

DESIGN TECHNOLOGY

Overall grade boundaries

Higher level

Grade:	1	2	3	4	5	6	7
Mark range:	0-14	15-26	27-36	37-49	50-63	64-76	77-100

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0-14	15-29	30-39	40-52	53-63	64-76	77-100

Introduction

The May 2003 examination session is the first May session for the new Guide. Specimen papers have been available for some time and hopefully have been helpful to teachers preparing students for the new examinations. The examining team continues to be aware of the importance of both examination papers and the subject report in facilitating the preparation of candidates for future examination sessions. This first set of examination papers and the resultant report will add to the material available to support teachers in their work.

The structure of the examination papers has not changed in any significant manner, apart from additional questions worth 8 marks in Section A of the Higher Level Paper 2 bringing the total raw mark for Paper 2 Higher Level to 60 marks. However, the changes in the syllabus particularly relating to the ‘greening’ of the Guide and the banishing of ‘Electronics’ to Option H have had significant impacts on the accessibility of the papers.

Overall numbers of candidates has increased significantly for May 2003, especially at Higher Level, and the number of Higher Level candidates was 165 compared with 87 candidates at Standard Level. This has resulted from an overall growth in the number of Schools involved and a significant number of Schools having more candidates at Higher Level.

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. 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.

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

interpolation from these three boundaries. The boundaries for Paper 1 are set with reference to the Paper 2 boundaries as the Papers 1 and 2 have the same syllabus coverage.

Standard level paper 1

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	26-29

General comments

Six G2s were received. The paper was considered by three G2s to be of similar standard to the previous year. Four G2s considered the level of difficulty appropriate. Two considered syllabus coverage satisfactory and two considered it good. Three G2s considered clarity of wording satisfactory and one considered it good. The presentation of the paper was considered to be satisfactory by two G2s and good by two. Some G2s commented on specific questions and these are discussed below. Most of the questions stimulated little comment on the G2s.

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	4	72*			94.73	.16
2	3	44	15	14*	18.42	.16
3	4	5	67*		88.15	.32
4	51*	2	11	12	67.10	.60
5	29	36*	4	7	47.36	.44
6	8	37	7	24*	31.57	.24
7	1	16	52*	7	68.42	.56
8	63*	12	1		82.89	.32
9	16	2	3	55*	72.36	.28
10	70*	1	1	4	92.10	.20
11	2	66*	2	6	86.64	.32
12	5	8	55*	8	72.36	.40
13	9	13	28	26*	34.21	.36
14	64*	9	3		84.21	.28
15	2	56*	15	3	73.68	.52
16	Removed from examination					
17	61*	10	1	4	80.26	.44
18	2	71*	3		93.42	.20
19	44	6	2	64*	84.21	.24
20	5	7	55*	9	72.36	.60

21	5	65*	1	5	85.52	.36
22	35*	24	10	7	46.05	.68
23	3	3	65*	5	85.52	.36
24	1	71*	3	1	93.42	.16
25			2	74*	97.36	.08
26		2	63*	11	82.89	.20
27	5	2	4	65*	85.52	.28
28	70*	2	1	3	92.10	.08
29	13	3	13	47*	61.84	.52
30	7	61*	4	4	80.26	.40

Question setters use a grid to develop the paper and allocate questions to topics according to the hour weightings as identified in the Guide (see Appendix 1). The grid has changed from the previous year in the light of the new Guide.

On reflecting on candidate performance and teacher response via G2s, the examining team will continue to emphasise to question setters the importance of minimising the length of the question stems to ensure accessibility by English as Second/Foreign Language candidates. However, in attempting to define design contexts as unambiguously as possible the word length can increase.

General comments on the G2s for Paper 1s from previous years have suggested that one particular style of the question seems less accessible to candidates, i.e. the three options I, II and III with the answers being I and II, I and III, II and III or I, II and III. Limits will be set on the extent of use of this style of question and additional complications, such as double negatives, will **not** be used.

Question 12

One G2 commented that this question, specifically the use of the word ‘legislative’, was not suitable for second language students and that it would have been better to use the word legislation. The question did not seem to pose candidates any particular problems and was not negatively discriminating and was answered correctly by 55 candidates. The question was not removed from the examination

Question 16

One G2 asked which two pieces of a waterproof jacket were being referred to. Whilst the candidate performance did not indicate any particular problems the comment was felt a fair comment by the examining team and the question was removed from the examination.

