*	45.16
19	330*	28	19	26	81.89
20	145	130	58	70	0
21	7	179	66*	151	16.38
22	5	17	67	314*	77.92
23	17	368*	8	10	91.32
24	17	3	49	334*	82.88
25	36	323*	4	39	80.15
26	17	3	4	379*	94.04
27	254*	17	40	92	63.03
28	294*	62	22	25	72.95
29	63	58	18	264*	65.51
30	327*	5	42	29	81.14

Standard level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 6	7 - 12	13 - 16	17 - 21	22 - 26	27 - 31	32 - 40

General comments

The Standard Level Paper 2 is divided into two sections: Section A and Section B, as for the Higher Level Paper 2. Section A is worth 20 marks and comprises three questions – a data-based question (question 1) worth 12 marks and two questions worth 4 marks each to provide appropriate syllabus coverage. Students are required to answer all three questions in Section A. Section B comprises three questions each worth 20 marks, of which students are required to answer one. Each question in Section B comprises three parts with each part divided into two or three sub-sections. The questions are contextualized by the provision of stimulus material – generally a photograph reflecting a particular design scenario and the questions posed explore different aspects of the design scenario to provide syllabus coverage. Through the paper the examining team tries to ensure that evidence will be available to enable the determination of the grade boundaries through the application of the Group 4 Grade Descriptors.

The mean mark for this paper (M2008) was 21.94 compared with 18.6 (M2007), 20.4 (M2006), 17.1 (M2005) and 20.9 (M2004). The mean mark for new schools was 21.63 and for existing schools was 32.65 so the existing schools outperformed the new schools for Paper 2. The mean of 21.94 compared with 18.6 last year would suggest that the students did find the paper easier. There was patchy performance in different ways by different candidates but there were no questions on the paper which completely floored candidates. When there is a rogue question this can have a major impact on the mean mark. Notwithstanding comparisons with previous sessions, all G2s said the paper was an appropriate level of difficulty. In terms of syllabus coverage, clarity of wording and presentation of paper three G2s said it was good and one said it was satisfactory. One G2 commented that the exam 'Seemed just fine to me'. Please do send in G2s to feedback positively as well as negatively.

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

Section A

Again it is probably worth reminding teachers that the point of Question 1 is that it is to provide the opportunity for students to demonstrate data analysis and problem-solving skills and should be something that is off syllabus providing an unfamiliar context for the demonstration of these skills. Most of the average and above average students coped well with the question and there were no obvious problems. The design context selected for this paper was of an airport check-in zone.

Question 1 (a) (i) required students to annotate Figure 4 to show the route followed by passengers through the queuing area. Not all students answered this question which seemed very easy. Some candidates drew the zone on graph paper. This must have wasted valuable time for them in the examination. Question 1 (a) (ii) required a statement of the number of upright posts required to mark out the queuing area in the check-in zone. This was fairly straightforward. Question 1 (a) (iii) asked for a calculation of the floor area occupied by the queuing area in the check-in zone. The posts are spaced at 1.5 metre intervals so the area is ((12 x 1.5) x (5 x 1.5)) square metres. Having arrived at the right answer a number of students got the units wrong or omitted the units and so lost a mark.

Question 1 (b) (i) asked for a statement of the total length of rope required to mark out the queuing area in the check-in zone and most correctly answered 152 metres. In contrast question 1 (b) (ii) was much more challenging and answered well by a smaller number of students – to achieve three marks candidates must provide three distinct correct points.

Question 1 (c) (i) asked candidates to state the maximum number of passengers passing through the queuing area each day which is 15 planeloads of 250 passengers or 3750 passengers per day.

Question (c) (ii) asked for an explanation of why ceramic tiles are appropriate for the floor covering for the check-in zone and was reasonably straightforward for most candidates although achieving the third mark for a sufficiently in-depth answer was a challenge for all but the strongest students.

Question 2 (a) required students to define orthographic drawing. This was easy for most candidates. However explaining why orthographic drawings are used for communications between designers and manufacturers was much more difficult and there were many poorly articulated answers.

Question 3 (a) required students to define automated guided vehicle (AGV). This was answered very badly with students clearly not sure what an AGV was. The second part of question 3 was answered well by some students who did not earn a mark on part (a) and very badly by some who did. Again to achieve 3 marks requires an in-depth answer.

