Design Technology

Overall grade boundaries

Higher level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 14	15 - 27	28 - 39	40 - 50	51 - 62	63 - 74	75 - 100

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 13	14 - 25	26 - 36	37 - 48	49 - 61	62 - 73	74 - 100

Higher level and higher level 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

The range and suitability of the work submitted

Moderated work demonstrated examples of; exemplar project management strategies, original project ideas, the excellent use of modelling and CAD to enhance development, good workshop practice and a wide range of appropriate presentation techniques.

Schools continue to vary in their approaches to meet the requirements of the assessment criteria. One method, used by a few schools, is to assess two "design and make" projects, one of which submitted as the major design task. Another method is to complete the "design and make" project, but supplement this with a range of tasks and mini-projects that address different aspects of the assessment criteria. Either approach is appropriate, but the second

method provides greater opportunities for students to address each of the assessment criteria more than once. Schools that adopt the approach of lab and project work continue to score slightly higher marks overall as this generally takes up less time than that of design project, requires less specialist equipment and offers a more scientific route in the teaching of the subject.

Teachers are to be reminded that candidate work must be of that of an individual candidate and not overly teacher directed. This problem was less evident than in previous years, but common issues include Planning Aspect 1 and 2 and Research Aspect 1 where too much [teacher] direction is still provided.

Teacher 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 of the assessment criteria. Schools need to check and tally marks on the 4PSOWDT and those entered on to IBIS for each candidate are identical. Most samples were presented in an organized structure, but schools need to be reminded that work for each criterion needs to be clearly identified and there was little evidence of this. All sections of the 4/PSOWDT are to be completed. Schools must use the official documentation for assessment available in the handbook of procedures.

Teachers are encouraged to send a folder/folio for each candidate sample 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, or equivalent, format. Only work which is required for moderation is needed in the sample.

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 planning for a design project, candidates should consider; the feasibility of the study, identify the user, analyse the current situation/problem, write a clear brief which identifies the intended goal and produce a detailed and justified specification. Some work was very detailed and included photographic evidence of problems and market research. The quality of specifications is mixed; the best work makes use of research data, identifies quantitative constraints and includes detailed justification. Where initial specifications are considered, pupils need to follow this up with a more detailed version that considers the data collected.

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. A detailed analysis of the problem is required if students are to score highly for Aspect 1. For a design project, students need to include reference to primary and secondary data sources which are focused towards the task. Priorities need to made clear and where questions are raised, these need to be addressed in the collection and analysis of data.

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The best work in this section included a wide range of processed data which included market research, product analysis, information regarding user needs and constraints for where items were to be used. Data that is unfocused to the task is not required and generally shows a weakness in the pupils' understanding of the task.

Most students analysed data throughout research, but the best work also included a summary of data at the end of each page or before finalising design specifications.

Development (D)

There was evidence of some excellent work for this criterion, although some schools still fail to address Aspect 2 and Aspect 3 in sufficient depth.

The best work included a wide range of creative and original concept ideas, often sketched in isometric with different views for extra detail. Presentation included a range of rendering techniques and detailed annotation. Modelling strategies aided the refinement of ideas, culminating in sufficient detail for the intended outcome to be realised. Most work included use of CAD to present orthographic drawings.

Where ideas are mundane or offer limited variety pupils are likely to be awarded "Partial". In some schools this area needs further focus and attention to detail. Simply displaying an idea using a range of techniques or in different views is not enough to quantify awarding a "Complete". The chosen concept needs to be refined to consider functionality, user requirements, materials, construction, aesthetics, etc.

Evaluation (E)

With equal weighting being given to evaluation teachers need to consider how much time is ideally required to complete this part of the design project to an appropriate standard. Ideally candidates need to test their outcomes in the environment which it was designed for and with the intended end-user. The best examples of testing included detailed strategies for testing, including testing against specifications, user trials, expert feedback and performance tests.