Question 27

One G2 asked if this question is really relevant to the rest of the syllabus. Designers need to know about consumer attitudes to recognise trends in consumer demand. Response to green issues are a significant issue in consumer attitudes. The question was not removed from the examination.

Standard level paper 2

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

Five G2s were received. Three stated that the paper was of a similar standard to last year's. Five G2s thought the level of difficulty was appropriate. Four said that syllabus coverage was appropriate and one said that it was good. Five G2s rated clarity of wording as satisfactory. Two G2s said that the presentation of the paper was satisfactory and three said it was good.

There was evidence that many candidates had been better prepared for the style and format of the paper than earlier cohorts of candidates. The examining team would wish to reinforce the need for papers to collect evidence for the group 4 level descriptors and to enable grading of scripts into grades 1 to 7. 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 the importance of attention to detail, e.g. always including units with the answer to calculations. This should also come through from the internal assessment work.

There was less evidence that weaker candidates, having been put off by not being able to answer one element of a question, had not persisted and attempted to answer later elements of the question. The examining team pleads that teachers continue to encourage candidates not to be put off. The labelling of questions and sections of the questions as (a), (b), (c) with sub-sections labelled (i), (ii), etc. should help to signpost questions for candidates. 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.

In general candidates made a reasonable attempt at the paper. It was pleasing to see that better candidates had considered how to structure their answers for part (c), the extended response element, of the Section B questions.

Section A - Question 1

The examining team can only apologise for the missing dimension. The markscheme used found a way to be as fair as possible to all candidates. The issue did not seem to have an effect on performance on subsequent parts of the paper.

Question 1 discriminated well. Again some good candidates failed to achieve high marks not because they lacked knowledge and understanding but because their answers were not precise enough. To gain full marks for questions based on calculations candidates need to ensure that they state the appropriate units with the numerical answer. Where candidates are picking up data from tables they need to ensure they understand the significance of the units stated. They may need to convert units, e.g. mm to metres, to use them in calculations. This exercise is seen as appropriate by the examining team as it reflects the reality of design. On a database question of this type some of the data is redundant. Part of the skill shown by better candidates is their ability to sort out the data and achieve the correct answer.

Section A - Questions 2 and 3

These posed no particular problems for candidates and were good discriminators. Question 2 (b) elicited two types of response – one re manufacture of the extruded pipe and one re conversion of the pipe into the railings. Since the examining team felt that there was some ambiguity in this two versions were included in the markscheme so candidates were not disadvantaged.

Section B - Questions 4, 5 and 6

The three additional quality marks awarded for questions in Section B for clarity of argument (1 mark), designer’s logic (1 mark) and communication (1 mark) have gone and the markscheme identifies the allocation of 20 marks rather than 17 + 3 as in previous sessions.

There was good parity of questions as evidenced by the fairly even selection of questions 4, 5 and 6 by candidates. The extended response question is a major challenge to 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 go into a ‘stream of consciousness’ and just waffle on 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. A table or bullet points helps organise a response and candidates using such devices generally achieve higher marks by being able to identify clearly different points in their responses.

Standard level paper 3

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-3	4-6	7-8	9-13	14-17	18-22	23-30

General comments

Again the format for each of the Paper 3 options is that question 1 is a database question providing data in the form of a table, bar chart, photograph, flow chart, etc.. The database acts as 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 ‘sting in the tail’ of the database question and the extended response question that the more able candidates can demonstrate their ability and weak candidates can be better discriminated from stronger candidates.

Five G2s were received. Three G2s suggested that this year’s paper was of a similar standard to last year. Four suggested that the level of difficulty was appropriate and one that it was too easy. Syllabus coverage was considered by four G2s to be satisfactory and one to be good. Clarity of wording was rated as satisfactory by four G2s and good by one. Presentation of the paper was considered satisfactory by two G2s and good by three.

The inconsistency of candidate responses to options selected at individual schools suggests that some candidates are tempted to answer options that they have clearly not been taught and this obviously impacts on their performance.

Higher level paper 1

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-10	11-14	15-18	19-23	24-29	30-34	35-40

General comments

Five G2s were received for this component. One G2 suggested that the paper was a little easier than the previous year and two stated that the paper was of a similar standard. All five rated the level of difficulty as appropriate. Three G2s said that syllabus coverage was good and two said it was satisfactory. Clarity of wording was rated satisfactory by one G2 and good by three. Four rated the presentation of the paper as good and one as satisfactory. Some of the questions elicited specific G2 comments as discussed below.

