DESIGN TECHNOLOGY

Overall grade boundaries

Higher level

Grade:	1	2	3	4	5	6	7
Mark range:	0-15	16-29	30-42	43-54	55-67	68-79	80-100

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0-14	15-28	29-39	40-51	52-62	63-74	75-100

Higher and standard level 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 take Design and Technology in the November session is very few. Most schools submitted work of a suitable nature, but closer examination of the assessment criteria is required if candidates are to obtain higher marks. Work ranged from design and make activities through to smaller laboratory based experiments. Some schools did not complete the form 4PSOW correctly. All work that has been highlighted should be sent 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, however the logbook was not evident in all samples. The logbook is not formally assessed, but it helps the moderator to understand how the student tackled a given problem.

Work was submitted in different formats, and where the reports are clearly labelled to address the assessment criteria candidates have generally scored well. Some of the work submitted was disorganized. Teachers should try and highlight sections of work which have been highlighted on the form 4PSOW.

Candidate performance against each criterion

PI(a)

Most candidates seem to fare well in this section, but candidates 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 the projects feasibility and built in constraints. When using the design project assessment criteria, students should produce a justified specification.

Pl(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. Time should be allocated to each manufacturing procedure. Those who had written their plan in retrospect failed to address some of the assessment criteria. Most students displayed evidence of ongoing work 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. Data collection for project work should be focused and its use identified. Photocopies from text books should be annotated to illustrate their use.

DPP

Modelling continues to be a weak area, which is underused by most candidates. Development work should, where possible, show evidence of Cad and 3D modelling. Physical models should be tested in order to satisfy the specification and aid final manufacture. In most cases the quality of working drawings did not offer sufficient detail for the product to be realized. Working drawings should be in an appropriate format.

CE

In most instances insufficient time had been allocated to this aspect of the investigations. Some of the evaluation work was superficial and offered inappropriate recommendations. Those candidates who did fare well in this area offered recommendations in sketch format and a modified specification.

Recommendations for the teaching of future candidates

The OCC should be used as an additional source of information in order to develop good practice. IA work should be integrated in to the core teaching so that students can apply knowledge to new situations. More design and make activities should be encouraged, which will enable students to develop a skill base in preparation for the design project. Development work should include more Cad and 3D modelling, whilst the evaluation should be an integral part of any project.

Higher and standard level papers

The examining team continues to be aware of the importance of both examination papers in preparing students and the subject report in facilitating the preparation of candidates for future examination sessions. This set of examination papers and the resultant report will add to the material available to support teachers in their work.

Overall numbers of candidates and the number of schools has increased again compared with November 2004. There were 27 candidates from 6 schools at Higher Level and 7 candidates at Standard Level from 3 schools. Two schools entered candidates at both Standard and Higher Level. It is gratifying to see the numbers continue to increase.

Two G2 forms were received for this examination, and thank you to those teachers for taking the time to complete them. 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.

The examining team continues to request teachers to feedback both positive and negative comments to inform the development of this still small, but growing, subject. Teacher comments informed by candidate reaction to the papers after the examination this would be particularly useful.

Higher level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-10	11-16	17-22	23-26	27-30	31-34	35-40

General comments

One G2 form was related to HL Paper 1. The level of difficulty was deemed 'appropriate', the syllabus coverage, clarity of wording and presentation of the paper was classified as 'good'.

The mean for Paper 1 has been noted in past reports, and is included below in order to indicate the trend in increasing means.

Mean	Year
23.4	2003
26.5	2004
27.2	2005

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

Question	A	B	C	D	Difficulty Index	Discrimination Index
1	27*	1			96.42	.00
2			27*	1	96.42	.00
3	1	20*	6	1	71.42	.44
4	1	11*		16	39.28	-.11
5	5*	6	17		17.85	-.11
6	8	6	4	10*	35.71	.00
7	1	1	2	24*	85.71	.11
8	24*		4		85.71	.11
9		1	26*	1	92.85	.00
10		4	24*		85.71	.22
11	26*			2	92.85	.11
12			3	25*	89.28	.00

