

## DESIGN TECHNOLOGY

### Overall grade boundaries

#### Higher Level

<b>Grade:</b>	1	2	3	4	5	6	7
<b>Mark range:</b>	0 - 14	15 - 26	27 - 39	40 - 50	51 - 62	63 - 73	74 - 100

#### Standard Level

<b>Grade:</b>	1	2	3	4	5	6	7
<b>Mark range:</b>	0 - 14	15 - 26	27 - 38	39 - 49	50 - 61	62 - 73	74 - 100

### Internal assessment

### Component grade boundaries

#### Higher Level

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

#### Standard Level

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

### Recommendations for IB procedures, instructions and forms.

Most schools follow the correct procedures and include completed forms, with only a few choosing to design their own 4/PSOWDT. Those that use this approach need to ensure that all data fields are included for moderation. Some schools are to be reminded that it is inappropriate to submit group work for assessment where write-ups are a collaborative effort. Teacher notes for each investigation are to be included with the sample.

## The range and suitability of the work submitted

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.

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.

Literature assignments and product analysis tasks to include Powerpoint presentations are not suitable for assessment of Development. Only tasks that are suitable to achieve a maximum of six marks per criteria should be used to assess work.

## 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. However, some candidates did not perform so well, especially when repeating a common problem set by the class teacher or when submitting identical work of another candidate. When using the assessment criteria for a design project, candidates should consider the feasibility of the study, identify the user, 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 a problem is to be identified and independent/dependent variables made clear.

### 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. An example of planning for research for a design project is evident on page 28 of the subject guide. Where planning was limited collected data was either biased or missing critical information.. Candidates should fully analyze the brief in Planning if they are to prioritize strategies in which to identify wider issues to be researched. Those that achieved a high mark in this section displayed evidence of focused research that had been annotated to indicate its relevance in order to solve the 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.

### Development (D)

This criterion lends itself mostly 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 submitted inappropriate work for the assessment of Development. Literature research assignments and PowerPoint presentations are not suitable tasks for assessment of Development. Development is to include an element of refining solutions through modelling and the use of a wider range of techniques to optimise a solution is to be encouraged. Detailing for the solution to be realized needs to be detailed and presented in an appropriate format, such as engineering drawings. Detailing for all outcomes needs to be clear and sufficient for projects to be made. Where outcomes are only virtual, there should be evidence of detailed development and marks awarded for Development and Manipulative Skills should include evidence of different work.

### **Evaluation (E)**

Some candidates produced significant work in meeting this criterion, but others did not leave sufficient time to conduct a detailed evaluation of the outcome and procedures. Ideally candidates need to test their outcomes in the area designed for, or with the user for whom it had been designed. Projects which offer a limited or virtual outcome do not lend themselves well to addressing this assessment criterion, especially when it comes to testing, identifying weaknesses and suggesting realistic recommendations. 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 as this was often confused with improving the material or item being tested.

### **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. Most schools showed evidence of making in a photographic diary. 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.

Design and make tasks should offer sufficient opportunities to achieve high marks for development and evaluation. Tasks that offer limited opportunities are to be avoided.

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

## **Further comments**

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. Only the work that has been highlighted should be sent for moderation. Most samples were presented in an organized structure, but teachers are to be 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 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 easily legible; the copying of pencil sketched ideas is to be avoided.

## Higher level paper one

### Component grade boundaries

<b>Grade:</b>	1	2	3	4	5	6	7
<b>Mark range:</b>	0 - 10	11 - 14	15 - 19	20 - 23	24 - 26	27 - 30	31 - 40

### General Comments

18 G2s were received for this paper.

As always the Grade Award team value the responses provided by teachers through the G2 forms as it supports in the process of boundary setting. 77.8% of responders felt that this paper was set at an appropriate level with 22.8% finding it difficult. 61.1% felt that the presentation of the paper was good and in comparison to last year, 50% said it was of a similar standard, 33.3% found it a little more difficult and 11.1% found it much more difficult.

Candidates' responses to this paper have been evidenced through statistical analysis of each question. A difficulty index (Difl) and a discrimination index (Disl) reflects the percentages of candidates getting the question correct and can range from 100 to 0%. A higher Difl means that the question is easy, a lower Difl that the question is harder. This year the Difl value ranged from 95.65% to 7.62% with the rest of the questions pleasingly spread between these two values. This demonstrates that the paper was balanced in terms of difficulty. The Disl values highlighted that none of the questions were negatively discriminating which would mean that the candidates did not find the questions too difficult.

All G2 comments are carefully considered. It is important to point out that this paper is designed to test Objectives one and two only. This paper was constructed to provide breadth, covering a solid cross-section of the Guide and is produced to fit a difficulty index (25% easier, 50% moderate and 25% hard) The statistical analysis of this paper highlights this, demonstrating that it was accessible to an appropriate range of candidates. Interestingly, many of the concerns raised on the G2 forms concerning individual questions did not correlate directly with candidates' ability to answer questions, or their ability to answer them correctly.

## Difficulty Index

Question	A	B	C	D	Blank	Difficulty Index	Discrimination Index
1	151	87	484	11	2	65.85	0.27
2	113	297	313	11	1	42.59	0.23
3	42	249	252	190	2	25.85	0.16
4	59	60	472	143	1	64.22	0.36
5	28	12	655	38	2	89.12	0.12
6	46	442	90	156	1	60.14	0.22
7	317	179	94	143	2	43.13	0.35
8	27	105	51	550	2	74.83	0.32
9	11	565	36	121	2	76.87	0.31
10	173	320	53	186	3	43.54	0.27
11	6	28	668	31	2	90.88	0.17
12	2	134	573	25	1	77.96	0.33
13	454	18	5	256	2	61.77	0.37
14	165	79	199	291	1	39.59	0.29
15	526	152	14	42	1	71.56	0.29
16	611	72	16	33	3	83.13	0.23
17	9	703	19	2	2	95.65	0.07
18	18	630	63	23	1	85.71	0.14
19	46	23	466	196	4	63.40	0.32
20	54	90	311	277	3	37.69	0.32
21	356	133	83	159	4	48.44	0.24
22	43	617	40	31	4	83.95	0.24
23	22	52	79	580	2	78.91	0.26
24	89	262	102	279	3	37.96	0.22
25	547	121	37	27	3	16.46	0.08
26	456	226	19	32	2	62.04	0.35
27	51	39	61	582	2	79.18	0.30
28	4	627	98	3	3	85.31	0.17
29	182	127	368	56	2	50.07	0.40
30	6	88	129	510	2	69.39	0.24
31	354	19	50	310	2	42.18	0.40
32	114	42	434	141	4	59.05	0.28
33	36	105	106	484	4	65.85	0.36
34	20	35	337	340	3	45.85	0.29
35	16	361	123	231	4	49.12	0.19
36	472	42	22	196	3	64.22	0.24
37	26	616	35	55	3	83.81	0.20
38	99	157	56	420	3	7.62	0.02
39	356	14	118	244	3	48.44	0.17
40	371	64	94	200	6	50.48	0.23

Total number of candidates: 735

## Higher level paper two

### Component grade boundaries

<b>Grade:</b>	1	2	3	4	5	6	7
<b>Mark range:</b>	0 - 6	7 - 12	13 - 19	20 - 26	27 - 34	35 - 41	42 - 60

### General Comments

In general, the paper was well received. 94.4% of G2 respondents thought the paper was of an appropriate standard and 88.9% thought that the clarity of wording was satisfactory or good.