Recommendations for the design project need to include a revised the specification, sketched modifications and consider the need for scaling up production. This is often poorly completed as it is the final aspect of the project.

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. 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, but not overly complex as students need to ensure folio work is given adequate time to address each aspect.

Recommendations for the teaching of future candidates

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

The subject guide for examinations starting in May 2016 is now available. Teachers are encouraged to make use of the OCC teacher support materials and where possible attend training.

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Higher level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 10	11 - 15	16 - 20	21 - 24	25 - 28	29 - 32	33 - 40

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

Question	Responses				Difficulty Index	Discrimination index
	A	B	C	D		
1	2	75	0	58	42.65	0.29
2	11	3	19	102	75.00	0.33
3	5	13	5	112	82.35	0.24
4	3	8	107	17	78.68	0.27
5	3	12	5	115	84.56	0.27
6	16	95	6	18	13.24	-0.04
7	80	7	45	3	33.09	0.38
8	7	34	17	77	56.62	0.47
9	4	18	1	112	82.35	0.16
10	2	0	120	13	88.24	0.20
11	63	31	22	19	46.32	0.31
12	15	1	118	1	86.76	0.29
13	5	31	93	6	68.38	0.31
14	120	11	2	2	88.24	0.24
15	2	1	122	10	89.71	0.24
16	4	128	2	1	94.12	0.11
17	21	100	2	12	8.82	0.13
18	7	11	113	4	83.09	0.13
19	25	65	24	21	18.38	0.00
20	4	110	6	15	80.88	0.24
21	9	105	13	8	77.21	0.20
22	6	19	87	23	63.97	0.13
23	4	91	22	18	66.91	0.44
24	6	8	12	109	80.15	0.20
25	38	30	61	6	44.85	0.22
26	106	6	19	4	77.94	0.44

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27	5	12	104	14	76.47	-0.04
28	43	9	61	22	44.85	0.40
29	12	73	32	18	53.68	0.11
30	104	1	1	29	76.47	0.18
31	0	117	16	2	86.03	0.22
32	110	17	2	6	80.88	0.29
33	56	2	17	60	41.18	0.29
34	13	91	27	4	66.91	0.33
35	40	16	45	34	25.00	0.09
36	106	9	10	10	77.94	0.31
37	3	4	128	0	94.12	0.18
38	73	50	4	8	53.68	0.36
39	46	2	0	87	33.82	0.04
40	16	105	7	7	77.21	0.40

The difficulty Index refers [counter intuitively] how difficult a question is. The higher the difficulty index, the easier the question is; the percentage of candidates who achieved the correct response(s).

The discrimination index determines how well a question differentiates between those candidates who performed well on the examination paper as a whole and those who performed poorly. The discrimination index can range from -1 to +1. The higher the index, the more the question positively differentiates between the candidates who performed well on the examination paper as a whole and those who performed poorly. A negative discrimination index suggests weaker candidates on the examination paper overall performed better on the question than did stronger candidates on the examination paper overall.

In the Grade Award meeting the team looks at questions that have negative discrimination indices and any questions that receive comment on the G2s. As already mentioned there were no G2 comments on specific questions. As Questions 6 and Question 27 had negative discrimination indices they were looked at carefully. Question 6 uses the term 'least likely' with response B being selected by the largest number of candidates (95) although response D was considered by the examining team to be the least likely to be the impetus for green design. Question 27 the correct and most popular response was C with a difficulty index of 76.47, so this was a relatively straightforward question for candidates. Consequently it is difficult to see why this question caused problems for the most able candidates and resulted in a negative discrimination index. One suggestion is that some second language candidates struggle with terms like 'least likely' and 'not' style questions which is why their use on examination papers is limited but is sometimes unavoidable.

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Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 10	11 - 14	15 - 17	18 - 20	21 - 23	24 - 30

General comments

There were only 15 candidates for this component, so making generalizations is very difficult.

