

GCSE

Design and Technology: Resistant Materials

General Certificate of Secondary Education **J306**

OCR Report to Centres June 2016

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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.

OCR will not enter into any discussion or correspondence in connection with this report.

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A561 Introduction to designing and making and A563 Making quality products

A561 Introduction to Designing and Making

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

Introduction

This year overall candidate numbers for this specification have remained positive although the decline in students nationally studying design and technology courses is reflected in this qualification.

On the whole Centres have interpreted the marking criteria well, applying the marks appropriately and fairly across all criteria areas. However, it has been necessary, in some instances this series, to make adjustments to bring candidate's marks in line with the agreed National Standard. Where any adjustments have been made, this is as a result of misinterpretation of the marking criteria or a lack of evidence to justify the marks awarded in the portfolio.

Paper portfolios in both A4 and A3 formats still remain the most popular medium for entering the candidates work and whilst repository entries have also remained steady there has been a small increase in the number of Centres using other electronic storage methods to enter candidates work.

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.

Point to note: This report to Centres is an important document where issues raised from moderation are highlighted and suggestions for improvement given. It is recommended that all staff responsible for the delivery of this specification read this document thoroughly.

Administration

It is encouraging to report that communication with Centres was, on the whole, generally positive 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.

It is helpful to encourage candidates to organise their portfolios according to the assessment criteria in the portfolio. This makes identifying marks awarded by the Centre easier and quicker

during moderation. It was also noticeable this series that in the main candidates had presented their portfolio's with care and thought and that Centres are to be commended for this practice.

Please note that work presented for moderation should be removed from heavy ring binders so that pages can be turned over without having to remove sheets from plastic wallets. However, we do expect the portfolios to be securely fastened together; clearly labelled with Centre Number, Name and Candidate Number and with the correct mark sheet attached to each piece of 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 in the making sections of the portfolio. It is essential that the Centre includes this photographic evidence of the candidate's prototype/product clearly in the folders. 'A minimum of two clear digital images/photographs of the final product is required in the evaluation section (4.1 of the specification). Therefore, 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.

Photographic evidence of the key stages of production is also required in the 'Making' section of the marking criteria for controlled assessments (Appendix B of the specification). Marks may be compromised if candidates do not provide sufficient evidence of making.

Advice to centres

It may be advisable include annotation or other documentation to support your internal assessment in order to clarify your thinking. 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 (if used) should be completed in the same order as the MS1 sheets as this enables effective checking of the marks by the moderator.

Centres need to ensure that the theme and starting point are clearly stated on the front of each portfolio or on the Controlled Assessment Cover Sheet (CCS) which includes a 'Task Title' box allowing space for the theme to be entered.

We would encourage Centres to apply the mark scheme on a 'best fit' basis. For each of the assessment criteria band descriptors provided in the mark scheme the one that best describes the work of the candidate should be selected. When teachers then select the most appropriate mark within the descriptor, they should use the following guidance:

- Where the candidate's work convincingly meets the statement, the highest mark should be awarded
- Where the candidate's work adequately meets the statement, the most appropriate mark in the middle range should be awarded
- Where the candidate's work just meets the statement, the lowest mark should be awarded.

It is important that candidates include acknowledgements or a bibliography in the relevant sections of their portfolios. There was a noticeable increase once again this series in the number of design folders without reference to research sources.

It should also be noted that for accurate moderation 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 was drawn to the contents of this report as there were still a number of misconceptions that were still not being addressed in the candidates work.

It was again apparent from some of the work presented for moderation that even though a link is provided on the moderators report back to centres not all of them had taken the time to read the Principal's report or certainly act upon the information it provided. 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.

The more successful candidates work tended to reflect the assessment strands written in the specification and they provided evidence across all of these areas to support the marks awarded by the Centre.

Centres are also reminded that one of the main requirements of this unit is to design and make a prototype product primarily constructed using "Resistant Materials". In this way it should be viewed as an opportunity for the candidates to show some creativity in their work.

