DESIGN TECHNOLOGY

Overall grade boundaries

Higher level

Grade:	1	2	3	4	5	6	7
Mark range:	0-16	17-30	31-39	40-52	53-64	65-76	77-100

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0-16	17-32	33-44	45-56	57-67	68-80	81-100

Introduction

The examining team is very aware of the importance of both examination papers and the subject report in facilitating the preparation of candidates for future examination sessions. We trust this continues to be a useful form of review and assistance in planning to teach DT. We would welcome feedback about the usefulness of the report and any suggestions about how to make it more effective. The most obvious way to ensure usefulness is through the submission of G2 Forms.

Teachers have three options for submitting the G2 forms – through either IBNET or the OCC, or in hard copy form. The number of G2s submitted are as follows.

G2 Comments		
	HL	SL
P1	7	8
P2	7	8
P3	6	7

The G2 forms are extremely valuable in providing feedback to the examining team and are always studied carefully during grade award meetings. Comments from the G2s are fed back to other teachers via the subject report. More G2 forms were received for this examining session than for 2004.

As pointed out in previous subject reports not all schools take this opportunity to feedback comments on the paper and perhaps only feel moved to comment when they have an adverse reaction to an element of the paper. G2s should be viewed as 'constructive feedback sheets' rather than 'complaints sheets' and as such are welcomed by the examining team. The examining team pleads again for teachers to feedback both positive and negative comments to inform the development of this still small, but growing, subject. Where teacher comments are informed by candidate reaction to the papers after the examination this would be particularly useful.

This session has seen 31 schools (14 new) and 167 candidates being examined at SL, an 80% increase over May 2004; and 36 schools (9 new) and 283 candidates at HL, a 38% increase over May 2004. This represents the most dramatic increase in SL candidates in the history of the subject and a significant increase at HL level. It is gratifying to see the subject being introduced at this rate.

Grade boundaries are determined by matching the Grade Descriptors for Group Four 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

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 take Design Technology in the May session continues to grow to the benefit of the subject. Most of the new schools submitted work of a suitable nature, but closer examination of the assessment criteria and better guidance is required if candidates are to obtain higher marks. Work ranged from design and make activities through to smaller laboratory based experiments. Those schools that are established in the teaching of IB Design Technology continue to make improvements to their own schemes of work to the benefit of student outcomes. The schools that adopted the design and make route do seem to have fared better when addressing the assessment criteria. It is advisable to use coursework as a support exercise in order to help students understand the theoretical nature of the subject.

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 the coursework are not required for moderation. Where moderation was not possible more evidence of work was requested from the schools. 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 pages from it throughout the report. Work continues to be submitted in a wide range of formats, but most are presented in an organized structure. Some teachers use labels to indicate which work is to be assessed, this is to be in encouraged as it aids the process of moderation. Some of the work submitted was disorganized and in an inappropriate format.

Candidate performance against each criterion

P1(a): Most candidates seem to fare well in this section, but 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 built in constraints. When using the design project assessment criteria, students should produce a justified specification and time plan.

P1(b): Most candidates displayed evidence of planning, but methods did not always control the variables. Those who included annotated diagrams did seem to fare better. When considering the design project some candidates omitted a detailed plan of action and material list. Those who had written their plan in retrospect failed to address some of the assessment criteria. Evidence of ongoing work could be in the form of photographs and annotation.

DC: Smaller investigations where candidates had to collect 'raw' quantitative data offered ample opportunity to address the assessment criteria. Where candidates had completed a literature search, the data allowed insufficient identification of uncertainties and errors. The design project allowed candidates to address most research issues, but some marks were lost where candidates had omitted essential data to solve the problem. 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 the analysis. Not all candidates design ideas were supported by an initial evaluation.

DPP: Most candidates addressed the majority of the assessment criteria, but detailed annotation and careful presentation of improvements was not always considered. Drawings and evidence of modelling should be presented in an appropriate format. CAD should be encouraged as it not only offers visualization, but also allows students to explore how parts link and move against one another. Some candidates developed their chosen idea by using a range of sketches and modelling, but in most cases the quality of working drawings did not offer sufficient detail for the product to be realized. Most candidates omitted the need to state 'final specifications'.

CE: In most instances insufficient time had been allocated to this aspect of the investigations. Insufficient time had been devoted to completing a thorough evaluation/conclusion. 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. The more organised candidates did leave adequate time to address the criteria to a satisfactory standard.

Higher level

Higher level paper 1

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-10	11-12	13-15	16-21	22-26	27-32	33-40

The average score for HL Paper 1 was 26.4, slightly down on the average for May 2004 which was 28.1. An examination of the papers and the statistics seems to indicate that this is at least partly because of the significant number of new schools, where over one third of all candidates are new.

General comments

Seven G2s were received for this component. Six judged it was a similar standard to last year, six suggested it was an appropriate level of difficulty, three said syllabus coverage was satisfactory, four said it was good, three said clarity of wording was satisfactory and four said it was good, three said the presentation of the paper was satisfactory and four said it was good.

Only one G2 made any general comments, and that was that it was a very fair paper and provided good coverage of the syllabus.

