



GCSE

Design and Technology: Resistant Materials

General Certificate of Secondary Education **J306**

OCR Report to Centres June 2015

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

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A561 Introduction to designing and making

General Comments

Please read this report in conjunction with that for A563 as together they form the two controlled assessment units for the innovator specification.

Introduction

As a result of the changes in Government legislation relating to GCSE exam entries this specification is now a linear only qualification which has resulted in there being no January entries for this cohort of candidates. Overall candidate numbers have remained positive for this unit although the decline in students nationally studying design and technology courses is reflected in this specification.

Paper portfolios still remain as the most popular medium for entering the candidates work and whilst repository entries have also remained steady there has been an increase in the number of centres using other electronic storage methods to enter candidates work. However, there have been concerns mentioned by the moderators in connection with some of these portfolios due to the quality of the design work that was presented in this style of work. In some cases the reproduction techniques used to show this work, in what were predominantly power point presentations, were of such a low quality that it was difficult to see the content and detail of the designs. It is important in all cases that the moderator is able to see the full range of work which shows all of the presentation techniques used by the candidates.

With the improvements seen in storage options and the development of more readily available student friendly software it could be fair to conclude that the e-portfolio will become the chosen medium for an increasing number of centres over the next few years. From our experience it would be in the centre's own interest that they ensure, before sending the work, that all E-Portfolios are capable of being opened in PP 2003 or earlier using the 'Pack and Go' facility in PP which ensures videos and sound clips are correctly transferred to the CD.

Administration

It is encouraging to report that communication with Centres was generally good however, it should be noted that not all assessment material reached the moderators by the dates given in the specification or within the three days once the sample request has been notified and that this clearly needs to be addressed for future entries.

Most centres provided individual Controlled Assessment Cover Sheets for each candidate with clear and relevant information which was helpful to the moderation process; however Centres are also reminded that moderators still need to receive the Centre Authentication form CSS160 as without either of these forms moderation cannot take place and feedback provided to the centre on their assessment of the candidates work.

Since the introduction of postal moderation moderators rely on the centres to provide enough evidence to support the marks that they submit for each candidate. Photographic evidence is a major part of this evidence and at least two photographs, produced by the centre, of the end prototype product should be provided which are normally supplemented by others that the candidates presents when recording the stages in producing the practical work.

These photographs are an important element of the postal moderation process and centres are requested to ensure that they supply photographs which are of a sufficient size and quality to provide full details of the prototype product that the candidate has produced.

Advice to centres

It may be advisable to include annotation or other documentation to support your internal assessment in order to clarify your marking. It was not always clear how the marks submitted by some centres related to the marking criteria.

Please could we remind you that the CSF forms should be completed in the same order as the MS1 sheets as this enables effective checking of the marks by the moderator.

Please note that work should be sent within three days of receipt of the sample request email.

It is worth noting that it is the centres responsibility, and not the candidates, to provide at least two clear photographs of the end product in each of the folders.

Performance of Candidates

Moderators were again asked this year to ensure that every centre's attention is drawn to the contents of this report as there are still a number of misconceptions that are not being addressed in the candidates work.

It has become apparent that even though a link is provided on last year's moderators report to centres, not all centres have taken the time to read the report or acted upon the information it provides. Centres that have acted upon this feedback were able to focus the candidates work on the requirements of the assessment criteria which in turn then supported the preparation they had received before starting the controlled elements of this unit of work.

Overall it was encouraging to see that there were fewer recommendations for change this year, especially in terms of the larger scaling that have been evident with a few centres in previous years. Where some recommendations were made by the moderators it was due to different interpretations of the mark scheme being taken by teachers in the same centre. It is important that all centres ensure that they internally standardise marking, otherwise there is a risk that the whole cohort will be affected by the inaccuracies in the assessment of a few candidates.

Interpretation of the Marking Criteria

In wishing to support to centre's we offer the following advice and wish to draw their attention to some of the more common issues which again affected candidate's achievement included –

Creativity

In this assessment strand candidates are required to select a theme set by OCR in the specification for this subject as part of the control guidance for the unit. Once the theme is stated the candidate will then need to identify a specific product or starting point that is associated with the theme in order to complete a product analysis. For example, if the chosen theme is 'Travel' a candidate may decide to design and model a prototype hand held game which can be used 'on the move'.

This assessment strand and the use of the word "creativity" as an assessment heading has clearly caused some confusion in centres who have not adapted their previous work from the legacy specifications to meet the content expected in this unit. It is intended that the word creativity, as used in this assessment, should be related to how the candidate shows their ability through the work they present in identifying trends or design features from their research work.

Candidates should be encouraged to –

Produce a clear and precise design brief to improve, modify or develop the product and the theme they have previously selected.

Identify any design features (trends) or technical knowledge gained from analysing a range of similar or existing products.

Candidates in this assessment strand should be encouraged to give examples of the intended users and their likely needs when using the product.