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

Question	Responses				Difficulty index	Discrimination index
	A	B	C	D		
1	2	1	1	11	73.33	0.60
2	1	7	5	2	46.67	0.60
3	0	4	0	11	73.33	0.20
4	6	3	1	5	20.00	0.00
5	5	0	10	0	66.67	0.40
6	0	2	12	1	80.00	0.00
7	3	9	1	2	13.33	0.00
8	9	2	4	0	26.67	0.40
9	0	4	2	9	60.00	0.20
10	0	5	0	10	66.67	0.60
11	0	0	3	12	80.00	0.20
12	5	4	2	4	33.33	0.20
13	8	1	6	0	53.33	0.40
14	9	3	1	2	60.00	0.40
15	3	8	4	0	53.33	0.40
16	2	0	11	2	73.33	0.40
17	0	2	13	0	86.67	0.40
18	9	0	6	0	60.00	0.80
19	4	7	0	4	46.67	0.60
20	0	0	0	15	100.00	0.00
21	1	13	0	1	86.67	0.20
22	3	5	3	3	20.00	0.20
23	2	12	0	1	6.67	0.20
24	0	3	10	2	66.67	-0.20
25	2	5	7	1	46.67	0.40

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26	2	8	1	4	53.33	0.80
27	0	15	0	0	100.00	0.00
28	2	2	0	11	73.33	0.40
29	2	1	2	10	66.67	0.40
30	3	2	10	0	66.67	0.20

The difficulty Index refers [counter intuitively] how difficult a question is. The higher the difficulty index, the easier the question is; the percentage of candidates who achieved the correct response(s).

The discrimination index determines how well a question differentiates between those candidates who performed well on the examination paper as a whole and those who performed poorly. The discrimination index can range from -1 to +1. The higher the index, the more the question positively differentiates between the candidates who performed well on the examination paper as a whole and those who performed poorly. A negative discrimination index suggests weaker candidates on the examination paper overall performed better on the question than did stronger candidates on the examination paper overall.

Again no G2s were received. The question with negative discrimination indices (Question 24 in this case) was reviewed. It was retained despite its negative index as there seemed nothing inappropriate about the question which the majority of candidates got right and because of the very small size of the candidature which can distort this type of analysis.

Higher level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 6	7 - 12	13 - 18	19 - 25	26 - 32	33 - 39	40 - 60

General comments

Candidates appeared to feel comfortable with the paper as nearly all questions were attempted with full responses given, though not necessarily accurate, as indicated in the question by question analysis.

Teachers are advised to apply the Grade Descriptors when grading students' work, especially in the latter part of the course as part of preparations for the examination. The Grade Award Team adhere closely to the Grade Descriptors when deciding the grade boundaries for each assessment component though some are applicable to practical coursework rather than scripts. It is clear from the predicted grades supplied by schools that not all teachers are familiar with the Grade Descriptors and how to apply them to students' work even though this procedure is an essential aspect of the IB in-service training programme for teachers.

The areas of the programme and examination which appeared difficult for the candidates

Extended response questions in Section B (c) (ii) proved challenging for many candidates. This type of question is included to provide the opportunity for able candidates to not only show their knowledge but also to demonstrate their ability to communicate effectively. This objective links to the Grade Descriptors relating to the higher grades i.e. comprehensive knowledge; thorough command of concepts and principles and ability to select and apply them; constructs detailed explanations; communicates logically and concisely and shows insight or originality (Grade 7 Excellent Performance).

The areas of the programme and examination in which candidates appeared well prepared

Question 1 (Section A) seemed very accessible in terms of the nature of the data and most candidates were able to provide a response to each sub-question.

In Section B there was little difference between question choices indicating that the contexts were appropriate for candidates.

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The majority of candidates appeared well prepared for the format of the examination and coped with design questions well but were less competent with technology questions such as 3(b) and 5(a).