A comment was made that Question 18 was off the syllabus, but reference is made to acid rain on page 78 of the syllabus.

One commentator felt that the term 'fashion products' in Question 38 was confusing for candidates. While this is a fair comment, the examining team felt that the focus of the question was on sustainability and so the interpretation of the term 'fashion products' was not critical to getting a correct answer. The statistics seemed to indicate that this did not adversely impact on candidate performance and the question was not removed from the analysis.

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 calculated comparing the performance of the top 25% of candidates on a particular question with the top 25% of candidates overall. With such a small candidacy the discrimination index is a less useful tool than it is in large entry subjects.

Question	**A**	**B**	**C**	**D**	Blank	Difficulty Index	Discrimination index
1	6	9	22	246*		86.92	.25
2	214*	16	15	38		75.61	.22
3	76	172*	15	20		60.77	.42
4	22	173*	85	3		61.13	.08
5	37	227*	10	9		80.21	.27
6	6	9	264*	4		93.28	.11
7	83	11	127*	62		44.87	.36
8	24	218*	28	13		77.03	.32
9	247*	2		34		87.27	.21
10	231*	47	2	3		81.62	.23
11	32	155*	30	65	1	54.77	.26
12	211*	4	10	57	1	74.55	.37
13	7	28	37	211*		74.55	.40
14	131	7	141*	4		49.82	.00
15	30	57	183*	13		64.66	.39
16	47	68	8	160*		24.02	.17
17	13	200*	18	52		70.67	.12
18	31	195*	19	38		68.90	.40
19	36*	14	4	229		12.72	.09
20	23	4	238*	18		84.09	.28
21	26	137*	9	111		48.40	.24
22	4	33	238*	8		84.09	.22
23	135*	38	102	8		47.70	.36
24	15	66	35	166*	1	58.65	.39
25	246*	6	18	13		86.92	.20
26	267*	4	10	2		94.34	.10
27	3	7	85	188*		66.43	.19
28	73	15	16	179*		63.25	.52
29	29	26	151*	77		53.35	.44
30	33	28	30	192*		67.84	.45
31	43	53	167*	20		59.01	.44
32	41	36	202*	4		71.37	.43
33	5	224*	35	19		79.15	.28
34	46	23	74*	139	1	49.11	.26

35	175*	1	100	7		61.83	.11-
36	14	7	244*	17	1	86.21	.27
37	104	40	33	106*		37.45	.41
38	22	84	6	167*	4	59.01	.56
39	13	135*	110	22	3	47.70	.23
40	191*	46	23	20	3	67.49	.19

Only one Question, 35, had a negative discrimination index, because many students (not the majority) selected C as the correct answer, and options B and D were not very effective discriminators. Some confusion may have arisen because students did not link the notion of availability to the market. After discussion it was decided to retain the question.

One other Question, 14, had a very low discrimination index, though not negative. Again this was because many students chose A as the correct option, and B and E were poor discriminators. It was felt that many students chose option A because they incorrectly applied the notion to mass customization.

Higher level paper 2

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-8	9-17	18-22	23-29	30-37	38-44	45-60

Seven G2s were received. Of these two were from new Schools and five from Schools who had done Design Technology in previous sessions. Four of these five thought that the paper was of a similar standard to the previous year and one thought it was a little more difficult. Notwithstanding this all seven G2s thought the level of difficulty was appropriate. Three thought syllabus coverage was satisfactory and four thought it was good. Three thought clarity of wording was satisfactory, three thought it was good and one thought it was poor and offered specific comments relating to specific questions which will be discussed below. Two G2s thought the presentation of the paper was satisfactory and five thought it was good. Feedback from one examiner suggested that overall the exam was good, well laid out and balanced. Feedback from a second examiner suggested that candidates might benefit from focusing on:

- interpreting information in diagrams or tables;
- material properties and their effect on performance of products;
- green issues which are dealt with by candidates in a manner which is generally too vague and not specifically answering the questions asked;
- lack of understanding of how designers use ergonomic information and failure to understand the limitations of such information.

The same examiner commented that there did not seem to be candidates producing consistently excellent answers and achieving close to maximum marks for the paper in this session. Organization and clarity of answers was a problem for the longer answers, e.g. the final section, i.e. (c) (ii), of Section B questions. Scientific and technical understanding of candidates was often poor and many candidates are not recognizing that as a Group 4 subject they need to be able to use information more precisely, make calculations and apply their subject knowledge to specific examples in an objective manner. Far too much knowledge appeared to be superficial and candidates did not demonstrate that they could relate their understanding to new situations.

Section A

Question 1

The major G2 comments about this paper related to Question 1 and that it took a do-it-yourself context and used inches for the door sizes in the first set of data. One teacher commented that hinges made no sense to her students who are English second language speakers and live in a culture where do-it-yourself is rare. This teacher went on to say, however, that the paper was fair even for non-Anglophones. In relation to the use of inches for the door sizes, some teachers thought this was unfair - one teacher, for example, commented that in North America it would be fine but others might struggle. The examiners feel that students will find they need to be able to work in diverse sets of units for different design contexts and will need to be able to move comfortably between sets of units.

