# DESIGN TECHNOLOGY

## Overall grade boundaries

## Higher level

| **Grade**: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| **Mark range**: | 0-14 | 15-25 | 26-35 | 36-49 | 50-63 | 64-77 | 78-100 |

## Standard level

| **Grade**: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| **Mark range**: | 0-14 | 15-28 | 29-39 | 40-52 | 53-63 | 64-76 | 77-100 |

The November 2003 examination session is the first November and second examination 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 in increasing the accessibility of the papers.

The number of candidates for the November session is increasing gradually although there was a 'blip' last year and a considerably larger number of candidates were examined. This session saw five Standard Level candidates from two School and eleven Higher Level candidates from three Schools being examined. Only one School entered candidates at Standard and 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. One teacher used the G2s in this session to provide very positive feedback about the Higher Level paper and did not identify any problems and this was extremely helpful. No G2s were received for the Standard Level papers.

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 suitably 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 – 30 |

## General comments

No G2s were received for this paper.

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 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. Although the discrimination indices are not published as part of the subject report, all questions achieving a negative or low discrimination index are discussed at the grade award meeting. No questions got a negative discrimination index in this session.

| **Question** | **A** | **B** | **C** | **D** | Difficulty Index |
|---|---|---|---|---|---|
| 1 | | | 5* | | 100 |
| 2 | 4* | 1 | | | 80 |
| 3 | | | 5* | | 100 |
| 4 | | | | 5* | 100 |
| 5 | | 5* | | | 100 |
| 6 | | | 5* | | 100 |
| 7 | | | 1 | 4* | 80 |
| 8 | 3* | | 2 | | 60 |
| 9 | 1 | 4* | | | 80 |
| 10 | | 3 | 2* | | 40 |
| 11 | | | | 5* | 100 |
| 12 | 1 | | 4* | | 80 |
| 13 | 4* | | | | 80 |
| 14 | 5* | | | | 100 |
| 15 | | | | 5* | 100 |
| 16 | 2 | 1* | 2 | | 20 |
| 17 | | | | 5* | 100 |
| 18 | | 5* | | | 100 |
| 19 | 1 | | 3* | 1 | 60 |
| 20 | | | | 5* | 100 |
| 21 | 4* | | 1 | | 80 |
| 22 | | 5* | | | 100 |
| 23 | | 2 | 3* | | 60 |

 

| | | | | | |
|---|---|---|---|---|---|
| 24 | 4* | | | 1 | 80 |
| 25 | | 4* | | 1 | 80 |
| 26 | 3 | | | 2* | 40 |
| 27 | 3* | | 2 | | 60 |
| 28 | | 5* | | | 100 |
| 29 | 2 | 2 | 1 | | 20 |
| 30 | | 2* | 3 | | 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 that used in the previous Guide.

On reflecting on candidate performance and teacher response via G2s in previous sessions, 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 II 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.

## 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

No G2s were received.

Candidates seemed relatively 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 be reinforced through the IA work.

Whilst there was no evidence from this small candidature that weaker candidates had been put off by not being able to answer one element of a question and had not persisted to attempt 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 action verbs are important indicators of the nature and extent expected in answers. It is worth teachers continuing to emphasise 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**

Question 1 discriminated well. 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. seconds to minutes, to use them in calculations. This exercise is seen as appropriate by the examining team and 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 through the data and achieve the correct answer.

**Section A - Questions 2 and 3**

Posed no particular problems for candidates and were good discriminators.

**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) in the previous iteration of the Guide have gone and the mark scheme now identifies how the full allocation of 20 marks should be made rather than 17 + 3 as in previous sessions. This is seen as providing greater parity between examiners.

One candidate attempted Question 4 and four attempted Question 6. No candidates attempted Question 5. There seemed to be no particular problems with Question 5 that would have discouraged candidates from attempting it. With such a small candidature this is not an unexpected outcome.

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.

No G2s were received.

Candidates attempted options A (three candidates), C (five candidates) and F (two candidates). Where there is an inconsistency of candidate responses to options selected at individual schools, this suggests that some candidates are tempted to answer options that they have clearly not been taught and this obviously impacts on their performance. There was no evidence of this in this session.

# Higher level paper 1

## Component grade boundaries

| **Grade**: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| **Mark range**: | 0 - 10 | 11 - 13 | 14 - 17 | 18 -23 | 24 - 29 | 30 - 35 | 36- 40 |

## General comments

One G2 was received for this component, which suggested that the paper was of a similar standard to the previous year's paper. It said that the level of difficulty was appropriate and syllabus coverage, clarity of wording and presentation of the paper were good.