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

Section A

1.(a) (i) Candidates needed to read the stem of the question astutely to recognise that constructive discontent was the answer required.

(i) Most candidates appreciated the characteristic of polystyrene in providing insulation.

(iii) A number of possible answers available so quite an easy question for the majority of candidates.

(b) (i) Candidates needed to think carefully about the conditions of use for the Wonderbag so hygiene would be an issue and durability of the material/stitching.

(ii) This question related to manufacturing techniques for creating the bag from textile material by cutting and stitching rather than creating the textile from raw materials.

(c) (i) Most candidates focused on the price of paraffin.

(ii) Not a difficult question in terms of comprehension but for 3 marks candidates needed to make 3 clear (linked) distinct points in a discussion of one limitation.

(d) (i) Quite a number of candidates stated the saving in millions of tons – a quick 'order of magnitude' glance at the answer would have spotted this error.

(ii) Most candidates focused on the image of the company but few planned their answer carefully enough to develop the discussion in relation to market penetration and development in the region.

(e) (i) Candidates needed to apply characteristics of *appropriate technology* as defined in the Subject guide i.e. appropriate to the local community in terms of labour and materials rather than generalising about energy saving.

(ii) A number of safety issues applied so not a very difficult question though many candidates only gained one mark as their answers were too vague.

2. Part (a) was straightforward but for part (b) many candidates did not focus their answer on 'scale of production' but discussed steam powered trains etc.

3. Part (a) was answered well but there was a lack of understanding of the concept of 'moment arm' so not many candidates achieved even one mark for part (b).

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4. Some candidates confused kinetic energy with potential energy in part (a) and though there was generally a good understanding of capital and manufacturing costs many candidates merely defined them rather than comparing them in the given context.

5. Part (a) required mere syllabus recall but this proved difficult for many candidates and there was a tendency just to describe the technique of compression moulding for part (b) rather than identifying the characteristics of compression moulding which thermosetting plastics are able to tolerate.

6. In general, part both parts of the question for answered well.

Section B

7.(a) (i) Too many responses to this question were convoluted as candidates failed to consider the implications of such a radical design for research and development costs.

(ii) Candidates needed to focus very specifically on characteristics of market development in the given context to gain marks – many candidates just generalised about market conditions.

(b) (i) Most candidates appreciated the benefits to consumers of the similar appearance of the Burgman Scooter to existing models.

(ii) Too many candidates discussed issues relating to the use of hydrogen rather than focusing on it as an industrial by-product and whether it would be a reliable resource if demand for the scooter was high.

(c) ((i) This was not a difficult question as long as candidates assimilated the information contained in the stem.

(ii) The focus of the question related to purchasing a Burgman Scooter i.e. following on from previous questions which concerned the nature of the technology and the market. If candidates understood this focus and planned their answer carefully to differentiate between three distinct considerations it was not difficult to gain high marks. Unfortunately, most candidates discussed broader considerations and did not refer specifically to aspects of the design of the Burgman scooter.

8.(a) (i) Although it might be argued that the mechanism is not shown very clearly in Figure 5, the cables from the handlebars to the wheels are distinct and bicycle mechanisms are a feature of the syllabus (10.3.2).

(ii) A straightforward question for candidates who appreciated that the interaction between the chain and the cogs requires regular maintenance in relation to lubrication to prevent damage and ensure efficiency of use.

(b) (i) An easy question as long as candidates knew the difference between a body load and an external load.

(ii) Many candidates found this question difficult, not because they felt they could not answer it but because they missed the point i.e. the extra wear and tear relating to the folding mechanism.

(c) (i) An easy question for candidates with knowledge of permanent joining techniques.

(ii) Candidates needed to spend time planning their answer to ensure they differentiated succinctly between social, economic and environmental factors. Too many responses were generalised with considerable overlap and repetition in the discussion of the benefits of using the folding bicycle.