Question 1 was structured as three question sections: (a), (b) and (c), on one set of data and then two question sections: (d) and (e), on additional data. The first set of data related to door types, their construction and the use of hinges for hanging them.

(a) (i) This was a data handling question and awarded 1 mark for stating the range of door frame heights that an 80-inch door would fit, i.e. 79 ¾ - 80 5/8 inches. Some candidates seemed unfamiliar with the term 'range' and thus were unable to achieve the mark.

(ii) Again was a data handling question and required candidates to state the appropriate number of hinges required to hang an 80-inch door. Data in the stem of the question enabled candidates to calculate and **round up** to the correct answer of 3 hinges. Many, but not all, candidates were successfully able to do this. The issue of rounding up or down appropriately in design contexts is an important consideration. The most common error here was to round down the answer to two hinges.

(iii) Again a data handling question for which 1 mark was awarded for identifying the appropriate size hinge for a 36-inch wide door. It required candidates to read from a data table provided. Most candidates achieved this.

(b) (i) This question awarded 1 mark for listing each of two advantages of using cardboard for the infill of the hollow door, e.g. that it: gives strength; makes door rigid; is light; is cost-effective/cheap; is easily recyclable. One G2 commented that candidates have not studied the properties of cardboard and that the information to answer the question is not in the data. Most candidates were able to provide distinct correct responses and achieved the full two marks.

(ii) The second part of (b) required students to calculate the length of wood required for the upper part of the frame of the door. It awarded 1 mark for identifying the correct values for calculation and I mark for the correct answer including units of 32.5 inches. This question was extremely discriminating and although good students were able to gather the relevant data to achieve the correct answer not all were able to read the diagram of the door frame and match it with the data. Many candidates completely misunderstood this question.

(c) (i) This question asked students to list two appropriate advantages of using plywood for the cladding of the door and awarded 1 mark for each answer from a list, including: can be varnished to give a natural timber effect**;** cheaper than solid timber; can be stained to an appropriate colour; can be painted later for a "new" look; will not warp; lighter; easier to handle; strength due to composite nature; available in standard size sheets. Many candidates, although not the weakest candidates, were able to answer this question and the answers were generally good.

(ii) This question required students to explain the advantage of using a loose pin hinge for hanging the door. The question awarded 1 mark for each distinct point in an appropriate explanation. the door can be removed easily at a later date; no screwdriver would be required; if the door needs to be re-painted or varnished or removed to allow easier passage, *e.g.* for moving furniture into a room. This question was more challenging and certainly most of the G2 comments related to this question. Some candidates were confused by the difference in size of the photographs and the examining team will seek to avoid this in future.

The question then went on to present a second set of data relating to the staining and finishing of doors. The data was presented in the form of a flow chart with some information provided in the introductory stem.

(d) (i) This question required students to read the flow chart and to state the first decision that would need to be taken, i.e. whether to use an oil-based or a water-based stain for the door. The question awarded 1 mark for a correct answer. This question posed candidates few problems.

(ii) The second part of the question required candidates to calculate the minimum time required to apply a water-based stain and a matt finish to the door and required candidates to read data from the flow chart and a data table. One mark was awarded for each correct step in a calculation culminating in a correct answer including units. This was surprisingly challenging for some candidates many of whom seemed unable to put the information from the flow chart and table together to achieve the correct answer. There were a number of blank answers for this suggesting that some candidates did not engage with the question at all.

(e) (i) This question awarded 1 mark for stating an appropriate reason for applying a finish to the door. Acceptable answers included: *to s*eal the door; to enhance its water resistance; to stop dirt and grease getting ingrained into the surface. Most candidates were able to achieve this mark.

(ii) This question awarded up to 3 marks, 1 mark per step for calculating the number of cans of finish that would need to be purchased to complete the job. This question was completed satisfactorily by stronger candidates and provided good discrimination.

Question 2

(a) This question awarded 1 mark for a definition of computer-aided design. Most candidates were able to provide reasonable definitions and achieved the mark.

(b) This question asked candidates to explain why designers use a range of models. 1 mark was awarded for each distinct appropriate point in an explanation. All but the weakest candidates achieved marks on this question.

Question 3

(a) This question asked candidates to compare user research and a user trial. Two marks were awarded for this. Many candidates attempted this successfully but a considerable number of candidates were unable to make a clear distinction between user research and a user trial.

(b) Thus section of the question asked candidates to identify a way in which planned obsolescence influences the product cycle and awarded 1 mark for a reason and 1 mark for a brief explanation. Some candidates struggled with this question and answers were often very vague.

Question 4

(a) Section (a) asked candidates to state a nutritional advantage of mycoprotein. Most candidates achieved this successfully and demonstrated a good understanding.

(b) Section (b) asked for an explanation of how mycoprotein can be designed into a range of novel food products. This question was badly answered by many candidates despite being one of the assessment statements in the Guide. Few students mentioned adding some form of binder to the mycoprotein to help shape it.

