November 2012 subject reports

DESIGN TECHNOLOGY

General comments

The purpose of this report is to provide feedback to teachers on the various components of the November 2012 examination including comments on the general performance of candidates for individual questions and to highlight any problems/issues. It is important that teachers are aware of the use of the Grade Descriptors for Group Four subjects the descriptors state sets of skills and knowledge required to achieve the grades 1-7 and is used by members of the Design Technology Grade Award Panel when reassessing marked scripts to decide on the grade boundaries for a particular examination session. Panel members pay due attention to comments received from teachers on the G2 feedback forms. No G2 forms were received for this examination session which is disappointing in one sense but the Panel assumed that 'no news is good news' and teachers were satisfied with the level and format of the papers. Grade boundaries are set on the basis of evidence found in the scripts matched to the requirements of the grade descriptors. Teachers are encouraged to use the grade descriptors when making final judgements on their students' performance in internal examinations and important pieces of coursework as well as for the predicted grades submitted to the IB. Grade descriptors can be found in the Handbook of Procedures available from IB Co-ordinators or from the On-line Curriculum Centre (OCC).

For the November 2012 examination there was a decrease in candidature of 3% at Higher Level with 10 new schools and an increase of candidature of 20 at Standard Level with 3 new schools. However, these figures are highly volatile as the Higher Level candidature was 105 and the Standard Level candidature 41. Teachers in new schools who are also new to the IB Diploma Programme will need to work through a few iterations of their schemes of work before they are completely confident with their teaching programme and the standards applied in all the examination components. Scrutiny of the mark schemes for the written papers along with the comments on individual questions contained in this report should help teachers in this regard.

In keeping with IBO policy for examinations, November 2013 papers will be marked electronically. This procedure will not affect the style of the papers or how they are sat by candidates but it will be a more efficient process for the despatch and marking of papers.

Overall grade boundaries

Higher level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 14	15 - 26	27 - 39	40 - 51	52 - 63	64 - 75	76 - 100

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 13	14 - 26	27 - 36	37 - 48	49 - 61	62 - 74	75 - 100

Higher and standard 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

Practical investigation

Sample work displayed evidence of a wide range of investigations and projects that satisfied the assessment criteria. Schools that adopt the approach of lab and project work tend to offer the most opportunities to address assessment criteria, as they are able to concentrate on one or two criterion at a time. Schools are asked to avoid excessive use of time for investigations, but are reminded to meet the minimum requirements for SL and HL.

Coursework should be used as a support exercise in order to help candidates understand the theoretical nature of the subject and develop project skills.

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.

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.

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Most samples were presented in an organized structure, but teachers are reminded that work for each criterion needs to be flagged. Teachers are also reminded to complete all sections of the 4/PSOWDT, including details of the project, ICT usage, topics covered in each IA and the time taken for each IA.

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.

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. When using the assessment criteria for a design project, candidates should consider the feasibility of the study, identify the user, analyse the situation, write a clear brief which identifies the intended goal and produce a detailed and justified specification. Where possible photographic evidence of problems is encouraged as these can help establish the need. When completing a lab based investigation independent and dependent variables must be identified.

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. 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.

A literature search, a “history of products” PowerPoint presentation or product analysis and the copying of textbooks is to be discouraged. The need to collect data should be apparent.

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

Development (D)

This criterion lends itself to **design-based** activities, where candidates have the opportunity to generate and develop an innovative range of ideas using suitable techniques. Few schools misinterpreted the criteria and submitted inappropriate work for the assessment of Development. Literature search assignments, PowerPoint presentations, computer test

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simulation software and most laboratory-based experiments are not suitable tasks for assessment of Development.

Teachers should consider how the techniques outlined on page 49 of the subject guide along with card, manufactured boards, CAD and Styrofoam can be used to aid model development. Development is the refinement of a solution using appropriate strategies so as to establish suitable materials, construction, dimensions, form and finish. Detailing for the solution to be realized needs to be detailed and presented in an appropriate format, such as engineering drawings or patterns for textile outcomes. Detailing for all outcomes needs to be clear and sufficient for projects to be made.

Evaluation (E)

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

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

Manipulative Skills (MS)

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

Recommendations for the teaching of future candidates

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

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

Schools are reminded to flag work for moderation. Use of the OCC exemplar material is to be encouraged by teachers in helping them understand and meet the standards of assessment.

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

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Higher and standard level paper one

The variability of the boundaries for both components were addressed this session (due to the algorithms that link the grade boundaries of Paper 1 to the outcomes from Paper 2) as a baseline for grade boundaries, based on the assumption of the papers being of equal accessibility, being agreed.