9.(a) (i) To answer this question successfully candidates needed to know how the chair would be manufactured and the nature of plywood for a design where aesthetics is important – many candidates failed to appreciate this.

(ii) The question asked candidates to refer to the 'design of the chair' in which the pattern of holes has a practical function as well as a decorative one.

(b) (i) Candidates who were aware of how plywood is manufactured found this a straightforward question.

(i) Surprisingly, many candidates found it difficult to gain all three marks as the focus of the question was anthropometrics i.e. broad percentile range or physiological aspect (comfort).

(c) (i) this question required candidates to think again about the use of plywood in the given context and the need to ensure the many edges were smooth/safe or the issue of durability in using such a material for an intricate design.

(ii) This question followed on naturally from part (i) requiring candidates to consider how quality control measures would deal with the issues raised for safety, durability and aesthetics. Many candidates merely explained general quality control considerations for producing the chair rather than focusing on the specific type of design.

Recommendations and guidance for the teaching of future candidates

In order to gain high grades candidates need to perform well on the data-based question (Question 1) and their chosen Section B question.

Question 1 is not syllabus specific so candidates cannot "revise" for it in the same way as for other questions. They need to gain practise in assimilating data and selecting the appropriate data to answer the questions. This may not be a straightforward exercise for many candidates and they will need instruction and guidance from teachers to feel confident when tackling this style of question. It is important, therefore, that teachers integrate this into their *Scheme of Work.* It may be better to devote time for this later in the course once students are more familiar with the course concepts and the nature of the vocabulary used.

Candidates need to be taught how to structure extended response questions especially for part (c) (ii) of the Section B question. It is usually apparent from the wording of the question how the available 9 marks will be allocated in the markscheme. Candidates should be shown how to format their response to match the "clusters" of 3 marks. Use of past papers and markschemes will indicate how marks are distributed for astutely differentiated responses.

Standard level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 3	4 - 7	8 - 10	11 - 15	16 - 21	22 - 26	27 - 40

General comments

There were only 15 candidates for this component, so making generalizations is very difficult. However, candidates appeared to feel comfortable with the paper as nearly all questions were attempted with full responses given, though not necessarily accurate as indicated in the question by question analysis.

Teachers are advised to apply the Grade Descriptors when grading students' work, especially in the latter part of the course as part of preparations for the examination. The Grade Award Team adhere closely to the Grade Descriptors when deciding the grade boundaries for each assessment component though some are applicable to practical coursework rather than scripts. It is clear from the predicted grades supplied by schools that not all teachers are familiar with the Grade Descriptors and how to apply them to students' work even though this procedure is an essential aspect of the IB in-service training programme for teachers.

The areas of the programme and examination which appeared difficult for the candidates

Extended response questions in Section B (c) (ii) proved challenging for many candidates. This type of question is included to provide the opportunity for able candidates to not only show their knowledge but also to demonstrate their ability to communicate effectively. This objective links to the Grade Descriptors relating to the higher grades i.e. comprehensive knowledge; thorough command of concepts and principles and ability to select and apply them; constructs detailed explanations; communicates logically and concisely and shows insight or originality (Grade 7 Excellent Performance).

The areas of the programme and examination in which candidates appeared well prepared

Question 1 (Section A) seemed very accessible in terms of the nature of the data and most candidates were able to provide a response to each sub-question.

In Section B there was little difference between question choices indicating that the contexts were appropriate for candidates.

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The wording of some of the questions seemed to confuse some candidates. Although paper authors appreciate that many candidates are studying in a second language it is assumed that the technical terms used in the Subject Guide will be familiar and well understood.

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

Section A

1.(a) (i) A relatively simple calculation required but quite a few candidates failed to assimilate the data correctly to carry this out.

(ii) Some candidates seemed confused by the term 'raw material'.

(iii) Candidates needed to focus on the information stated in the stem of the question referring to 'prototype' and hence, the difference from a commercially produced still.