The table below includes the number of candidates selecting each response and the difficulty index of each question. A lower difficulty index indicates a harder question. The correct response is indicated with an *.

Question	A	B	C	D	Difficulty Index	Discrimination Index
1	8	151*	1	2	93.20	.14
2		6	140*	16	86.41	.24
3	48	85*	7	22	52.46	.37
4	3	13	134*	12	82.71	.31
5	30	3	9	120*	74.07	.33
6	22		112*	28	69.13	.50
7	9	123*	7	23	75.92	.22
8	19	29	58	56*	34.56	.25
9	9	112*	33	8	69.13	.48
10	117*	35	5	5	72.22	.59
11	104*	33	13	12	64.19	.51
12	7	152*	3		93.82	.05
13	5	140*	3	13	86.41	.16
14	24		134*	4	82.71	.20
15	12	4	140*	6	86.41	.31
16	2		1	159*	98.14	.05
17	18	3	3	138*	85.18	.27
18	84	15	8	55*	33.95	.20
19	26	9	30	97*	59.87	.44
20	5	135*	3	19	83.33	.14
21	153*	3	4	2	94.44	.14
22	3	3	152*	4	93.82	.11
23	15	18	11	118*	72.83	.48
24	70*	43	13	36	43.20	.27
25	28	108*	21	5	66.66	.38
26	18	46	13	84*	51.85	.33
27	7	18	100*	37	61.72	.53
28	131*	5	28	8	80.86	.37
29	44	2	104*	12	64.19	.24

30	17	9	32	104*	64.19	.48
31	19	128*	8	7	79.01	.37
32	112*	2	3	35	75.30	.44
33	19	5	135*	3	83.33	.37
34	1	7	16	138*	85.18	.24
35	155*	3	2	2	95.67	.12
36	6	142*	7	7	87.65	.31
37	149*	5	2	6	91.97	.18
38	80*	6	5	71	49.38	.18
39	5	7	145*	5	89.50	.20
40	114*	22	20	6	70.37	.29

The general comments on Paper 1s for the Standard Level paper apply equally to the Higher Level paper and will not be repeated here. One G2 commented on a lack of quantitative answers now that the electronics is no longer in the core. Certainly the removal of electronics from the core has had a great impact on the content of Papers 1 and 2. There were a large number of candidates who just ignored the electronics questions in previous years whereas this year there is no sense of chunks of the Guide being ignored so that the overall effect is of greater accessibility.

Question 8

One G2 commented that density (or the lack of it) is relevant in all the design contexts. The question was a good discriminator and not negatively discriminating, so was left in the examination.

Question 32

One G2 commented that this question requires candidates to know what materials a racing car body shell is made from. The examining team agree that this is a fair comment. Since the question was a good but not negative discriminator it was left in the examination.

Question 37

One G2 commented about the use of the word ‘stratospheric’ in this question. The question posed no problem to candidates and was left in the examination. However, the comment raises an interesting issue. The examining team try to stick to words that are used in the Guide, either in the assessment statements or in the Teacher’s notes underneath the assessment statements. It is clear that some teachers share the Guide with candidates and use it as an organising framework for delivery of the programme or in revision sessions. However, it is equally clear that some teachers do not. The examining team tries to avoid unnecessary words to make the papers as accessible as possible for second language candidates. It was felt necessary to include the word here and it is a word with which candidates should have been made familiar.

Question 40

One G2 commented on the use of the word ‘exchange value’. Again this is a term which is included in the Teacher’s notes under the appropriate assessment statement. The question was not problematic for candidates and was left in the examination.

The mean for Paper 1 over the past five years is interesting and shows a five point jump as shown in the following Table.

Mean	Year
20.4	1999
23.5	2000
25.6	2001
24.8	2002
29.8	2003

This is attributed to the electronics issue, which can only be described as having been extremely badly taught in some Schools so that candidates were not in a position to attempt the questions at all as evidenced by performance on Paper 1 and Paper 2. The greening of the Guide has enhanced the holistic nature of the subject and its accessibility to candidates.