Section B

The examining team tries to pick design contexts that are readily accessible to students in a range of global contexts to frame a series of questions that cut across the syllabus. The age of the candidates, their likely experiences and the international context are all taken into account in assessing the accessibility of design contexts. We try to pick questions which require specific answers rather than ones that students can answer ‘environment’ or ‘green’ or ‘recycling’ and get a mark. We aim to make a paper that discriminates between stronger and weaker candidates and provides evidence to enable to us to use the Group 4 Grade Descriptors to grade the scripts in the Grade Award meeting. Well-organized, logically-structured answers invariable obviously achieve higher marks since they enable the candidate to check that they have gone into sufficient depth. Poorly organized, rambling responses often do not achieve the full marks. Organizing question responses is a skill which teachers should emphasize in preparing students for examinations.

The design context for Question 4 focused on a laminated chair. Question 4 (a) (i) asked candidates to define batch production and was answered correctly by most candidates. Question 4 (a) (ii) asked for an outline of one way in this one-off production contributes to the batch production of the chair. The mould required for the lamination of the seat as a one-off product was identified correctly by some but by no means all students.

Question 4 (a) (iii) asked for a list of two aesthetic considerations important in the design of the chair and was reasonably straightforward. Questions 4 (b) (i) and (ii) asked for a description of how fixed and variable costs, respectively, contribute to the final cost of the chair and were very badly answered by candidates. Question 4 (c) (i) asked candidates to outline one way in which suing laminated timber does not facilitate the recycling of the material in the seat of the rocking chair on disposal. Most candidates were able to identify the issues associated with recycling composite materials. Finally question 4 (c) (ii) asked for an explanation of one way in which shaping, joining and wasting contribute to the manufacture of the chair. Again organisation of responses by candidates ensures sufficient depth of response is achieved. For too many candidates the page is filled with words which are incoherent and consist of repetitive and often irrelevant material.

The design context for Question 5 focused on a refrigerator in a youth hostel/backpacker hostel. Question 5 (a) (i) asked for a definition of thermal conductivity. This was very badly answered. Question 5 (a) (ii) asked for an outline of one reason why thermal conductivity is an important physical property to be considered in the selection of materials for the doors of the refrigerator. This was reasonably well answered.

Question 5 (a) (iii) asked for one benefit of the refrigerator being fitted with a glass door when it is being used in the hostel. Question 5 (b) (i) asked for an outline of one mechanical property relevant to the selection of the material for the wire for the refrigerator shelves. This was generally answered well. Question 5 (b) (ii) asked for an outline of one advantage if using a thermoplastic material to coat the wire. This was not well answered. Question (c) (i) required an outline of one way in which using plastic-coated steel wire does not facilitate the recycling of the material in the refrigerator shelves on disposal. This was quite well answered. Finally question 5 (c) (ii) asked for an explanation of three aspects of the design of the refrigerator that could be modified to minimize the environmental impact of the refrigerator during use in the hostel. Organisation is required in answering a question of this type and those students who do not organise their responses generally do not score well. Also focusing responses on issues relating to use is important. In this context the major considerations relate to energy consumption.

The design context for Question 6 focused on a disposable toothbrush given to passengers travelling on long distance flights. Question 6 (a) (i) asked candidates to define brief. Some excellent answers were provided. Question 6 (a) (ii) asked students to list two elements which would be identified in the brief for the toothbrush apart from cost constraints. Target market and design goal were the favoured responses. Question 6 (b) (i) asked for a list of two characteristics of the bristles of the toothbrush that make them suitable for manufacture by extrusion. This was not well-answered. Question 6 (b) (ii) required one reason why thermoplastic is a suitable material for injection moulding and was reasonably straightforward. Question 6 (c) (i) asking for an outline of one way in which injection moulding can be considered a clean technology and seemed to have been easy for candidates. Finally, question 6 (c) (ii) asked for an explanation of three ways in which the environmental impact of the toothbrush on disposal could be reduced. This was relatively straightforward for candidates and there were some good answers from better candidates. Candidates who developed well-organized responses to the question going into appropriate depth achieved the full nine marks available.

As for the Higher Level Paper 2 the Standard Level Paper 2 structure will not be changed in assessing material in the new Guide. The new Standard Level Paper 2s will continue to comprise two sections: A and B.

Section A worth 20 marks – 12 marks relating to a data-based question and 8 marks relating to syllabus coverage. Section B will comprise three questions relating to different design contexts.