(b) Both parts of the question proved difficult for many candidates as they failed to appreciate the difference between social and moral responsibilities leading to confused and inaccurate responses. It is true that the difference is quite subtle but that was the point of the question which meant it served the purpose of differentiating between ability levels.

(c) Part (i) was quite easy for most candidates but although many candidates correctly focused on the limited amount of clean water from the solar still in terms of the needs of a family in part (ii) they did not structure their response astutely enough to gain all three marks.

3. Surprisingly, not many candidates were able to state the type of model represented in Figure 3 for part (a) but in part (b) most candidates successfully comprehended that the map did not represent reality as it is based on a grid for ease-of-reference so the locations would not be neatly in straight lines above ground and distances between them would be more varied.

2. Part (a) was straightforward as long as candidates knew about the general structure of composite materials and for part (b) most candidates understood that fibres were woven together to create a matrix but the tendency was to *describe* the link rather than *explain* it.

Section B

5.(a) (i) Candidates needed to convey the essence of the definition from the Subject Guide though not necessarily using the exact terminology.

(ii) Candidates who understood the difference between the various types of corporate strategies stated in the syllabus were able to describe how *product development* may have been used in the given context.

(iii) 'Form v Function' questions are a common feature of the Design Technology examination papers as they epitomise *design* and *technology*. Although the concepts tend to be

comprehended by most candidates the difficulty lay in applying them to the context and it is easy to write vague answers which is what happened overall.

(b) (i) This was an easy question for candidates as long as candidates referred to *data* i.e. appropriate body part measurement.

(ii) This was a difficult question. Candidates needed to think carefully about the importance of perception to the designer in deciding what combination of mood lighting and sounds to integrate into the product and the nature of the data that would be used during the research and development phase.

(c) (i) The majority of candidates gained the marks for this question.

(ii) Although the strategies of *performance testing, user trials* and *expert appraisal* appeared to be well known to candidates not many successfully applied the strategies to stages of the design cycle for the given product. When answering this type of question candidates need to ensure repetition is avoided.

5.(a) (i) As intended, this was quite an easy question and most candidates gained the mark.

(ii) Many candidates failed to focus on reference made in the question to 'choice of materials'.

 (iii) Candidates needed to consider why *mass customisation* might be used e.g. promotional events so a specific surface design for the Vegware products.

(b) (i) The wording of answers need to convey the meaning of the definition stated in the Glossary of the Subject Guide.

(ii) Candidates needed to focus on the nature of the technology for the Vegware products i.e. the materials used with implications for the amount of R&D compared to low design costs for such a simple product range, little different to normal paper-based tableware.

(c) (i) If candidates appreciated that there was an existing market for disposable tableware it would not be difficult to show how the market might be developed with the introduction of Vegware tableware.

(ii) The answer to this question needed to be structured carefully in order to differentiate between environmental effects of the product range at different stages of the life cycle. Candidates might have used an environmental impact matrix to plan their answer as they focused on benefits/detriments in relation to the environment.

6.(a) (i) This was a relatively straightforward question.

(ii) Most candidates successfully identified an appropriate manufacturing technique but did not *outline the response* rather than just stating it.

 (iii) This was intended as a relatively easy question but not many candidates understood how the shape of the legs would be produced.

(b) (i) If candidates used the information supplied in the stem of the question they should have been able to work out that the chair has been successfully sold for many years and continues to sell well.

(ii) Although most candidates understood that the thermoplastic seat was likely to be cheaper to manufacture, not many were able to explain why this would be the case.

(c) (i) To answer this question well candidates needed to know the definition of *robust design* and use the information from the stem of the question to show how the original design has been adapted in relation to new materials and manufacturing techniques.