There were no G2s received for this session. Can we please encourage that as many schools as possible to return these forms in the future and also to post their reflections on the OCC DT forum. The comments on these forms are carefully considered at the Grade Award Meeting.

Higher level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 10	11 - 14	15 - 19	20 - 24	25 - 28	29 - 33	34 - 40

Individual Question Analysis:

Question 3

This question was relatively hard with poor discrimination (Difl=36.59; Disl=0.00). It was felt that if candidates would have had a clearer understanding of the terms *algorithm* and *flowchart* and applied it to this question then it would have led to greater clarity with more students selecting the correct answer.

Question 30

This question was difficult and poorly discriminated (Difl=38.61; Disc=0.06). Many candidates thought the answer was either A or C, but although it was a hard question the better students would have known that A was correct.

Question 35

This was a difficult question that poorly discriminated (Difl=15.84; Disl=0.21). This question is deliberately meant to be harder. The question focus' on how daylighting reduces consumption not reducing waste and thus, only I and III can be correct.

Question 39

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This statistical was the hardest question on the paper (Difl=8.91; Disl=0.06) as it required knowledge of strategies for green design and applying this to economic considerations. Through a process of elimination the correct response could have been arrived at.

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 11	12 - 14	15 - 17	18 - 21	22 - 24	25 - 30

Individual Question Analysis:

Question 3

This question was relatively hard with poor discrimination (Difl=36.59; Disl=0.00). It was felt that if candidates would have had a clearer understanding of the terms *algorithm* and *flowchart* and applied it to this question then it would have led to greater clarity with more students selecting the correct answer.

Question 10

Candidates found this to be a difficult question that discriminated poorly (Difl=39.02; Disl= 0.07). With a clearer understanding of what ecolabels and energy labels are students should have been able to answer this question correctly.

Question 16

Upon review of this question it was decided that the mark scheme needed to change as both B and C could be accepted as adding scrap glass leads to savings not only in the raw materials, but also in the energy consumption of the glass furnace.

Question 21

Whilst candidates found this question difficult and it poorly discriminated (Difl=19.51; Disl=0.00) through a process of elimination it would have been possible to arrive at the answer. It is also important that the Design technology Guide is used for a definitive answer.

Question 24

This question was statistically the most difficult on the paper with reasonable discrimination (Difl=14.63; Disl=0.29). Confusion could have stemmed from a lack of clarity surrounding quality assurance and quality control.

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Question 28

This proved to be a difficult question although it did allow for positive discrimination (Difl=19.51; Disl=0.21). Whilst B and D are advantageous, response A is the major advantage and is in fact a consequence of this direct relationship.

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Higher level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 6	7 - 12	13 - 19	20 - 26	27 - 33	34 - 40	41 - 60

General comments

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 subset 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.

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

If no question analysis is provided the question was straightforward and caused few problems for candidates.

Section A

Question 1

The data appeared to give little cause for concern and most candidates were able to assimilate it and select the appropriate aspects for each part question. Although the annotation for Figure 2 was not very clear it did not have a bearing on any of the questions.

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(a) (i) Some candidates repeated what was stated in the stem of the question i.e. “wind” rather than “external” but many candidates understood the nature of the question well.

(ii) “Isometric” was incorrectly stated by quite a few candidates.

(iii) As the question was a two mark “outline” candidates who merely stated ‘analogy’ without qualifying what type of analogy gained only one mark.

(c) (ii) Unfortunately many candidates did not make good use of the data in Table 1 to explain the terminal most crowded at capacity so few candidates gained all the available marks.

(d) (ii) The key word in the question was “pattern” so in order to gain all three marks candidates needed to comment on the fluctuations pattern of energy consumption as part of an overall trend.

(e) (ii) This question proved to be more difficult than anticipated. Most candidates thought the answer was “food waste” or “vehicle tyres….” rather than plastics which would be a diverse mix of thermoplastics and thermosets to be identified and sorted. Food waste is easily recycled and the vehicle tyres category would be easily sorted by product.

Question 2

(b) Although most candidates understood the terms “deflection” and “stiffness” not many structured their response effectively enough to explain the relationship between them.

Question 4

(a) Most candidates failed to gain the mark for this question probably because of the design context stated though it relates directly to Assessment Statement 10.1.10 in the Subject Guide.

(b) Many candidates misinterpreted the question and discussed a belt and chain drive system rather than separate systems. Those candidates who fully understood the question were able to gain full marks.

