DESIGN TECHNOLOGY

Introduction

The November session has a relatively small candidature although it is growing exponentially year by year. There is a core of schools/colleges which have offered the course for many years and teachers have built up considerable experience of teaching the various components. Teachers new to the course will be able to reflect on the grades achieved by their students compared to the predicted grades sent to the IB prior to the examination session. This report highlights strengths and weaknesses of the candidature as a whole in relation to components of the examination and individual questions on the written papers.

104 candidates sat the Higher Level papers and 34 candidates sat the Standard Level papers. At Higher Level there was generally a good standard of candidature displaying sound knowledge of the syllabus while at Standard Level there was a distinct split between the more able candidates who scored very well on most questions and the less able candidates who struggled to cope with the demands of the various components. The proportion of candidates at HL compared to SL mirrors the trend of the May session.

The Grade Award team read the comments made by teachers on the G2 forms and with so few G2 forms submitted reference to these individual comments can be made in this report if applicable. The team assumed that the majority of teachers were content with the examination papers as discontent usually provokes more comments sent to the IB via the G2 forms.

Overall grade boundaries

Higher level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 13	14 - 24	25 - 36	37 - 48	49 - 60	61 - 72	73 - 100

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 13	14 - 25	26 - 37	38 - 50	51 - 63	64 - 75	76 - 100

Internal assessment

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 8	9 - 17	18 - 25	26 - 32	33 - 39	40 - 46	47 - 60

General comments

A range of suitable projects and investigations were evident throughout the moderation sample, work included small design and make activities based on the design cycle and experiments that followed a more scientific approach. Those schools that are established in the teaching of IB Design Technology, or have recently attended training continue to do well when developing a course that meets the assessment criteria. Some schools choose to assess design and make activities for all investigations thus limiting the number of projects that can be completed in the time available. Although it is best practice to integrate the teaching of the core and options through investigations, the amount of time devoted to internally assessed work should not be at the detriment of candidates gaining a detailed insight of subject theory. Schools are asked to avoid excessive use of time for investigations, but are reminded to meet the minimum requirements for SL and HL.

Coursework should be used as a support exercise in order to help candidates understand the theoretical nature of the subject and develop project skills by concentrating on one or two assessment criteria at a time. For instance a teacher could provide a brief, specification and some research material which will enable the candidates to develop and model ideas to be assessed for Development, an area that is considered a weakness in some schools when moderating the Design Technology project.

Small lab based investigations tend to require less time than design and make tasks (normally no more than 3-4 hours) and the integration of such assignments in to the course structure is to be further encouraged.

Teachers are to be reminded that candidate work should not be assessed where too much information has been provided, as the work must be of that of an individual candidate. Where group work is to be assessed, each candidate must show evidence of their own work. It is not satisfactory for a group to submit one common document or share written work for assessment.

The topics covered through coursework must be entered on the form 4/PSOWDT along with the time taken for each investigation and indicate where ICT has been used.

Teachers support materials, notes and project briefs should be attached to the sample of work. Marks selected for moderation need to be highlighted on the 4/PSOWDT form for each assessment criteria. Two marks for P, R, D and E must be submitted, one of the marks must be for the design project and the other for any of the other investigations. Only the work that has been highlighted should be sent for moderation.

Most samples were presented in an organized structure, but teachers are reminded that work for each criterion needs to be flagged. Teachers are also reminded to complete all sections of the 4/PSOWDT, including details of the project, ICT usage, topics covered in each IA and the time taken for each IA. Schools are advised not to make their own versions of the 4/PSOWDT as all data input fields are required by the moderator and senior moderator.

Teachers are encouraged to send an individual candidate sample per folder/folio with the form 4/PSOWDT attached. Dividers should be used to indicate the start of different investigations and all work sent to moderators should ideally be in A4 format. Where A3 drawing work is to be included, pages should be folded and included in the A4 report. All photocopied work must be legible; the copying of pencil sketched ideas is to be avoided.

Candidate performance against each criterion

Planning (P)

The majority of candidates were able to achieve a minimum of at least a 'Partial' for this criterion. When using the assessment criteria for a design project, candidates should consider the feasibility of the problem, identify the user, analyse the situation, write a clear brief which identifies the intended goal and produce a detailed specification. Where possible photographic evidence of problems is encouraged as these can help establish the need. When completing a lab based investigation independent and dependent variables must be identified. Detailed tasks provided by the teacher which clearly set out the problem, specification or variables should not be assessed.

Research (R)

Not all candidates had considered the need to plan data collection from a variety of sources or include a list of apparatus and order of method for an experiment that controlled variables. Thought showers are useful in analysing the type and range of data to be collected, but do not address from where data is to be collected. An example of planning for research is evident on page 28 of the subject guide. Where planning was limited collected data was either biased or missing critical information. When designing products or systems, students are encouraged to collect data that may act as a design constraint. Tasks relating to the gathering and analysing of information before tackling the Design Technology Project are to be encouraged. Candidates that achieved a high mark in this section displayed evidence of focused research that had been annotated to indicate its relevance in order to solve the problem.

Smaller laboratory-based investigations where candidates had to collect raw qualitative/quantitative data offered ample opportunity to address the assessment criteria, but not all candidates had processed the information correctly. Tables and graphs must be correctly labelled with analysis.

Development (D)

This criterion lends itself to **design-based** activities, where candidates have the opportunity to generate and develop an innovative range of ideas using suitable techniques, such as sketching, cad or modelling. Some schools continue to misinterpret the criteria and submit inappropriate work for the assessment of Development. Literature search assignments, PowerPoint presentations, computer test simulation software and most laboratory-based experiments are not suitable tasks for assessment of Development if candidates are to have the opportunity to be able to achieve 6 marks. This is an area where candidates can lose a significant amount of marks.