Higher level paper 2

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-5	6-10	11-17	18-25	26-34	35-42	43-60

General Comments

Four G2s were received. Two suggested that the paper was of a similar standard to the previous year. Three said that the level of difficulty was appropriate. One G2 suggested that syllabus coverage was poor and two said it was satisfactory. Two G2s suggested that the clarity of wording was satisfactory and one said it was good. One G2 said the presentation of the paper was satisfactory and one said it was good.

The major, indeed only real issue with this paper was the missing dimension in Paper 2, which impacted on Question 1 (a) (iii). There is one dimension missing from each paper but it is not the same dimension. As always in these situations, which fortunately have been fairly rare, the examining team tries to ensure that there is no disadvantage to candidates. Clearly without this dimension the candidates could not answer the question. Candidates found different ways to come up with an answer and these attempts were rewarded appropriately.

One G2 commented about the use of a semi-glossy paper, which caused some students to have problems with wet/smudging of ink. The recyclability of glossy paper is something that is covered in the Guide. Hopefully, a matt paper will be able to be used for future sessions.

Section A

Each question within Section A should be separate and not build on from previous sections to cause issues of double jeopardy. 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 and is the nub of Paper 2. Apart from the missing dimension this question posed no particular problems for candidates. The question was a good discriminator and

poor candidates achieved very low marks and good candidates very high marks so using the full range of the scale. This has not always been the case. The accessibility of the design context selected for the question was considered to be a major factor in this. Whilst in previous year the examining team would defend the appropriateness and fairness of the questions set, it would not be as easy to defend the accessibility of some of the contexts. Also the electronics issue has affected accessibility. Before an electronics section or sub-section, e.g. using digital logic, would not be attempted by some even very good candidates so higher marks were not easily achieved.

Question 2, 3, 4 and 5

These provided syllabus coverage and were not specifically commented upon by G2s. The questions provided a highly discriminating assessment tool.

Section B

Parity of Section B questions and syllabus coverage remain conflicting constraints. In this years Section B questions the examining team has tried very hard to produce equally difficult questions whilst achieving syllabus coverage. The fairly well-balanced numbers of responses for each of the questions is perhaps the best indicator that candidates did not perceive any one question to be any more or less difficult or accessible than any other. The three quality marks, awarded for clarity of argument (1 mark), designer’s logic (1 mark) and communication (1 mark), have gone and all marks are included explicitly into the markscheme which identify 20 marks rather than the 17 + 3, which was the previous practice.

Each question covered green issues. The examining team sees the ‘greening’ of the Guide as a major change in the development of this version. Whilst Section (c) may be ‘green’ in future sessions, it may not be. Please do not take this year as a signal that it will always be green.

Good candidates were able to provide a clear structure to their answers, especially the extended response in section (c) (ii). With a framework candidates are able to ensure that they provide a balanced response. Where there is evidence of candidates planning their answers, perhaps in pencil and crossed out afterwards, there was also evidence that the planning benefited the coherence of the answer. Some candidates did not answer the question asked and did not achieve marks. Where a candidate was responding in a ‘stream of consciousness’ rather than in a coherent fashion there was often a large volume of answer but in not addressing the points in the question candidates did not achieve marks. Volume is no indicator of quality!

Higher level paper 3

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-4	5-8	9-10	11-17	18-24	25-31	32-40

General comments

The paper appears to have been well received by both candidates and teachers. Four G2s were received. Two G2s commented that the paper was of a similar standard to the previous year. The G2s suggested that the level of difficulty was appropriate and syllabus coverage, clarity of wording and presentation of the paper were satisfactory or good.

Good discrimination was achieved throughout the paper with the best candidates scoring almost full marks and the weakest very low marks. Again, a general criticism of candidates is that the use of specific technical terms was rather limited except by the better candidates and lack of precision in answers was fairly widespread, especially with higher order questions.

Options E and F are the most popular with Option D close behind. Option G and Option H were notably unpopular.

Some candidates dilute their effort by ignoring the instruction to select two of the Options. Where candidates do not indicate which two options they are answering on the front page of the answer booklet the examiners will mark the first two options selected. In such cases, which generally involve weaker candidates, it is difficult to tell whether candidates have studied more than one option or whether they were not clear about which options they were studying. It is the feeling of the examining team that the data-based question in each section should provide a context in which the syllabus can be explored rather than being another opportunity for data handling.

Candidates seemed better prepared for the extended response questions and provided much more balanced answers than often there has been previously and teachers are to be congratulated for this. There seemed to be good parity between the options in terms of the challenge offered by the extended response questions as evidenced by candidate performance. It was noticeable 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. The extension material for HL in each option explores global issues. There was some evidence that some candidates had not come to terms with this.