Standard level paper three

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 4	5 - 8	9 - 12	13 - 15	16 - 19	20 - 22	23 - 30

General comments

Again the format for each of the Paper 3 options is that question 1 is a data based question providing stimulus and context in the form of a table, photograph, flow chart, etc. 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 this question and its extended response that the more able candidates demonstrate their ability and weak candidates can be better discriminated from stronger candidates. It is important to reinforce with students that a question worth 6 marks is generally looking for 6 specific points in the answer, and that these can be presented as a list of points, and does not need to be structured as an essay. The examining team often notes candidates who waste time unnecessarily structuring their answer with an introduction and conclusion. The indicative space for answering the questions does not assume an introduction and conclusion. Often two main points are required in the answer, and then these are elaborated on by making two more points about each, for a total of 3 + 3 = 6 marks. Candidates should structure their answer clearly according to this formula.

Four G2 forms were received and all stated that the paper was of a similar standard to last year. All four felt that the level of difficulty was appropriate. One stated that the syllabus coverage was satisfactory and three that it was good, one that the clarity of wording was satisfactory and three that it was good, and one that the presentation of the paper was satisfactory and three that it was good.

No teachers made any general comments on the paper.

In popularity order the options are ranked: F, E, C, D, G, A, B and H. In the majority of schools, most candidates from the same school attempted the same option. In some schools however, candidates selected different options, maybe suggesting that some candidates are tempted to answer options that they have clearly not been taught and this obviously impacts on their performance. It is also possible that in some schools candidates may be left to prepare for their options individually; an approach which also generally leads to poor outcomes.

As in the past, the main difficulties for candidates appeared to be with examination technique and knowledge. The range of knowledge and understanding varied from excellent to very poor. It was clear that some candidates had rote learnt definitions but had difficulty applying them to a context or did not realize that the answer required understanding with examples.

It appeared that for many candidates they had the ability to construct answers, but had not read the question adequately enough to develop an appropriate answer. The weak candidates appeared to be very ill-prepared for the examination; this was typically the case where candidates for the same school attempted different options.

It would be beneficial for all students to practice examination techniques, especially how to answer Question 4 in each option. Some students highlighted or underlined key elements of the questions, and made initial margin notes to organize their answer and these candidates seemed to do well. The marks allocated for each of the action verbs should be clear to candidates so they can structure answers appropriately.

Examination Session	SL P3 Mean score
May 2005	17.6
May 2006	14.6
May 2007	15.3
May 2008	13.7

Fifty-five more candidates (16%) sat this examination in 2008 than in 2007, and the mean score for the paper from the new schools was 12.9, a little lower than the mean for all schools (13.7) which would be expected in the first year of attempting a new subject.

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

OPTION A – RAW MATERIAL TO FINAL PRODUCT

Few candidates attempted this option.

Question A1

(a) Few candidates received the full 2 marks for this question, most finding it difficult to apply their knowledge of superconductors to the context of mag-lev trains.

(b) Candidates tended to either get all 3 marks or no marks for this question indicating they were either familiar with sintering or not. Some candidates focussed on the train rather than on the sintering process.

Question A2

Many candidate incorrectly answered this question by describing toughened glass or plexiglass. From some schools it seemed that the majority of candidates from the school gave the same incorrect answer (eg plexiglass) which seemed to indicate they had studied that material.

Question A3

Most candidates received at least one mark for their answer to this question by being able to identify some difference between hardwood and softwood, and many received full marks.

Question A4

This question was generally well answered, although many students focussed on the strength, hardness and toughness of steel without explaining other possible reasons.

The answer from many candidates did not reflect their understanding of the 2 x 3 structure required in the answer. Some students underlined or made headings of their two reasons and these students seemed to do well.

OPTION B – MICROSTRUCTURES AND MACROSTRUCTURES

The very few candidates who attempted this option indicated a very general level of knowledge with very few technical details and very little in depth understanding, particularly in describing the chemistry required for 1(b) and the application of Young's Modulus in Q4.

OPTION C – APPROPRIATE TECHNOLOGIES

Question C1

(a) Most students achieved one mark for showing some understanding of appropriate technology.

(b) Many candidates provided anecdotal answers to this question, but most received at least 2 marks. There did not seem to be any difficulty with the 'select' and 'discuss' format to the questions, using two action verbs rather than the normal one.

Question C2

Most candidates knew what sustainable development is, but some had difficulty relating it to the University House context.

Question C3

Most candidates received the full 2 marks for this question, being an easier type of 'list' question, although some listed energy sources such as geothermal and tidal where there is no indication that these would be appropriate for this context.

