

GCSE

Design and Technology: Resistant Materials

General Certificate of Secondary Education **J306**

OCR Report to Centres June 2017

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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

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

Introduction

As this qualification has developed, it has been encouraging to see that more centres now have a very clear understanding of the requirements of this specification and are directing the candidate's experiences accordingly in preparation for the two assessed controlled assessment units.

Probably as a result of this, centres have, on the whole, interpreted the marking criteria well and have applied the marks that they have awarded appropriately and fairly across all criteria areas. However, it has been necessary, in some instances to adjust a number of centres in order to bring their candidate's marks in line with the agreed National Standard. Where any adjustments have been made, this is because of misinterpretation of the marking criteria or a lack of evidence to justify the marks awarded in the portfolio. It is apparent 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.

Where adjustments were recommended by the moderators, as a result of centres moving beyond the tolerance allowed for this unit, it was usually because of the lack of information regarding technical problems or the understanding of the requirements in the evaluation for A561.

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.

The requirement for centres to record marks directly onto the OCR interchange web page has certainly proved to be beneficial to the moderation process as there were fewer centres this year that did not get their marks onto the system by the specified date. Where concerns did occur they usually related to the time taken by centres to send the required samples of work through to the moderator and centres are requested to ensure that they understand the time limits indicated for this process.

Administration

Most centres provided individual Controlled Assessment Cover Sheets for each candidate with clear and relevant annotation that was helpful to the moderation process.

It is also helpful to encourage candidates to organise their portfolios according to the assessment criteria in the specification documents. This makes identifying marks awarded by the centre easier and quicker during moderation. It was also noticeable that during this examination series candidates had, in the main, 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.

Paper portfolios still remain the most popular medium for entering the candidates work and whilst repository entries have remained very steady there has been an 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

Interpretation of the Marking Criteria

In wishing to support centre's we offer the following advice and would like 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 and again the two most popular ones proved to be Storage and Celebrations.

Many more centres are now linking the product analysis exercise with meaningful conclusions about fashion trends and changes in technology. Candidates in the top ability range are identifying and processing relevant research material that help inform good design specifications. At the lower end, there is a great deal of teacher led, isolated sheets with very little understanding of the wider demands. Candidates at this achievement level are still looking at individual existing products and their characteristics without comparing them and picking out trends or commonalities.

The general standard of specifications produced by the candidates was again commented on by a number of the moderators as in numerous instances they lacked justification, reasoning and evidence that they had resulted from the candidates work prior to producing this list of requirements.

Centres are also reminded to be aware of the instructions relating to controlled assessment when providing "prompt sheets" to aid the production of specifications.

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.

Some candidates 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 in this assessment strand 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 quality of design sketches is often disappointing in the candidate's portfolios and in a number of instances; they are still restricted to four or five similar ideas and then given top band marks by the centre. Candidates should be encouraged to show greater variety, originality and creativity in their thought processes when presenting and developing their design ideas. Information relating to materials, sizes and construction also varied which should be seen as fundamental to making any final chosen idea.

However, It has been encouraging to see a greater use of CAD and 3D card modelling which has helped candidates visualise their design ideas and to show real problem solving as they work out proportions, components etc.

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 in this assessment strand 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

Many candidates chose the theme of trophies as their selected topic for this unit of work and centres should be aware that the selection of the theme is a stated high level of control when completing the controlled assessments.

The standard of outcome produced by the candidates varied considerably but the quality of the prototype produced for this unit of work also, in the majority of cases, reflected the standards produced in the main portfolio.

For the high assessment band candidates are expected to display a range of workshop processes and techniques. CAD CAM must be an integrated part of construction not a stand-alone construction. Plans produced by the candidates clearly showed the preferred sequence for manufacture often with quality control and safety checks.

For this assessment requirement the majority of candidates produced clear photographic evidence, with supporting notes, of the key stages in the making of their product.

Candidates' 'ability in solving technical problems' was often over marked. It is important that candidates produce a written log explaining the problems and challenges they encountered in producing their prototype. Candidates need to communicate what they did to rectify the situation and show how successful, or not, the solution became.