Question 5

(a) Few candidates provided a simple “list” and spent valuable time describing or outlining two functions. As part of their examination preparation candidates should recognize the implications of command terms used at the start of questions and the nature of the answer required.

(b) The technique of “vacuum bagging” as part of a lay – up process was not well understood by the majority of candidates.

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Question 6

(b) Candidates who recognised the necessity to refer to “u – values” were able to relate the concept of selection of materials for a building and the effect on heat loss or gain but many other candidates provided quite vague responses.

Section B

All questions appeared to be accessible to candidates as there was a fairly equal distribution of choices made. Candidates attempted all parts of their chosen question which indicated that they felt they could provide a suitable answer even if the answer was not always entirely accurate.

Question 7

(a) (i) Most candidates described the alternating layers of veneers or ply but surprisingly not all of them mentioned the use of glue, possibly because it may have seemed too obvious. Candidates should ensure that answers are precise in all respects.

(ii) Many candidates either did not read the question carefully enough and/or did not know the list of physical properties from section 4.1 of the Subject Guide.

(b) (ii) As this was a “discuss” question candidates needed to ensure their answer was detailed enough to gain all three marks relating to one ergonomic consideration. Many responses focused on an appropriate consideration but lacked sufficient detail.

(c) (i) Surprisingly, this question was not answered well overall as many candidates assumed that the product would be mass produced but the answer needed to focus on the limited market for such a product.

(ii) Many answers were much too convoluted to gain a significant amount of marks. Candidates needed to think carefully about which advantages to focus on and how each advantage would be explained by three distinct points.

Question 8

(b) (i) Not many candidates thought about the lack of buffeting action which is an essential part of the design when used in close proximity to a desk etc.

(ii) Most candidates understood that such a product was the result of a complex design process but not many explained the need for different specialists in the team and that it would be very difficult for one person to have all the necessary expertise.

(c) (i) Most candidates correctly focused on the Dyson fan’s adjustable height range.

(ii) The issues of maintenance and safety were well covered by many candidates but good responses relating to aesthetics were rare.

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Question 9

(b) (i) Many candidates found it difficult to articulate an appropriate response relating to the nature of the “two-in-one” product and the context in which it would be used.

(ii) Most candidates correctly identified the issue of reliability but failed to gain all three marks due to the lack of sufficient detail and/or a poorly structured response.

(c) (i) Some candidates incorrectly focused on reduction in energy during use rather than a reduction on materials and energy resources during manufacture.

(ii) Many candidates were able to differentiate successfully between invention and innovation but few went on to discuss design considerations in relation to style and form verses function.

Recommendations and guidance for the teaching of future candidates

In keeping with other years, the main problem with candidates’ responses to questions on the paper was not lack of knowledge but the inability to plan and structure their answers to questions which fall into the “objective three” category. Although it is recognised that the syllabus is demanding in terms of teaching hours it is important that a scheme of work allows for sufficient preparations for the different styles and levels of questions so candidates can make the most of their ability under examination conditions. The inability to structure extended response questions appropriately is shown by the numerous additional pages used by candidates. Although it may be necessary for an able candidate to expand a little on a point being made, candidates should recognise that the amount of space allocated to answer a question should be sufficient to provide a suitable response which gains full marks. Rarely does the use of a large amount of additional pages add much to the clarity of an answer.

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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

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

Section A

Question 1

(a) (i) and (ii) The majority of the candidates were able to extricate the relevant data from the stem to answer this question correctly.

(iii) Most students could identify a suitable reason.

(b) (i) The question was answered well by most candidates.

(ii) Many students could identify a reason, but did not gain both marks, as they did not provide a brief account of what they meant.

(iii) This question was relatively easy for most candidates.

(c) (ii) Although many students connected with the context and could identify a limiting reason many answers lacked sufficient clarity to gain all three marks.

Question 2

(a) Many students could define fixed costs from the glossary of terms or use words to that effect to gain the mark.

(b) Many students understood the concept of break-even point, but failed to gain all three marks due to the fact that their answer lacked planning, veering away from the detail in the specification.

Question 3

(a) Many students failed to gain 2 marks for this question. A lot of students discussed the affects of cooling on grain size.

(b) Many students were able to describe what alloying was but failed to relate it to tensile strength.

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Section B

There was a reasonable spread of choices between the tree questions, although Question 5 was the most popular followed by Question 6 and then Question 4.

Question 4

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

(ii) This was a straightforward question for most candidates.