Candidates who gain high grades on Paper Two usually tackle question one and their chosen question from Section B well. The short answer questions in Section A range from relatively easy to quite difficult so most candidates are able to gain reasonable marks from answering them. Section B questions are context based and cover different aspects of the syllabus though with a bias to particular topics so candidates can weigh up the requirements of the individual questions to match their knowledge and preferences. It is clear from the marking that some candidates do not spend enough time considering the ramifications of the sub – set of questions before deciding which Section B question to answer and so perform poorly on the nine mark question which has considerable impact on the final grade.

For question one in Section A candidates should appreciate that the intention is to test their ability to assimilate the data provided and select appropriate aspects of the data to use when answering the individual questions. At Higher Level more marks are available for the data-based question in comparison to Standard Level and so more data is used in order to test candidates' abilities further. Although the context of the design situation and associated data will differ markedly from year to year the amount of marks for each individual question remains the same as does the structure of question one so candidates can become accustomed to the generic nature of the format of the question as part of their examination preparation.

One comment made by a teacher on the G2 form asks for clarification of the amount of “calculate” questions especially as there was an imbalance this year between Higher and Standard Level papers. With more marks available for question one at Higher Level and so more questions there is greater opportunity to assess different skills but there is no definite rule for how many marks should be allocated to calculations though they are not intended to be a dominant feature.

### Individual Question Analysis

#### Section A

##### Question 1.

The majority of candidates coped well with the context of the question and the amount of data. It would have been better (especially for candidates with English as a Second Language) if the titles for the Performance Data in Table 1 differentiated more clearly between the various Searaser products. This was especially apparent for part (e) (i) though after sample marking the mark

scheme was adapted to allow for different interpretations so no candidates were disadvantaged. Parts (b) (i) and (b) (ii) needed careful consideration of which evaluation strategies were appropriate at the different stages of the evolution of the design taking into account the information supplied in the stem of the question. Many candidates did not re-read the information but just outlined (or mostly stated) the first strategy which came into their head. Part (c) (i) was problematic for many candidates as the concepts of *analogy* and *adaptation* are often used interchangeably. In this instance the design of the float was adapted from the use of the football as the context was similar. A couple of G2 comments stated that the use of the term *innovation cycle* for (c) (ii) was inappropriate as this is not commonly used in the Subject Guide and therefore in their teaching. Teacher notes for Assessment Statement 2.2.2 in the Guide mention a cycle in relation to different stages of innovation and the point of the question was for candidates to discuss the Searaser in relation to the potential for innovation as it is clearly referred to as a prototype only. More able candidates appreciated the meaning of the question and gained marks accordingly – thus the question differentiated well between ability levels. For part (d) (i) one G2 comment stated that it required candidates to understand how many days there are in the month of April and this was unfair but this did not seem to be an issue for the majority of candidates based on the marks achieved for the question. The use of the term *efficiency* was criticised in a G2 comment as inaccurate and *maximum output* would have been a better term to use. There was no evidence in candidates' responses to the questions concerned that suggested they were confused by the terminology.

#### Question 2.

Part (a) was a simple question that just required a one word answer but many candidates incorrectly stated that that the main source of energy for powering the industrial revolution was steam power and not coal. For part (b) most candidates did not structure their answers correctly or specifically enough to gain full marks.

#### Question 3.

For part (a) candidates needed to refer to the *design* of an I-shaped beam in relation to effective an economical use of materials. It was clear that most candidates knew what an I-shaped beam was but many did not refer to its shape in their answer. For part (b) candidates needed to relate the benefit of the use of an LVL beam to the *construction* industry.

#### Question 4.

Although most candidates referred to the relationship of stress to strain for part (a) of the question not many gained full marks for part (b) by relating the concept to the design and use of a tennis racquet.

#### Question 5.

Criticism of the wording of part (a) was stated in a G2 form commenting that the question should have been more explicit if candidates needed to refer to injection moulding for the cap and blow moulding for the body. The expectation was that candidates would understand that an injection moulded plastic "plug" is created prior to being blow moulded to create the body of the bottle. Surprisingly, a limited number of candidates understood the function of a *draft angle* in the process of vacuum forming for part (b).

## Question 6.

Very few candidates could accurately define an *intelligent building* for part (a) but part (b) was generally answered well.

**Section B**

The most popular question was number 9 followed by number 7 followed by number 8. This trend was probably due to the bias towards AHL topics in question 8, especially for part (c) (ii).

## Question 7.

For part (a) (i) candidates usually gained the marks as long as they referred to *safety* but many candidates merely looked at Figure 4 and outlined the first ergonomic feature that came into their head. For part (b) (ii) many candidates identified vacuum or blow moulding instead of injection moulding for the body of the charger. For part (c) (i) many candidates did not understand the true definition of a *product family* and provided a vague answer rather than looking back at the stem of the question to see that the different surface designs give rise to choice of use. Many candidates struggled to gain a high percentage of the available marks for part (c) (ii). One G2 form comment was that *hybrid strategy* was not on the syllabus but Assessment Statement 2,3.6 states 'explain the benefits for a company of using a hybrid strategy'. Many candidates merely described the three corporate strategies stated in the stem of the question and did not relate them to the charger specifically or explain how a combination of strategies was appropriate.