Teachers should consider how the techniques outlined on page 49 of the subject guide along with card, manufactured boards, CAD, simulation software and Styrofoam can be used to aid model development and refine the final solution. The development stage is not simply making the same model using a range of techniques; it is the refinement of a solution using

appropriate strategies so as to establish materials, construction, dimensions, form and finish. Detailing for the solution to be realized needs to be detailed and presented in an appropriate format, such as engineering drawings or patterns for textile outcomes. Detailing for textile outcomes need to include copies of scaled patterns that include information on where stitches and other fasteners will be used. Food outcomes need to include a detailed list of ingredients and consider methods of how items can be formed together. Detailing for all outcomes needs to be clear and sufficient for projects to be made.

Teachers should note that there should be a clear difference between the initial stages of development and the final outcome if they are to be able to assess Manipulative Skills for the Design Technology Project. Teacher led investigations which focus on this criterion alone will aid candidates in developing the necessary skills to tackle a design and make project.

Evaluation (E)

More time needs to be devoted to this criterion if candidates are to achieve high marks. As this is normally the last element undertaken when completing project work, candidates generally leave insufficient time to complete testing and suggest improvements. Ideally candidates need to test their outcomes in the area for which they have been designed. The more organised candidates did leave adequate time to address the criteria to a satisfactory standard. Recommendations for the design project need to include a revised the specification, sketched modifications and consider the need for scaling up production.

For laboratory-based tasks, candidates need to evaluate the process of data collection and identify weaknesses in their methodology in order to suggest improvements.

Manipulative Skills (MS)

In most cases thorough planning had taken place, but there is a need for some schools to be more detailed in their identification of materials and processes in order to plan time effectively. If Gantt charts are used, timings need to be detailed; candidates should, ideally, plan to the hour and revise the plan when changes are required. Photographic evidence of candidates using equipment at different stages of realization is encouraged. Health and Safety risks need to be considered and evidence of safe working should be obvious. Outcomes need to be of sufficient complexity for the level studied.

Recommendations for the teaching of future candidates

The assessment weightings and time allocations for Investigations and the Design Project need to be considered when developing a scheme of work in schools.

Practical schemes of work that make use of design and lab tasks generally offer more opportunities for pupils to meet the assessment criteria.

Schools are reminded to flag work for moderation.

Use of the OCC exemplar material is to be encouraged by teachers in helping them understand and meet the standards of assessment.

Training for those new to teaching IB Design Technology is encouraged.

Higher level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 10	11 - 14	15 - 19	20 - 24	25 - 28	29 - 32	33 - 40

General comments

Three G2 forms were received for this paper. These comments were studied carefully at the grade award meeting and were used alongside other evidence, particularly student responses to the paper, to determine grade boundaries for the paper. At the grade award we are provided with a computer analysis of student performance and are provided with a difficulty index (DifI) and a discrimination index. DifI reflects the percentage of students getting the question right and can range from 0 to 100%. A higher DifI means that the question is easy. In terms of discrimination index (DisI), a negative discrimination index means that the better students found the question difficult. For smaller entry subjects these statistics are less reliable. We can remove questions from the analysis in the grade award meeting if we are unhappy with them.

General G2 comments

All respondents (3) stated that the paper was “appropriate”, that the presentation was good and the clarity of wording was good or satisfactory.

Individual question analysis

Question1

One comment on the G2 form stated that the question was confusing as it referred to the *design development process* rather than the *design cycle*. The design development process is part of the design cycle and the question is based on Assessment Statement 1.1.8 in the Subject Guide.

Question 2

There was criticism from one teacher via the G2 form of the use of roman numerals in this type of question as the format is unfamiliar to students. Each examination session contains a few questions on paper one using this format so candidates who had seen past papers would recognize the style of question and the results indicate that candidates did not have a problem understanding the question.

Question 3

This proved to be a relatively easy question.

Question 4

One G2 form contained a comment that the term used in the table does not correspond exactly to the definition of *corporate strategy* used in the Subject Guide. However, “product” and “market” are commonly used terms throughout the course.

Question 5

This was a straightforward question.

Question 6

The question was set as a difficult one and this proved to be the case. There was a positive discrimination index of 0.26 which shows that the question worked as intended by stretching candidates' knowledge.

Question 7

Most candidates were able to deal with this question successfully.

Question 8

This was a relatively easy question for most candidates.

Question 9

The majority of candidates achieved the mark for this question.

Question 10

This was a straightforward question.

Question 11

This question posed few problems for candidates.

Question 12

The majority of candidates answered this question successfully.

Question 13

Most candidates recognized the technique of weaving as depicted in *Figure 5*.

Question 14

This was a medium difficulty question as it required candidates to consider the link between two different topics i.e. clean technology (topic 5) and radical/incremental design (topic 1).

Question 15

This was a difficult question but the correct answer of *low price and high response to individual need* reflects the benefits of mass customization to the consumer.

Question 16

This was a straightforward question for most candidates.

Question 17

Most candidates found this question easier than intended as it was classified as a *medium difficulty* question.

Question 18

Quite a number of candidates found it difficult to relate the 5th percentile to facilitating ease of use for the majority of people with positioning a light switch.

Question 19

This was a difficult question as it required candidates to assimilate information relating to different parts of the syllabus and make the link with *quality control* and *quality assurance*.

Question 20

This was an easy question for the majority of candidates.

Question 21

The majority of candidates achieved the mark for this question.

Question 22

This proved to be a very easy question for most candidates.

Question 23

A straightforward question for candidates who had learnt the definitions as stated in the Glossary of the Subject Guide.

Question 24

This proved to be a difficult question and one comment made on the G2 form stated that it was “off syllabus” but it relates to Assessment Statement 9.3.6 in the Subject Guide.

Question 25

This was quite a difficult question as all the possible answers refer to aspects of a stress/strain graph but the function stated in the stem of the question clearly relates to *elastic region* i.e. Answer A.

Question 26

This was a straightforward question for candidates who knew how to calculate mechanical advantage.

Question 27

This question was designated as *medium difficulty* and it differentiated well between ability levels.

Question 28

Most candidates could relate easily to the context of the children’s toy and the function of the ratchet mechanism.

Question 29

This was a relatively straightforward question.