Question 5

(a) This subsection asked candidates to list two characteristics of glass. This question was easy for most candidates and caused few problems.

(b) This subsection asked for a description of cotton and awarded 1 mark for each distinct correct point in a description. Most candidates offered high absorbency as one of the two points. Some weak candidates were unable to offer any points. Answers were generally good for this question.

Question 6

(a) This first question section asked candidates for a straightforward definition of renewable resources. Some very weak candidates could not do this. Many answers lacked any indication of a time scale. Incorrect answers generally assumed that the resource was inexhaustible even if overexploited.

(b) The second question section (worth 3 marks) asked for an explanation of how renewable energy could contribute to sustainable development. Although straight out of the Guide this question challenged a considerable number of candidates. Answers demonstrated poor understanding of the term 'sustainable'.

Section B

Question 7

This was a very popular question. The question offered a freehand drawing of a concept car as the context for a series of questions exploring different aspects of the concept car drawing on different parts of the syllabus.

(a) (i) This question asked candidates for a definition of freehand drawing. Most, but not all, candidates attempting this question were able to do this.

(ii) This question asked candidates why designers annotate freehand drawings. The mark scheme awarded 1 mark for each distinct point in a brief response.

(iii) This subsection of the question asked candidates why concept cars can be considered as a combination of incremental and radical design. 1 mark was awarded for a point relating to incremental design and 1 for a point relating to radical design. Few clear examples of incremental and radical design relating to the concept car were offered by candidates.

(b) (i) This question awarded 1 mark for a reason why mild steel should be treated and 1 mark for a brief explanation. Some candidates did not understand the process of rusting and what is required to prevent it.

(ii) This question awarded 1 mark for each distinct point in a description of how plastic deformation is relevant to the shaping of the mild steel body parts. Many candidates confused plastic deformation with a common name for polymers.

(c) (i) This question awarded 1 mark for each of two ways in which fashion influences design of the concept car. Most candidates were able to achieve two marks on this question.

(ii) This question required candidates to discuss the strategies of reuse, repair and recycle and how they were applied in the design of the car. Whilst candidates understood the terms reuse, repair and recycle, strategies adopted by designers were not discussed. Answers were vague and lacked substance. Facts were lacking. Many answers were poorly organized and lacked detail. Failure to address the specific question asked was common.

Question 8

This was the next most popular question. It offered a disposable hooded poncho as its design context.

(a) (i) This question asked for a definition of percentile range. 1 mark was awarded for an appropriate definition. The definitions of many candidates were not well written.

(ii) This question asked candidates to list two reasons why the designer would design three sizes of adult poncho. 1 mark was awarded for each correct answer. The examiners noted no particular problems with this question.

(iii) This question asked candidates to describe in detail what might happen to the thermoplastic material if a very large person attempted to pull on a small size poncho. The mark scheme awarded 1 mark for each distinct point in an an appropriate description. Material properties were not understood except at a very superficial level.

(b) (i) Candidates were asked to list two disadvantages of cutting and machining the pieces for the poncho. 1 mark was awarded for each appropriate response. Most candidates were able to provide appropriate responses.

(ii) Candidates were asked to identify two advantages of heat fusing over stitching to join the pieces of the poncho together. Most candidates were able to provide two appropriate advantages.

(c) (i) This question asked candidates to outline one advantage of selecting polyethene for the production of the poncho. 1 mark was awarded for identifying an advantage of selecting polythene for the production of the ponchos and 1 mark for a brief explanation. The question posed few problems to candidates

(ii) This question asked candidates to evaluate three aspects of the hooded poncho design in terms of the extent to which it is consistent with the characteristics of sustainable development. Candidates assumed that the poncho was a sustainable development product and wrongly created false arguments to support the argument rather than arguing for and against its consistency with sustainable development. This question was poorly answered.

Question 9

This was the least popular question. It focused on the design context of superconductors and a levitating train.

(a) (i) This question awarded 1 mark for a definition of superconductor. The question posed candidates few problems.

(ii) This question asked candidates to identify the relevance of constructive discontent in the ongoing development of superconductors. 1 mark was awarded for identifying the relevance of constructive discontent in the development of superconductors and 1 mark for a brief explanation. Few problems were noted.

(iii) This question awarded 1 mark for an advantage of being able to produce superconducting materials that operate at room temperature and 1 mark for a brief explanation. No examiner comments were received in relation to this question.

(b) (i) This question asked candidates to describe how one-off production contributes to the volume production of sintered products. The mark scheme awarded 1 mark for each distinct point in a brief description of how one-off production contributes to the volume production of superconductors. No particular problems were noted in relation to this question.

(ii) This question awarded 1 mark for identifying a reason why economic considerations mean that sintered products are normally produced in volume and 1 mark for a brief explanation. Most candidates were able to achieve 2 marks for this question.

(c) (i) This question awarded 1 mark for each of two appropriate ways that sintering can be considered a clean technology. Most candidates were able to apply their understanding of clean technology to this design context.