## Question 8.

A comment on a G2 form stated that question (a) (i) was inappropriate as mechanical properties are more relevant to the choice of material for the bike frame than physical properties. The question was intended to be harder by asking for physical properties and candidates needed to think about the properties in relation to carbon fibre. Most candidates seemed to understand the term *matrix composition* in relation to composite materials for (a) (ii) but not many managed to gain full marks by structuring their answer appropriately. For part (b) (i) some candidates did not read the question carefully enough and outlined a safety issue rather than a security issue. For part (b) (ii) almost all candidates could identify that extra torque would increase power or speed but few referred to rotational force. Part (c) (i) required candidates to think about the bike in use and the effect on other road users rather than the relationship of the bike to the rider, Part (c) (ii) was generally answered poorly as candidates failed to differentiate well between *strength, stiffness and factor of safety*. In order to gain top marks candidates also needed to refer to specific aspects of the bike design.

## Question 9.

Most candidates clearly felt quite comfortable with this question and were able to gain reasonable marks except for part (c) (ii). Part (b) (ii) was a little problematic for weaker candidates as they did not consider the choice of glue in relation to the different materials for the pencil. If candidates understood the concept of *robust design* then part (c) (i) posed few problems. Answers for part (c) (ii) need to be carefully structured to compare the two pencils in relation to consumer value. The mark scheme shows that candidates had considerable choice in how they structured their answer but too many merely wrote what spontaneously and repeated points.

**Recommendations for future candidates.**

As preparation for the examination candidates should have the opportunity to practise answering three and nine mark questions where well developed answers gain the high marks. For such questions candidates should be encouraged to analyse the questions astutely and refer back to the stem of the question often. The information contained in the stem often directly corresponds to aspects of the question for Section B. Well structured answers (with sub-headings if appropriate) which clearly focus on the design context will score highly.

Many candidates do not appreciate the meaning of the *command terms* used at the start of each question and which relate to Assessment Statements in the Subject Guide. Consequently, time is often wasted in the examination providing more information to a question than is required and not enough time is then allocated to the extended response questions.

Candidates should be shown how to structure their answers to extended response questions that are concise and fit the space allocated for the question. Candidates who write long-winded responses rarely gain high marks as the response is unfocused.

For question 1 candidates needed to appreciate that the data introduced in the second half of the question still relates to the data at the start of the question and all the data should be judged holistically when attempting to answer parts (d) and (e).

## Higher level paper three

### Component grade boundaries

<b>Grade:</b>	1	2	3	4	5	6	7
<b>Mark range:</b>	0 - 4	5 - 9	10 - 13	14 - 18	19 - 24	25 - 29	30 - 40

### General Comments

There were 19 G2s received for this paper. Looking at the overall G2 comments 17 (94.4%) of the respondents thought that the paper was an appropriate level of difficult and 1 (5.6%) thought it was too difficult. In comparison with last year's paper 2 (11.1%) thought it was a little easier, 11 (61.1%) thought it was of a similar standard, 4 (22.2%) thought it was a little more difficult and 1 (5.6%) thought it was much more difficult. 9 (50%) thought the clarity of wording was satisfactory and 9 (50%) thought it was good. In terms of the presentation of the paper 1 (5.6%) thought it was poor, 6 (33.3%) thought it was satisfactory and 11 (61.1%) thought it was good.

In terms of general comments, one G2 said the paper was very fair whereas another said that this year's paper was 'somewhat more difficult and more technical than the previous ones'. Certainly as Schools get used to the curriculum there is often significantly better performance although new Schools seem to find the papers challenging. One of the G2s commented about the parity of difficulty between the options and that some of the options (food for example) are easier and also on the use of products which are familiar in a UK context citing the example of the Pot Noodle. The issue of parity is very difficult to judge and the examining team is very aware of the potential problem and does everything it can to overcome the problem. The issue of parity of difficult across the 9-mark questions is particularly problematic.

It is worrying where candidates from the same School answer different options and this is by no means uncommon. There is an expectation that a School would select an option based on its physical infrastructure and that all the candidates would answer the same option in the examination. What is even more worrying is when a candidate answers all the questions for each of the options (all very badly!). One has to question if teachers have prepared candidates appropriately for the examination when this happens although I think we all realize that there are some candidates who just do not listen.

Overall Option E was by far the most popular followed by Option C, then Option A, Option D and Option B.

### **OPTION A (FOOD SCIENCE AND TECHNOLOGY)**

Question A1 focused on the shelf life of milk that had undergone various forms of treatment. Section A required candidates to state a reason why the pasteurization process extends the shelf life of milk. This question should have been very easy but only about half the candidates attempting the question scored the one mark available. Section B asked candidates to outline one way in which ultra-heat treatment affects the organoleptic properties of milk. There were some excellent answers that were balanced by some very poor answers. It was not clear that some candidates understood what an organoleptic property was. Section C asked candidates to explain why powdered milk has such a long shelf life. The mark scheme was expecting candidates to identify that the dehydration process removed water and resulted in a low water activity unsuitable for the growth of microorganisms and therefore no spoilage.

Question A2 (a) asked candidates to state one advantage of making crops resistant to the herbicide Roundup Ready. Remarkably few candidates offered appropriate answers. Question A2 (b) asked candidates to outline one way in which consumer attitudes may impact on the development of Roundup Ready crops. Again this was poorly answered.

Question A3 focused on the Pot Noodle – a commercially-produced instant snack food. Section (a) asked candidates to identify one reason for the increasing popularity of foods such as the Pot Noodle. This section was answered better and more (but not most) achieved one if not two marks for their responses. Section (b) asked candidates to describe how market testing would be used in the development of the Pot Noodle food product. This question was not well answered in the whole despite its apparent straightforwardness.

Question A4 was worth six marks and asked candidates to compare food allergy and food intolerance in relation to the impact on diet. There were some excellent answers by better candidates to this question and only the weakest candidates failed to achieve any marks.

Question A5 focused on food poisoning. Section (a) asked candidates to list two symptoms of food poisoning. Most candidates identified diarrhoea and vomiting and achieved two marks. Section (b) asked candidates to outline one way in which food poisoning can be avoided. This was not answered as well as section (a) but many candidates were able to achieve one mark and some both marks. Section (c) asked candidates to outline one way in which barbecued (BBQ) food contributes to an increased incidence of food poisoning. This was generally well answered by all but the weakest candidates.

Question A6 showed a map of the world produced by the Food and Agriculture Organisation (FAO) showing the prevalence of undernourishment in the total population. Section (a) asked candidates to explain the geographical distribution of countries with more than 35% undernourishment in the total population as shown by the map. There was a good spread of marks for the responses to this question. Section (b) asked for the role of the FAO in combating food insecurity. This question was relatively well answered.

Question A7 – a 9-mark question – brought Option A to a close. It asked candidates to explain why it is important for governments to raise public awareness of food-related health issues with reference to moral, social and economic responsibility. Those candidates providing well-structured answers avoided repetition and achieved the highest marks.