Question 30

This was a difficult question as candidates needed to fully understand the concept of *clean technology* in order to relate it to the technique of injection moulding. The Teacher Note for Assessment Statement 5.6.2 refers to the link between clean technology and manufacturing. The Grade Award team did not agree with a comment made on a G2 form that 'materials used and carbon emissions from electricity negate clean technology' as this relates more to *green design*.

Question 31

This should not have been a difficult question for candidates who knew the definition of *parison* from the Glossary of the Subject Guide.

Question 32

This was quite a difficult question for the majority of candidates who did not understand why Plaster of Paris would be used in the process of lost wax casting.

Question 33

There was a considerable amount of information to absorb in order to answer this question correctly. One comment made on the G2 form stated that the question was unfair as it did not relate to conditions in the southern hemisphere. Teachers and candidates should recognize that all IB courses reflect internationalism and in this instance candidates just needed to use the data stated in the question rather than relate it to their own environment.

Question 34

Although this question was designated *medium difficulty* it discriminated extremely well.

Question 35

This question was attempted well by the majority of candidates.

Question 36

This proved to be a more difficult question than anticipated as many candidates did not think that *high stiffness* was an advantage of laminated glass for the solar panel but without high stiffness the panel would not operate successfully throughout the seasons.

Question 37

This was a medium difficulty question and so more able candidates coped with it successfully.

Question 38

This was a relatively straightforward question for the majority of candidates.

Question 39

This was the only question on the paper which discriminated negatively but as this was only by 0.06% the effect was negligible.

Question 40

Most candidates found this question quite easy.

HL paper 1 item analysis

The following table provides a summary of the how each candidate answered each question, the resulting difficulty index and discrimination index.

Question	A	B	C	D	Blank	Difficulty Index	Discrimination Index
1	3	7	0	94		90.38	0.14
2	4	14	71	15		68.27	0.40
3	12	7	15	70		67.31	0.43
4	9	30	64	1		61.54	0.06
5	77	12	5	10		74.04	0.34
6	37	11	21	35		35.58	0.26
7	20	17	61	6		58.65	0.26
8	2	89	4	9		85.58	0.17
9	88	3	9	4		84.62	0.40
10	15	2	12	75		72.12	0.31
11	5	20	73	6		70.19	0.51
12	1	89	3	11		85.58	0.20
13	6	96	2	0		92.31	0.00
14	10	21	54	19		51.92	0.14
15	19	45	5	35		43.27	0.14
16	6	97	1	0		93.27	0.14
17	0	1	11	92		88.46	0.14
18	21	57	15	11		54.81	0.29
19	0	7	32	65		30.77	0.31
20	0	0	102	2		98.08	0.06
21	78	13	3	10		75	0.31
22	0	0	1	103		99.04	0.03
23	90	9	4	1		86.54	0.11
24	53	16	8	27		50.96	0.17
25	53	6	30	15		50.96	0.43
26	14	6	67	17		64.42	0.26
27	25	14	54	11		51.92	0.26
28	51	39	9	5		37.50	0.37
29	7	10	32	55		52.88	0.26
30	28	23	30	23		22.12	0.31
31	41	9	11	43		41.35	0.40
32	20	60	12	12		19.23	0.06
33	41	16	11	36		34.62	0.49
34	67	13	6	18		64.42	0.51
35	21	1	3	79		75.96	0.06
36	10	14	36	43	1	41.35	0.23
37	5	69	0	29	1	66.35	0.17
38	0	98	5	1		94.23	0.11
39	87	13	2	2		83.65	-0.06
40	10	7	9	78		75	0.40

Higher level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 5	6 - 11	12 - 17	18 - 24	25 - 31	32 - 38	39 - 60

General comments

Three G2 forms were received for this paper. Two teachers thought he paper was of an appropriate standard and one teacher thought it was too difficult and two teachers thought that the paper was a little more difficult than last year. The Grade Award team took this into account when deciding on grade boundaries though with only three respondents the data is not necessarily an accurate representation of teachers' opinions in general. Clarity of wording and presentation were both deemed to be satisfactory or good. It should be noted that Paper One and Paper Two examine core and AHL topics. For Paper One the number of questions is in proportion to the recommended teaching hours for each topic and in this way syllabus coverage is maintained. Paper Two questions are more diverse with 50% of the marks for Objective One and Objective Two questions and 50% for Objective Three questions. In Section B 9 marks are allocated to the last part of the question so clearly syllabus coverage is restricted in relation to this. A holistic view is required therefore when assessing syllabus coverage for Paper Two.

Comparison with last year's paper

Much easier	**A little easier**	**Similar standard**	**A little more difficult**	**Much more difficult**
0%	0%	33%	66%	0%

Suitability of question paper

	Too easy	**Appropriate**	**Too difficult**
Level of difficulty	0%	66%	33%

	Poor	**Satisfactory**	**Good**
Clarity of wording	0%	66%	33%
Presentation of paper	0%	33%	66%

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

Section A

Question 1

From the marking it seems clear that the data in question 1 was accessible to most students though, as always with this question, the data is non syllabus specific.

a) (i) Surprisingly few candidates achieved the mark for this question.

(ii) This question needed careful consideration but most candidates were able to work out the answer successfully.

(iii) Many candidates thought through the question well in relation to the type of engine.

b) (i) This was answered well by most candidates though not many identified the analogy with *green* design.

(ii) This question posed few problems for the majority of candidates.

c) (i) This question was relatively easy for most candidates.

(ii) Although many candidates connected well with the context of the question and identified the nature of the limitation many answers lacked sufficient planning and hence, clarity, to gain all three marks.

d) (i) Most candidates merely restated information from the given data rather than considering a *factor of safety*.

(ii). Most candidates could identify a suitable reason for government support but few gained all three marks as the discussion lacked sufficient depth.

e) (i) This question was answered well by most candidates.

(ii) Many candidates failed to comprehend the question in terms of a trial and answered it in relation to increasing the scope of the innovation rather than collecting data.