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 |
|---|---|---|---|---|---|
| 1 | 1 | | 10* | | 90.90 |
| 2 | 2 | | 8* | 1 | 72.72 |
| 3 | 3 | 7* | | 1 | 63.63 |
| 4 | | | 6 | 5* | 45.45 |
| 5 | 2 | 9* | | | 81.81 |
| 6 | 1 | 2 | 7* | 1 | 63.63 |
| 7 | | 1 | 1 | 9* | 81.81 |
| 8 | 10* | | 1 | | 90.90 |
| 9 | | | | 11* | 100.00 |
| 10 | | | | 11* | 100.00 |
| 11 | 2 | | 9* | | 81.81 |
| 12 | | 8* | 3 | | 72.72 |
| 13 | 9* | | 1 | 1 | 81.81 |
| 14 | 1 | 10* | | | 90.90 |
| 15 | | 1 | 8* | 2 | 72.72 |
| 16 | 3 | | | 8* | 72.72 |
| 17 | 1 | 8* | 1 | | 72.72 |
| 18 | 9* | | 1 | 1 | 81.81 |

 

| | | | | | |
|---|---|---|---|---|---|
| 19 | 2 | 4 | 4* | 1 | 36.36 |
| 20 | 2 | 5* | 3 | 1 | 45.45 |
| 21 | | 1 | | 10* | 90.90 |
| 22 | | 9* | 2 | | 81.81 |
| 23 | 7* | 2 | 1 | 1 | 63.63 |
| 24 | 4 | 6* | | 1 | 54.54 |
| 25 | 1 | | 10* | | 90.90 |
| 26 | | 1 | 2 | 8* | 72.72 |
| 27 | 9* | 1 | 1 | | 81.81 |
| 28 | 1 | 1 | 6* | 3 | 54.54 |
| 29 | | 5* | 5 | 1 | 45.45 |
| 30 | 4* | 6 | 1 | | 36.36 |
| 31 | 5* | 4 | 2 | | 45.45 |
| 32 | 2 | 2 | 7* | | 63.63 |
| 33 | 1 | 6 | 2 | 2* | 18.18 |
| 34 | 3 | | 6* | 2 | 54.54 |
| 35 | 1 | 2 | | 8* | 72.72 |
| 36 | 4 | 1 | | 6* | 54.54 |
| 37 | 7* | 1 | 1 | 2 | 63.63 |
| 38 | 7* | 3 | | 1 | 63.63 |
| 39 | 11* | | | | 100.00 |
| 40 | 4* | 4 | 2 | 1 | 36.36 |

The general comments on Paper 1s for the Standard Level paper apply equally to the Higher Level paper and will not be repeated here. 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 sessions whereas this year there is no sense of chunks of the Guide being ignored so that the overall effect is of greater accessibility.

The mean for Paper 1 over the past five years for the May session is interesting and shows a five point jump as shown in the following Table. There is similarly a jump of four points for the November session, although the low numbers of candidates means that no major conclusions can be drawn from this observation.

| Year | May Mean | November Mean |
|---|---|---|
| 1999 | 20.4 | - |
| 2000 | 23.5 | 23.0 |
| 2001 | 25.6 | 21.5 |
| 2002 | 24.8 | 19.0 |
| 2003 | 29.8 | 23.4 |

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 their performances on Papers 1 and 2. The 'greening' of the Guide has further 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

One G2 was received. It suggested that the paper was of a similar standard to the previous year, that the level of difficulty was appropriate and that syllabus coverage, clarity of wording and presentation of the paper were good. It commented that the integration of the syllabus topics seemed to be more natural and that all the examples were within the scope of student experience and that question 1 was particularly appropriate.

**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, Section A. 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. The electronics issue has had a major impact on the accessibility of the paper. In papers based on the previous version of the Guide, an electronics section or sub-section, e.g. using digital logic, would not be attempted even by very good candidates so higher marks were not easily achieved.

**Questions 2, 3, 4, 5 and 6**

These provided syllabus coverage and were not specifically commented upon by the G2. The questions provided a highly discriminating assessment tool.

**Section B**

Parity of Section B questions and syllabus coverage remain conflicting constraints. In this year's Section B questions the examining team had tried very hard to produce equally difficult questions whilst achieving syllabus coverage. The fairly well-balanced numbers of responses for each of the questions (Question 7 – two responses, Question 8 – six responses, Question 9 – three responses) is a good 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 mark scheme which identifies 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' or 'appropriate' in future sessions, it may not be. Please do not take this year as a signal that it will always be 'green' or 'appropriate'.