Overall it was encouraging to see that there were fewer recommendations for changing a Centre's marks this year. Where these recommendations were made by the moderators it was due to different interpretations of the mark scheme being taken by teachers. It is also important that all Centres ensure that they internally standardise their assessment, 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 Centre's we offer the following advice and would 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 to complete a product analysis.

The themes for this unit of work are written on Page 46 of the specification and in this cohort of entry the two most popular ones were Storage and Celebrations.

Centres are again advised to prepare candidates prior to starting the controlled assessment on how to present the work required for the creativity section of this unit. We are not expecting work that is not relevant, informative or focused upon the theme selected by the candidates. In this way research work such as a questionnaire produced to find out the user needs can still be completed but within the "controlled" environment it is the results or conclusions only that we would expect to see in the portfolio.

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

Far too often many candidates failed to recognise the links between a quality product and the technology involved. It was seen that in a number of portfolios the product analysis was often formulaic and it referred to general features rather than a detailed breakdown into ‘how’ and ‘why’ a product is successful.

Marks awarded by some Centres, especially in the higher response band, often show that conclusions to the research information continue to be lacking in detail and are often completed as an ‘afterthought’. Our advice would be that the conclusion needs to bring all of the research activity together and form the basis for producing a detailed and justified Design Specification.

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.

Designing

The better candidates in this assessment strand were able to start the work by analysing their design brief and the conclusions that they made from their previous research before producing a detailed specification for their own prototype product.

However, there has been a great variation in both the quality and content of the design specifications seen in the portfolios with a lot of very generic or vague statements being given that could apply to any product rather than specifically to the design that candidates wish to produce. 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 creativity section of the portfolio.

Most candidates used freehand sketching to illustrate their initial design ideas. Some candidates generated and developed detailed ideas showing a range of various and different solutions. These ideas were then fully explained with notes which provided further information on materials, sizes and construction methods. However, the quality of presentation 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.

Overall the standard and quality of the annotation of these ideas was disappointing as it sometimes provided little in terms of further detail or explanation of the candidate’s thoughts or to provide evidence of how they had chosen their final idea.

Design development also continues to be one of the weaker aspects of the Unit. Whilst a good number of candidates now undertake some form of modelling to test their “best” design this is often a repeat of one idea with little explanation provided as to how this helped them to finalise their chosen solution. Candidates should use this process to combine ideas, make modifications and suggest alternatives.

There was felt to be a definite improvement in the quality and quantity of CAD work in folders perhaps connected to the availability of more user friendly software in the centres. As a result candidates were able to combine a range of 3D sketches in producing and developing their design ideas.

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.

With the increase of e-portfolios there have been concerns mentioned by the moderators in connection with some of these due to the quality of the design work that was presented. 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.

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

Please note that the focus of this unit remains as an introduction to designing and making and as such candidates should be developing a prototype product which enables the candidates through the assessment scheme to show some creativity in their work. It therefore remains a

concern at the variety of products being produced by candidates in some centres due to their size and complexity. These Centres still appear to view the controlled assessment units in the Innovator suite as being two similar units of work. It is worth stating again that this has never been the intention of the examination board with the introduction to the unitised approach to assessment in this specification.

It was noticeable in this cohort that on the whole Centres are now following this advice and that candidates are generally moving towards producing less complex, prototype products which can be completed within the recommended time limits stated for this unit of work. This is to be commended but Centres need to be careful that products requiring less skill do not compromise the high marks that can be awarded through the mark scheme.

It would be worth taking note of the previous statement as the marks awarded by some Centres for the quality of making did not reflect the standards set for this assessment in the moderation process. Recommendations were made by moderators for marks that were awarded as a high ability response which were felt to be only sound or even basic in the quality of work that was presented in the candidate's portfolio.

With the access to computer technologies now becoming readily available in many centres there was an increase noted in the number of prototype products produced by the use of CAD and CAM techniques and because of this centres should be reminded that Candidates should be able to show a variety of construction techniques in the making of the prototype product.

Where CAM has then been used in the construction they should be made aware that there also needs to be evidence of other making 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.