(ii) *Planned obsolescence* and *fashion* are usually familiar concepts for most candidates, especially as past papers contain many questions relating to the concepts. 'Consumer perception of quality' is not a common phrase but candidates should know how to apply the principle of *quality* to a product and 'consumer perceptions' relate to the nature of the Eames DSW chair as a design classic. If candidates appreciated the classic status of the chair they should have been able to consider durability of materials and construction, style and hence, perceived quality which has made the design successful for many years.

Recommendations and guidance for the teaching of future candidates

In order to gain high grades candidates need to perform well on the data-based question (Question 1) and their chosen Section B question.

Question 1 is not syllabus specific so candidates cannot "revise" for it in the same way as for other questions. They need to gain practise in assimilating data and selecting the appropriate data to answer the questions. This may not be a straightforward exercise for many candidates and they will need instruction and guidance from teachers to feel confident when tackling this style of question. It is important, therefore, that teachers integrate this into their *Scheme of Work*. It may be better to devote time for this later in the course once students are more familiar with the course concepts and the nature of the vocabulary used.

Candidates need to be taught how to structure extended response questions especially for part (c) (ii) of the Section B question. It is usually apparent from the wording of the question how the available 9 marks will be allocated in the markscheme. Candidates should be shown how to format their response to match the "clusters" of 3 marks. Use of past papers and markschemes will indicate how marks are distributed for astutely differentiated responses.

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Higher level paper three

Component grade boundaries

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

General comments

Overall, Option E was the most popular option, closely followed by Option C. There were a few responses to Option A – far too few to make any meaningful comment, and none from Options B and D. Therefore this report will concentrate on Options C and E.

A general comment that can be made about candidate performance is that too many times the detail in the stem of the question is ignored e.g. outline one advantage, or the focus is missed e.g. the owner of a fast food restaurant.

Many candidates waste time (and space within the answer box), repeating the stem of the question. This appears to give them the impression that they have fully answered the question, even though they have given no new information. It may also result in them writing on other areas of the answer book that may well be missed by the examiner.

The areas of the programme and examination which appeared difficult for the candidates

Many candidates had a reasonable general knowledge of the content required for this paper, but often lacked the technical knowledge to access the higher mark ranges. Examples of this were how stereo lithography differed from fused deposition modelling, or how motion capture technology is used to create a digital human.

The areas of the programme and examination in which candidates appeared well prepared

Candidates are able to make good observations based on general knowledge about many of the topics focused on in the questions.

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

Candidates are able to make good observations based on general knowledge about many of the topics focused on in the questions.

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

Question15 was poorly answered; especially part (c), where photographs were rarely mentioned.

Question 16 was well answered by the majority.

Question 17 (a) was an example where lack of technical knowledge limited some candidates. Part (b) was well answered.

Question 18 was a 6 mark question, where a lack of structure to the answer led many candidates to repeat themselves. The focus was a multinational cosmetic company and this was ignored by a significant minority.

Question 19 was accessible by the majority of candidates, although in part (b), the advantages of using robots in batch production were not well explained.

Question 20(a) was well answered, but in part (b) there was a lack of understanding of what was meant by 'work patterns'.

Question 21 once again suffered from poor structuring of the answer, leading to repetition and a lack of the correct number of points to access the higher mark ranges.

Question 29 was well answered by most candidates, although in part (b) many failed to refer to the use of PPE.

Question 30 was also generally well answered, but the technical term 'torque' was sometimes not known.

Question 31 Candidates were able to clearly state a human factor in part (a), but too many offered answers to part (b) that were not so e.g. 'provides a hook to hang it from'.

Question 32 Candidates tended to 'mix up' their responses to this question, combining the memory burden and mapping strands in one discussion point based on history. The fact that the mapping of the letters on the keyboard is illogical now that they are electronic was not discussed by the majority of candidates.

Question 33 was well answered by many candidates, but an apparent 'sense of repetition' led some candidates to offer some far-fetched reasons in part (b) e.g. 'gives you more time for other things'. In part (c), an explanation of the moral responsibility was often missed out.