Edit research information and provide summary conclusions as to what they had learned from producing these materials.

However, during the moderation process it was reported that some candidates –

Produced a “range” of existing products in the creativity section of the portfolio without **concluding what trends or design features they had identified.**

Were unable to edit their research material by explaining what would be relevant to their product and how this will help them to develop their design ideas.

Were seen to complete questionnaires and charts with no summary or analysis of the findings which should be the main reason for producing them.

Successful candidates clearly showed how they had selected their own problem area from the list of controlled assessment themes stated in the specification. They carried out a thorough analysis of one existing product and then by editing information from other similar research they were able to identify what were good design features and explained the significance of any trends in these existing products. By using notes, sketches and photographs they were also able to give examples of intended users and their likely needs when using the product. From this, candidates were then able to analyse the information that they had gathered before using this to generate a concise Design Brief that clearly identified the product and users.

Designing

The vast majority of candidates used freehand sketching to illustrate their initial design ideas with basic annotation, which sometimes provided little in terms of detail or explanation. The quality of presentation also varied both within centres and across the whole cohort, with some candidates being awarded very high marks for what was a range of limited design ideas. In other cases candidates had combined a variety of presentation techniques to develop their design ideas towards a working prototype product.

There also continues to be a gradual increase in the use of both 2D and 3D modelling, however, some centres still need to be reminded that it is a stated requirement in the specification, and therefore the assessment criteria, that candidates show evidence of these techniques in developing their design solutions.

Ref specification content 3.1 (page 9)

“They develop their design and use modelling before making and testing their prototype”.

Develop Designing Skills – “Use appropriate modelling techniques to aid product development”.

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Candidates should be encouraged to –

Begin this assessment strand with a detailed list of specifications for their own prototype product that they have identified in the previous section of their project work.

Show a range of creative and original design ideas using a variety of presentation techniques; which should include the use of CAD to support the development of a solution to their chosen problem especially if the higher grades are submitted by the centre.

Show appropriate modelling techniques in order to support the development of the final prototype product.

Explain the reasons behind the selection of the design chosen for production and to provide details of the final developed idea.

However, during the moderation process it was reported that some candidates –

Produced design ideas which did not show the variety of techniques and quality of presentation described in the assessment criteria.

Produced limited, if any, **evidence of modelling techniques** to support their development of the design ideas.

Successful candidates having analysed their brief and the conclusions that they had reached from the research were then able to produce a clearly structured design specification which related to the product that they intended to design. Design ideas were presented using a range of graphic techniques, including the use of CAD, which were supported by detailed annotation. Modelling helped them to develop the final solution where they were then able to give details of sizes, possible materials, likely construction methods and processes. Reference to the specifications then helped them to give reasons for the choice of the prototype product that they intended to make.

Making

It should also be remembered that in this unit candidates should be developing a prototype product which should enable them to show some creativity in their work. The emphasis should be on the candidates experiencing an introduction to designing and making within the 20hrs of controlled assessment.

It is for this reason, that along with evidence of the more traditional materials and process that we connect with “Resistant Materials” we also accept prototypes where **parts of the prototype** may be made in foam, balsa, jelutong instead of a more durable timber, aluminium instead of steel or silver, plastozote instead of acrylic etc. This would then demonstrate an understanding of how the “real” product might be made, have most of the function of the “real” product but not be so demanding in time spent on production or finish.

Candidates should be able to show a variety of construction techniques in the making of the prototype product and where this includes CAM they should be made aware that there also needs to be evidence of other techniques used in conjunction with this in order to comply with the requirements of the assessment criteria. Please note that the higher mark range should not be applied to these products, however well-assembled, unless a variety of processes are used in the construction of the prototype.

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Centres are also reminded that if a prototype, or part of one, has been produced using CAM as one of the manufacturing processes than the use of screen shots or CAD drawings to show “ownership” of this process should also be expected as without this supporting work moderators are left with concerns regarding the involvement of the candidate in the making process.

Whilst the majority of candidates had planned the stages of making their product to some degree or other before starting to make the prototype, there were also portfolios where no pre-planning was evident and yet centres had awarded marks well into the “works competently” assessment responses. Therefore, centres are reminded that when assessing the making of the prototype product, the planning provided by the candidate should be taken into account when deciding upon the overall mark to award.

Candidates should be encouraged to -

Produce a “prototype” product primarily be made from “resistant materials” which is capable of being tested for its intended use.

Use a range of skills to produce a 3D functioning prototype/product and if CAM is used in its production there also needs to be sufficient evidence that the candidate has used a variety of other constructional techniques in the making process.

Produce a production plan showing the intended use of the tools, and equipment along with the relevant risk assessment for processes that they intend to use.

Produce a diary, notebook or record of the key stages in the making of the prototype product. Evidence should be provided in the form of written notes and photographs.