It is vital that the centre provides at **least 2** quality photographs of the completed product which show clearly the accuracy and precision involved in producing the final practical work. Far too often the moderator had to rely on construction or evaluation photographs to judge the quality of the outcome which is unsatisfactory. Please note also that this should be seen as the centre's responsibility and not that of the candidate.

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 the evidence provided by the candidate in their portfolios of work.
- 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.

Centres are therefore again reminded that the Specification for Unit A561 clearly states 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 quality products

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

Introduction and general feedback

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 allocated for this unit the majority of this period should be used by the candidates to produce the product rather than the portfolio of design work.

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”.

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.

Finally, a reminder that the use of pre-printed sheets and writing frames in a controlled assessment, should be used selectively to support less able candidates only.

Designing

Most of the candidates introduced the theme well and were able to explain what they intended to do, who would use the product and provide some information about the environment in which the product would be used. For the four marks available, it is not necessary to carry product analysis or consumer questionnaires. Specifications were usually well written and went beyond bullet point lists of requirements. However, there was still a lot of evidence showing too much irrelevant research, and also research with no specific conclusions reached by the candidates. The standards of sketching and presentation drawings were higher in A563 than A561 which is to be expected. Although moderators felt that there was still a lack of creativity and originality seen in some of the design ideas presented by the candidates.

The general use of CAD seen in the portfolios continues to improve as more user friendly software seems to be more readily available to the candidates.

It is suggested that it would be beneficial for candidates to title a sheet ‘Details of the design for production’ which would maximise the final four marks available in this assessment strand. Often this sheet was overlooked and the information about the final chosen product was not clearly communicated by the candidates.

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

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
- 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.

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.

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 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. These photographs must be able to show the quality of the final product so that the moderator is able to complete their role in this process correctly and fairly.

Products ranged considerably in quality and finish although the completed practical products in this unit are of a higher quality than A561 which should be expected given the focus of the assessment criteria. The majority of these products followed a traditional woodworking outcome, with perhaps little evidence of innovative design, whilst it remains that very few products were made in metal.

The planning that was seen in the portfolios varied considerably in content and detail with a few centres giving 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. The quality of work produced for recording technical problems and production logs are similar to A561, where in a lot of cases there was not enough evidence for the marks awarded by some centres. This area is definitely where greatest differences appear between centre marks and the standards expected in the assessment criteria. Unfortunately, some centres still misinterpret this part of the assessment criteria and marks are awarded where there is little or no evidence in the candidate's portfolios.

Most candidates produced photographic evidence, with supporting notes, of the making process although it should be noted that with six marks possible to award under the assessment criteria for this assessment strand then it is equivalent to a grade boundary in the previous year's awarding for this unit.

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.
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.

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

Top ability candidates physically tested their outcomes, with photographic evidence, against the specification. Detailed analysis and conclusions led to justified suggested modifications. Specialist terms were used appropriately by many candidates and information presented in a logical way throughout the designing and making process.

Centres are also reminded that as part of this assessment strand candidates should also be marked on their correct use of specialist terms and accurate use of spelling, punctuation and grammar.

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.

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:

The format of A565 has been established for 4 years, with one final year to run before the implementation of the new specification in September 2017 and examining in 2019. A565 remains 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 years, and despite recommendations in previous Reports to Centres, most candidates attempt all questions, but lose marks by 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 (e.g. “It is strong and will not bend when pressure is applied” – are not awarded. Comparative, unqualified adjectives, e.g. “Stronger” are 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 and, to a lesser extent, in 2016.

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 2 marks, an unrelated response without an explanation will not gain 2 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) without intrusive spelling or grammatical errors 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:

The published Mark Scheme should be read in conjunction with the comments below, to reduce the repetition of correct answers.

Section A Sustainability

5 multi-choice questions, 5 written short answers and 5 True/False questions, each are worth one mark. There is also one question in several parts, worth 20 marks.