### **OPTION B (ELECTRONIC PRODUCT DESIGN)**

Question B1 focused on the design context of an exterior solar lamp that switches on automatically when it gets dark. It showed a photographic image of the solar lamps and a circuit diagram for the lamps. Section A asked for the name of one of the components (A – a transistor) in the circuit. This posed few problems for candidates. Section B asked candidates to identify the purpose of a second component (P1 – a variable resistor). Although this did not cause a problem for the candidates it did produce G2 comments – one that the diagram was missing an arrow and also that it was a potentiometer and not listed in the guide. The candidates answered variable resistor and identified its purpose correctly. The final section (c) asked candidates to explain how the operation of a comparator in the circuit in Figure B2 influenced the type of output saturation. Candidates were able to provide reasonable answers to this question and were able to achieve 2 or 3 marks depending on the depth of response.

Question B2 (a) asked candidates to define product stewardship. Most candidates were able to offer a definition that enabled them to achieve one mark. Question B2 (b) asked for a list of two ways in which manufacturers can meet the aims of product stewardship.

Question B3 focused on a traffic light system using sensors to detect the presence of traffic. Section (a) asked candidates to describe how the system in Figure B3 works. G2 comments stated that this question required knowledge of electromagnetic fields and induction loops and these are not part of the course and not mentioned in the Guide and therefore an unfair question. This is probably a fair comment. However, candidates were not fazed by the question and provided fairly reasonable answers.

Question B4 was worth six marks and asked candidates to discuss two issues that a communication systems designer would consider when implementing an information transfer system using copper wire. This question did not pose any particular problems for candidates apart from the issue – fairly widespread across Papers 2 and 3 – that these three mark questions requiring a more in-depth answer are more difficult and probably require teachers to discuss how to achieve the third mark. Many candidates can gain two marks on this sort of question but the third mark is much more of a challenge.

Question B5 focused on converging technologies. Section (a) asked candidates to describe one way in which converging technology encourages planned obsolescence. Section (b) asked for a list of two ways in which converging technologies can benefit national defence. Section (c) asked for an

outline of one advantage of converging technologies for hearing aids. While no section seemed to pose particular problems few candidates achieved all six of the available marks on offer.

Question B6 (a) asked for an explanation of how the use of smart technology can help to conserve water use in the home. Question B6 (b) asked for an explanation of how the use of smart technology to operate windows or blinds in the home can contribute to the comfort of the occupants. The question was not particularly problematic for candidates but structuring answers and achieving the full three marks for each section was.

Question B7 – a 9-mark question – brought Option B to a close. It asked candidates to discuss three reasons why Programmable Interface Controllers can be regarded as a sustainable technology. While the question itself was not a problem for candidates, structuring answers in a way that achieved an appropriate depth of response to achieve the third mark for each of the reasons was. This is a question of examination technique and teachers need to help candidates to achieve this skill.

### **OPTION C (CAD/CAM)**

Question C1 focused on the process of laser cutting different materials. Section (a) asked candidates to state one disadvantage of using a subtractive process. This posed most candidates no problem. Section (b) asked candidates to outline the settings for the CNC laser cutting that would need to be changed to produce a prototype of the sign from a thin piece of card rather than plastic. This question was not well answered and candidates did not seem to appreciate the relationship between power and feed speed in the context of different materials. Section (c) asked candidates to explain one advantage of using a laser cutter rather than a CNC router to make the sign from a thermoplastic. This was answered much better and many candidates earned two marks if not all three marks. Again the issue of providing enough depth of response to earn the third mark is an issue.

Question C2 (a) asked candidates to state one benefit of CAD for a multinational company with design teams in different parts of the world. This was generally well answered and most candidates were able to achieve 1 mark. Question C2 (b) asked candidates to outline one limitation of the nature of the design work if the design teams for the multinational company never meet face-to-face. This was also well answered and candidates generally were able to earn both the marks on offer.

Question C3 focused on a chair seat made from hardwood and shaped using a CNC router. Section (a) asked for a description of the relationship between the X, Y and Z axes of the CNC router and the manufacture of the chair seat. Surprisingly this question was not well answered in the whole despite its apparent straightforwardness. Section (b) asked candidates to outline one way in which the machine tool step variable determines the quality of the chair seat when using a ball nose cutter. There were some excellent answers complete with diagrams and some very poor answers.

Question C4 was worth six marks and asked candidates to explain two differences between haptic technology and virtual reality. There were some very good answers to this question and many candidates scored full marks.

Question C5 comprised three sections each worth two marks. Section (a) asked candidates to identify one limitation when using natural timber for CAM. This was generally well answered.

Section (b) asked for an outline of one health and safety issue associated with using MDF as a modeling material in a CNC routing system. Again this was generally well answered. Section (c) asked for an outline of one quality control issue associated with using metals in a CNC milling machine. This was not well answered by most candidates although some of the better students developed reasonable answers and achieved the two marks on offer.

Question C6 provided a photograph of a team of robots working together to weld the main frame (shell) of a vehicle. Section (a), worth three marks, asked candidates to discuss one advantage of using robots to weld the vehicle in terms of quality control. Many candidates achieved two marks and some, better, candidates achieved the full three marks. The three mark questions require more depth and some candidates struggle to provide sufficient depth of response. Section (b) asked for a discussion of one reason why it may be cost effective for a company to replace the human workforce with robots. This was fairly straightforward and apart from the issue of depth of response most candidates provided reasonable responses.

Question C7 – a 9-mark question – brought Option C to a close. It showed a photograph of a desk made of MDF with a thermosetting plastic veneer which had been designed as a piece of flat pack furniture. The question asked for a discussion of three issues in relation to the design of the flat pack furniture desk in relation to its manufacture with CNC machinery. On some papers candidates had underlined the word design and focused on the word design that was the whole point of the question. Some candidates ignored the word design and rattled off some very long answers but because they were not about the design of the furniture achieved no marks. It is critical that students read the questions carefully and answer the question asked on the paper not the question they think was asked.

#### **OPTION D (TEXTILES)**

Question D1 focused on two security tags used by clothes retailers and provided photographs of the tags and some information about them. Section (a) asked candidates to state one reason why retailers might choose to use one of the tags over the other. This was fairly straightforward for most candidates. Section (b) asked for an outline of one reason why the tagging systems are only suitable for a limited range of soft goods. Many candidates correctly identified that the tags make a hole in garments and can damage them. The third section of the question, (c), asked for an explanation of one reason why tagging systems were more popular with large retail outlets than smaller shops. Most candidates were able to offer reasonable answers to this. Those candidates providing sufficient depth of response were able to achieve all three available marks.