Question 2

a) This was answered correctly by most candidates.

b) This question needed to be thought through very carefully before writing the answer to ensure that all three marking points were focused on logically and sequentially.

Question 3

a) Many candidates seemed to know about bevel gears but had difficulty articulating a correct response.

b) Some candidates used a drawing to show the components which was not required but if suitably labelled they were marked correctly.

Question 4

a) Many candidates failed to relate *parison* to blow moulding.

b) Not many candidates answered this question correctly – most referred to the need for a compressed handle so it would be durable enough.

Question 5

a) Few candidates were correctly able to describe the process of filament winding.

b) Although most candidates failed to obtain the marks for part (a) quite a few were able to relate the process to the concept of fishing rods.

Question 6

a) Few candidates were able to state the equation correctly.

b) Most candidates understood the concept of *u value* and the impact on heat gain or loss but only a few gained all three marks by referring to choice of material.

Section B

Question 7 was the most popular question followed by question 8 while relatively few candidates attempted question 9.

Question 7

a) (i) Not all candidates focused their answer on consumer values but those who did were able to gain both marks.

(ii) Nearly all candidates correctly identified the issue of the re-use of the fire hose material though not many referred to the concept of the proportion of the final cost of a product made up by material cost.

b) (i) Many candidates failed to read the question correctly and just referred to a property rather than a physical property.

(ii) Those candidates who understood the nature of the bonding structure of plastic materials were able to gain at least two of the three available marks.

c) (i) Most candidates found this question very accessible.

(ii) This question was answered quite well by many candidates. The way in which the concept of *triple-bottom-line sustainability* is set out in the Guide helped candidates to structure their answer in three aspects which related well to the nature of the product.

Question 8

a) (i) This should have been a relatively easy question as there are many possible correct answers but quite a few responses just referred to a characteristic of hardwood without focusing on one which was appropriate for the rockers of the chair.

(ii) Candidates needed to focus on the nature of the design of the chair and the structure of laminated timber which makes it advantageous.

b) (i) This was a relatively easy question for the majority of candidates.

(ii) Most candidates correctly referred to the use of fasteners and were able to explain the appropriateness of a particular fastener.

c) (i) This was an easy question if candidates understood the concept of body load but unfortunately many candidates related it to the load exerted by a person.

(ii) This was not an inherently difficult question but the answer needed to be planned carefully to differentiate between the three aspects in relation to the design of the chair. Consequently, it was quite easy for candidates to achieve up to half the available marks but only a few managed to achieve high marks.

Question 9

a) (i) This question was answered well by nearly all candidates.

(ii) A straightforward question as long as candidates recognized the implication of *outlined* rather than just *stating* an answer.

b) (i) Nearly all candidates correctly focused on *kinetic energy*.

(ii) The concept of *bio-compatibility* was not well understood by some candidates and so it was difficult for them to relate it to the given context.

c) (i) Not all candidates understood the difference between physiological factors and psychological factors in relation to ergonomics but those who did gained both marks.

(ii) The question required candidates to think carefully about the nature of the product and its stage of development in relation to potential for success in the marketplace. It was easy for candidates to discuss general issues pertaining to a successful innovation but astute planning was required to focus on aspects of the design context.

Recommendations for the teaching of future candidates

The context for the data based question was accessible and students felt able to attempt the questions. It must be stressed that the point of including a data based question is that the context is not from the syllabus and the objective is that candidates can understand the data, identify relevant aspects to specific questions and successfully apply the data. This is consistent with the work of designers in different fields. Objective Three questions in this section lulled many candidates into a false sense of security as the questions themselves are not inherently difficult but for the marks candidates had to think carefully how three different marks could be achieved. As part of their examination preparation students must become aware that marks will not be given for repeating parts of the given question or repeating answers in sub-parts of questions.

In Section B Candidates should be encouraged to consider the implications of the final sub-part (c) (ii) of each question before making a decision which question to answer as this usually has a strong bearing on the amount of marks that will be gained.

Higher level paper three

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 2	3 - 5	6 - 9	10 - 15	16 - 20	21 - 26	27 - 40

General comments

The table below shows the structure of the questions for each option. This allows for parity to be achieved between the standard and format of questions in each option. Of the options E and C were the most popular followed by A, D and finally B.

Question	Comments	Mark allocation
1	A data question based on core material	6 (1, 2 and 3)
2	Syllabus coverage based on extension material	3 (1 and 2)
3	A data question based on core material	4 (2 and 2)
4	Syllabus coverage based on core material.	6 (3 and 3)
5	Syllabus coverage based on extension material	6 (2, 2 and 2)
6	An extended response question based on extension material	6
7	An extended response question based on core material	9

Only 3 G2s were received for this paper by the time that the grade award meeting was convened so statistical evidence of syllabus coverage and presentation is inconclusive but no particular problems were highlighted. All respondents thought that the paper was appropriate and that the presentation/clarity of wording was either satisfactory or good. Two respondents considered the paper a little more difficult than the 2010 paper. The only criticism made on the G2 forms concerned question C1, part (a) and whether candidates would be confused by the type of machine shown in Figure C1. The question relates to Assessment Statement C.2.7 and the Grade Award team considered that candidates should have been able to recognize the machine as a vinyl cutter or plotter cutter.

Comparison with last year's paper

Much easier	A little easier	Similar standard	A little more difficult	Much more difficult
0%	0%	33%	66%	0%

Suitability of question paper

	Too easy	Appropriate	Too difficult
Level of difficulty	0%	33%	66%

	Poor	Satisfactory	Good
Clarity of wording	0%	66%	33%
Presentation of paper	0%	0%	100%

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

OPTION A – FOOD SCIENCE AND TECHNOLOGY

Question 1

This was a three-part data question worth a total of six marks and based on core material.

a) This was an easy question for the vast majority of candidates.

b) There was a good choice of possible answers for this question and most candidates achieved at least one mark.

c) Many candidates did not seem to appreciate the meaning of the term *organoleptic property* and so compared fresh and canned peaches in general terms not related to an organoleptic property.