Centres are also reminded that if a prototype, or part of one, has been produced using CAM as one of the manufacturing processes then 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.

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:

- Were not able to show the quality of practical work in their portfolios for the marks awarded by the centre.
- 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

Although there was evidence that a lot more Centres have now focused their work to reflect the specification requirements for this assessment strand it is still disappointing to see candidates who have based their evaluation on their prototype product and how it functioned rather than modifications to improve the designing and making process. It is worth noting that with grade boundaries previously amounting to fewer marks than those that can be awarded for the evaluation process it may have a significant effect on the candidate's achievement if an adjustment is recommended by the moderator due to a lack of understanding from the Centre.

Centres are therefore again reminded the Specification for Unit A561 clearly states that the evaluation should be of the complete 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 the candidate has produced in completing this unit of work only.

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 a quality product

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

Introduction

In this unit candidates are expected to have designed and made a fully functioning quality product. The type of project selected should be challenging but realistic in terms of the resources and time available within the centre.

Candidates should have been encouraged 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.

It can therefore be concluded that Centres see this particular unit as the second controlled assessment project even though they can be taken in any order to suit the requirements of the candidates.

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.

Centres are also required to ensure that candidates do not pursue the same 'theme' for their work as submitted or intended for submission in Unit A561. A full list of themes for each unit of work can be found on the relevant pages of the specification.

The themes for this unit of work are written on Page 47 of the specification and in this cohort of entry the two most popular ones were "My Environment" and "Home".

Administration

When producing e-portfolios 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 few difficulties were experienced in the administration of this unit and for future reference centres attention should be drawn to the following:

- 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?
- A number of Centres entered for the repository option but didn't upload work but instead sent paper folios or electronic files instead. Some electronic files were difficult for the moderator to navigate with "links" in the presentation to other parts of the portfolio rather than a clear progression of slides.

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.

When compared to Unit A561 Centres are, in general, more accurately marking this piece of controlled assessment and this is reflected in the achievements of the candidates.

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.
- Little evidence of suitable 3D 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

For unit A563 there are three separate assessment strands covered by the overall heading of designing.

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

In the work of a successful candidate we were likely to see:

- Work to show how they had selected their own problem area from the list of controlled assessment themes stated in the specification.
 - A design brief for their intended product together with supporting evidence to explain what conclusions they had reached from any related research.
 - A clearly structured design specification which is specific to the product that they intend to make.
2. 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.
 3. The production of a range of creative design ideas using a variety of techniques.

In the work of a successful candidate we were likely to see:

- Presentation of their design ideas using a range of graphic techniques, including the use of CAD. This work should be supported by detailed annotation where they are also able to provide details of sizes, possible materials and likely construction methods and processes.
- Modelling which has then helped the candidate to develop the final solution.
- References made to the specifications in explaining the reasons for the choice of the product that they intend to make.

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

In the work of a successful candidate we were likely to see:

- A good range and variety of well-presented design ideas.
- Detailed sketches and notes in order to show the technical and constructional information related to the development of the chosen design idea.

Having selected the problem area candidates should then have been able to produce a design brief and specification with some evidence of how they responded to these as part of the initial assessment strand. 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.

Candidates are asked to demonstrate an appropriate response to a design brief initiated from their theme/starting point and produce a specification. Responses therefore need to be relevant, clear and thorough to achieve the high marks. Some Centres had spent too much time on research which lacked thorough conclusions.

In a few cases, notes about production methods and how to complete various construction and decorative techniques were included in the portfolio. If this work is not focused on the chosen product and is seen as being little more than general theory work then this is not necessary and will not be allocated marks.

The design specifications produced by candidates varied in content and detail. Candidates need to justify each specification. Some candidates did provide uniquely detailed specifications that clearly applied to the product they intended to make. A good specification forms an essential checklist that will guide the candidate through this controlled assessment.

Please note that as in the previous unit the specification clearly states that candidates should “use appropriate modelling techniques and CAD to aid product development.”