Question D2 (a) asked candidates to state one limitation of the disposal of synthetic textiles into landfill sites and was reasonably straightforward for most candidates. Question D2 (b) asked candidates to outline one advantage of reuse rather than recycle in relation to cotton products. This also was answered well by all but the weakest candidates.

Question D3 focused on a woven decorative fabric designed using a CAD program that can convert image files into weave patterns. Section (a) asked for an outline of one advantage for the client of using CAD to design the fabric. This question was reasonably well answered on the whole. Section (b) asked for an outline of one issue that the designer must consider when designing the fabric for production using CAM. This posed more of a challenge to candidates although the good candidates were able to achieve both marks on offer.

Question D4 showed a photograph of coffee being spilt on a carpet that had been treated with a chemical finish after fitting in the home rather than during manufacture to help prevent staining. The question was worth six marks and asked candidates to discuss two advantages of this method of producing stain resistant carpets. Apart from the issue of providing enough depth of response to achieve the third mark this question was reasonably answered by most of the candidates.

Question D5 was a three-section question with each section worth two marks. Section (a) asked for a description of one way in which wearable computing can be used to monitor medical conditions and was answered well by most candidates. Section (b) asked for a list of two considerations for the designer of wearable computing garments and was fairly straightforward for most candidates. Section (c) asked candidates to outline the relationship between value and the consumer in relation to purchasing wearable computing garments. Most candidates were able to identify that wearable computing garments are generally more expensive and this challenges consumers, many of whom will not see the benefit of paying the extra.

Question D6 was a two-section question with each section worth three marks. Section (a) asked for an explanation of one environmental impact of growing cotton. Section (b) asked for an explanation of one issue in relation to clean technology for the cotton dyeing process. Again, apart from the issue of depth of response, both sections were answered reasonably well by most candidates.

Question D7 – a 9-mark question – brought Option D to a close. It focused on a range of sports product brand logos and asked candidates to discuss three issues relating to branding of sports clothing as a global market strategy. Some candidates were able to provide well-structured answers identifying three distinct issues and sufficient depth of response. Candidates not developing a good structure for this question tended to provide repetitive answers and not achieve the full marks on offer. This issue of structuring three mark questions is particularly evident on the 9-mark questions that ask for three 3-mark responses.

### **OPTION E (HUMAN FACTORS DESIGN)**

Question E1 showed a side view of a standard kitchen unit and an anthropometric model. Section (a) asked candidates to state the adult percentile used to decide the height of the wall unit. Many candidates offered 50<sup>th</sup> percentile and many more offered 5<sup>th</sup>-95<sup>th</sup> percentile as responses. The issue is one of reach and so the correct answer to this was 5<sup>th</sup> percentile a response offered by remarkably few candidates. Section (b) asked candidates to list two pieces of anthropometric data required to determine the depth of the base unit to allow users to gain access to the wall mounted electrical socket. Most candidates identified correctly arm length, the second piece of data was more problematic for most candidates. Section (c) asked candidates to discuss how the user would make best use of the kitchen units for storage in terms of efficiency and safety. This was reasonably well answered by candidates.

Question E2 focused on some taps designed for disabled users. Section (a) asked candidates to state one visual aspect of the design that had been employed to assist the user. Most candidates correctly identified colour as their response. Question E2 (b) asked candidates to outline one way in which the design of the taps would assist users with limited hand movement and was a relatively straightforward question.

Question E3 focused on a storage unit for a computer printer as part of an integrated home office. Section (a) asked candidates for a description of how the designer had combined ease-of-use and

aesthetics. This question was not well answered in the whole despite its apparent straightforwardness. Section (b) asked for an outline of one limitation of using the storage unit in relation to bodily tolerance. This seemed to generate answers either gaining zero marks as they were totally off course or two marks and not many candidates achieved one mark.

Question E4 showed a right-handed version of the Maltron single-handed keyboard. It asked for a discussion of two user considerations for the adoption of the keyboard as a mass market product and was worth six marks. This question was not well answered by candidates.

Question E5 focused on the four pleasure framework. Section (a) asked candidates to outline which aspect of the framework is experienced by employees wearing uniforms. Most candidates correctly identified socio-pleasure and belongingness. Section (b) asked for a description of how the design of a mobile phone might promote psycho-pleasure and posed few problems. Section (c) asked for a description of the relationship between ideo-pleasure and being an eco-fan. Again this section posed few problems.

Question E6 was a two-section question with each section worth three marks. Section (a) asked for an explanation of how motion capture can assist designers in the development of clothing for competitive skiers. It was generally well answered. Section (b) asked for an explanation of how motion capture can contribute to the cost-effectiveness of product development. This section was more problematic particularly for weaker candidates.

Question E7 – a 9-mark question – brought Option E to a close. It asked candidates to discuss three issues relating to displacing population stereotypes in the design of controls for products. Some candidates defined population stereotype but did not discuss problems relating to their displacement. Answering the question asked is a major issue for weaker candidates who often write a long response totally missing the point of the question. The skill of reading the question is one that teachers should focus on in preparing candidates for the examination.

## Standard level paper one

### Component grade boundaries

<b>Grade:</b>	1	2	3	4	5	6	7
<b>Mark range:</b>	0 - 7	8 - 11	12 - 16	17 - 18	19 - 21	22 - 23	24 - 30

### General Comments

14 G2s were received for this paper.

All comments are carefully studied and considered at the Grade Award Meeting and along with other evidence are used to determine the grade boundaries for this paper. The use of statistical analysis as evidenced through candidate responses to the paper (Difficulty index (DiffI) and Discrimination index (DisI)), forms the basis of this evidence. We would like to encourage that schools submit G2 responses and also use the OCC as a forum to continue to put forward their

reflections and opinions. The Grade Award team certainly takes the time to reflect on these during their meetings.

Comments from G2s highlighted that 28.6% considered this paper to be of a similar standard to that of last year. 57.1% found it to be a little more difficult, whilst 7.1% found it to be much more difficult. The statistical analysis of candidates' responses showed that the Difl value ranged from 93.62% to 21.88% with the rest of the questions pleasingly spread between these two values, thus reflecting the case that this was a balanced paper allowing accessibility to all candidates. The Disl values highlighted that none of the questions were negatively discriminating which would mean that the candidates did not find the questions too difficult.

71.4% felt that the clarity of the wording of this paper was satisfactory or good.

71.4% felt that the papers presentation was of a good standard.