Overall the Paper 3s produced a better spread of marks and addressed the upward drift of marks, which had become a feature of later papers examining the previous version of the Guide. The ‘beefing up’ of the options in terms of content has been a welcome change for the examining team who have more material to explore in question papers and has resulted in Paper 3 becoming a more discriminating instrument, which is welcome.

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.

Higher and standard level internal assessment (IA)

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

With the increase in new schools this year an even more diverse range of practical programmes has been evident.

The major modification to the assessment procedure which sets Design Technology apart from the other Group Four subjects is the compulsory Design Project element. Not all schools realised that they were required to use the Design Project as evidence for each set of assessment criteria on the

4/PSOW form. As two 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 mark for any of the other investigations.

Fortunately, in schools where the Design Project had not been highlighted on the 4/PSOW form, moderators were able to highlight the mark themselves as projects had been included in the sample material. Hence, the necessity of asking for a re-mark by such centres was avoided.

The importance of the Design Project was appreciated by the majority of schools and practical programmes had been planned to give students suitable experience of using the design process prior to tackling the Design Project itself. Where this had not taken place there tended to be major inconsistencies in the evidence produced by the students.

In order to try and help students to carry out the Design Project, Topic One in the subject guide sets out the requirements for a design brief and specifications (1.1.1/1.1.2), and ideas generating techniques (1.4). Different types of communication techniques are also explored (1.5) to assist students with design development. The importance of using appropriate modelling techniques should be noted as this was a weakness in many students' work.

In quite a large number of schools the use of the Log Book compared to the Project Report is still not fully appreciated. In some instances students wasted valuable time repeating evidence or there were so many gaps in the work it was difficult to make a good holistic judgement as to what had taken place.

Astute use of photographs by many students communicated effectively 3D practical work. The increase in availability of digital photography is immensely helpful in this respect. This is not to say that there is an expectation that digital photographs have to be included, just to say how they can enhance the evidence provided.

Schools have the freedom to develop a practical programme which suits the resources and expertise available as long as the evidence produced by students matches the assessment criteria. Many teachers have become adept at using both the Design Project assessment criteria and the assessment criteria common to all the Group Four subjects. The nature of each practical investigation dictates which set of criteria is appropriate to use. Design Technology teachers are in a unique situation compared to teachers of other Group Four subjects in that they may decide which set of criteria they wish to use for a particular investigation as long as the investigation is planned with that criteria in mind. The balance between the use of each set of criteria is the school's decision except, of course, that the Design Project must address the Project Criteria.

The use of the Group Four Project for assessment is still a cause for concern in some schools. The problem for moderation is usually that one report is produced compiled by all members of the group but it is not clear what the individual input of each member of the group has been. This is made especially difficult when planning (a) and planning (b) is assessed using the Group Four Project but all members of the group have the same hypothesis or design brief and identify the same procedures for practical investigation.

Another cause for concern is the nature of research used for Data Collection and Data Processing and Presentation especially for project-based investigations. In many instances the data gathered is not RAW but a literature search of existing data and errors and uncertainties are neither identified or explained.

In order to assist teachers further with planning suitable practical programmes and carrying out accurate assessment teacher support material (TSM) will shortly be available on the on-line curriculum centre (OCC). The material takes the form of exemplar investigations or parts of investigations (projects) with the use of the assessment criteria evident and explained. This material will supplement the more detailed exemplar work used at workshops.

It is satisfying to be able to report the continued development of challenging and interesting practical programmes in Design Technology departments.

CONCLUSION

The considerable increase in the candidature for the subject is perhaps the single most pleasing feature of this examination session. Congratulations to all candidates on their success and to teachers in facilitating this success.

There was good understanding this year of the action verbs (e.g. state, list, outline, describe, explain – see pages 8 and 9 of the Guide) and more evidence to suggest that candidates recognise the significance of the mark weighting in relation to the expectations of the answer. 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.

Good candidates took the advice from previous reports of ‘sign-posting’ answers with headings and bullet points or using tables to identify distinct points. 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. Answers from better candidates were notably more succinct, used appropriate terminology, provided clear and well-annotated diagrams where appropriate and structured their answers demonstrating a ‘designer’s logic’ (see the Grade Descriptor for Grade 7).

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.