Question 2

a) A fairly simple question which relied on syllabus recall.

b) Candidates had little problem dealing with this question.

Question 3

a) The majority of candidates understood the concept of *lifestyle factors* and those who made sure they answered the question by making two distinct points were able to gain both marks.

b) Most candidates understood the role of market testing but some did not relate it to the development of food products.

Question 4

The concept of farmers' markets was well appreciated by many candidates. The question also asked candidates to focus on "urban areas" which was not considered by some candidates. Three marks were available for each of two reasons discussed so candidates needed to develop each reason into three distinct points as shown in the markscheme.

Question 5

a) The link between climate and food insecurity was exploited well by most candidates.

b) Many candidates seemed confused by the term *local strategies* even though it clearly relates to Assessment Statement A.12.12 in the Subject Guide.

c) In contrast to part (b) of the question, the term *international strategies* was much better understood and many candidates achieved both marks.

Question 6

a) Most candidates appreciated why producers would be reluctant to label GM crops but many found it difficult to structure their answer correctly to gain all three marks..

b) This question proved to be difficult for the majority of candidates who did not understand what is meant by inappropriate technology in relation to crop growth.

Question 7

Most candidates coped well with this nine mark question. Although some candidates failed to avoid overlap between the three aspects answers were generally structured to gain most of the available marks.

OPTION B – ELECTRONIC PRODUCT DESIGN

There were no candidates for this option.

OPTION C – CAD/CAM

Question 1

a) Some candidates did not appreciate the implications of manufacturing using CNC equipment and referred to the CNC machine as a printer.

b) Most answers were not specific enough with reference to the x, y and z axes.

c) Many candidates did not consider the appropriate size of machine to make the sign.

Question 2

a) This question elicited a relatively straightforward and successful response from most candidates.

b) Many candidates did not focus on safety aspects of CNC machines such as guards and the lack of interaction between the worker and moving parts of the machine.

Question 3

a) The key phrase in the stem of the question was prototype for the designer so candidates needed to outline an advantage of stereo lithography in relation to this rather than just an advantage in general.

b) This question required candidates to differentiate between advantages of stereo lithography for designers and manufacturers. Many answers failed to focus on these roles.

Question 4

Many candidates discussed benefits of CAD/CAM or automation for manufacturing flat pack furniture rather than the specific use of a CNC router and so not many candidates achieved high marks.

Question 5

a) This was quite a straightforward question with a good choice of possible answers.

b) Most candidates focused on teamwork for robots in relation to assembly line production rather than linking it to specific aspects of manufacturing cars.

c) This was a relatively easy question for the majority of candidates.

Question 6

a) This question was not answered well in general. Most candidates thought that the wax model was important for user trials rather than a stage in the production of the ring even though this was clearly stated in the stem of the question.

b) This question was not answered well by most candidates. For a “compare” question reference needs to be made to both aspects in relation to value for money for the consumer. Only the very able candidates were able to work out the answer to this question with success.

Question 7

The majority of candidates seemed very comfortable with this question but they did not gain many marks as the advantages discussed were not related to the context of electronic product housing.

OPTION D - TEXTILES

Question 1

a) This was an easy question for the majority of candidates.

b) Many candidates failed to focus on a property of felt rather than general characteristics.

c) Most candidates were able to score reasonably well on this question though some did not develop an explanation of one reason with three distinct points related to the specific reason.

Question 2

a) This question was well understood by most candidates.

b) Candidates who astutely avoided repeating the answer given in part (a) generally did well.

Question 3

a) The majority of candidates correctly focused on the use of rivets for joining the strap to the body of the rucksack though some just stated this rather than describing it.

b) This question was not answered well as many candidates failed to focus on a mechanical property.

Question 4

This question was misinterpreted by many candidates as they failed to appreciate the technical issues involved in creating a black and white version and a colour version of the design using LIT technology.

Question 5

a) This was quite straightforward question for most candidates.

b) Many candidates did not focus on the manufacture of cotton clothing rather than cotton clothing in general.

c) Candidates who read the question carefully and made the link between designing cotton products and ease of maintenance gained full marks.

Question 6

a) Many candidates did not plan their answer effectively and discussed in vague terms environmental concerns relating to clothing. The question referred to the fashion industry which should have guided candidates to discuss obsolescence and waste.

b) This question was not answered well by the majority of candidates who failed to understand the difficulty in replacing human involvement with handling of a fabric for effective sewing of it.

Question 7

The concept of *branding* was well understood by most candidates but answers needed to be carefully structured to focus on one issue related to the designer, one for the manufacturer and one for the consumer.

OPTION E – HUMAN FACTORS DESIGN

Question 1

a) Nearly all the candidates achieved the mark for this question.

b) Candidates who understood what is meant by user population were able to relate it quite easily to a distribution curve shape.

c) Most candidates appreciated the concept of method of extremes but not many gained all three marks by providing a detailed enough explanation.

Question 2

a) A straightforward question for most candidates, merely requiring syllabus recall.

b) Many candidates scored highly on this question.

Question 3

Candidates needed to be careful in answering both parts of this question to differentiate their answers well and avoid repetition. Unfortunately, the majority of candidates failed to do this and so did not maximise on the available marks. Part (a) relates to the shape of the pen and part (b) to the rubber material.

Question 4

Very few candidates split their answer into two parts, one relating to the home office and one to a commercial office, but just wrote at length what they knew about ergonomics in the workplace. This meant that many candidates only achieved a portion of the marks available but with more thought given to the application of their knowledge to the context of the question full marks could have been achieved.

Question 5

a) There was a good choice of possible answers to this question which gave the majority of candidates the opportunity to gain both marks.

b) This was a comfortable question for most candidates who scored well with it.

c) Most candidates focused on the lack of funding issue but did not necessarily develop their answer into a suitable outline of the issue.

Question 6

a) Generally, candidates provided quite convoluted answers to this question. The nature of the smart technology was not often made clear.

b) This question was not answered well. Hardly any candidates considered the possibility of the ramp being a slip hazard and concentrated instead on the extra effort required to walk up a ramp.