#### Difficulty Index

Question	A	B	C	D	Blank	Difficulty Index	Discrimination Index
1	180	129	330	18	1	50.15	0.40
2	121	263	253	20	1	38.45	0.32
3	55	224	234	144	1	21.88	0.18
4	85	98	379	96		57.60	0.49
5	39	433	80	106		65.81	0.29
6	268	167	77	145	1	40.73	0.39
7	7	104	76	470	1	71.43	0.51
8	17	518	42	81		78.72	0.34
9	145	310	59	143	1	47.11	0.31
10	87	26	542	3		82.37	0.24
11	14	26	576	41	1	87.54	0.20
12	2	146	488	22		74.16	0.45
13	383	11	11	253		58.21	0.45
14	198	65	197	198		30.09	0.34
15	5	17	292	344		52.28	0.43
16	22	118	218	299	1	33.13	0.25
17	262	257	7	130	2	39.82	0.23
18	26	604	19	9		91.79	0.21
19	25	546	59	28		82.98	0.27
20	91	403	47	117		61.25	0.44
21	291	29	224	114		34.04	0.32
22	221	361	21	52	3	33.59	0.44
23	164	46	141	305	2	46.35	0.27
24	322	127	63	145	1	48.94	0.26
25	30	63	84	477	4	72.49	0.41
26	55	395	116	91	1	60.03	0.47
27	278	268	44	68		42.25	0.28

28	212	268	93	81	4	40.73	0.37
29	513	28	95	21	1	77.96	0.24
30	11	14	616	16	1	93.62	0.11

Total number of candidates: 658

## Standard level paper two

### Component grade boundaries

<b>Grade:</b>	1	2	3	4	5	6	7
<b>Mark range:</b>	0 - 4	5 - 8	9 - 12	13 - 16	17 - 21	22 - 25	26 - 40

### General Comments

The Paper appears to have been well received by candidates and over 90% of teachers who responded via the G2 forms thought that the level of difficulty was appropriate and 66.7% thought it was of a similar standard to last year. Clarity of wording continues to vex some teachers with only 28.6% considering it good and 14.3% considering it poor. In contrast, 100% of teacher responses thought the presentation of the paper satisfactory or good. Clearly, paper setters need to continue to strive to make questions better to understand taking into account that many students are studying in English as a Second Language.

### Individual Question Analysis

#### Section A

##### Question 1.

A comment made on the G2 form questioned whether candidates would find the annotations in Figure 1 difficult to read but there was no evidence from marking the scripts that candidates could not read or understand what was written.

For part (a) (iii) a couple of G2 comments questioned the appropriateness of asking candidates to describe the extrusion process used to manufacture the hose. The question was intended to extend candidates' understanding as they not only had to know about extrusion but also relate it to the use of polyurethane for coating the wire following on from (a) (ii). Extrusion is a common technique for use with plastics and metals and has featured in many past questions in examinations. It is considered that as students are taught to outline moulding techniques (Assessment Statement 5.1.2) and relate them to different materials (Assessment Statement 5.1.3) that they would be understand processes such as injection moulding and extrusion. For part (c) (ii) many candidates failed to *explain* why the number of tests used for different components varied but tended to *describe* tests as stated in Figure 1.

##### Question 2.

Many answers for part (b) of this question were surprisingly poor as candidates struggled to make the connection between planned obsolescence and the use of particle board for the desk. The question relates to knowledge gained from studying Assessment Statements 4.3.6 - 4.3.10 and focuses on product life cycle and maintenance /aesthetic issues.

Question 3.

Part (a) was answered well by the majority of candidates though one G2 comment questioned whether the question was off syllabus. As explained for question 1 (a) (iii), the question relates to the link between common moulding techniques and material groups. Part (b) required an explanation of the composition of Pyrex glass which makes it successful in the marketplace. The question relates to Assessment Statement 4.6.4 and the associated teacher note.

## Section B

Question 4 was the most popular question followed by question 5 and then question 6.

Question 4.

For part (a) (i) some students merely stated a percentile rather than a range. For part (a) (ii) most candidates understood that percentile ranges vary in different parts of the world but some candidates did not refer to the need for a range of sizes for particular market sectors. Part (b) (ii) was not difficult to understand for the majority of candidates but many responses were quite convoluted and did not *compare* stitching with gluing but merely described each technique. For part (c) (i) many candidates did not fully comprehend *Design for Manufacture* and failed to identify *design for materials* or *design for process* as an important feature of the design brief. Candidates who were familiar with past papers recognized that for part (c) (ii) three marks would be allocated to each of the three concepts stated in the question. This should have helped candidates structure their responses. Unfortunately many answers were poorly planned with candidates failing to tease out the differences between the three concepts in relation to the design of the shoe. Few candidates mentioned that the shoes could be reused by others as often people do not wear out their shoes due to trends in fashion for example.

Question 5.

For part (a) (i) candidates needed to provide a crisp, concise answer – many responses were too vague to gain the mark. Most candidates stated that the Yogo was the first product of its type but did not say in which way it was pioneering for part (a) (ii). Many candidates found it relatively easy to gain at least one mark for part (b) (ii) but did not gain full marks due to an incomplete explanation – candidates should appreciate that there needs to be three distinct points made in order to gain all three marks for a “level three” question. Very few candidates gained high marks for part (c) (ii). Considerable thought needed to be given to planning an answer before committing pen to paper. Candidates know the difference between an *inventor*, *innovator* and *entrepreneur* but could not use the information provided in the stem of the question to identify how the roles applied in this context.

Question 6.

Most candidates correctly stated *reach* or *arm length* for a relevant anthropometric consideration in part (a) (ii) but did not gain the second available mark for outlining why it was important. Part (a) (iii) was problematic for the majority of candidates. The question related to Assessment Statement

6.1.7 in the Subject Guide which states *texture* as a psychological ergonomic factor – for a highly decorative piece of furniture such as the bureau in Figure 5 this would be a feature. For part (b) (ii) most candidates focused correctly on the contribution of craft production for the manufacture of the bureau due to the information in the stem of the question but did not appreciate the contribution made by using machines for cutting and abrading the frame. The question for Part (c) (ii) was a common feature of a number of past papers and requires candidates to take a holistic view of the design and use of the bureau and how the designer has resolved conflict in balancing *form* with *function*. Although candidates may have been familiar with the style of question it is always difficult to apply it to the specific context. It is easy to write a great deal about aspects of form and function but only higher order candidates are able to show how the designer has balanced the two aspects.

## Recommendations for future candidates

As preparation for the examination candidates should have the opportunity to practise answering three and nine mark questions where well developed answers gain the high marks. For such questions candidates should be encouraged to analyse the questions astutely and refer back to the stem of the question often. The information contained in the stem often directly corresponds to aspects of the question for Section B. Well structured answers (with sub-headings if appropriate) which clearly focus on the design context will score highly.