Few candidates provided any quality evidence of 3D modelling in their folders that would have helped them to develop a final idea and in a number of instances there was a feeling that Centres had encouraged candidates to “go through the motions” rather than producing this work for a purpose.

In some Centres modelling must have taken place as products had developed from earlier designs but this was not always evident in the work presented for moderation or was included as part of the record of practical work. It is essential then that candidates include evidence of modelling and make reference to this work in developing their design ideas if the higher mark bands are to be awarded by the centre.

The final mark in this assessment strand should be used to indicate how well the candidate has communicated the details of the final product they have chosen to produce for this unit. In some cases it was difficult to see any evidence of this requirement as candidates moved straight from a series of design ideas onto the planning required for production

Making

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

1. The planning and making of a quality product.
In the work of a successful candidate we were likely to see:
 - Completed planning which shows the intended stages of manufacture before they started the practical work.
 - A high quality product suitable for the intended user which had been made using a variety of constructional techniques and materials. Also please note that where CAM had been used as one of these techniques then besides the supporting evidence we should also be expecting to see other construction techniques being used in the production of the final design idea.
2. Details of how they overcame any technical problems in the making of the product.
3. Recording the making of the product.

In the work of a successful candidate we were likely to see:

- A record of the key stages of manufacture in the form of comprehensive notes and photographic evidence produced by the candidate.
- Further written evidence to demonstrate how they solved any technical problems in the making of the product.

Please note that with 6 marks available for both of these two assessment strands in Unit A563 they have been the equivalent to a grade boundary in the previous year's awarding. Further to this it will also move a centre's marks outside of the tolerance limit allowed for moderation.

Therefore, in this cohort of entry the quality of practical work seen by moderators was generally good across the full range of abilities. Centres are starting to become far more realistic in terms of their expectations due to the obvious time constraints in this unit of work, although there were still some very ambitious projects being attempted.

Most of the candidates appeared to have worked skilfully and safely to produce a quality end product which reflected the quality of the work shown in the portfolio. Overall, this was the most successful aspect of the work seen for moderation this year. However, some Centres seemed to assess this work without using any discretion towards the statements in the mark scheme when it came to judging the quality of the final product produced by the candidates

Planning consisted of a flow chart for most candidates. It is expected that candidates planning shows each intended stage of manufacture along with health and safety issues, tools, equipment and processes required to make the product. A plan in a table format that shows each of these requirements would be of benefit to a number of candidates.

From this the majority of the candidates then included a record of the key stages in making the final product using notes, sketches and photographic images. A photographic record with annotation or even a scrapbook diary that is completed in each lesson would be useful in completing this section.

Please note that Centres are reminded that for all aspects of the making process evidence must be provided in the portfolio.

Evaluation

In the work of a successful candidate we were likely to see:

- Evidence that the candidate has tested their completed product in use and then compared this information to their list of specifications.
- Possible improvements to their product shown by using a series of notes and sketches.
- Evidence throughout the portfolio of the correct use of specialist terms and accurate use of spelling, punctuation and grammar.

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.

Quality of written communication

Centres applied this mark fairly and accurately. Candidates should be encouraged to use appropriate specialist terms throughout their portfolio and organise their portfolio in a structured and logical manner, following the stages outlined in the mark scheme. There were many instances of paper based candidate portfolios being in a very disorganised state, candidate work produced using ICT (such as PowerPoint) were mostly in the correct order.

A565 Sustainability and technical aspects of designing and making

General Comments:

The format of A565 has been established for 3 years now, and continues as two sections; the first (Section A) concentrating upon areas of sustainability and the second (Section B) upon the more technical aspects of the materials described in the specification. Each section contains questions (or part questions) worth from 1 to 6 marks, and the paper attempts to cover as broad a range as possible of the specification points.

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

As in previous examinations, most candidates attempt all questions, but many marks are lost by candidates not expanding upon simplistic answers, or wasting their time by writing out part (or all) of the question as a preamble to the response. Single-word responses such as “strong”, “quick”, “easy” and “light” are seen in many scripts and – unless suitably qualified – are not awarded. Comparative, unqualified adjectives, e.g. “Stronger” are only awarded only if the question requires a comparison between two materials. Examiners were pleased, however, to see that in Section A, less reliance seems to have been given to vague terms like “environmentally friendly”, and “recycling”, which were prolific in 2015.