Question C4

The 'waste' aspect of this question was not answered as well as that section related to 'energy'. Many students personalized the answer rather than relating it to the design of the house. A number of students could discuss waste and energy considerations, but found difficulty relating them to house design. There were some long but quite weak answers.

OPTION D – FOOD TECHNOLOGY

This option was undertaken by very few candidates.

Question D1

(a) Most candidates made a successful attempt at this question for 2 marks, being able to at least name the method of collection.

(b) Most candidates received at least two marks for this question by using the sensory ratings that were listed in the stem of the question, and at least saying something about it.

(c) This was a challenging question for many students, those who were successful described bacteria as the answer.

Question D2

The majority of candidates who answered this question did so successfully by listing two alternative methods of food preservation. Some used the word preservation in their answer without really understanding its meaning.

Question D3

Candidates tended to focus on additives to fish rather than other processes in this question, and many answers were not well organized into a 3+3 format of 2 explanations.

OPTION E – COMPUTER AIDED DESIGN AND MANUFACTURING

Question E1

(a) Candidates who did not get full marks in this question may have been able to list 2 advantages, but failed to relate them to the designer.

(b) Some candidates seemed confused by the similarity between this question about consumers and 1(a) which was oriented toward designers.

Question E2

This was a challenging question for candidates. It was not clear that candidates understood the differences between NC and CNC or why CNC would be used.

Question E3

This question was answered well with most candidates able to make 2 points in a description of the impact on a traditional workforce.

Question E4

Some candidates spent time in answering this question by defining mass customization, for which they received no marks. Others were able to list 2 advantages but provided little discussion of the advantages for the manufacturer. In general, though, the question was answered quite well.

OPTION F – INVENTION, INNOVATION AND DESIGN

This option continues to be by far the most popular selected by students.

Question F1

a) Most candidates were able to list two reasons why the bicycle did not become an innovation.

b) Again, as is common in an “Explain” question worth three marks, a number of candidates listed three reasons rather than explaining ONE. A deeper response is required in this type of question, and candidates should be aware of that requirement. Few candidates successfully made the deductions necessary for a complete answer.

Question F2

Many candidates received full marks for this question and were able to identify incremental as the type of design. Some candidates received just 1 mark by identifying the type of design but not elaborating on it for the extra mark.

Question F3

The majority of candidates successfully identified one technological development, and many received the full 2 marks by elaborating on the technological development they had identified.

Question F4

Many candidates answered this question with a discussion of attitude – which is just one reason, even though there may be different types of attitudes, and so received 3 marks. There seemed to be little depth in most of the answers.

Many candidates seemed to get bogged down with an initial idea and could not extend their thinking beyond this idea.

OPTION G – HEALTH BY DESIGN

Very few students selected to do this option, and those that did seemed not to have been taught the Option or had spent little time in preparation. The answers were mainly anecdotal for Q3.

OPTION H – ELECTRONIC PRODUCTS

The very few candidates who attempted this Option performed poorly.

Conclusion

As is often the case, many candidates could quite easily achieve more marks by developing their examination skills. A good understanding of the action verbs (e.g. state, outline, describe, explain) and their value is vital so that candidates recognise the significance of the mark weighting in relation to the expectations of the answer.

Good candidates took the advice from previous reports using headings and bullet points in their answers, but this practice is still not widespread. Many candidates still structure their answer as an essay, by repeating the questions in an introduction and then summarizing their answer in a conclusion. Other candidates who underlined or highlighted key phrases in the questions seemed to do well.

Teachers should continue to stress this to candidates and encourage candidates to confirm their understanding of the extent of the answer required by checking the mark allocation for the question, and ensuring that a matching number of points are identifiable in the answer. Answers from better candidates were more succinct and used appropriate terminology.

Care in reading the questions should be emphasized, in order for the required information to apply to the context provided rather than just repeated. Candidates repeat a definition when it is the application of the definition that is sought.

The answering of the last question in the Options proves to be the most difficult for many. The answer pattern is generally a variation on 2x3 or 3x3 for six or nine marks. Candidates should be encouraged to use headings, bullets or blank lines to divide their answer up into the required number of sections.

Candidates should be encouraged to use the indicative spaces provided for their answer. It is not essays that are required, as some candidates structure their answers with introductions and conclusions for which they receive no marks and which consume time and space.

Teachers should continue to familiarise themselves with the Group 4 Grade Descriptors. 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.