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 lengthy answer but in not addressing the points in the question candidates did not achieve marks. The length of the answer is no indicator of quality!

## Higher level paper 3

## 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

One G2 was received. It suggested that the paper was of a similar standard to the previous year, that the level of difficulty was appropriate and that the syllabus coverage, clarity of wording and presentation of the paper were good. The photographic images were commended.

Good discrimination was achieved throughout the paper with stronger candidates scoring very high marks and weaker ones 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 and answered by all but one of the candidates who opted for Option H. Options D and G were not attempted in this session at Higher Level.

In some previous sessions some candidates have diluted their effort by ignoring the instruction to select two of the Options and have elected to answer all 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 in the past 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, length of answer 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)

## 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 |

Four schools entered candidates for this year's examination which was surprisingly no increase on the previous years entry.

Administrative procedures continue to give cause for concern. Teachers responsible for compiling the 4/PSOW forms should ensure they are fully cognizant with the requirements for moderation documentation. All details are produced in the vade mecum which IB Co-coordinators have or they can be accessed from the IB web-site

In some instances the 4/PSOW forms were not completed accurately and the majority of work sent for moderation was not "flagged" to indicate which aspects of the work to focus on for different assessment criteria

Moderators need to gain a good comprehension of what the practical programme has contained before looking at individual pieces of work. Sufficient evidence is therefore required of assignments set and the timescale involved.

Although it is possible for HL and SL students to be taught together for some parts of the course, HL students will undertake the extension material and practical programmes should differentiate between the two levels. This is especially important with the Design Project. The students are allocated more time for tackling the project so consequently more is expected of them.

The major modification to the assessment procedure, which sets Design Technology apart from the other Group Four subjects, is the compulsory Design Project element. In May, not all centres had 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 Centres 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 centres and practical programmes had been planned to give students suitable experience of using the design process prior to tackling the Design Project itself. In centres where this obviously had not taken place there tended to be huge inconsistencies in the evidence produced by the student.

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.

If a common theme is set for the design project work of all students, care must be taken to ensure that each individual student develops their own design brief and specifications. Planning (b) (often set out as a "production plan" for projects) should not be a retrospective account of what had taken place. Documentation of the realisation stage of the project should show how the practical work has progressed and indicate clearly changes made to the original planning procedure. Digital photography is a great help in this aspect.

In quite a large number of centres 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 of 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.

Centres 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 centre'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 centres. The problem for moderation is usually that one report is produced compiled by all members of the group but 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 addressed by 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) is 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.

In centres where it is clearly evident that practical programmes have been planned to take into account the requirements of the assessment criteria, moderation went smoothly.

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

## Conclusion

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. When the question asks the candidate to 'Explain **one** issue', listing three issues will gain one mark not three. Objective 3 action verbs, such as Explain require a deeper explanation.

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, particularly in May, the subject continues to grow. The overall evidence of the November 2003 session is that candidates were well prepared for the examinations. The May 2003 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 (for examination 2003 – 2008) 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 dominate 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 with a concomitant impact on the grade boundaries for Paper 3 although these were compensated by the effect of the new Guide on Paper 1.

The single most challenging part of the development of a good Design Technology programme is the development of the practical programme. 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. A list of resources generated by participants in the Bilbao workshop is included in Appendix 4. This list is not exhaustive but might trigger ideas for teachers. Practical work is key and must not be supplanted by these additional resources.

Overall the enhanced accessibility of Papers 1 and 2 and the strengthening up of Paper 3 balance out. 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 in May. 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 tyranny 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 | - | - | - | - | - | - |

 

APPENDIX 3

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**

- 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
- Biocompatability
- Fuzzy logic
- Reuse
- Repair
- Recycling
- 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

Appendix 4

DESIGN TECHNOLOGY RESOURCES

Potential sources of Design Technology resources identified by teachers at the Bilbao Workshop include:

- parents;
- buying old Lego by the kilo;
- taking apart old domestic equipment to see how it works;
- local industry;
- Opitec (UK) produce automaton kits including mechanisms and wooden wheels;

http://www.opitec.com/

- TEP (**T**echnology **E**nhancement **P**rogramme) catalogue is very cheap and includes cheap solutions for injection moulding;

http://www.tep.org.uk/res_cat.htm

- Crocodile clips

http://www.crocodile-clips.com/index.htm

- K and M (US)

http://www.kandm.com/

- Engineering Education Scheme (UK)

http://www.engineering-education.org.uk/

- Examining Boards (UK & US)