Record in a clear written format how they solved any technical difficulties in the making of the prototype

However, during the moderation process it was reported that some candidates –

Did not produce a **written commentary** to support the marks awarded to show how they overcame technical problems in the making. Far too often centres are rewarding the candidates in this assessment strand purely on what they have observed rather than evidence provided by the candidate.

Produced limited photographic and written evidence in the record of the key stages in making the prototype.

Successful candidates made appropriate choices of materials, tools and equipment and worked skilfully and safely to produce a high quality prototype product suitable for the intended user. They showed evidence of having used a variety of making processes in producing the product and where CAM had been used as one of these techniques they provided supporting evidence in the form of screen shots which indicated understanding and ownership of the manufacturing system. Planning the stages of manufacture had clearly been produced before they started the practical work and they were then able to demonstrate their ability to solve any technical problems in the record they made of the key stages in creating the prototype through comprehensive notes and visual evidence.

Evaluation

It still remains disappointing to see the number of candidates who have based their evaluation on their prototype product and how it functioned rather than modifications to improve the designing and making process as stated in the wording of this assessment.

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Clearly centres need to be more aware of the assessment criteria for this particular strand as it is evident that it is the work of the whole centre and not individual candidates where this misconception occurs.

Centres are therefore again reminded that the Specification for Unit A561 clearly states the evaluation should be of the **designing and making process** and not how well the final product functions. Furthermore that any modifications proposed by the candidate should be of ways to improve the designing and making process that they have completed in developing the final prototype product.

Finally attention is drawn to the marking criteria for spelling punctuation and grammar which has three different response levels which should be applied when marking the work presented by the candidate in this assessment strand.

Successful candidates critically evaluated the processes involved in designing and making the prototype in this unit of work as opposed to the product itself (as in unit A 563). With reference to their initial planning, and the record they produced of the stages in making their prototype product, they were then able to reflect and suggest modifications to improve the design, modelling and prototyping processes using specialist terms with a clear emphasis on the correct use of spelling, punctuation and grammar.

A563 Making quality products

General Comments

Please read this report in conjunction with that for A561 as together they form the two controlled assessment units for the innovator specification.

Administration

Moderators were able to accept candidates portfolios for moderation as “traditional” paper folders, e -portfolios or through the repository which allowed them to see a good range and variety of work. However, centres should be aware that the methods they employ for uploading some of the design work resulted in very unclear images of hand drawn ideas. Our advice would be ensure that the images are scanned into the presentation as accurately as possible and to avoid the use of photographing the pages as this does not allow the clarity of the candidates work to be fully appreciated during the moderation process.

A number of difficulties where experienced in the administration of this unit and for future reference centres attention should be drawn to the following –

- The method of entering candidates for this exam has obviously caused confusion in some centres as a number of the repository entries that we were expecting eventually reached the moderator as paper portfolios. Please note that the 01 prefix is the repository entry and not postal.
- Most centres included CWS forms and / or coversheets to indicate the marks awarded for each of the assessment strands and this is to be commended. However, not all centres provided at least one of these forms and without them moderation cannot take place and feedback provided to the centre on their assessment of the candidates work.
- There needs to be sufficient photographic evidence of the completed product shown in all portfolios which is separate to any that is shown in the candidate’s record of the practical work. Centres are reminded that it is their responsibility, and not the candidates, to provide at least two clear photographs of the end product in each of the folders.
- When presenting paper portfolios please could candidates be reminded not to enclose folios in separate plastic wallets or binders?

Performance of Candidates

The more successful candidates work was clearly focused upon the requirements of the assessment criteria which indicated the preparation candidates had received before starting the controlled elements of this unit of work.

Moderators this year were also asked to ensure that the centre’s attention was drawn to the contents of this report as there are still a number of misconceptions that are not being addressed in some aspects of the work. Again some of the more common issues which affected candidate’s achievement included –

- The presentation and annotation of the design ideas was, in some portfolios, of a limited quality and this was not reflected in the marks awarded by a few centres.
- Limited use of CAD in developing the design ideas and yet full marks were often awarded for the designing sections of the folders.
- Little evidence of suitable modelling techniques being employed that would support the development of the design ideas.
- The lack of formal detail (written notes) to support the marks awarded on how they overcame technical problems in the making.

- Little information including sizes and construction details of the final chosen product and why this one was selected for production instead of the other design ideas in the folder. Centres need to be aware that marks for these details should be accounted for in the Communication assessment.

Designing

This assessment strand has three separate marks than can be awarded –

- *An appropriate and considered response to a brief and a detailed specification for a product produced as a result of analysis.*

Centres should be aware that the focus of this unit should be on the making of a quality product and therefore within the 20hrs of controlled time, the majority of this period should be used by the candidates to produce the product rather than portfolio of design work.