With more new schools participating each year the subject continues to grow. The overall evidence of the May 2003 session is that candidates were well prepared for the examinations. The Grade Award team commented on the fact that candidates from **some** schools do not all answer the same options on Paper 3 and were slightly worried by this, particularly when this was coupled with poor performance. The Grade Award team came up with several explanations for this and teachers may like to reflect on these. One explanation is that some teachers do not realise that they only have to do two options and teach all the options thus not enabling sufficient time for the level of detail requisite for each individual option. A second explanation is that teachers do not teach options at all but allow candidates to select and study their own options. This is a worrying explanation as the recommended time allocations for the subject include an appropriate allocation for the study of optional material. Also there is the issue of the integration of IA into the optional material. The ‘hands on’ experience is important in the understanding of core and optional material. A third explanation is that whilst teachers teach two options that they do not emphasise which options they are and thus candidates are not able to make an appropriate selection in the examination room. A very small proportion of the

candidature attempt all options. The examining team recommend that teachers do not leave the teaching of the options to the end but integrate their teaching of the options with that of the core and particularly the IA.

The single most significant change in this version of the Guide is the shift towards ‘greenness’. This was reflected throughout the various assessment elements of the programme. In future sessions the examining team may specifically exclude recycling or other answers from questions as there was a tendency for some (weaker) candidates to trot out recycling in almost every answer. Whilst recycling is a critically important issue the team would not wish it to overshadow all other issues. Questions asking for factors influencing a particular design solution may thus be worded as ‘Apart from recycling, identify...’.

The HL extension material in the Options in Paper 3 has a global, international focus for each of Options D – H. This new material is significantly different to the previous Guide and there was some evidence that candidates had struggled to assimilate this material much more than they had struggled to assimilate the changes in the core. This made Paper 3 significantly more difficult than it has been in previous years and much more discriminating. When comparing the final grades for the individual papers it was noticeable that there was often one grade difference between papers 1 and 2 against paper 3 for individual candidates. Nonetheless it was pleasing that see that the final grades awarded by IBO correlated extremely well with School predictions.

The single most challenging part of the development of a good Design Technology programme is the development of the practical programme. One G2 comment relating to Option E which this year featured an embroidery machine was about ‘*access ... to this facility and do we expect all schools to have this facility?*’ The examining team understands that it is not possible for schools to have equipment to support all aspects of core and the selected options. However, there is a massive range of resources available in the form of CD-ROMs, videos and websites produced by a whole range of organisations which can **supplement** the ‘hands on’ experience provided through IA and these can again be supplemented by factory visits to local manufacturing industry, use of guest speakers, etc. to exemplify the principles developed in the Guide.

Overall the accessibility of Paper 2 and the strengthening up of Paper 3 balance out and the grade boundaries are remarkable stable, which is pleasing. It is clear that the subject is growing in popularity and that there is increasing subject confidence as reflected by some schools entering large numbers of candidates at HL. Hopefully in the next review of the subject there will be further consolidation of the subject to further enhance what has become an interesting and extremely relevant offering in Group 4. Design Technology is unique in being International Baccalaureate’s only applied science (to date) and in being developed as an experimental science – this is not the case for other examining boards. Whilst this uniqueness stems originally from the constraints of the hexagon it has worked to the longer-term benefit of the subject, which has now developed a solid foundation for further development.

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	2
4	8	3
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.

APPENDIX 2

Grade	Knowledge of facts	Understanding of concepts or principles	Analysis of quantitative and/or qualitative data	Explanation of phenomena	Problem solving	Communication	Insight and originality
7	comprehensive	thorough command applied in a wide variety of contexts	thorough	constructs detailed explanation of complex phenomena and makes appropriate predictions	solves most quantitative and or qualitative problems proficiently	logical and concise using appropriate terminology and conventions	Yes
6	very broad	thorough understanding applied in most contexts	high level of competence	constructs explanations of complex phenomena and makes appropriate predictions	solves basic or familiar problems and most new or difficult quantitative or qualitative problems	effective using appropriate terminology and conventions	occasional
5	Broad	sound understanding applied in some contexts	competence	constructs explanations of simple phenomena	solves basic or familiar problems and some new or difficult quantitative or qualitative problems	little or no irrelevant material	-
4	reasonable though some gaps	adequate understanding for basic concepts with limited ability to apply	some	-	solves basic or routine problems but shows limited ability to deal with new or difficult situations	adequate though some responses may lack clarity and include some repetitive or irrelevant material	-
3	mediocre	partial understanding for basic concepts with weak ability to apply	some	-	can solve basic or routine problems	possible lack of clarity and some repetitive or irrelevant material	-
2	little	weak understanding even for basic concepts and little evidence of application	minimal	-	little or no ability to solve problems	offers responses which are often incomplete or irrelevant	-
1	fragmented	-	-	-	-	-	-