(ii) This question awarded 1 mark for each distinct point in an explanation of three ways that levitating trains are consistent with sustainable development. Again it was assumed that this is a sustainable development rather than arguing for and against its consistency with sustainable development. Candidates failed to plan their answers and they appeared to be rushed, perhaps because they had not managed their time appropriately.

Higher level paper 3

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

Six G2s were received. Four G2s commented that the paper was of a similar standard to the previous year and one felt it was a little easier. All six G2s suggested that the level of difficulty was appropriate. One G2 suggested that syllabus coverage was poor and five said it was good. All six G2's suggested that clarity of wording and presentation of the paper were good.

The G2 that stated that syllabus coverage was poor thought the CAD (Option E) was a little too centred on manufacturing. While the title of the Option is 'CAD, manufacture and production' the examining team notes this comment focussing on a balance in this option.

Another G2 stated that this paper is an "excellent suite of questions. Subject material is relevant and suitably stimulating for students. Colour has again greatly helped in this respect. Much improvement as last year."

The candidates seemed generally well prepared for the paper and for the extended response questions. The mean score for the paper was a little higher this year (21.4) than May 2004 (19.5).

The low take up of Options G and H continues and is being addressed in the current curriculum review.

Option D – Food technology

This option was a little more popular than last year, but still not taken by a large number of candidates.

Question D1

a) Most candidates made a successful attempt at this question.

b) The majority of candidates who attempted this Option were successful in this question.

c) This question was not answered well by many candidates with many only achieving one mark. Candidates had some difficulty interpreting the meaning of accessibility.

Question D2

This question was not answered well by many candidates who seemed not to be able to make the link between secondary processing and value enhancement.

Question D3

The majority of candidates who answered this question received only one mark, seemingly not being able to extend a simple point into the two-mark outline required.

Question D4

This question was very well answered by some who were aware of how bacteria might arise in the soup and how the processing, packaging and preparation for eating reduce the likelihood of contamination. A significant number of other candidates only mentioned some of the points. This question discriminated well between weak and strong candidates.

Option E – Computer aided design and manufacturing

Question E1

This question required candidates to interpret the rules outlined in the question stem. Some found it difficult to write clear appropriate answers, tending to repeat the statements about the rule from the question stem.

Question E2

a) The majority of candidates received two marks for their description of the relationship.

b) Most candidates appeared to understand what virtual reality could provide and the term mass customization, but some did not provide a clear answer.

Question E3

While some candidates produced clear answers to this question many found it difficult. Some appear to have had difficulty structuring an answer and some seemed not to understand the term lean production. A number focussed on Japan as the antithesis of the west rather than answering the question.

Option F – Invention, innovation and design

This option continues to be by far the most popular.

Question F1

The majority of candidates seemed to understand concepts of the lone inventor and product champion and so received good marks for these two questions.

Question F2

Most candidates received full marks for this question.

Question F3

The evidence was that this topic had been well taught and so students did well in this question, particularly as there are three classifications and the question was worth three marks.

Question F4

Most candidates received full marks for this question.

Question F5

This question discriminated well amongst the candidates, some did very well and others did poorly. A significant number of candidates did not discuss different strategies and just suggested improvements for further developments of the mobile phone. Some looked at marketing strategies rather than including developments of the mobile phone.

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.

Option H – Electronic products

The very few candidates who attempted this Option performed poorly.

Standard level

Standard level paper 1

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-7	8-12	13-18	19-21	22-24	25-27	28-30

General comments

Eight G2's were received. One suggested that in comparison with last years paper this paper was a little easier, three that the standards was similar and one that it was a little more difficult. All eight felt that the level of difficulty was appropriate. Five thought the syllabus coverage was satisfactory and three that it was good, five that the clarity of wording was satisfactory and three that it was good, and four that the presentation of the paper was satisfactory and four that it was good.

The mean score for this paper (19.6) was slightly less than the May 2004 paper (20.6). This may reinforce the notion that the paper was a little more difficult, but it may also be because of the large number of new candidates and schools doing the paper in 2005. There was a 75% increase in candidates in 2005 compared with 2004.

Question 27

Two G2's commented on Question 27. One was that it is off the syllabus, but an example is provided on page 78 of the syllabus. The other comment was that both sulphur dioxide and carbon monoxide could be said to contribute to acid rain. The syllabus does not refer to carbon monoxide as a source of acid rain.

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.

A discrimination index is calculated comparing the performance of the top 25% of candidates on a particular question with the top 25% of candidates overall. With such a small candidacy the discrimination index is a less useful tool than it is in large entry subjects.