(iii) Many candidates could identify the scale of production, but failed to outline why this was the case.

(b) (i) This question proved to be surprisingly difficult for many students.

(ii) Most students could suggest a reason (mainly that it took a long time to develop), but failed to or were unable to expand on this answer.

(c) (i) Candidates understood what the concept of design for disassembly was but often failed to relate it to the design context.

(ii) This question highlighted the point that these questions need to be clearly structured into three defined aspects in order to avoid vagueness and repetition. Most student responses failed to do this.

Question 5

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

(ii) Surprisingly this question was not well answered with many students being unable to make appropriate links.

(iii) The majority of candidates were able to make the link between the founder's name and the emphasis on technology.

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

(ii) Many students achieved two marks for this question, but not many developed there answer sufficiently enough to gain all the marks.

(c) (i) This question was not answered well with few students able to identify the appropriate strategy.

(ii) The majority of students clearly knew what the roles of an inventor, innovator and entrepreneur were, but only the better students were able to apply this to the design context and thus gain higher marks.

Question 6

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

(ii) Many students were able to identify what radical and incremental development was but failed to apply it in this particular context.

(iii) Many students were able to identify that a key reason was choice, but failed to identify cost as a reason for the range of colours. Those who were able to concisely reason why this was the case obtained both marks.

(b) (i) For those that had learnt the definitions from the Guide's Glossary found this question straightforward.

(ii) This proved to be a difficult question. Some students clearly understood the concept of design for materials, but were unable to assimilate this knowledge into their responses.

(c) (i) Candidates clearly understood the concept of planned obsolescence, but few were able to relate it successfully to the design concept.

(ii) Many candidates failed to focus on ease-of-use of this particular product with responses tending to be very generic.

Recommendations and guidance for the teaching of future candidates

At times students' examination technique let that down rather than their lack of knowledge. It is essential that they are able to assimilate knowledge and relate it directly to the appropriate design context within the questions rather than just regurgitating facts.

Candidates should be made more familiar with the meaning of the command terms used at the start of each question and which relate to Assessment Statements in the Subject Guide. Students are failing to maximize marks because of this.

In order to generate well developed answers and thus gain high marks, students should have the opportunity to practice answering questions; especially the three and nine mark questions. Well structured responses are clearly focused on the design context and draw on key aspects provide in the stem of the question.

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Higher level paper three

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 4	5 - 8	9 - 13	14 - 18	19 - 24	25 - 29	30 - 40

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

No G2s were received for this paper which is an awful shame as it means the examining team has absolutely no feedback to help inform future practice. Overall Option E was by far the most popular option closely followed by Option C. There were just one or two responses to each of Options A, B and D – far too few to make any meaningful comment. Therefore this report will comment on Options C and E.

OPTION C (CAD/CAM)

Question C1 focused on a CNC router. Section (a) asked for a suitable tool for machining a boat hull shown in a photo. Few candidates selected an appropriate tool. Section (b) asked how the settings of the machine tool step-over variables would impact on the quality of the surface finish. This was answered much better and most candidates were able to relate a low setting to smoother surface finish. Section (c) focused on the constraints of using a 3-axis machine to manufacture the boat hull. Many candidates were able to identify that there was no allowance for undercuts and that the product could only be worked on from above and would have to be turned over to work on the underside. Many candidates earned two marks but few achieved all three marks. There was, as always it seems, an issue related to candidates providing enough depth of response to earn the third mark is an issue.

In question C2 section (a) asked candidates to state a suitable modelling material for a CAM system. This seemed a very easy question but was very poorly answered by many candidates. Section (b) asked candidates to outline one benefit of surface modelling techniques for consumers. This was answered reasonably and posed few problems for candidates.

Question C3 section (a) focused on the advantages of LOM as part of rapid prototyping. Many candidates seemed to have no idea about what was an advantage of LOM. There were some good answers though and a number of candidates achieved full marks for this question. Section (b) asked candidates to list two benefits of being able to rapid prototype a product. A few candidates got full marks for this but many were not able to produce responses matching the markscheme.

Question C4 was worth six marks and asked candidates to discuss two benefits of using CAM when manufacturing a ring shown in a photo. Whilst the subject matter did not seem to pose particular problems, the issue of depth of response was evident. Well-organised responses achieved high marks with candidates providing sufficient depth of response.