DESIGN TECHNOLOGY - SPECIFIC EXAMPLES OF TERMS USED IN THE GROUP 4 GRADE DESCRIPTORS

FACTS

- Benefits of flexible manufacturing systems
- A crystal is a regular arrangement of atoms, ions or molecules
- Advantages and disadvantages of JIC/JIT in manufacturing
- Manufacturing process of iron and steel
- Advantages of mycoprotein
- Stages in the invention of the electric light bulb

CONCEPTS AND PRINCIPLES

- | | |
|---|--|
| <ul style="list-style-type: none"> • The design cycle • Design specification • Design brief • Constructive discontent • User-centred design • Analogy • Adaptation • Convergent thinking • Divergent thinking • Cost effectiveness • Value for money • Planned obsolescence • Fashion • Cybernetics • Feedback • Tensile strength • Ductility • Toughness • Hardness • Stiffness • Electrical resistivity • Thermal conductivity • Product cycle • Weight • Mass • Body load • Young's modulus • Yield stress • Stress • Strain • Grain size • Plastic deformation • Biocompatibility • Fuzzy logic • Reuse • Repair • Recycling | <ul style="list-style-type: none"> • Environmental impact • assessment matrix • Seasoning • Serial processing • Parallel processing • MP3 technology • Converging technologies • Appropriate technology • Intermediate technology • Alternative technology • Resource • Reserve • Sustainable development • Clean technology • Green design • Fixed costs • Variable costs • One off production • Batch production • Volume production • Percentile range • Incremental design • Radical design • Robust design • Lone inventor • Entrepreneur • Product champion • Life cycle analysis • Literature search • User trial • Expert appraisal • Performance test • User research • Corporate strategy • Pioneering • Imitative |
|---|--|

DATA ANALYSIS

Quantitative data analysis

- Calculate the Young's modulus of a material
- Calculate a tensile or compressive strain given values of force and area
- Calculate a tensile or compressive strain given values of the original dimension and the change in dimension
- Calculate the stiffness of a structure
- Calculate the factor of safety for a structure
- Interpret orthographic drawings

Qualitative data analysis

- Analyse a flow chart
- Analyse algorithms
- Interpret truth tables
- Analyse digital logic circuits

PROBLEM SOLVING

Quantitative problems

- Calculate the current through and voltage across resistors in series and parallel using Ohm's Law
- Calculate the gain of op-amps in practical circuits and the values of resistors in op-amp circuits to achieve specific gains
- Identify specific design contexts where a designer would use particular percentile ranges
- Evaluate the importance of forces in a design context
- Make design decisions based on the analysis of quantitative data

Qualitative problems

- Use of fuzzy logic in controlling the wash cycle in a washing machine
- Define an algorithm to communicate a process
- Analyse the environmental impact of consumer products using an environmental impact matrix

Basic or familiar problems

- Apply digital logic in the design of products
- Identify the importance of critical damping in a position control servo system
- Evaluate a product against a specification

PHENOMENA

Simple phenomena

- Behaviour of particles in melting
- Behaviour of particles in boiling
- Early, mature and late stages of the product cycle
- The reversible effect of temperature on a thermoplastic

- The contribution of the movement of free electrons to electrical and thermal conductivity of metals
 - Individual's reaction to technology

Complex phenomena

- Implications of MP3 technology on the traditional music industry
- Importance of international standards in the development of technology
- The evolution of electric vehicles
- The global consumer and the global marketplace
- Dimensional stability in the application of vascular prostheses

APPROPRIATE TERMINOLOGY AND CONVENTIONS

- 2D drawing techniques
- 3D drawing techniques
- Orthographic drawings
- Isometric drawings
- Exploded isometric drawings
- Perspective drawings
- Symbolic modelling
- Algorithms
- Flow charts
- Symbols for electronic components and digital logic gates
- Truth tables
- Boolean algebraic expressions
- Simple IF-THEN rules
- Processing block diagrams