Question 7

A small proportion of candidates scored highly on this question by carefully making sure that they avoided overlap when discussing clearance, reach and comfort. The difference between *clearance* and *reach* was not well understood by many candidates.

Recommendations for the teaching of future candidates

Candidates should be made aware of the theories and concepts underpinning the optional material and to be able to see how these theories and concepts impact on the real world and the design process through appropriate practical work. Ideally, the Design Project should relate to the option selected so that the project and the option are synergistic and build on each other to reinforce learning and do not lead to an exacerbation of workload issues which would be to the disadvantage of the candidate. Teachers should spend some time in helping candidates to understand how to structure their answers, especially for six mark and nine mark questions. It is worth noting from the markschemes that a mark is awarded for each distinct relevant correct point.

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 11	12 - 15	16 - 19	20 - 22	23 - 25	26 - 30

General comments

Two G2s had been received for this paper by the time of the Grade Award meeting. As for the Higher Level paper these comments were studied carefully at the Grade Award meeting and were used alongside other evidence, particularly student responses to the paper as evidenced through the statistics (difficulty index (DifI) and discrimination index (DisI) see the section reporting on the Higher Level Paper One for explanation of these terms), to determine grade boundaries for the paper.

Comparison with last year's paper

With only two G2 forms returned it is not feasible to draw comparisons with last year's paper. Both respondents thought that the paper was appropriate and that the presentation/clarity of wording was either satisfactory or good.

General G2 comments

One comment made was that the wording of some questions did not mirror exactly the wording stated in the Subject Guide especially in relation to definitions contained in the Glossary. Most Subject Guides do not contain a Glossary of Terms but in Design Technology experience has shown that teachers and students find it a useful inclusion in the Guide. Questions on a particular topic may not always contain the exact wording of definitions as long as the meaning is conveyed accurately. This relates also to Paper Two and Paper Three where sometimes candidates are asked to state a particular definition. Examiners are instructed to use their discretion when marking these questions and to award the mark if candidates express the correct meaning of the definition even though the wording does not reflect precisely that stated in the Glossary. There were 15 questions common to both the higher and standard level papers.

Individual question analysis

Question1

One comment on the G2 form stated that the question was confusing as it referred to the *design development process* rather than the *design cycle*. The design development process is part of the design cycle and the question is based on Assessment Statement 1.1.8 in the Subject Guide.

Question 2

This was a common question and the results indicate that candidates did not have a problem understanding it though one teacher thought the style of the question with the use of Roman Numerals could be confusing.

Question 3

This proved to be a relatively easy question.

Question 4

A medium difficulty question – candidates often confuse the requirements of a design brief with a design specification even though Assessment Statements 1.1.3 and 1.1.5 in the Subject Guide clearly set out the differences.

Question 5

One G2 form contained a comment that the term used in the table does not correspond exactly to the definition of *corporate strategy* used in the Subject Guide. However, "product" and "market" are commonly used terms throughout the course.

Question 6

This was a relatively straightforward question.

Question 7

This common question for HL and SL proved interesting in that SL candidates found it less difficult than HL candidates overall.

Question 8

This was a relatively easy question for most candidates.

Question 9

The majority of candidates achieved the mark for this question.

Question 10

This was a straightforward question.

Question 11

Some candidates did not think carefully enough about the question and related air pollution to a wind turbine rather than noise pollution.

Question 12

The majority of candidates answered this question successfully.

Question 13

Most candidates found this question relatively easy.

Question 14

This question posed few problems for the majority of candidates.

Question 15

This common question for HL and SL Paper One proved to be much more difficult for SL candidates who seemed quite confused by it.

Question 16

This was a straightforward question for most candidates.

Question 17

Many candidates achieved the correct answer to this question though some candidates did not read the stem of the question carefully enough to consider the context of the interior wall.

Question 18

One teacher commented on the G2 form that this question was inappropriate as there is no mention of *bolts* in the Subject Guide. However, Assessment Statement 5.1.2 refers to using fasteners and the understanding is that this would be taught by referring to a range of common types of fasteners.

Question 19

This was a relatively easy question for most candidates.

Question 20

The majority of candidates found this question quite easy, possibly achieving the correct answer by a process of elimination as one comment made on a G2 form stated that the question was not appropriate as *ancient methods of production* are not referred to in the Subject Guide.

Question 21

The majority of candidates achieved the mark for this question.

Question 22

This proved to be an easy question for most candidates.

Question 23

This common question proved to be less difficult for SL candidates than HL candidates overall.

Question 24

This was quite an easy question for the majority of candidates.

Question 25

As with HL candidates this question proved to be difficult and there was a slightly higher negative discrimination factor for SL candidates but it was still only 0.18%.

Question 26

This was a straightforward question for most candidates.

Question 27

The majority of candidates had a good understanding of the meaning of the ideas generating techniques and achieved the correct answer.

Question 28

Most candidates answered the question well.

Question 29

This proved to be quite a difficult question for many candidates presumably because they failed to appreciate the need for the product to withstand the forces of the vehicle by being flexible and durable.

Question 30

Nearly all the candidates achieved the mark for this question.

The following table provides a summary of the how each candidate answered each question, the resulting difficulty index and discrimination index.