**W**elsh **J**oint **E**ducation **C**ommittee - http://www.wjec.co.uk/

**Assessment and Qualifications Alliance - http://www.aqa.org.uk/.**

EDEXCEL - http://www.edexcel.org.uk/

OCR - http://www.ocr.org.uk/

**S**cottish **Q**ualifications **A**uthority - http://www.sqa.org.uk/

EIRE (Department of Education & Science) –

http://www.education.ie/home.jsp?category=10917&language=EN

Nuffield Curriculum Center - http://www.nuffieldcurriculumcentre.org/

**A**dvanced **P**lacement (USA) - http://www.collegeboard.com/student/testing/ap/about.html

- Guest speakers
- Other teachers
- Industrial and other visits, e.g. to Design Museums, to factories doing craft production, e.g. cut glass or ceramics, IKEA for flat pack furniture

http://www.designmuseum.org/

http://www.ikea.com/

- The Design Magazine: Design Council (UK) which included photographs of design projects completed by students the same age as IB students

http://www.idonline.com/

- DATA (**D**esign **A**nd **T**echnology **A**ssociation) membership

http://www.data.org.uk/welcome/welcome.htm

- Design Tools – a 2-D design tool produced by TECHSOFT, Mold (£200 for site licence)

http://www.denford.co.uk/techsoft.htm

- Economatics (UK) who produce Logicator and pneumatics kits

http://www.economatics.co.uk/

- Advanced Design Technology book by Eddie Norman, Syd Urry, Joyce Cubitt and Mike Whittaker

http://www.longman.co.uk/secondary/design_tech/16-18kt.htm

- "Collins GCSE CDT: Design And Realisation" - Chapman C, Peace M.

http://www.collinseducation.com/books/book.aspx?id=9514

- Stuart Dunn's book which includes photocopiable Design Technology assignments

http://www.collinseducation.com/books/book.aspx?id=14159

- Design and Make assignments

http://www.technologystudent.com/

http://www.nelsonthornes.com/secondary/d&t/index.htm

- Phillip Harris catalogue and other suppliers, e.g. Draper Tools or Technology Supplies UK

http://www.draper.co.uk/

http://www.philipharris.co.uk/

http://www.technologysupplies.co.uk/

- Cabaret Mechanical Theatre (UK)

http://www.cabaret.co.uk/

- Flying Pig - can download automata designs, print them on card and make them;

http://www.flying-pig.co.uk/

- Technology in Practice – John Cave, sponsored by TEP (**T**echnology **E**nhancement **P**rogramme) which includes colour pictures and some good analysis

http://www.johnmurray.co.uk/index.asp?url=bookdetails.asp&book=50254

- Royal College of Art's Advanced Manufacturing Technology, Case Study and Product Analysis

http://www.amazon.co.uk/exec/obidos/ASIN/0340705280/026-3595762-9532416

- Collins Series – Technology, Communication, Realization

http://www.collinseducation.com/books/book.aspx?id=9514

- Lots of good CD-ROMs, e.g. Focus on plastics, TEP (**T**echnology **E**nhancement **P**rogramme) Manufacturing Technology including 3-D animation of processes

http://www.focuseducational.com/main.htm

- Videos, e.g. on manufacture of timber, manufacture of biscuits, The Design Council, Channel 4, Seymour Powell – design of bins, shopping trolleys, seats for Swiss Air, electric car (green issues), toilets;

http://www.designcouncil.org.uk/webdav/servlet/XRM?Page/@id=6000

http://www.seymourpowell.com/home.html

http://www.channel4.com/learning/main/secondary/des_tech.htm

- Sky/Star satellite TV system provides access to BBC2 and the Discovery channel which has good coverage of technological issues

http://www.discovery.com/

http://www.bbc.co.uk/learning/index.shtml

- Internet – use search engines to find relevant websites (here are a few):

http://www.google.com/

http://www.lycos.com/

http://www.yahoo.com/

http://www.dogpile.com/info.dogpl/

http://www.teoma.com/

http://www.altavista.com/

- Materials, e.g. perspex can be bought from Technology Supplies (up to 1m square), K and M do offcuts

http://www.technologysupplies.co.uk/

- Open University Secret Life series – washing machine, motor car;

http://www.open.ac.uk/frames.html

- Centre for Alternative Technology, (UK)

http://www.cat.org.uk/

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