In this unit of work candidates will be expected to further develop skills and abilities gained while undertaking Unit A561 in order to design and make a fully functioning quality product. Our advice would be to encourage candidates to consider their own needs/requirements or those of an identified user group, as well as the situation in which the product will be used when selecting a suitable theme for their project from those listed in the specification. It should be explained that the type of project selected needs to be challenging, but realistic in terms of the resources and time that is available.

The majority of candidates provided a suitable “response” in terms of the content of the work that they presented in this assessment strand having previously identified their own brief from those themes stated in the specification. However, there are still some candidates who provide far more information than is required to fulfil the assessment criteria as much of their work is lacking in the focus and direction expected.

Centres are advised to look carefully at the allocation of marks in this section of the portfolio as an indication of the amount of work that should be produced by the candidates. The advice that we offer would be to show this response in about two sheets of detailed and focused presentation.

By editing the work a considered response could possibly include –

- Sizes of any items important to the design of the intended product.
- Relevant design features of other similar products.
- The needs of the intended user group.
- The nature of how and where the product is likely to be used

Design specifications again showed great variation in both the quality and content with a lot of very generic or vague statements being produced that could apply to any product rather than specifically to the design that candidates wish to produce. Candidates should be encouraged to refer back to their research and analysis to justify their specifications.

Our advice would be to produce this list of specifications as a series of bullet points that are relevant to the product being produced and which reflect the information presented in the designing sections of the portfolio.

- *The production of a range of creative design ideas using a variety of techniques.*

Freehand sketching is still the most popular method used by candidates to illustrate their initial design ideas with annotation which varied both in terms of content and quality. In this cohort of entry there was increasing evidence of CAD being used to support the development of the final

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design with Google “sketch up” proving to be the most popular software used by the candidates. However, centres should be aware that the assessment criteria requires a response which shows a variety of techniques if the higher marks are to be submitted.

The standard of work seen where candidates had used CAD effectively was very encouraging as it provides a high standard of presentation and visual support in developing the candidates design ideas.

However, there are still some centres that have not understood the need for 2D and 3D modelling to be included as part of this process and are still awarding high marks for this assessment strand without there being any real evidence in the portfolios to support this requirement.

As in A561 it is essential that candidates include evidence of modelling work to show how the product has developed from their earlier designs and to make informed decisions about materials and construction techniques in order to gain full credit for their work. Please reference the relevant sections of the specifications as detailed in the report for unit A 561.

- *The use of detailed drawings and annotation to communicate these ideas.*

The final mark in this assessment strand should be used to indicate how well the candidate has communicated the details of the product they have chosen to produce for this unit. In some cases it was difficult to see any evidence of the final product as candidates moved straight from a series of design ideas onto the planning required for production. Higher achieving candidates were able to provide details of construction, sizes and materials at this stage of their portfolios which then helped them to produce a suitable plan for construction of the chosen product.

Successful candidates clearly showed how they had selected their own problem area from the list of controlled assessment themes stated in the specification. They were then able to produce a design brief for their intended product together with some supporting evidence to show what conclusions they had reached from any related research that they had previously conducted. A clearly structured specification resulted from this which was specific to the product that they intended to design. Design ideas were then presented using a range of graphic techniques, including the use of CAD, and were supported by detailed annotation. Modelling helped them to develop the final solution where they were then able to give details of sizes, possible materials, likely construction methods and processes. Reference to the specifications then helped them to give reasons for the choice of the product that they intended to make.

Making

There are three main requirements in this assessment strand that the candidates need to address –

- *The planning and making of a Quality product.*

The planning that was seen in the portfolios varied considerably in content and detail with a few centres giving very high marks for the quality of the making assessment even though the planning provided by the candidates was felt to be very limited. It is worth noting that although there are no specific marks given for planning in this specification it is a requirement in all three response levels of the assessment criteria that planning is evident to support the production of the product.

It should also be remembered that where candidates use CNC (CAM) techniques to produce the final product they should be used in conjunction with other construction methods as stated in the specification guidance. Further reference to this issue is also made in the report for unit A561.

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Centres need to be more aware of the importance of the marks in the following two assessment strands as the six marks that can be awarded for evidence of this work is equal to the current grade boundaries for this unit.

- *Recording the making of the product.*

The responses from this cohort of entry were generally of a better standard than we had observed from previous years as centres now seem to have a much better understanding of the work required in this assessment. However, in a few cases it was still limited to just a few written notes produced by the candidate. Our advice remains that photographic evidence should be provided to support this process and where this was evident and detailed many of the candidates were able to achieve full marks for this assessment strand.

- *Details of how they overcame any technical problems in the making of the product.*

Centres attention is also drawn to the requirement that in order to achieve the marks that can be awarded for identifying how the candidates overcame technical problems they must provide evidence of this in their portfolios. Out of all the assessment strands in this unit this was the one indicated by moderators as needing the greater number of adjustments. Our advice would be to ensure that candidates clearly state these issues in the record they make of producing the product or on a separate sheet in their portfolios.