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Question C5 comprised three sections each worth two marks. Section (a) asked candidates to identify one effect of CAM on the workforce of a company wishing to move from traditional to modern manufacturing techniques. There were no particular problems with this question and most candidates were able to achieve one mark on this and many achieved both marks on offer. Section (b) asked for an outline of one way in which CAM has impacted on the design of kitchen cabinets. There were some excellent answers from a small number of candidates but many candidates struggled to respond appropriately. There does not seem to be a particular problem with the question. Section (c) asked for an outline of one impact of CAD on the designer-client relationship. This posed few problems and was well answered by many candidates who achieved the two marks on offer.

Question C6 section (a), worth three marks, focused on a comparison of the use of humans and of robots in relation to safety in a manufacturing system. This was generally well answered and apart from the issue of depth of response posed few problems except to the weaker candidates. Section (b) asked for a discussion of one advantage of using robots for batch production. This was generally not well answered except by the more able candidates.

Question C7 – a 9-mark question – brought Option C to a close. It asked for a discussion of how the use of haptic technology aided the design and use of virtual training in relation to user observation, training and feedback. The term user observation was not interpreted as observation by designer of users by many candidates. Similarly, the issue of being able to simulate dangerous/difficult situations was not recognized by many candidates. Good candidates produced well-organised answers with sufficient depth to achieve full marks. Lack of organization was evident from many candidates.

OPTION E (HUMAN FACTORS DESIGN)

Question E1 showed a plan of a kitchen layout. Section (a) asked candidates to state the reason for the position of the dishwasher in the kitchen layout. Most candidates were able to achieve the one mark on offer for this question. Section (b) asked candidates to describe the purpose of the use of a kitchen triangle for the designer. Again most candidates were able to offer answers worthy of two marks. Section (c) asked candidates to explain how the work triangle can improve safety for users. This was reasonably well answered by candidates with the issue of depth of response rather than subject knowledge being the main discriminator.

Question E2 section (a) asked candidates to consider why the lid of a jar is usually fastened tightly at the end of the manufacturing process. This was fairly straightforward and most candidates were able to earn one mark. Section (b) asked candidates to outline one bodily tolerance involved with unscrewing the lid of a jar. This was a relatively straightforward question for most candidates who identified torque or grip and the force needed to undo the lid as their response.

Question E3 showed an anthropometer. Section (a) asked for a description of its function. Most candidates were able to provide reasonable answers. Section (b) asked for an outline of one limitation of the use of the instrument for collecting anthropometric data. This was well answered by many candidates who offered responses commenting on the accuracy of the measurements or who commented on the fact that it generated static data.

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Question E4 was not an easy question judging by the candidate performance. It focused on the issue of adjustability and range of sizes in the global marketplace. This question was difficult for many candidates and few, if any, achieved full marks. In terms of range of sizes the markscheme was looking for responses relating to the wide range of sizes evident in the global marketplace and regional variations within the wide range which manufacturers would need to cater for. The issue of adjustability of clothing was discussed only by a very few of the strongest candidates.

Question E5 section (a) asked candidates to outline one reason why the concept of 'design for discomfort' may be used in the design of public seating in railway stations. Most candidates correctly identified that this would ensure that the station would not become a meeting place for non-rail users since users would want to limit the time they were seated and this would move on and leave space for other users. Section (b) asked candidates to outline one piece of dynamic human factors data important to the designer of public seating. This was not well answered except by a very few candidates. Section (c) asked candidates to outline one security issue which has affected the design of seating in airports. About half the candidates were able to identify that security was an issue and that seats were designed so that if would be difficult to hide anything in them.

Question E6 was a two-section question with each section worth three marks. Section (a) asked candidates to explain the relationship between a user trial and motion capture. Many candidates were able to achieve two of the three marks available for this question. Only a small number achieved the third mark. Again it is depth and organization of response which poses problems for candidates. Section (b) asked for an explanation of how the use of digital humans can assist the designer of a car to deal with the problem of designing the car for a wide percentile range. This section posed few problems and was answered reasonably by many candidates.

Question E7 – a 9-mark question – brought Option E to a close. It asked candidates to explain why feedback, mapping and affordance are important in human factors design. Considering how straightforward this seemed as a question it was remarkably badly answered by a number of students. Again clarity of response and organization of answer was critical to achieving top marks. Those candidates who were poorly organised in responding often provided long answers but repeated themselves and did not reach sufficient depth of response. 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.

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Standard level paper three

Component grade boundaries

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

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

As for the HL Paper 3 no G2s were received for this paper so the examining team have no feedback to help inform future practice. As for the HL, Option E was by far the most popular option closely followed by Option C. There were just one or two responses to each of Options A, B and D – far too few to make any meaningful comment. Therefore this report will comment on Options C and E.