Many candidates do not appreciate the meaning of the *command terms* used at the start of each question and which relate to Assessment Statements in the Subject Guide. Consequently, time is often wasted in the examination providing more information to a question than is required and not enough time is then allocated to the extended response questions.

Candidates should be shown how to structure their answers to extended response questions that are concise and fit the space allocated for the question. Candidates who write long-winded responses rarely gain high marks as the response is unfocused.

## Standard level paper three

### Component grade boundaries

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

There were 14 G2s received for this paper. Looking at the overall G2 comments 13 (92.9%) of the respondents thought that the paper was an appropriate level of difficult and 1 (7.1%) thought it was too difficult. In comparison with last year's paper 2 (15.4%) thought it was a little easier, (61.5%) thought it was of a similar standard and 3 (23.1%) thought it was a little more difficult. 1 (7.1%) thought the clarity of wording was poor, 8 (57.1%) thought it was satisfactory and 5 (35.7%) thought it was good. In terms of the presentation of the paper 1 (7.1%) thought it was poor, 5 (35.7%) thought it was satisfactory and 8 (57.1%) thought it was good.

In terms of general comments, there were no general comments on the G2s for the SL paper three.

It is worrying where candidates from the same School answer different options and this is by no means uncommon. There is an expectation that a School would select an option based on its physical infrastructure and that all the candidates would answer the same option in the examination. What is even more worrying is when a candidate answers all the questions for each of the options (all very badly!). One has to question if teachers have prepared candidates appropriately for the examination when this happens although I think we all realize that there are some candidates who just do not listen.

Overall Option E was by far the most popular followed by Option C, then Option A, Option D and Option B.

### **OPTION A (FOOD SCIENCE AND TECHNOLOGY)**

Question A1 focused on the shelf life of milk that had undergone various forms of treatment. Section A required candidates to state a reason why the pasteurization process extends the shelf life of milk. This question should have been very easy but only about half the candidates attempting the question scored the one mark available. Section B asked candidates to outline one way in which ultra-heat treatment affects the organoleptic properties of milk. There were some excellent answers that were balanced by some very poor answers. It was not clear that some candidates understood what an organoleptic property was. Section C asked candidates to explain why powdered milk has such a long shelf life. The mark scheme was expecting candidates to identify that the dehydration process removed water and resulted in a low water activity unsuitable for the growth of microorganisms and therefore no spoilage.

Question A2 (a) asked candidates to state the role of protein in the body. Question A2 (b) asked candidates to list two effects of protein deficiency. Both sections of this question were surprisingly poorly answered.

Question A3 focused on the Pot Noodle – a commercially-produced instant snack food. Section (a) asked candidates to identify one reason for the increasing popularity of foods such as the Pot Noodle. This section was answered better and more (but not most) achieved one if not two marks for their responses. Section (b) asked candidates to describe how market testing would be used in the development of the Pot Noodle food product. This question was not well answered in the whole despite its apparent straightforwardness.

Question A4 asked for a list of two factors determining the need for primary processing of food commodities. Most candidates, bar the weakest, achieved at least one mark if not two on this question.

Question A5 was worth six marks and asked candidates to compare food allergy and food intolerance in relation to the impact on diet. There were some excellent answers by better candidates to this question and only the weakest candidates failed to achieve any marks.

Question A6 – a 9-mark question – brought Option A to a close. It asked candidates to explain why it is important for governments to raise public awareness of food-related health issues with reference to moral, social and economic responsibility. Those candidates providing well-structured answers avoided repetition and achieved the highest marks. There was no significant difference in performance between HL and SL candidates in this question.

**OPTION B (ELECTRONIC PRODUCT DESIGN)**

Question B1 focused on the design context of an exterior solar lamp that switches on automatically when it gets dark. It showed a photographic image of the solar lamps and a circuit diagram for the lamps. Section A asked for the name of one of the components (A – a transistor) in the circuit. This posed few problems for candidates. Section B asked candidates to identify the purpose of a second component (P1 – a variable resistor). Although this did not cause a problem for the candidates it did produce G2 comments – one that the diagram was missing an arrow and also that it was a potentiometer and not listed in the guide. The candidates answered variable resistor and identified its purpose correctly. The final section (c) asked candidates to explain how the operation of a comparator in the circuit in Figure B2 influenced the type of output saturation. Candidates were able to provide reasonable answers to this question and were able to achieve 2 or 3 marks depending on the depth of response.

Question B2 (a) asked candidates to state one advantage of converting a telephone system from analogue to digital. The mark scheme offered a range of answers and candidates generally achieved one mark. Question B2 (b) asked candidates to outline one reason why some telephone systems were still analogue. Again this was answered reasonably by all but the weakest candidates.

Question B3 focused on a traffic light system using sensors to detect the presence of traffic. Section (a) asked candidates to describe how the system in Figure B3 works. G2 comments stated that this question required knowledge of electromagnetic fields and induction loops and these are not part of the course and not mentioned in the Guide and therefore an unfair question. This is probably a fair comment. However, candidates were not fazed by the question and provided fairly reasonable answers.

Question B4 was a fairly straightforward question asking candidates to outline one benefit for the user in purchasing electronic products based on generic standards. It was answered fairly well by most candidates.

Question B5 was worth six marks and asked candidates to discuss two issues that a communication systems designer would consider when implementing an information transfer system using copper wire. This question did not pose any particular problems for candidates apart from the issue – fairly widespread across Papers 2 and 3 – that these three mark questions requiring a more in-depth answer are more difficult and probably require teachers to discuss how to achieve the third mark. Many candidates can gain two marks on this sort of question but the third mark is much more of a challenge.

Question B7 – a 9-mark question – brought Option B to a close. It asked candidates to discuss three reasons why Programmable Interface Controllers can be regarded as a sustainable technology. While the question itself was not a problem for candidates, structuring answers in a way that achieved an appropriate depth of response to achieve the third mark for each of the reasons was. This is a question of examination technique and teachers need to help candidates to achieve this skill.

**OPTION C (CAD/CAM)**

Question C1 focused on the process of laser cutting different materials. Section (a) asked candidates to state one disadvantage of using a subtractive process. This posed most candidates no problem. Section (b) asked candidates to outline the settings for the CNC laser cutting that would need to be changed to produce a prototype of the sign from a thin piece of card rather than plastic. This question was not well answered and candidates did not seem to appreciate the relationship between power and feed speed in the context of different materials. Section (c) asked candidates to explain one advantage of using a laser cutter rather than a CNC router to make the sign from a thermoplastic. This was answered much better and many candidates earned two marks if not all three marks. Again the issue of providing enough depth of response to earn the third mark is an issue.