Question	**A**	**B**	**C**	**D**	Blank	Difficulty index	Discrimination index
1	5	10	12	133*		83.12	.16
2	19	20	18	103*		64.37	.45
3	116*	17	10	17		72.50	.30
4	41	103*	6	10		64.37	.50
5	17	2	25	116*		72.50	.30
6	141*	15	4			88.12	.13
7	88*	26	6	40		55.00	.49
8	23	127*	3	7		79.37	.33
9	2	3	49	106*		66.25	.52
10	12	4	139*	5		86.87	.26
11	46	1	83*	30		51.87	.33
12	22	14	7	117*		73.12	.50
13	16	117*	22	5		73.12	.41
14	130*	4	2	24		81.25	.35
15	26	6	107*	21		66.87	.60
16	118*	40		2		73.75	.43
17	44	30	80*	6		50.00	.60
18	20	79*	22	39		49.37	.60
19	2	22	131*	5		81.87	.35
20	9	19	18	113*	1	70.62	.37
21	62	6	89*	2	1	55.62	.07
22	17	40	72*	31		45.00	.37
23	8	147*	1	4		91.87	.16
24	49	29	7	75*		18.12	.09
25	8	98*	17	37		61.25	.24
26	6	52	92*	10		57.50	.45
27	38	74*	20	27	1	46.25	.54
28	20*	10	2	128		12.50	.13
29	149*	5	2	4		93.12	.18
30	53	19	4	84*		52.50	.16

No questions in this paper had a negative discrimination index.

Standard level paper 2

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-5	6-11	12-14	15-20	21-25	26-31	32-40

Eight G2s were received. Of these three were from new Schools and five from Schools who had done Design Technology in previous sessions. One of these five thought that the paper was a little easier than the previous year and four thought it was a little more difficult. Notwithstanding this seven G2s thought the level of difficulty was appropriate and one thought it was appropriate and too difficult! Three thought syllabus coverage was satisfactory and five thought it was good. Four thought clarity of wording was satisfactory and three thought it was good. One G2 thought the presentation of the paper was satisfactory and seven thought it was good.

Section A

Question 1

The major G2 comments about this paper related to Question 1. Question 1 was structured as two question sections: (a) and (b) each with subsections, on one set of data. The question took a terraced stand in a sports ground as its design context. One G2 commented that the design context was too difficult for second language students. One G2 commented that the presentation of the question 'frightened them off'. One G2 commented that this is the first time students have been asked to draw information from four sets of data to answer this section and that having to interpret this much data it was felt made this a significantly harder paper. These are extremely valuable comments and examining team will bear them in mind in future examination sessions.

(a) (i) This was a data handling question and awarded 1 mark for stating the maximum horizontal spacing between crush barriers for the terrace. 1 mark was awarded for stating the maximum horizontal spacing between crush barriers from Table 1.

(ii) This question required candidates to analyze a diagram showing alternative positions for the crush barriers. Most candidates were successfully able to do this.

(iii) Again a data handling question which required candidates to calculate the number of steps there will be between the crush barriers if they are positioned as in Figure 2(a) and at the maximum horizontal spacing. Candidates needed to take 3.1 metres from Table 1 for a terrace angled at 25 degrees and 380 mm for the spacing of the steps from Figure 2 to give an answer of 8.16 which needed to be rounded down to 8 steps. Again knowing whether to round up or down in design contexts is an important issue.

(iv) This question asked candidates to outline one reason why additional guarding must be provided on the crush barriers if children are allowed into the standing area. The mark scheme awarded 1 mark for identifying an appropriate reasons why additional guarding must be provided on the crush barriers if children are allowed into the standing area and 1 mark for brief explanation.

(b) (i) This question asked candidates to calculate the area behind the crush barriers available to spectators. The mark scheme awarded 1 mark for identifying the correct values and 1 mark for getting the right answer, including units. Some, weaker, candidates were not able to do this. Some candidates calculated the area behind one crush barrier and some the area of the whole stand behind the crush barriers.

(ii) This question required candidates to calculate the maximum capacity of the stand. 1 mark was awarded for identifying the correct values and 1 mark for getting the right

answer, including units. Candidates were required to carry forward the value from (b) (i) for the available viewing area and were not penalized if this was the wrong answer. Most candidates were able to do this.

(iii) This question required candidates to calculate the number of turnstiles required to enable the total number of spectators to enter the stand in one hour. Again this required candidates to make a calculation and to decide whether to round up or round down the answer. Many candidates achieved this successfully.

Question 2

(a) This question awarded 1 mark for a definition of tensile strength. Most candidates were able to provide reasonable definitions and achieved the mark.

(b) This question asked candidates to explain one design context in which tensile strength is an important consideration. 1 mark was awarded for each distinct appropriate point in an explanation. All but the weakest candidates achieved marks on this question.

Question 3

(a) This question asked candidates to define cost-effectiveness. Most candidates attempted this successfully.

(b) This section of the question asked candidates to explain the key factors that determine the final cost of a product. The mark scheme awarded 1 mark for each distinct appropriate point in an explanation. Marks were not awarded for just listing different costs, e.g. material costs or labour costs. The mark scheme was looking for variable costs (1 mark) plus a proportion of fixed costs (1 mark) depending on the breakeven point (1 mark). Identifying profit as an element of the final cost of a product was also acceptable. Many candidates struggled with this question and answers were often very vague.

Section B

Question 4

This was the most popular question. The question offered a photograph of a person testing a new model of electric toothbrush as a design context.

(a) (i) This question asked candidates for a definition of user trial. Most, but not all, candidates attempting this question were able to do this.

(ii) This question asked candidates to outline one advantage of using a user trial in the development of the electric toothbrush. The mark scheme awarded 1 mark for an advantage and 1 mark for a brief explanation.