13	26*		2		92.85	.00
14	3	24*	1		85.71	-.22
15	4	22*	1	1	78.57	.22
16	4	3	5	16*	57.14	.22
17	2		25*	1	89.28	.11
18		10	18*		64.28	.33
19	2	26*			92.85	-.11
20	20*	2	2	4	71.42	.33
21			25*	3	89.28	.22
22	2	17*	3	6	60.71	.22
23	12	2	11*	3	39.28	.55
24	8	3	11	6*	21.42	.22
25	3	6	5*	14	17.85	.00
26	5	14*	5	4	50.00	-.22
27	7	14*	5	2	50.00	.11
28	5	4	1	18*	64.28	.33
29	10	16*	1	1	57.14	.55
30	2	3	14*	9	50.00	.22
31	13*		2	13	46.42	-.22
32	13		11	4*	14.28	.22
33	20*	3	5		71.42	.33
34	1	7		20*	71.42	.11
35	23*	1	4		82.14	.33
36	20*	3	5		71.42	.00
37	1		27*		96.42	.00
38		1		27*	96.42	.00
39	2	2	5	19*	67.85	.11
40	4	22*		2	78.57	.11

The G2 commented on the wording of questions 39 and 40, which the examining team notes. The majority of students selected the correct option for these questions, and the difficulty index is acceptable.

As is normal practice, the questions with the lowest difficulty index were analysed by the examining team. In order from the lowest, this includes questions 32, 25, 5, 24, 6, 23, 4 and 31. It was decided all these questions were valid and the answers correct, so they were all retained for the reasons outlined below.

4: the computer device is analogous to a mouse, hence B is the correct answer. D is incorrect because brainstorming is not convergent thinking.

5: the answer does not include II because that is the definition of ergonomics (see guide Glossary)

6: all methods would be used to evaluate different aspects of ergonomics.

23: glass is mainly composed of silica, hence a number of students choosing option A. However, B_2O_3 is added to overcome poor shock resistance.

24: D is the only option that applies to all hardwoods. C is a common characteristic, but not exclusively.

25: Option C is correct because the statement is not true; most students selected option D, which is a true statement, so not the correct option.

31: about half the students selected option D, but statement III is not correct as polypropene is a thermoplastic.

32: few students selected the correct option D, confusing the chemical compounds of glass with bonded materials and so thinking it is a composite.

Higher level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-6	7-13	14-22	23-30	31-39	40-47	48-60

General comments

One G2 was received for this paper. The level of difficulty was judged as appropriate, and the syllabus coverage, clarity of wording and presentation of the paper were all judged as good. A comment was made on the clarity of Figure 4 which the examining team notes for the future. It was also felt that Option B Question 9 may be a little easier than the other options, "although this would depend on the individual". The examining team will continue to strive for parity in the option questions in Section B.

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

Section A

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

Question 1

Question 1 is a data question.

Parts a(i) and (ii) posed no significant problems for candidates. Very few candidates provided the correct answer to (iii) with a range of different types of answers, most based on the mean.

Question b(i) and (ii) were not well answered. Many answers to b(ii) were related to sampling issues or comparisons with Figure 2, which was not part of the question.

Many candidates noted parts of the definition in their answer to Question c(i), but few noted all elements of the definition. Candidates were able to list three factors in their answer to c(ii).

All parts of questions d and e were well answered.

Questions 2 - 6

These questions provided syllabus coverage and represented good discrimination. Questions in which candidates experienced difficulty will be noted.

Many candidates applied the idea of thermal expansion to the width rather than the length of railway tracks in question 2(b).

Most candidates received one mark for 3(a) and one for 3(b), indicating they knew some information but not enough for a complete answer.

In answers to 5(b), candidates provided many good statements about pollution and manufacturing, but very few recognized the need for quantitative data.

Question 6(a) was not well answered, with most candidates describing characteristics rather than structure.

Section B

Parity of Section B questions and syllabus coverage remain conflicting constraints. The examining team continues to try hard to produce equally difficult questions whilst achieving syllabus coverage. The majority of candidates chose to answer Question 9, either indicating they felt more familiar with this context, or reinforcing the G2 comment that this option was slightly easier.

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

Three candidates attempted question 7 and two question 8. Two of these candidates dealt well with the questions and received high marks, the others in many instances seemed to be guessing and were not well prepared.

Question 9(a) and (c) were well answered. In question (b), many students focused more on injection moulding rather than the structure and bonding of the plastic, having not understood the question adequately. The students who scored poorly in question (d) made comparisons with Kettle A, again indicating a lack of focus on the question.

Higher level paper 3

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-5	6-10	11-14	15-20	21-27	28-33	34-40

General comments

No G2s were received. The trend continued in this paper with all candidates choosing Options E and F. Options G, D and Option H were notably unpopular.

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

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

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

There was no indication of any differences in performance across the different options, particularly in the extended response question, which is pleasing.

Overall the Paper 3s produced a good spread of marks and reasonable discrimination was achieved. The mean for the Higher Level Paper 3 in 2003 was 24.7, in 2004 was 23.5 and this paper was 23.8.