In both sections, candidates seemed able to access the essential requirements of the questions where they were answered, but some lacked sufficient knowledge to expand upon their basic responses – or neglected to recognise the various “command” words:

State ... name ... give require a short response – perhaps the name of a piece of equipment, a specific material or a definition;

Complete requires finishing off a drawing, a table or design;

Describe needs a short paragraph to outline a process or how something works;

Use sketches and notes requires both for maximum marks – just sketches or just notes will not gain all the marks available for this question – and notes should expand upon what is seen in the sketches (stating the obvious or labelling parts of the drawings cannot be classed as notes);

Explain requires a detailed response including reasons for your response – if a question is worth 4 marks, two unrelated and unexplained responses will not gain 4 marks;

Discuss usually carries 6 marks, and is tested as much for the Quality of Written Communication (QWC) as for the technical content – a list of unrelated points (bulleted or not) will gain no more than 2 marks (Level 1), whereas three well-argued paragraphs (pro, con, conclusion) could gain all 6 marks.

Centres should allow time for their candidates to practise responding to any of these commands, particularly the **QWC** and **sketch/notes** leads.

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 Only a very small minority chose a response other than the correct **Disassembly**.

Q2 Again, the majority chose the correct **Product Design**, although there was a significant number who were unaware of the sequence of product creation, at least in the context of the question. Product development was the most popular incorrect answer.

Q3 Almost all candidates were able to recognise easily the correct response **Flying Splinters, Sparks and Dust**. Those very few candidates who did not gain a mark here made no attempt to answer it (“No Response”) rather than making an incorrect choice.

Q4 Only (a) Producers only receive enough for their goods to cover their costs and (d) **Producers receive a reasonable price for their goods** seemed to be picked, the other two choices being ignored. A good majority chose the correct response.

Q5 A reasonable number of candidates chose (c) **Dangerous for the environment**, although (a) Water pollution was a popular second choice and a few went for (d) No fishing. The introduction to HVOC materials did not appear to faze the candidates.

It was pleasing to note that very few candidates were unable to pick the correct responses in these questions; those that did are as likely to have rushed their reading of the questions as misunderstood them.

Q6 This was not answered well. The most common incorrect response was carbonate, followed by compound, committee, chemicals and even conspiracy. Only about 30% of candidates managed **Carbon(s)**. This was disappointing, considering that CFCs have been in the news since their effects upon our ozone layer was first discovered in the 1970s, and the provisions of the Montreal Protocol agreed in 1987.

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 or re-make. Rethink was the most common incorrect response.

Q8 Carbon Footprint was proposed by 70% of the candidates, although emissions, monoxide, dioxide and factor(?) were seen too often.

Q9 **Landfill** was the only correct response, seen from approximately 80% of the candidates, although landfill was observed.

Q10 A large majority of candidates arrived at a satisfactory answer to this question of which **dangers, hazards** and **safety issues** figured highly. “Risks” was considered a repeat of the question and was disallowed, however, and “risks and dangers” was thought too much of a “scattergun” approach and was also awarded zero marks.

As in previous years, it was felt that candidates let themselves down in these five questions by not reading the question correctly, or by not taking the time to understand the thrust of the question.

The next five questions (True/False) were generally very well answered, with the exception of Q14, where approximately 20% responded incorrectly. Life Cycle Analysis appears not to be well understood by many candidates (see also Q2 above).

Answers are:

Q11 **False**

Q12 **False**

Q13 **False**

Q14 **True**

Q15 **True**

Generally, these first 15 questions were better answered than in previous sessions, but there is still evidence that some candidates consider these to be not worthy of their best attention, and are glossing over these to get to the “meat” of the paper. This is most clearly seen in the first five questions, where ringed first attempts are crossed out in favour of correct choices.