(iii) This subsection of the question asked candidates for one disadvantage of using a user trial in the evaluation of the electric toothbrush. 1 mark was awarded for an appropriate disadvantage and 1 mark for a brief explanation. This quest posed candidates few problems.

(b) (i) This question awarded 1 mark for each distinct point in a description of the significance of stiffness in the selection of the plastic materials for the body of the electric toothbrush and the switch cover. A number of candidates found this question really challenging and provided very poor answers.

(ii) This question awarded 1 mark for outlining one reason why fusing is an appropriate method of joining the two types of plastic. Some very good answers were offered in response to this question.

(c) (i) This question awarded 1 mark for a way in which consideration of planned obsolescence would influence the design specification of the electric toothbrush and 1 mark for a brief explanation. Most candidates were able to achieve two marks on this question.

(ii) This question required candidates to discuss the strategies of reuse, repair and recycle and how they were applied in the design of the electric toothbrush. Whilst candidates understood the terms reuse, repair and recycle, strategies adopted by designers were not discussed. Answers were vague and lacked substance. Facts were lacking. Many answers were poorly organized and lacked detail. Failure to address the specific question asked was common.

Question 5

This was a reasonably popular question. It offered the development of the ballpoint pen as a design context.

(a) (i) This question asked for a definition of product cycle. 1 mark was awarded for an appropriate definition.

(ii) This question asked candidates to describe the role of constructive discontent in the early stages of the development of the ballpoint pen. The examiners noted no particular problems with this question.

(iii) This question asked candidates to outline one reason why the ballpoint pen can be considered in the mature stage of its product lifecuycle. Some very good answers were offered to this question.

(b) (i) Candidates were asked to list two disadvantages of injection moulding in the production of the ballpoint pen body. 1 mark was awarded for each appropriate response. Most candidates were able to provide appropriate responses.

(ii) Candidates were asked to list two mechanical properties that makes a material suitable for injection moulding. Most candidates were able to provide two appropriate properties.

(c) (i) This question asked candidates to describe how the symbol shown in Figure 8 facilitated recycling. 1 mark was awarded for each distinct correct point in an appropriate description of how the symbol helped. The question posed few problems to candidates

(ii) This question asked candidates to explain three ways in which the adoption of a proactive environmental policy can help increase profits for the ballpoint pen manufacturer. This question should not have posed any particular problems for candidates but poor organization of answers let many candidates down.

Question 6

This was also a popular question. It focused on the design context of a shopping centre built after extensive public consultation.

(a) (i) This question awarded 1 mark for stating one drawing technique that could be used to communicate proposal for the design of the shopping centre to local residents during the public consultation process. The question posed candidates few problems.

(ii) This question asked candidates to state one advantage and one disadvantage of using a physical model of the shopping centre in the consultation process. Few problems were noted.

(iii) This question awarded 1 mark for identifying a factor that influences the spacing of the bollards and 1 mark for a brief explanation. No examiner comments were received in relation to this question.

(b) (i) This question asked candidates to outline one property that makes a material suitable for extrusion. The mark scheme awarded 1 mark for an appropriate property and 1 mark for a brief explanation. No particular problems were noted in relation to this question.

(ii) This question awarded 1 mark for each of two advantages of extrusion for the manufacture of the upright sections of the bollards. Most candidates were able to achieve 2 marks for this question.

(c) (i) This question awarded 1 mark for identifying one aspect of the design of the bollards that makes them suitable for application in the public access area of the shopping centre and 1 mark for a brief explanation. Most candidates were able to provide good responses to this question.

(ii) This question asked candidates to explain how automation, batch production and craft production would be incorporates into the production and installation of the safety bollards. Some candidates were able to think this through and provide good answers. Where candidates took the three words as subheading and to structure their answers the marks achieved tended to be higher.

Standard level paper 3

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-5	6-10	11-13	14-17	18-20	21-24	25-30

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 are able to 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.

Seven G2's were received, one stated that the paper was a little easier than last year, and three that it was of a similar standard. All seven felt that the level of difficulty was appropriate. Five stated that the syllabus coverage was satisfactory and two that it was good, three that the clarity of wording was satisfactory and four that it was good, and two that the presentation of the paper was satisfactory and five that it was good.

One G2 commented that the graphics are good, but could not see the relevance of the picture to the question in A1. Pictures are more or less related directly to the questions, but all are designed to provide an interesting and familiar context to the Option.

Another G2 comment was that the CAD Option (E) was a little too centred on manufacturing. While the title of the Option is 'CAD, Manufacture and Production', and the balance across these three areas

may vary slightly from year to year, the examining team notes this comment to ensure that a balance is achieved in this option.

A final G2 comment was that the Appropriate Technology Option (C) was a little easy. This did not seem to be the case from the markers perspective and the marks achieved for this option do not tend to indicate that it was easier.

In popularity order the options are ranked: F, E, D, C, G, A, B, H. The inconsistencies of candidates options selected at individual schools (students from some schools selected 3 different options) suggests 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; this approach also leads to poor outcomes.