Question 34 (a) was well answered, but in part (b), many candidates gave a description of the use of digital humans rather than explaining 'how' motion capture was used to create a digital human.

Question 35 The majority of candidates were able to describe an example of the use of the kitchen work triangle. However, few were able to explain three ways how this could improve human factors consideration at the design development stage. A significant number of candidates discussed ergonomic/anthropometric issues instead.

Recommendations and guidance for the teaching of future candidates

Apart from the comments already made regarding the need for deeper technical knowledge of the subject content, centres would be advised to concentrate on enabling their candidates to access the higher mark ranges in the two extended questions (6 & 9 marks each).

Repetition is the major enemy, but a lack of structure that clearly visits the required number of issues required by the question (2 or 3) and provides 3 distinct points in the explanation of these issues limits many candidates the lower ranges.

Once again, it must be noted that the skill of reading the question is one that teachers should focus on in preparing candidates for the examination.

Standard level paper three

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 3	4 - 6	7 - 9	10 - 13	14 - 18	19 - 22	23 - 30

General comments

There were only 15 candidates for this component, so making generalizations is very difficult.

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

The small number of candidates/schools resulted in anything like a reasonable number of responses being obtained for Option C and Option E only. This report will therefore focus on these two options.

Option C

Question 13

(a) A straightforward question that posed few problems for any except for the weakest candidates.

(b) A straightforward question that posed few problems for any except for the weakest candidates.

(c) A straightforward question that posed few problems for any except for the weakest candidates.

Question 14

A straightforward question that posed few problems except for the weakest candidates.

A straightforward question that posed few problems except for the weakest candidates. Most recognised that the fea results could be used to develop the design virtually before going into production.

Question 15

Not so well answered by candidates but it is not clear why that should have been.

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Many candidates recognised that surface modelling results in an appearance prototype rather than a functional prototype (working model)

Question 16

This question posed few problems.

Question 17

Again this question posed few problems apart from the ongoing issue that three mark questions require the candidate to provide a depth of response and the weaker candidates seem unable to do that.

Question 18

As for question 17 this three by three-mark question required candidates to provide a depth of response and the weaker candidates seemed unable to do that.

Option E

Question 25

(a) Most candidates achieved a mark for this question.

(b) This question seemed easy and most candidates achieved one or two marks for this question

(c) The depth of response for some (weaker) candidates meant that many achieved two rather than three marks for their answee

Question 26

(a) This was very straightforward.

(b) This was not well answered. The issue of hair on the head ar slouching was mentioned only by a few candidates.

Question 27

(a) This was well answered by the majority of candidates who recognised that the twist if the handle made the can opener more comfortable to use.

(b) This similarly was straightforward to most candidates who recognised that the holes in the rotating head prevented slippage.

Question 28

This was remarkably badly answered despite appearing relatively straightforward..

Question 29

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This also was badly answered even by some of the better candidates. As for question 17 this three mark question required candidates to provide a depth of response and the weaker candidates seemed unable to do that.

Question 30

As for Question 18 this three by three-mark question required candidates to provide a depth of response and many of the candidates seemed unable to do that. Those candidates laying out their answers in a structured manner generally performed better. Answering this sort of questions is something that teachers should focus on in preparing for the examinations so that candidates recognise the importance of providing a depth of response. Even some of the stronger candidates would benefit from this.

Recommendations and guidance for the teaching of future candidates

Apart from the comments already made regarding the need for deeper technical knowledge of the subject content, teachers would be advised to concentrate on enabling their candidates to access the higher mark ranges in the two extended questions (6 & 9 marks each).

Repetition is the major enemy, but a lack of structure that clearly visits the required number of issues required by the question (2 or 3) and provides 3 distinct points in the explanation of these issues limits many candidates the lower ranges.

Once again, it must be noted that the skill of reading the question is one that teachers should focus on in preparing candidates for the examination.