Q16 The thrust of the majority of the question was one of designing or re-designing a child’s educational toy. The QWC part centred upon globalisation.

Q16a The point of this question is “**one** relevant piece of *user research*” in relation to the child’s clock/shape sorter. As the child in question is probably only 2 or 3 years old, such areas of research as questionnaires, surveys or cost become irrelevant, but for every correct answer examiners saw one that was irrelevant or too vague. “**Sizes of children’s hands**” is correct; “anthropometrics” is too vague, for example.

Q16b Safety precautions when working with MDF must focus upon the dust generated when the material is being shaped. Thus, “**goggles to prevent flying splinters getting into eyes**” is good, “goggles” is not. Similarly, “dust mask” does not get awarded, “**dust mask to prevent dust getting into lungs**” does. As in 16a, as many gained a mark as failed to gain one.

Q16c The environmental impact of the clock when it has reached the end of its useful life is such that it cannot easily be disposed of. Small parts, painted MDF, bits of acrylic all make the clock useless as an easily-disposed artefact. It is unlikely to have become splintered, it is not “too old”, it won’t suddenly have developed sharp edges. Essentially, the explanation must highlight a problem and a corollary. The clock has to be **disassembled if it is to be recycled**, but the **paint coatings prevent MDF from decomposing quickly** and the **acrylic does not biodegrade and has to go to landfill**; any of these suggested responses would be acceptable, and would gain two marks. Unfortunately, a large minority were unable to respond in these ways, assuming that the MDF does not degrade, that the acrylic/paint will give off harmful gases when dumped in landfill and that the clock will become a mass of sharp edges and splinters before it cannot be played with.

Q16d requires candidates to improve the clock by making modifications to prevent the small parts falling out – any parent’s nightmare! **Velcro, magnets, bayonet fixings** and even **string** are brought into service, and are all awarded with at least two marks. A recognition that the pieces still needed to **protrude** for them to be gripped (an extra mark) and an **explanatory note** gives the fourth mark (not, “this is a magnet”). A large minority were able to gain only one mark, though (perhaps placing a magnet on the back of the block without a magnetic surface applied to the bottom of the clock recess). A small minority did gain the full four marks, however.

Q16e The phrase, “users who have *restricted manual skills*” is crucial here, and was ignored or misunderstood by almost half the candidates. Many responses involved colours, sounds and even smells. Some candidates felt that the clock needed bringing up to date by introducing touch buttons, screens, LEDs and speech. However, enough candidates recognised that size is important (**larger blocks, larger clock face, larger clock hands**) to gain at least one mark.

Q16f allows candidates to bring up the reinforcements: to make the clock safer for the user we can **smooth the surface/edges, make blocks bigger** (so they can't be swallowed), **use non-toxic paints, make robust construction** – all familiar responses to a myriad of past questions. Candidates let themselves down by repeating similar techniques in each sub-section: smooth faces; smooth cut edges; smooth corners.

Q16g* This question, the first of two in this paper, tests the candidates' writing skills, discussion style and technical knowledge. For a few, however, their skills were not up to the task, and these candidates merely listed points related to manufacturing in general (fuel costs, use of fossil fuels, eliminating transport by manufacturing nearer home, and so on). With no mention of wider markets, good will between countries or competition between companies, 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). Some more extensive discussion centred on profitability, sharing designs across countries and other implications of transporting across countries' borders, and these candidates will have moved their responses into Level 2. It was clear that many candidates had been taught about the use of conjunctions to expand a written argument, but using conjunctions at the beginning of every sentence is not the way to go to achieve Level 3, the text reading like an unbulleted list of bullet points.

For the great majority of the candidates, the responses they gave showed a very limited understanding of globalisation. For many, their discussion centred on the use of low-paid labour, sweat-shops, low Health & Safety levels, poorly made products and manufacturing in China. Other popular topics were cost of transportation, long lead times between ordering and receiving a product, unavailability of spare parts and the job market in the manufacturing country. Some candidates assumed that the "manufacturer" in the context of the question was in fact the artisan(s), and their discussion revolved around the plight of the artisan in a developing country.