SL paper 1 item analysis

Question	A	B	C	D	Blank	Difficulty Index	Discrimination Index
1	1	3	0	30		88.24	0.36
2	2	7	24	1		70.59	0.55
3	3	1	1	28	1	82.35	0.09
4	19	2	4	9		55.88	0.36
5	1	6	27	0		79.41	0.55
6	25	2	3	4		73.53	0.45
7	21	1	5	7		61.76	0.45
8	6	0	26	2		76.47	0.09
9	1	32	1	0		94.12	0.18
10	32	0	2	0		94.12	0.18
11	0	5	3	26		76.47	0.45
12	33	0	1	0		97.06	0.09
13	2	3	5	24		70.59	0.55
14	1	1	2	30		88.24	0.27
15	13	7	12	2		35.29	-0.18
16	0	31	3	0		91.18	0.27
17	4	7	2	21		61.76	0.73
18	6	23	2	3		67.65	0.36
19	0	0	28	6		82.35	0.27
20	22	4	5	3		64.71	0.45
21	4	27	2	1		79.41	0.27
22	1	8	2	23		67.65	0.09
23	2	31	1	0		91.18	0.09
24	34	0	0	0		100	0.00
25	0	1	9	24		26.47	-0.18
26	0	3	30	1		88.24	0.18
27	4	25	1	4		73.53	0.55
28	1	0	21	12		61.76	0.00
29	1	12	4	17		35.29	0.09
30	0	3	2	28	1	82.35	0.18

Standard level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 3	4 - 7	8 - 11	12 - 16	17 - 22	23 - 27	28 - 40

General comments

Two G2s were received by the cut-off date so it is not feasible to make a definitive judgment about level of difficulty, and presentation of the paper though both respondents thought the paper appropriate and the presentation/clarity of wording either satisfactory or good. The only criticism received on the G2 forms related to Question One and the use of the word “pace” in part (a) (iii) as this word is not used in the Subject Guide. “Pace” is not a difficult word for IB diploma students to understand and relate to the graphic in Figure 1.

The same reasoning applies to SL as made for HL in this respect – Paper One and Paper Two examine the Core Topics with Paper One containing questions across all topic areas. The structure of Paper Two with 12 marks allocated to a data based question in Section A which is non syllabus specific means that only eight marks are available for other questions in Section A for syllabus coverage. Section B questions are designed to be cross –topic but with nine marks for the last part of each question only eleven marks are available for other questions. In order to maintain parity between each question in Section B the same structure is applied to each question. Question setters work to a pre-determined grid which states the marks allocated to each question and sub-parts. In this way the balance between questions based on Objectives One, Two and Three is achieved. Teachers may use this information to prepare students for the examination papers and particular styles of questions. Although not many comments were received from teachers it is assumed that most teachers must be satisfied with the standard and presentation of the paper otherwise comments would have been made to the contrary.

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

Section A

Question 1

a) (i) The question is based on candidates’ knowledge of the origins of the Industrial Revolution rather than specific knowledge of dates.

(ii)Many candidates confused the start of mass production with automation and so stated the third wave rather than the fourth.

(iii) This question was answered well in general.

b) (i) This was a relatively easy question for the majority of candidates.

(ii) Many candidates gave the answer of *chemicals* rather than the more specific *petrochemicals* from the list.

c) (i) The majority of candidates answered this question well.

(ii) Considerable thought needed to be applied to providing an answer which covered all three marking points. Nearly all candidates were able to tackle the question and achieve at least two marks.

Question 2

a) Many responses were too vague to achieve the mark. Candidates should recognize the definitions as stated in the Glossary of the Guide.

b) Most candidates were able to gain marks for this question but only carefully crafted answers gained all three marks.

Question 3

a) A straightforward question for most candidates.

b) The majority of candidates understood the concept of smart materials and those who produced a carefully worded explanation which included a suitable example gained full marks.

Section B

There was a reasonable spread of choices between the three questions with Question Four being the most popular followed by Question Five then Question Six.

Question 4

a) (i) Most candidates answered this question correctly.

(ii) Many candidates found this question difficult as they failed to appreciate the link between cost reduction and scale of production.

(iii) The majority of candidates understood the relationship of nickel based alloys to resistance of heat.

b) (i) This was a straightforward question for most candidates.

(ii) Most candidates achieved two marks for this question but not that many developed their answer in sufficient detail to cover all the marking points.

c) (i) This question proved surprisingly difficult for many candidates who did not appreciate the logistical problems of relying on biomass as a fuel for the given context.

(ii) The majority of candidates clearly felt comfortable with the question so achieving high marks was possible if the answer was structured carefully into three distinct advantages and repetition was avoided.

Question 5

a) (i) This was a straightforward question for candidates who had learnt the definitions stated in the Guide's Glossary.

(ii) Some candidates failed to read the question carefully enough so gave an answer related to aesthetics or appearance rather than preservation.

(iii) This question was a quite a common one but many answers were too convoluted to gain both marks.

b) (i) This was a relatively easy question for the majority of candidates.

(ii) This proved to be quite a difficult question – candidates needed to assimilate the information provided carefully and consider the multi-purpose use of the table.

c) (i) Candidates who understood the concept of *factor of safety* were able to relate it successfully to the design context.

(ii) This question proved more difficult than anticipated as many candidates failed to focus on the product life cycle and merely discussed the use of plywood in general.

Question 6

a) (i) This was not an easy one mark question as candidates needed to know which costs are categorized as *fixed*, so many answers were incorrect.

(ii) Many candidates did not focus on a specific *physical property* rather than properties in general.

(iii) In general, this question was answered well.

b) (i) Surprisingly this question was not answered well considering the type of product and its diffusion in the marketplace.

(ii) This proved to be a difficult question for many candidates who failed to consider the nature of the technology employed in the product and conditions of use.

c) (i) The majority of candidates answered this question well.

(ii) As with many of the nine mark questions on the paper, structuring an answer into three clearly defined aspects is important in order to differentiate well between marking points and avoid vague, repetitive responses.

Recommendations for the teaching of future candidates

A key feature of this paper which is crucial to candidates achieving a high score is the choice of question for Section B and in particular, the ability to answer the nine mark question well. The application of grade descriptors during the Grade Award meeting to decide on the grade boundaries focused heavily on these key aspects. Not all of the Section B questions will appeal to candidates as the contexts are so diverse and question (c)(ii) for each requires candidates to apply knowledge gained from various parts of the course but the diversity offers a range of choices.

Standard level paper three

Component grade boundaries

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

General comments

Standard level options were marked out of 30 marks (see below). As for the higher level paper, options E and C were the most popular followed by A, D and finally B.