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

Option E

Questions 1(a) and (b) were answered well. Those who lost marks in 1(c) tended to focus on the customer rather than the designer.
Not many candidates received the full three marks for question 3, but most received two.
Some candidates were confused in question 4 between DfM and lean production, and consequently lost marks. Some candidates included an introductory summary paragraph in their answer which was not necessary and wasted time.

Option F

Questions 1 and 2(a) were well answered. Question 2(b) was not well answered, students not being able to make the link between carbon fibre manufacturing and pro-active environmental policies.
Many students in their answers to question 3 listed two characteristics for two marks rather than stating one characteristic and then elaborating on it for an "outline" type question. Teacher need to sensitize students to this difference.
There were many appropriate answers to question 4 which was generally well done.

Recommendations and guidance for the teaching of future candidates

In teaching the options teachers are advised not to leave the options to last but to incorporate the option into the core and particularly into the practical work so candidates have some 'hands on' experience of the option in order to both broaden and deepen their understanding..

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-7	8-12	13-17	18-20	21-22	23-25	26-30

General comments

No G2s were received.

The mean for Paper 1 has been noted in past reports, and is included below in order to indicate the trend in increasing means.

Mean	Year
15.6	2003
18.8	2004
19.8	2005

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

Question	**A**	**B**	**C**	**D**	Difficulty Index	Discrimination Index
1	7*				100.00	.00
2		5	1	1*	14.28	.50
3	2		5*		71.42	.00
4	1	5*	1		71.42	.50-
5	3	1	2	1*	14.28	.50
6		5*		2	71.42	.50
7		1*	1	5	14.28	.00
8	1*	2	4		14.28	.00
9	1			6*	85.71	.00
10		1		6*	85.71	.50
11		1	2	4*	57.14	.00
12	4*	1	1	1	57.14	1.00
13		7*			100.00	.00
14	6*		1		85.71	.50
15	1		6*		85.71	.50
16			5*	2	71.42	.50
17	2		3*	2	42.85	1.00
18	7*				100.00	.00
19			3	4*	57.14	.00
20	7*				100.00	.00
21	1	6*			85.71	.50
22		1	1	5*	71.42	.50
23		7*			100.00	.00
24	3			4*	57.14	1.00
25	1		6*		85.71	.50
26			7*		100.00	.00
27		3	3*	1	42.85	1.00
28		5*	1	1	71.42	1.00
29	3*	1		3	42.85	1.00
30	1	2	2*	2	28.57	.50

It is obvious that with such a small number of candidates that the Difficulty Index and the Discrimination index are of limited use, although the eight questions with the lowest difficulty index were examined for validity: 8, 7, 5, 2, 30, 29, 27, 17. It was decided all these questions were valid and the answers correct, so they were all retained for the reasons outlines below.

2: developing a chosen solution involves more divergent thinking than any of the other options. Generating ideas involved thinking, but is more divergent.
5: D is clearly the best answer as all other options are incorrect, students were not well prepared for this question.
7: the computer device is analogous to a mouse, hence B is the correct answer. D is incorrect because brainstorming is not convergent thinking.

8: the answer does not include II because that is the definition of ergonomics (see guide Glossary)
17: the majority of students selected the correct option – sintering is not possible and welding is possible but not likely so not the best option.
27: B is not correct because carbon monoxide does not effect the stratospheric ozone layer, although it does help produce ozone in the troposphere.
29: D is incorrect because the question stem refers to initial design, not redesign.
30: C is the only option that is not true.

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

Standard level paper two

Component grade boundaries

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

General comments

No G2s were received.

In general candidates made a good attempt at the paper. It was pleasing to see that better candidates had structured their answers according to an understanding of the action verbs and the marks awarded for the question.

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

Section A - Question 1

Most candidates completed the calculations in 1(a) successfully. Most included the units of measurement in their answer, for those who were incorrect in 1(a)(ii), 80,000 sq mm was a common answer reflecting a lack of understanding about area.

The majority of students were able to suggest appropriate re-design ideas for 1(b). This is an example of the type of information that cannot be directly taught, but is developed over time by students exploring a range of design contexts.

Each question in 1(c) was worth two marks, some students simply listed a feature or modification and did not include an elaboration and so only received one mark. Teachers need to reinforce with students the importance of matching the points available to the answer. A number of students misinterpreted 1(c)(i) and suggested modifications to the trailer rather than examining existing features.

Section A - Question 2

These posed no particular problems for candidates and were good discriminators. Some candidates provided a general description rather than a specific definition for 2(a). The most common mistake in 2(b) was the listing of three reasons rather than the explanation of one reason. Teachers need to ensure that this type of question interpretation is understood by candidates.