In the final analysis, less than 10% achieved a Level 3 discussion, combining technical content with a sound knowledge of how to set out a reasoned argument. We have taken a copy of one such response to illustrate the point. Highlighted sections are those most on topic, the last two being written on an additional page – one of only a very few to achieve 6 marks.

There are many advantages and disadvantages of globalisation for manufacturers. Firstly they can receive the greatest profit as they can source the materials for the cheapest price globally. They can also set up a base of operations in a location that suits them better. Governments also want to help them out their cooperation in their area and can provide tax incentives to entice them. They also create more jobs in especially in areas that are more jobless. There are still negatives though such as another manufacturer creating a very similar product to yours after you and selling it in area which cuts off your customers from there. The large manufactures can also undercut your prices as they can afford to do so and drive you out of an area. Your quality could drop as you try to make it as cheap as possible or you receive less profits as you ~~raise~~ raise the quality and keep the price relatively the same.

The consumers are also affected. They can receive better prices for their goods as they've been sourced from the cheapest location for the same quality. The quality of goods they buy could go up for almost the same price [6]

as it would now cost. The manufacturer almost the same amount as before if not less.

There are disadvantages too such as the quality of goods they buy go down as multiple manufacturers are trying to compete with each other. There can also be an increase in greenhouse gas emissions which negatively impacts everyone as there are for more factories now.

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. 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. Each question focussed upon a different resistant material – Q17 on metals, Q18 on Acrylic and Q19 on veneered MDF.

Q17 This question focused upon metalworking for making jewellery, specifically a pierced bracelet.

Q17a The question asks specifically for a name of a non-ferrous metal which could be used to manufacture the bracelet. Examiners were willing to accept any non-ferrous metal or alloy, but even with this wide brief we could not award iron, steel, cast iron or stainless steel, proposed by approximately 20% of the candidates ...

Q17b ... but candidates were not penalised again if they gave correct properties of the material they proposed in 17a, although few were able to explain their reasoning for the full 4 marks. Properties such as **shiny, non-corrodible** were common, but the need for a shiny appearance eluded a good minority. Incidentally, a common response "does not rust" was disallowed for any non-ferrous metal, as rusting refers only to iron-based alloys.

Q17ci The range of thicknesses of the metal strip (**0.5 – 2.0mm**) was set by extensive research of workable sizes of common jewellery metals, bearing in mind the possible cost of thicker materials, and the workability of very thick metals. However, the great majority of candidates seemed to ignore practicalities, and plumped for any dimension from 3mm up to an astonishing 50mm.

Q17cii The concept of anthropometrics is recognised by candidates, but the application of the data is difficult for some to put into words. Many responses described taking **measurements of a wrist** and transferring this to the metal strip, but without seeming to understand that the anthropometric data already tabulates this information. Ensuring that the strip is long enough to **fit** the wrist is necessary for the second mark.

Q17d Generally, most candidates were able to gain at least one mark here, and a good majority gained full marks. However, it was noted that many tools cited here for use on a metal would have been better used on MDF (see also 18c below) and some tools proposed are not suitable for use by students (...naming the tools **you** would use...); thus, tools such as Forstner bit and bandsaw are not awardable for these `respective reasons...

Q17e ... and the responses to this question would have been most appropriate for bending acrylic, involving line benders, strip heaters, ovens and hot-air guns. Too many responses required heating the chosen metal to red heat, which would cause aluminium to melt and silver to become very brittle. Almost all the hearth/torch heating processes submitted would be applicable only to iron or steel, but at least the candidates had remembered their theoretical learning. Examiners were looking for simple processes such as **hammering** around a **round former (mandrel)**, holding the end of the metal in a form of **clamp/vice**, using a **soft-head hammer** or a **smooth planishing hammer, annealing** if necessary and the use of a **template**. Of course, answers are required in both sketch and note form for full marks, which were gained by very few candidates.

Q18 centres on the use of 5mm thick acrylic sheet to form a simple, square-cornered mobile phone holder.