Successful candidates made appropriate choices of materials, tools and equipment and worked skilfully and safely to produce a high quality product suitable for the intended user. They showed evidence of having used a variety of making processes in producing the product. Where CAM had been used as one of these techniques candidates provided supporting evidence in the form of screen shots which indicated understanding and ownership of the manufacturing system. Planning the stages of manufacture had clearly been produced before candidates started the practical work and they were then able to demonstrate their ability to solve any technical problems in the record they made of the key stages in creating the product through comprehensive notes and visual evidence.

Evaluation

With the requirement here to evaluate the function of the product as opposed to the design processes as in A561 it was encouraging to note that there were far fewer recommendations to adjust centre marks.

By evaluating their products firstly against the specifications candidates were able to base their conclusions on the product and how it functioned having previously conducted a series of tests to see how it performed in use. From this they were then able to suggest modifications through notes and detailed sketches.

Successful candidates Showed evidence of having tested their completed product in use and compared this to their list of specifications. From this they were then able suggest improvements to their product using a series of notes and sketches. Throughout this assessment strand they also showed evidence of the correct use of specialist terms and showed accurate use of spelling, punctuation and grammar.

A565 Sustainability and technical aspects of designing and making

General Comments

As in 2014, this year's paper was split into two sections; the first (Section A) concentrated upon areas of sustainability and the second (Section B) upon the more technical aspects of the materials described in the specification. Each section contained questions (or part questions) worth from 1 to 6 marks, and the paper attempted to cover as broad a range as possible of the specification points.

In each section there was a part question requiring candidates to sketch their answer and annotate their sketch(es) with appropriate notes. Additionally, there was a question in each section which required candidates to formulate a discussion around a given topic, for which marks were awarded for the quality of the written communication (QWC) and for the technical content or relevance to the subject matter.

The majority of candidates attempted all questions, but marks were lost by candidates being unable to expand upon simplistic answers. Also time was wasted by writing out part (or all) of the question as a preamble to the response. Single-word responses such as "strong", "quick", "easy" were seen in many scripts and, unless suitably qualified, marks could not be awarded.

"Stronger" was awarded in Q18eii, as the comparison was implied in the question (*stronger than mild steel*). In Section A, too much reliance was given to vague terms like "environmentally friendly", and "recycling" would seem to be a panacea for many problems.

In both sections, candidates seemed able to access the essential requirements of the questions, but some lacked sufficient knowledge to expand upon their basic responses. For example:

- in Q16, the fundamental themes were secondary recycling and re-use of components, but a number of candidates were unable to progress beyond "recycling" as a response;
- in Q19 some candidates made it harder for themselves by not providing construction details of the trophy cabinet although their knowledge of the basic materials appeared to be sound;
- in the two QWC questions responses were seen that merely listed advantages/disadvantages without discussing them (Level 1), or presented their discussion as one long paragraph without suggesting corollaries or a conclusion in separate paragraphs;
- in the two sketching/notes question parts, many candidates wrote labels on their drawings ("glass", "acrylic", "oak"), rather than providing written expansion of obvious points.

Centres should allow time for their candidates to practise responding to the longer parts of past questions, particularly the QWC and sketch/notes parts.

Comments on Individual Questions

Section A Sustainability

5 multi-choice questions, 5 written short answers and 5 True/False questions, each worth 1 mark. One question in several parts, worth 20 marks.

Q1 Most recognised **Pine** as being the correct response, although a minority thought that acrylic was manufactured from a sustainable source. Few chose the other two options.

Q2 Again, the correct response, **Geothermal**, was picked by a large majority of candidates. Natural gas was a popular second choice.

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Q3 A minority of candidates chose manufacture as the correct response to the ergonomics question, but fortunately **User** was correctly chosen by over 70%.

Q4 While LCA confuses some candidates, a good majority chose **Raw Material Extraction** as the first step in a product's life (but see also Q16b below).

Q5 Again, a majority of candidates correctly chose **Softwood**, but many of the others picked cast iron as a possible response.

It is of concern that 20-25% of candidates are unable to pick the correct response from these, relatively straightforward, questions. However, within the context of the whole paper, it would seem that these same candidates are not taking the time to read the questions thoroughly, and are rushing their responses accordingly.

Q6 It may be surprising that this question was not answered correctly by all; bio-degradable, eco-friendly, renewable were just three of the alternatives put forward. Some told us that it *was* – a Möbius strip – but not what it *meant*. However, over 90% did answer correctly, giving various acceptable combinations of **Recycle/recycling**; recycled was not awarded. A few did not respond at all, and one or two just wrote out all six of the 6Rs, which did not gain a mark (mark scheme states, *where the candidate adopts a “scattergun” approach by providing multiple answers to a single response question, no mark should be given*).

Q7 Most were able to propose **Re-use** as the correct response, but all of the other 6Rs were also provided, and a few made-up ones such as re-design (taking as its theme the word from the question).