Option A – Raw material to final product

Of the very few candidates who attempted this option, few performed well.

Question A1

(a) Candidates answering this question tended to have one of the chemical changes correct but not two and so did not receive full marks.

(b) Similar to (a), candidates had some knowledge of the correct answer but failed to provide a complete answer.

(c) The majority of candidates who attempted this question were able to include three points in their explanation to receive the three marks.

Question A2

Many candidates were able to state the characteristic but few completed the question by adding an elaboration in their outline.

Question A3

This question asked candidates to discuss two reasons, so it should be clear that each reason is worth three marks and so should include three distinct points. The stronger students recognized this and organized their answer appropriately. A number of candidates stated the two reasons but inadequately discussed them.

Option B – Microstructures and macrostructures

Very few candidates attempted this option.

Question B1

(a) Most of the few candidates who attempted this option received 2 marks, though some failed to make it clear in their outline why standardization is important.

(b) Most of the few candidates who attempted this option received 2 marks.

Question B2

(a) Responses to this question were often vague, and generally candidates did not do well.

(b) One mark was awarded for the explanation of the nature of the bond and two marks for related properties. Many candidates simply listed some properties and so did not receive full marks.

Question B3

Three marks were awarded for identifying three major regions of the graph and then another three for relating this graph information to the manufacture of vehicle body parts. Few answers were well structured clearly identifying six points, though most candidates received some marks.

Option C – Appropriate technologies

Question C1

(a) Most students achieved two marks for their answer to this question.

(b) Most candidates were able to utilize three distinct points in an explanation of why international cooperation is necessary.

Question C2

Some candidates found it difficult to outline a disadvantage, but the majority received one mark for stating a disadvantage.

Question C3

Most candidates received the two marks for this question.

Question C4

There were some good attempts by candidates to answer this question but structuring the answer appropriately appeared to be difficult for some candidates and not all dealt with systems level changes.

Option D – Food technology

This option was a little more popular than last year, but still not taken by a large number of candidates.

Question D1

(a) Most candidates made a successful attempt at this question.

(b) The majority of candidates who attempted this Option were successful in this question.

(c) This question was not answered well by many candidates with many only achieving one mark. Candidates had some difficulty interpreting the meaning of accessibility.

Question D2

This question was not answered well by many candidates who seemed not to be able to make the link between secondary processing and value enhancement.

Question D3

This question was quite well answered by some candidates, but a significant number did not structure their answer well and consequently did not include sufficient points.

Option E – Computer aided design and manufacturing

Question E1

This question required candidates to interpret the rules outlined in the question stem. Some found it difficult to write clear appropriate answers, tending to repeat the statements about the rule from the question stem.

Question E2

Most candidates appeared to understand what virtual reality could provide for communication, but some did not provide a clear answer.

Question E3

While many candidates could state one advantage and one disadvantage of JIT, the discussion was often not comprehensive enough to warrant full marks.

Option F – Invention, innovation and design

This option continues to be by far the most popular and appears to be well taught and understood.

Question F1

The majority of candidates seemed to understand concepts of the lone inventor and product champion and so received good marks for these two questions.

Question F2

Most candidates received full marks for this question.

Question F3

The evidence was that this topic had been well taught and so students did well in this question, particularly as there are three classifications and the question was worth three marks.

Question F4

The terms pioneering and imitative seemed to be generally well understood, but often the discussion was not sufficiently comprehensive for full marks.

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.

Option H – Electronic products

No candidates responded to this option so we have no additional information to supplement the question paper and the marks scheme.

Conclusion

The good understanding of the action verbs (e.g. state, outline, describe, explain) seen in the past continued to be evident, as did evidence to suggest that more candidates are recognising the significance of the mark weighting in relation to the expectations of the answer.

Good candidates took the advice from previous reports of ‘sign-posting’ answers with headings and bullet points, but this practice is still not widespread.

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.

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.

There are about 16 and 25 lines provided, respectively, for the final question in each option for SL and HL. Candidates should be encouraged to use about that amount of space 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.

APPENDIX 1

Standard Level (SL) Paper 1

This comprises 30 multiple choice questions (MCQs) across the 6 topics comprising the SL core. To ensure appropriate coverage of the syllabus the number of MCQs on each topic should reflect the teaching hours for each topic, as identified in the Design Technology Guide and indicated in the table below:

Topic	Teaching hours	Number of MCQs
1	15	7
2	11	5
3	6	3
4	8	4
5	9	4
6	16	7
Total	**65**	**30**

Higher Level (HL) Paper 1

This comprises 40 MCQs across the 9 topics comprising the HL core. Again, to ensure appropriate coverage of the syllabus the number of MCQs on each topic should reflect the teaching hours for each topic, as identified in the Design Technology Guide and indicated in the table below:

Topic	Teaching hours	Number of MCQs
1	15	4
2	11	3
3	6	3
4	8	2
5	9	3
6	16	5
7	15	6
8	19	8
9	15	6
Total	**114**	**40**

15 of the questions on topics 1 – 6 are common to SL and HL papers to enable comparison of achievement by SL and HL candidates.