OPTION C (CAD/CAM)

Question C1 focused on a CNC router. Section (a) asked for a suitable tool for machining a boat hull shown in a photo. Few candidates selected an appropriate tool. Section (b) asked how the settings of the machine tool step-over variables would impact on the quality of the surface finish. This was answered much better and most candidates were able to relate a low setting to smoother surface finish. Section (c) focused on the constraints of using a 3-axis machine to manufacture the boat hull. Many candidates were able to identify that there was no allowance for undercuts and that the product could only be worked on from above and would have to be turned over to work on the underside. Many candidates earned two marks but few achieved all three marks. There was, as always it seems, an issue related to candidates providing enough depth of response to earn the third mark is an issue.

In question C2 section (a) asked candidates to state an input device for a CAD system. This was very straightforward and most candidates achieved the one mark on offer. Section (b) asked candidates to outline one advantage of using finite element analysis (FEA) to design structures. Again this was relatively straightforward and posed few problems for candidates.

Question C3 section (a) focused on the advantages of LOM as part of rapid prototyping. Many candidates seemed to have no idea about what was an advantage of LOM. There were some good answers though and a number of candidates achieved full marks for this question. Section (b) asked candidates to list two benefits of being able to rapid prototype a product. A few candidates got full marks for this but many were not able to produce responses matching the markscheme.

Question C4 was worth two marks. It asked candidates to outline one reason why numerically controlled machines are still being used in manufacturing systems. Many candidates were able to identify an appropriate reason and achieve the two marks on offer.

Question C5 was worth six marks and asked candidates to discuss two benefits of using CAM when manufacturing a ring shown in a photo. Whilst the subject matter did not seem to pose

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particular problems, the issue of depth of response was evident. Well-organised responses achieved high marks with candidates providing sufficient depth of response.

Question C6 – a 9-mark question – brought Option C to a close. It asked for a discussion of how the use of haptic technology aided the design and use of virtual training in relation to user observation, training and feedback. The term user observation was not interpreted as observation by designer of users by many candidates. Similarly, the issue of being able to simulate dangerous/difficult situations was not recognized by many candidates. The Good candidates produced well-organised answers with sufficient depth to achieve full marks. Lack of organization was evident from many candidates.

OPTION E (HUMAN FACTORS DESIGN)

Question E1 showed a plan of a kitchen layout. Section (a) asked candidates to state the reason for the position of the dishwasher in the kitchen layout. Most candidates were able to achieve the one mark on offer for this question. Section (b) asked candidates to describe the purpose of the use of a kitchen triangle for the designer. Again most candidates were able to offer answers worthy of two marks. Section (c) asked candidates to explain how the work triangle can improve safety for users. This was reasonably well answered by candidates with the issue of depth of response rather than subject knowledge being the main discriminator.

Question E2 section (a) asked candidates for a definition of biomechanics. This question was answered reasonably well by most candidates. Section (b) asked candidates to describe how biomechanics may affect the choice of a sample of people to be part of a user trial at the design development stage of a new type of can opener. This was a relatively straightforward question for most candidates who correctly identified that a wide range of users would need to be sampled to assess capability in relation to muscle strength/dexterity.

Question E3 showed an anthropometer. Section (a) asked for a description of its function. Most candidates were able to provide reasonable answers. Section (b) asked for an outline of one limitation of the use of the instrument for collecting anthropometric data. This was well answered by many candidates who offered responses commenting on the accuracy of the measurements or who commented on the fact that it generated static data.

Question E4 was a two-mark question asking candidates to describe the purpose of conceptual testing in determining adequate product safety. Most candidates were able to provide crisp answers which achieved the two marks on offer.

Question E5 was not an easy question judging by the candidate performance. It focused on the issue of adjustability and range of sizes in the global marketplace. This question was difficult for many candidates and few, if any, achieved full marks. In terms of range of sizes the markscheme was looking for responses relating to the wide range of sizes evident in the global marketplace and regional variations within the wide range which manufacturers would need to cater for. The issue of adjustability of clothing was discussed only by a very few of the strongest candidates.

Question E6 – a 9-mark question – brought Option E to a close. It asked candidates to explain why feedback, mapping and affordance are important in human factors design.

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Considering how straightforward this seemed as a question it was remarkably badly answered by a number of students. Again clarity of response and organization of answer was critical to achieving top marks. Those candidates who were poorly organised in responding often provided long answers but repeated themselves and did not reach sufficient depth of response. 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.

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