Question C2 (a) asked candidates to state the characteristic of the liquid resin used in stereo lithography that makes it appropriate for 3D printing. The answer was simply photosensitivity but very few candidates were able to offer this as the characteristic and to achieve the one mark on offer. Question C2 (b) asked candidates to outline one limitation of the nature of rapid prototyping for volume production. This was generally answered better and many candidates were able to earn both the marks on offer.

Question C3 focused on a chair seat made from hardwood and shaped using a CNC router. Section (a) asked for a description of the relationship between the X, Y and Z axes of the CNC router and the manufacture of the chair seat. Surprisingly this question was not well answered in the whole despite its apparent straightforwardness. Section (b) asked candidates to outline one way in which the machine tool step variable determines the quality of the chair seat when using a ball nose cutter. There were some excellent answers complete with diagrams and some very poor answers.

Question C4 asked candidates to outline one benefit of using CAD/CAM to create lost wax castings. This question was generally answered well.

Question C5 was worth six marks and asked candidates to explain two differences between haptic technology and virtual reality. There were some very good answers to this question and many candidates scored full marks.

Question C6 – a 9-mark question – brought Option C to a close. It showed a photograph of a desk made of MDF with a thermosetting plastic veneer which had been designed as a piece of flat pack furniture. The question asked for a discussion of three issues in relation to the design of the flat pack furniture desk in relation to its manufacture with CNC machinery. On some papers candidates had underlined the word design and focused on the word design that was the whole point of the question. Some candidates ignored the word design and rattled off some very long answers but because they were not about the design of the furniture achieved no marks. It is critical that students read the questions carefully and answer the question asked on the paper not the question they think was asked.

#### **OPTION D (TEXTILES)**

Question D1 focused on two security tags used by clothes retailers and provided photographs of the tags and some information about them. Section (a) asked candidates to state one reason why retailers might choose to use one of the tags over the other. This was fairly straightforward for most candidates. Section (b) asked for an outline of one reason why the tagging systems are only suitable for a limited range of soft goods. Many candidates correctly identified that the tags make a

hole in garments and can damage them. The third section of the question, (c), asked for an explanation of one reason why tagging systems were more popular with large retail outlets than smaller shops. Most candidates were able to offer reasonable answers to this. Those candidates providing sufficient depth of response were able to achieve all three available marks.

Question D2 showed a photograph of a pair of close fitting silk leggings used by mountaineers as a base layer underneath their outer clothes. Section (a) asked candidates to state one characteristic of silk that makes it suitable for undergarments for mountaineers. Many candidates provided reasonable responses and earned the one mark on offer. Section (b) asked candidates to identify the most suitable manufacturing technique for an undergarment made from silk. This was not well answered and only the best candidates managed to achieve the two marks on offer.

Question D3 focused on a woven decorative fabric designed using a CAD program that can convert image files into weave patterns. Section (a) asked for an outline of one advantage for the client of using CAD to design the fabric. This question was reasonably well answered on the whole. Section (b) asked for an outline of one issue that the designer must consider when designing the fabric for production using CAM. This posed more of a challenge to candidates although the good candidates were able to achieve both marks on offer.

Question D4 asked candidates to outline one advantage of using lace to create underwear. This was not well answered by some of the candidates.

Question D5 showed a photograph of coffee being spilt on a carpet that had been treated with a chemical finish after fitting in the home rather than during manufacture to help prevent staining. The question was worth six marks and asked candidates to discuss two advantages of this method of producing stain resistant carpets. Apart from the issue of providing enough depth of response to achieve the third mark this question was reasonably answered by most of the candidates.

Question D6 – a 9-mark question – brought Option D to a close. It focused on a range of sports product brand logos and asked candidates to discuss three issues relating to branding of sports clothing as a global market strategy. Some candidates were able to provide well-structured answers identifying three distinct issues and sufficient depth of response. Candidates not developing a good structure for this question tended to provide repetitive answers and not achieve the full marks on offer. This issue of structuring three mark questions is particularly evident on the 9-mark questions that ask for three 3-mark responses.

### **OPTION E (HUMAN FACTORS DESIGN)**

Question E1 showed a side view of a standard kitchen unit and an anthropometric model. Section (a) asked candidates to state the adult percentile used to decide the height of the wall unit. Many candidates offered 50<sup>th</sup> percentile and many more offered 5<sup>th</sup>-95<sup>th</sup> percentile as responses. The issue is one of reach and so the correct answer to this was 5<sup>th</sup> percentile a response offered by remarkably few candidates. Section (b) asked candidates to list two pieces of anthropometric data required to determine the depth of the base unit to allow users to gain access to the wall mounted electrical socket. Most candidates identified correctly arm length; the second piece of data was more problematic for most candidates. Section (c) asked candidates to discuss how the user would make best use of the kitchen units for storage in terms of efficiency and safety. This was reasonably well answered by candidates.

Question E2 showed a photograph of a skateboarder wearing a range of body armour to protect vulnerable body parts. Section (a) asked candidates to state one use of polymorph modelling material in the design development of body armour for skateboarders. This posed few problems and all but the weakest candidates achieved the one mark on offer. Section (b) asked candidates to outline one reason why the use of polymorph modeling material can contribute to a green design strategy. Many candidates focused on the fact that it can be reused and therefore reduces the amount of material going to landfill.

Question E3 focused on a storage unit for a computer printer as part of an integrated home office. Section (a) asked candidates for a description of how the designer had combined ease-of-use and aesthetics. This question was not well answered in the whole despite its apparent straightforwardness. Section (b) asked for an outline of one limitation of using the storage unit in relation to bodily tolerance. This seemed to generate answers either gaining zero marks as they were totally off course or two marks and not many candidates achieved one mark.

Question E4 asked for a list of two objectives of annual product testing for electrical equipment and was reasonably well answered by most candidates.

Question E5 showed a right-handed version of the Maltron single-handed keyboard. It asked for a discussion of two user considerations for the adoption of the keyboard as a mass market product and was worth six marks. This question was not well answered by candidates.

Question E6 – a 9-mark question – brought Option E to a close. It asked candidates to discuss three issues relating to displacing population stereotypes in the design of controls for products. Some candidates defined population stereotype but did not discuss problems relating to their displacement. Answering the question asked is a major issue for weaker candidates who often write a long response totally missing the point of the question. The skill of reading the question is one that teachers should focus on in preparing candidates for the examination.