Q8 High Standard, Health & Social, Hard & Sustainable and Housing and Social were but four responses for this question, but over half the candidates were aware of the correct terminology – **Health & Safety**.

Q9 Just over half the candidates were able to answer this correctly – **Carbon/eco footprint** – but many other propositions (pollution, ergonomics and even environmental issues) were widespread. Some did not attempt a response and. Anthropometrics was a popular response, possible due to candidates just seeing “measurement” and “human” in the same sentence.

Q10 Despite asking this question in virtually every session since 2009, the correct response eludes many candidates still. World-wide manufacturing, Batch production and multi-cultural design were three of many other possibilities proposed by the 70% of candidates who were unable to bring the correct term – **Globalisation** – to mind.

The candidates who performed poorly in these first five questions did not read the question correctly, or did not take the time to understand the thrust of the question. Many “No Response” were seen in this section, even from candidates who managed to answer more complex questions later in the paper. It is possible that candidates rush passed the first 15 questions, which attract only one mark each in favour of the succeeding questions.

Q11 Exactly half the candidates managed to answer this correctly. There appears to be a lack of real understanding of the difference between primary and secondary recycling on the part of candidates, just as there is between recycling and reusing (see below). Centres need to emphasise these differences if they are to give their candidates the best chance in future examinations. The correct answer here is, of course, **False**.

Q12 On the other hand, a large majority of candidates knew this statement to be **True**.

Q13 ... as they did in this question. Surprisingly, just as many failed to recognise the link between the anthropometric study and its application in real terms later in the paper (Q17c – see below).

Q14 With so many different labels and logos in the environmental field, candidates did well to distinguish the difference between the eco-label and the Fairtrade logo. . Nearly three-quarters of candidates knew that the statement is **False**.

Q15 Many candidates knew this statement to be **False**. Not all, though. The concept of products being made to last just a relatively short time is difficult for some young people to grasp and their responses to Q16b in relation to Life Cycle Analysis are evidence that a product's origins, longevity and demise are not concepts that readily come easily to candidates.

Centres should try to cover more than just the basics of sustainability if their candidates are to achieve their best. Just as in the technical section, knowledge and understanding of the finer points of the specification are essential skills for all students.

Q16 The thrust of the majority of the question was one of secondary recycling, using components taken from another product. The QWC part centred upon the packaging and transportation of assembled, large artefacts.

Q16a The question states that the clock is made from recycled bicycle parts. Repeating this in the answer gained the candidates no marks. Candidates did, however, recognise that the clock mechanism could be either battery-powered (with an electro-magnetic drive for the pendulum) or wind-up clockwork. References to either were awarded appropriately. Most candidates achieved at least one mark for making simplistic statements as “clock uses re-used parts” or “clock only needs battery power to work”, but very few managed full marks – which required two clear statements and a concise justification of the statement. Many referred to gases being evolved from the clock or its manufacture, or cost of manufacture/procurement of parts. There were a few interesting responses: “It can be made from recycled wood”; “It doesn’t use any wood”; “Trees don’t have to be cut down”; “It can be recycled” (most popular incorrect response).

Q16b Secondary recycling stumped many candidates, and they responded along the lines of “recycling again” (i.e. for the second time), rather than the actual meaning. Maintenance proved equally elusive, most candidates plumping for “fixing when broken” (but this is Repair, a 6R), rather than “keeping the product in a fit state for it to work properly”. Life Cycle Analysis was the most insurmountable for candidates, with “analysing how the clock works” and “seeing how long the clock will last”. Too many candidates neglected to read the question fully, and did not make reference to the clock in their answers, thus gaining only 50% of the marks available, at best.

Q16c Many candidates did well in this question, which required them to design a support upon which the clock can stand. The support was:

- to allow the clock’s pendulum to swing (freestanding);
- to emulate the theme of the clock (re-used bicycle parts);
- to use recycled or sustainable materials;
- to be stable.

The first point eluded quite a few candidates, as they used the pendulum as one of the supports, thus preventing it from swinging, but otherwise many gained the other three marks. On the other hand, some candidates devised an alternate wall mounting, which gained no marks (not a stand). Some others used materials such as tropical hardwoods (not sustainable), or were unable to convince the examiners that a two-legged stand could be stable!

Q16d* This question tested the candidates’ writing skills, discussion style and technical knowledge. For a few, however, their reading skills were not up to the task, and these

candidates merely listed points related to transportation in general (fuel costs, use of fossil fuels, eliminating transport by manufacturing nearer home, and so on). With no mention of artefact size, delicacy, volume or increased packaging, these candidates were deemed to have responded off-topic, and were awarded no marks. Bulleted points or lists are always deemed not to be a discussion, and will only gain a Level 1 mark (1 or 2). More extensive discussion centred on the implications of transporting assembled products (more packaging – and disposal of same, less products moved, flat-pack alternatives, etc.), particularly coupled with a good writing style (paragraphs to discuss each point, use of conjunctions, good spelling ...) raised candidates into Levels 2 and 3 depending upon the “technical content”. As a rough rule of thumb:

good writing style + limited technical content = Level 2;
 poor writing style + good technical content = Level 2;
 good writing style + good technical content = Level 3.