Question	Comments	Mark allocation
1	As higher level question 1 - a data question based on core material.	6 (1, 2 and 3)
2	Syllabus coverage based on core material.	3 (1 and 2)
3	As higher level question 3 – a data question based on core material.	4 (2 and 2)
4	Syllabus coverage based on core material.	6 (3 and 3)
5	As higher level question 4 - an extended response question based on core material.	6
6	As higher level question 7 - an extended response question based on core material.	9

It was anticipated that through an appropriate design of the scheme of work that teachers would be able to explore core material through the options. Obviously different options lend themselves to different topics to a greater or lesser extent.

Two G2s had been received by the time of the Grade Award meeting. Both respondents thought that the paper was appropriate and clarity of wording/presentation either satisfactory or good.

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

OPTION A – FOOD SCIENCE AND TECHNOLOGY

Question 1

This was a three-part data question worth a total of six marks and based on core material.

a) This was an easy question for the vast majority of candidates.

b) There was a good choice of possible answers for this question and most candidates achieved at least one mark.

c) Many candidates did not seem to appreciate the meaning of the term organoleptic property and so compared fresh and canned peaches in general terms not related to an organoleptic property.

Question 2

a) Most candidates achieved the mark for this question.

b) This question was not answered well by the majority of candidates who failed to relate a property of glass to the issue of nutrition.

Question 3

a) The majority of candidates understood the concept of lifestyle factors and those who made sure they answered the question by making two distinct points were able to gain both marks.

b) Most candidates understood the role of market testing but some did not relate it to the development of food products.

Question 4

There were a number of possible answers to this question but few candidates identified a factor that related to *primary processing of the orange juice* rather than its production in general.

Question 5

The concept of farmers' markets was well appreciated by many candidates. The question also asked candidates to focus on *urban areas* which were not considered by some candidates. Three marks were available for each of two reasons discussed so candidates needed to develop each reason into three distinct points as shown in the markscheme

Question 6

Most candidates coped well with this nine mark question. Although some candidates failed to avoid overlap between the three aspects answers were generally structured to gain most of the available marks.

OPTION B – ELECTRONIC PRODUCT DESIGN

There were no candidates for this option.

OPTION C – CAD/CAM

Question 1

a) Some candidates did not appreciate the implications of manufacturing using CNC equipment and referred to the CNC machine as a printer.

b) Most answers were not specific enough with reference to the x, y and z axes.

c) Many candidates did not consider the appropriate size of machine to make the sign.

Question 2

a) Most candidates achieved the mark for this question.

b) Most candidates appreciated the limitation of the use of a three-axis machine for producing a 3D product bit not many provided and answer which was precise enough to gain both marks.

Question 3

a) The key phrase in the stem of the question was prototype for the designer so candidates needed to outline an advantage of stereo lithography in relation to this rather than just an advantage in general.

b) This question required candidates to differentiate between advantages of stereo lithography for designers and manufacturers. Many answers failed to focus on these roles.

Question 4

The concept of JIT seemed to be understood by the majority of candidates but not many successfully linked it to CIM.

Question 5

Many candidates discussed benefits of CAD/CAM or automation for manufacturing flat pack furniture rather than the specific use of a CNC router and so not many candidates achieved high marks.

Question 6

The majority of candidates seemed very comfortable with this question but they did not gain many marks as the advantages discussed were not related to the context of electronic product housing.

OPTION D - TEXTILES

Question 1

a) This was an easy question for the majority of candidates.

b) Many candidates failed to focus on a property of felt rather than general characteristics.

c) Most candidates were able to score reasonably well on this question though some did not develop an explanation of one reason with three distinct points related to the specific reason.

Question 2

a) The definition of biomimetics is not an easy one to remember but candidates who had done their revision well gained the mark.

b) Most candidates achieved at least one mark for this question.

Question 3

a) The majority of candidates correctly focused on the use of rivets for joining the strap to the body of the rucksack though some just stated this rather than describing it.

b) This question was not answered well as many candidates failed to focus on a mechanical property.

Question 4

This question was not answered well as candidates failed to focus on the necessary technical details of the process.

Question 5

This question was misinterpreted by many candidates as they failed to appreciate the technical issues involved in creating a black and white version and a colour version of the design using LIT technology.

Question 6

The concept of *branding* was well understood by most candidates but answers needed to be carefully structured to focus on one issue related to the designer, one for the manufacturer and one for the consumer.

OPTION E – HUMAN FACTORS DESIGN

Question 1

a) Nearly all the candidates achieved the mark for this question.

b) Candidates who understood what is meant by user population were able to relate it quite easily to a distribution curve shape.

c) Most candidates appreciated the concept of method of extremes but not many gained all three marks by providing a detailed enough explanation.

Question 2

a) Most candidates achieved the mark for this question.

b) This question was answered well by the majority of candidates.

Question 3

Candidates needed to be careful in answering both parts of this question to differentiate their answers well and avoid repetition. Unfortunately, the majority of candidates failed to do this and so did not maximise on the available marks. Part (a) relates to the shape of the pen and part (b) to the rubber material.

Question 4

Most candidates scored well on this question though some did not read the question carefully enough to focus on the *design development stage*.

Question 5

Very few candidates split their answer into two parts, one relating to the home office and one to a commercial office, but just wrote at length what they knew about ergonomics in the workplace. This meant that many candidates only achieved a portion of the marks available but with more thought given to the application of their knowledge to the context of the question full marks could have been achieved.

Question 6

A small proportion of candidates scored highly on this question by carefully making sure that they avoided overlap when discussing clearance, reach and comfort. The difference between *clearance* and *reach* was not well understood by many candidates.

Recommendations for the teaching of future candidates

Candidates need to be made aware of the theories and concepts underpinning the optional material and to be able to see how these theories and concepts impact on the real world and the design process through appropriate practical work. Ideally, the Design Project should relate to the option selected so that the project and the option are synergistic and build on each other to reinforce learning and do not lead to an exacerbation of workload issues which would be to the disadvantage of the candidate. Teachers should spend some time in helping candidates to understand how to structure their answers, especially for six mark and nine mark questions. It is worth noting from the markschemes that a mark is awarded for each distinct relevant correct point.