Section A – Question 3

Candidates coped well with question 3. A key aspect to the definition of life cycle analysis was the environment, and not all candidates included that in their definition.

Section B - Questions 4, 5 and 6

In this section, the extended response question is the most significant and a major challenge to many candidates and some preparation is needed for this. A framework for answers helps guide candidates towards a balanced answer and the achievement of a good mark. Planning helps and, for candidates who clearly thought about their answer and jotted down some notes which were crossed out afterwards, there was the reward of a well-structured answer. Many candidates answer as ideas come to mind rather than answering the questions as set. Such answers are extremely difficult to mark and whilst examiners search hard for anything relevant, it is often very difficult to find anything that corresponds to the required material. Bullet points rather than an essay helps organise a response and candidates using such devices generally achieve higher marks by being able to identify clearly different points in their responses related to the marks available.

Section B - Question 4

While most candidates correctly responded to a(i), many responded with non-aesthetic considerations in a(ii) – clearly not studying the question adequately. Few candidates were successful in a(iii) reflecting an inability to interpret the graphic of the fridge-freezer.

Most candidates responded with the correct answer in (b) and (c). In the extended answer (d) all students listed some points of comparison and received some marks, again those who structured their answer to note three points for each of the three evaluation methods for a total of nine points received good marks.

Section B - Question 5 and 6

Candidates who attempted questions 5 or 6 did so successfully, with the exception of 5c(ii) where they struggled to note three points in an explanation of materials costs. Those who provided a structure in their answer to question (d) were most successful.

Recommendations and guidance for the teaching of future candidates

Although teachers cannot 'teach' the contexts covered in Section A Question 1, they can use past papers to expose students to this type of question and emphasize the importance of attention to detail, e.g. always including units with the answer to calculations.
Teachers need to continue to encourage candidates to persist with all sections of all questions. A number of weaker candidates appeared to have difficulty with the first parts of a question and then not persist with the remainder of the question. Mark allocations and the action verbs are important indicators of the nature and extent expected in answers. It is worth teachers emphasising this to candidates.

Standard level paper 3

Component grade boundaries

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

General comments

Again the format for each of the Paper 3 options is that question 1 is a database question providing a stimulus and context for the question. The last question in each option is an extended response question worth 6 marks to provide a better opportunity for candidates to demonstrate their understanding. It is through the extended response question in particular that the more able candidates can demonstrate their ability and discrimination between levels of candidates can be determined.

No G2s were received.

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

Option A

Most candidates were successful in (a). Some candidates lost marks in (b) by listing reasons rather than providing an explanation.
The most common answer to 2(a) was that toughened glass is tougher, and so loosing marks by not outlining why.
Candidates were well prepared for question 3 with a good understanding of the characteristics of nylon.

Option C

Some candidates were confused in question 1(a); the computed answer is 13.3, and some students rounded down rather than up to the correct answer of 14.
No candidates received full marks for 1(b), though if they provided their detailed calculations, some received one mark.
Candidates seemed well prepared for 1(c), but most had difficulty differentiating between a resource and a reserve in question 2.
Most candidates received some marks for question 3. Some candidates waste time and space with a long preamble, which may be appropriate for an essay, but in this case achieves no marks.

Option E

A surprising number of candidates were not able to list an input and an output device, with some listing the output of CAD/CAM systems. All candidates were able to list two benefits of computer modelling in 1(b).
A common error in 1(c) was the listing of an advantage without the detail required in an 'outline' question, resulting in one mark rather than two.
The majority of candidates were able to state an advantage and a disadvantage for one mark each, but not all were able to adequately explain each and so receive the extra two marks each.

Recommendations and guidance for the teaching of future candidates

Six candidates attempted option A, four C and six E. Some candidates from the same school chose different options, which seems to indicate that they need instruction from their teacher about how to attempt this paper.

Conclusion

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

The understanding of the action verbs (e.g. state, list, outline, describe, explain – see pages 8 and 9 of the Guide) seems to be continuing to increase in relation to required responses to questions. It also

seems that more candidates are recognising the significance of the mark weighting in relation to the expectations of the answer, though there are still some candidates who do not use this link. Familiarity with the way that the paper is constructed and particularly the way that action verbs signal expectations is an important part of candidate preparation and cannot be over-emphasised.

Teachers should continue to stress the importance of 'sign-posting' answers with headings and bullet points or using tables to identify distinct points. Candidates should also be encouraged to confirm their understanding of the extent of the answer required by checking the mark allocation for the question.
Teachers should continue to familiarise themselves with the Group 4 Grade Descriptors (see Appendix 2). The examining team continues to strive to:

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

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