A few candidates achieved the full 6 marks. Over 80% gained at least one mark (Level 1 or above). 30% extended their work into Level 2 (3-4 marks).

As in the preceding questions, reading and understanding the focus of the question is vital if candidates are to gain good marks. It is clear from some responses that often only half the question is read and understood. Many of these responses seem to be based upon a question that the candidates have set for themselves. Centres must give candidates time to practice these higher-mark questions, rather than relying solely upon gaining marks from high-quality workshop-based artefacts.

Section B Technical aspects of D&T

The questions in this section are designed to test the candidates' knowledge and understanding of the technical aspects of resistant materials – wood, metal and plastic. The specification is quite specific as well as being wide ranging, and covers many areas of cutting, jointing, forming and finishing these materials within a school workshop environment. Some of this knowledge will come from the candidates' own experiences of working with the materials in previous years and in their GCSE projects, but some will have been formally taught or demonstrated by the teacher.

Q17 focused upon plywood – its forming and fixing – within the context of a quarter-pipe construction.

Q17a asked about the properties of plywood that makes it suitable for the curved ramp surface. Some candidates considered the surface texture, others the capability of shaping to the curve. Immediately, the “strong” response was seen without any qualification in many candidates’ scripts, followed by “flexible”. Plywood may well be **capable of being bent**, but it is not flexible, and ultimately only 40% of candidates managed one of the correct responses seen in the mark scheme.

Q17bi We had hoped that candidates knew about kerfing, steaming and laminating, but less than 50% were able to come up with a correct response, despite the lengthy discussions in SSU and the *broadest* interpretation of the question.

Q17bii Within the context of technical aspects of D&T, broad answers such as “metal” were considered unacceptable; **stainless steel, mild steel, aluminium** were all considered worthy of the mark, however. Unfortunately, MDF was a popular response, followed by acrylic and then various forms of flexible man-made boards (flexi-ply, flexi-MDF and flexi-veneer) none of which are suitable for structural work. Lack of specific detail or technical knowledge meant that only a minority was able to gain the mark.

Q17c By contrast, knowledge of anthropometrics and its application to resistant materials was evident in this question, and more than half the candidates were able to gain two or more marks here. Those few that gained no marks either did not attempt an answer (No Response = 0) or confused anthropometrics with ergonomics. Others discussed the age of the users (0 for the

definition of anthropometrics) but redeemed themselves by following on with reference to age-related **hand size** and the **carrying-hole size**.

Q17di Many gave “butt joint” as an answer, but there were an encouraging number (still a minority, however) who were able to recognise the **(half)-lap joint** or **rebate joint**. “Housing joint” was another popular response, but which also gained 0 marks.

Q17dii Dimension A is approximately half of the plywood thickness, i.e. between **8 and 10mm**. Many candidates did not recognise this relationship (or did not see the reference to the 18mm thickness), answers ranging from 2mm up to 150mm.

Q17ei was easily answered by a large majority, recognising the correct **countersunk screw** either from personal experience or from the shape of the clearance hole in the platform from 17di.

Q17eii ... and as many knew that stainless steel **does not rust** and is **stronger** than mild steel. (Here, we can accept “stronger” without other qualification, as the comparison is implied in the question.)

Q17f This was well answered, and over half the candidates gained full marks. Very few candidates gained 0 marks, generally because they did not respond at all. A very small number thought they were dealing with plastic, and tailored their answers accordingly. For those who did not achieve all three marks, it is suggested that a “hole punch”, “bradawl” or “dot punch” do not make pilot holes, and that a “screwdriver” is not the universal tool that will address all three processes.

Q17g Given the interest in smart materials, it is not surprising that the majority of candidates selected “**nanotechnology**” as the correct answer. Alphatechnology proved to be a popular – though incorrect – alternative choice.

The whole question was generally quite well answered, focusing as it does upon wood-based materials. It was clear, however, that MDF figures heavily in many candidates’ consciousness, and centres should try to introduce their students to other wood-based products such as plywood, block/lamin board and veneers, and to demonstrate their properties as well as their failings.

Q18 This question’s focus was metal, specifically mild steel, and its forming. Associated metal components were also introduced to test fully the candidates’ understanding of this material.

Q18ai Most candidates were able to recognise the **washer**, although “spacer”, “ring” and “bearing” were all proposed – and in other contexts might have been acceptable – but not here!

Q18aii By contrast, the identification of the **wingnut** (or **butterfly nut** or **fly nut**) was problematic. Many candidates mistake a nut for a bolt/screw, and some simply called this object a nut. Variations of “bolt top” were seen, as well as “pivot” and – tantalisingly – “finger bolt”.