Q18a requires a reason for using 5mm thick acrylic sheet to make the phone holder. It doesn't need to be strong/light, withstand a lot of weight, be easily bent or vacuum-formed. However, acrylic is **self-coloured**, can be **transparent**, is **thick enough to form butt joints** easily and can be used to **evaluate a design** simply; not many candidates knew any of these properties, unfortunately.

Q18b Modelling is well-known to candidates, but the reasons behind the practice did not find their way onto many candidates' scripts. Responses relating to checking the strength (model may be in Foamboard) are not helpful, but **checking sizes creating shape templates**, or **forming scale model** are all useful starts for two marks, which most candidates achieved.

Q18c Marking out and cutting acrylic should be a relatively common task in a workshop situation, and a reasonable minority achieved full marks here. However, as mentioned above, there were too many responses that degenerated into an exercise in cutting and joining wood or MDF. If an appropriate tool was mentioned, this was awarded, but the techniques of joining (finger-joint, dowels and such like) could not be accepted. Tool names had to be specific – ruler was not acceptable, **steel rule** was; marker pen no, **permanent marker** yes; pencil no (unless used on paper protective film); **Chinagraph pencil** yes; and so on.

Q18d* For different reasons, responses to this question gained no more marks than for Q16g*. In the latter it was the lack of technical knowledge that let candidates down; in Q18d the technical knowledge was very evident, but candidates knew so much that – rather than discriminating and selecting just a few key points, many candidates chose to put all the points down on paper, thus creating a lot of bullet points, albeit not prefaced with a bullet. Significantly, much more was written about CAD than about pencil/paper drawing, but ultimately most gained only the top end of Level 1 or the lower end of Level 2.

Q19 is concerned with the use of veneered MDF, rather than solid timber or plain MDF.

Q19a A hardwood veneer is to be named, and **any hardwood** was considered appropriate – candidates don't seem to name Balsa wood any more. There was still some candidates who named a softwood, usually Pine, or plywood/flexiply, which is made from veneers, but the majority managed to gain the mark easily.

Q19b Again, as in other questions, two explanations were asked for, not just statements, and many candidates let themselves down by not elaborating upon their first answers. Examiners expected responses relating to the **saving of hardwood trees, large sheets** available, **less warping** of wide boards and so on. Many responses majored on the decrease in weight of MDF boards compared to solid wood (both 18mm MDF and seasoned oak have the same density – approximately 700kg/m³, not increased by the addition of two 0.5mm thick oak veneers to the MDF).

Q19c Most candidates did well on this question, only missing out on small, but vital, points. Some did not clearly state how the **holes** should be marked out, and some did not name the type of glue to be used to make the joint (there are no screws shown, so it's not going to hold together permanently without **PVA** or **wood glue**). There were enough middle sections which gained marks to satisfy all but a few candidates, and zero marks were generally due to candidates not attempting the question at all, or who concentrated upon cutting the boards square.

Q19di Very few candidates knew that this is a **stay**, although in ...

Q19dii more knew it was used on **the door**, or **on the inside of the cupboard**.

Q19e tests candidates ability to derive information from a drawing, and some located the undesirable **height of the door**, or the **lack of stability** of the relatively small base. However, based upon poor joinery skills evidenced in Q19c, many others cited the weakness of the structure as being a problem (only if it's not glued), or that fact that it would not fit in a bedroom (improbable). As many thought that the materials were the weak point and that the MDF would fall apart.

Q19f Most candidates were able to answer this question satisfactorily, although a reasonable minority proposed paint, gloss, plywood(?) or satin. The term "clear coating" was the clue, and candidates picked this up in the form of **varnish, polish** or **wax**.

Of the three "technical" questions, the first – focusing upon a non-ferrous metal – was the least well answered by candidates, indicating that these techniques are still unfamiliar to them. It is important therefore that Centres ensure all three material areas (metal, wood and plastics) are introduced in equal measure. Wood and plastics should be taught and used alongside metalwork (if it's only thin aluminium sheet) if candidates are to achieve their full potential in this subject.

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