Q18b Over half the candidates did not add the crucial words “**without tools**”, “**by hand**” or “**with the fingers**” and thus lost the mark available. “Easy to tighten/loosen” was insufficient, as a hexagonal nut is easy to tighten/loosen with the right tool.

Q18c Many candidates gave responses that could only be carried out on pieces of acrylic, such as using a coping saw to cut out the shape, or using a line bender to fold the bracket. Some used a buffing machine to smooth the edges, and others went for the whole vacuum forming route. Laser cutting was considered inappropriate for the thickness of metal (possible, but not in a school workshop), and a hole punch (without any qualification) was not thought sufficiently reliable for cutting the square hole. The mark scheme lists the various tools and processes that were thought relevant to the age and experiences of the majority of candidates.

Q18d As stated above, many candidates used their experience of acrylic cutting and shaping to make sense of this task. After drilling a starter hole, many went for a coping saw, fretsaw or even tenon saw to cut the square shape, and glasspaper to tidy up the cut edges. Fortunately, there were enough possible answers – from marking out to final finishing – that most candidates were able to achieve 1 or 2 marks.

Q18e* This question, as Q16d above, required both technical expertise as well as written skills and was marked in the same way. Here, though, the Examiners were looking for a worthwhile discussion which related and compared the use of CAM/CNC machinery with hand manufacture. This level of expertise was not accessible to some candidates, some of the responses seen were well written but entirely off- subject. Those that did answer the given question, wrote about speed of (CAM) manufacture, pride in a (hand-crafted) job well done, ease of making (hand-made) changes and 24/7 (CAM) working. Generally, candidates did slightly less well in this question than they did in Q16d.

Overall, this question highlighted the lack of real hands-on experience of working with “real” metals (as opposed to thin, aluminium sheets). Centres need to recognise that metalworking can be taught in workshops without the need for forges, brazing hearths and centre-lathes (but Examiners also recognise that engineering vices, folding bars and other tools are not cheap!).

Q19 This question focused entirely upon acrylic, with a passing nod to other resistant materials.

Q19a Most candidates recognised the “suitability” of the shield on the left of the figure, surrounded by the least amount of plastic sheet. Theoretically, any position would be suitable using such tools as a laser cutter, but the selected position is the least wasteful and the most accessible.

Q19b Candidates were split 50:50 between correct responses (see mark scheme) and incorrect (PVA, glue gun, sticky tape or the popular but unspecified “solvent glue”).

Q19c Examiners were looking for an adaptation of the MDF block to receive the bottom edge of the upstand (**slot**, or applied **moulding**) together with an indication of an **appropriate adhesive** (e.g. epoxy resin, as the materials to be bonded are incompatible with each other and thus with water-borne or solvated adhesives) and some note relating to **size, shape** or other **feature**. Those candidates who did not gain marks usually described how to adhere the shield to the upstand (not required) or applied a PVA adhesive directly to the top of the MDF and placed the lower edge of the upstand into the glue line.

Q19di Most candidates were able to identify a known workshop power tool that they used for this purpose. Unfortunately, the ubiquitous laser cutter shows up here, as do various types of wood saw (not power tools).

Q19dii ... and as many identified hand-held planes, abrasive papers and chizzels (sic).

Q19e With so many possible steps to include, it was relatively simple for candidates to gain some marks here, although many missed out on the full 2 marks by only describing one process – usually sanding down (although some were unclear as to whether this smoothed the surface before priming, or roughened the surface to allow the paint to be absorbed).

Q19f This question tested the candidates’ knowledge as well as their illustrative skills, and a few gained no marks – usually because the question was not attempted at all. However, many failed to gain full marks by omitting details of materials or construction (both requirements written into the stem of the question) and merely focusing upon the four bullet points. Lockability was not simply a drawn hole with the written label “lock”, but Examiners were looking for a view showing a hasp and staple, or a sliding ratchet as used on glass display cases – something with a degree of detail. To indicate the number of trophies, many candidates calculated the width/height using

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the given measurements, and appropriate dimensions were seen and credited on many designs. There were many designs which simply indicated some form of wooden or metal frame enclosing glass or acrylic, but without any indication of the material of the frame, its jointing detail or how the clear material would be fitted to the frame – but a mark was gained if the clear material extended around the side of the box. Interesting designs incorporated mirrored backs to the case, trapezium-shaped footprints so the viewer could see through the side without the need to move through 90° and glass shelves to the trophies could be seen from beneath.

Of the three “technical” questions, the last – focusing upon acrylic – was by far the best answered by candidates, indicating clearly that this is the material of choice for many centres when using a resistant material. While this is commendable, the other two main materials (wood and metal) must also be used and should be taught and used alongside the readily-worked plastics if candidates are to achieve their full potential in this subject.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Facsimile: 01223 552553

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