- Q1-4 A very small percentage of candidates achieved 0 marks in these 4 questions, seemingly as a result of failure to understand how to respond to the question (circles around more than one answer, for example) rather than a failure to respond at all (NR or No Response).
- Q5 Whilst it may be ecologically satisfactory to buy recycled packaging, or morally acceptable to spend money on Fairtrade materials or local labour, if a company cannot easily reduce their emissions of CO₂ they can offset this by purchasing **carbon credits** which go towards financial support of projects that reduce the emission of greenhouse gases (wind farming, biofuel, or biomass energy).
- Q6 A search on Google for Ethical *Trade* Initiative will direct the enquirer immediately to the correct Ethical *Trading* Initiative. Thus, the many candidates who give “Trade” as their response were not credited with this. Other responses included Thermal, Tribal, Tribunal, Timing and – most popular – Technology.
- Q7 Whilst the majority of candidates correctly recognised the logo for what it was, too many resorted to the vague “Environmentally friendly” or “Recycled”.
- Q8 Those few candidates that were not awarded a mark chose Distribution as their response, with very few picking the third option, Product Use.
- Q9 A minority did not respond to this question at all, whilst some chose other words that began with “C” – Committee, Control, Cycle of life or Career. However, the majority of candidates were able to respond correctly.
- Q10 Of those candidates that did respond to this question, almost half wrongly assumed that the question related to Ergonomics, although Weight, B.M.I., Arithmetics, Anthropomorphics and – oddly – Stomatotype all made an appearance.

As in previous years, candidates let themselves down in these ten questions by not reading the question correctly, or by not taking the time to understand the thrust of the question. Too many “No Response” were still seen in this section, even from candidates who managed to answer more complex questions later in the paper. It is possible that candidates see these first 15 questions as not worthy of their time, attracting as they do only one mark each, and they are mentally glossed over in favour of the succeeding questions, especially those in the technical section. This is most clearly seen in the first five questions, where ringed first attempts are crossed out in favour of correct choices.

- Q11-15 These five questions (True/False) were generally very well answered, with Q14 eliciting the most correct responses. Incorrect responses to Q15 were most concerning, as these show a lack of understanding of how CFCs interfere with our atmosphere.

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.

In Question 16 the thrust of the majority of the question was one of a waste bin to be used in a school environment, its design and possible modification. The QWC section centred upon built-in obsolescence.

Q16a The point of this question is the *gathering* of information, not simply finding it. Thus, “conducting a survey” or “questionnaire” implies that the results will be part of a larger collection of data, while “google” or “ask schools” does not have the same association. More than half the responses were deemed to be correct, however.

Q16bi & 16bii

Defining a word by using the word in the definition was not considered to be a useful or acceptable response. This was particularly evident in bii, where the large majority of answers used “Refuse to...” in the definition rather than “Choose not to ...” (if they did not try to define refuse (rubbish)).

Q16ci The use of a *clear* finish on the container confused some candidates. The drawing shows the container to be made of tropical hardwood, but many candidates assumed that the finish would render the hardwood transparent (clear), thus enabling to user to see how full the bin had become. However, the majority of answers showed that the tropical hardwood needed to be protected from the elements or was too nice to be covered.

Q16cii Questions about LVOC paints have been asked previously, but there is no evidence that this term is yet understood. The “low volatile organic” refers to the “carrier” (usually water) or to solvent-free paints such as epoxies. The “organic” term usually refers to hydrocarbons which in HVOCs may refer to white spirit, acetone, toluene or other highly-volatile liquids which act as solvents for the other components (usually called oil-based paints). Thus, the term Low Volatile Organic Compounds refers to the low/small/zero amount of volatile components (compounds) of the paint and the effects of any vapours upon the environment and/or the user. Typical LVOC paints are acrylic or PVA emulsions, which rely upon the evaporation of the water carrier and the subsequent oxidation/hardening of the resin(s). Thus, benefits of LVOCs centre upon the lack of solvent vapours, and their effects upon the user (breathing the fumes) or the ease of use of the paint (clean brushes/spills with water). Less than 20% of candidates recognised the term, or the material, for what it is. Most incorrect answers majored on the term “organic” and assumed that this meant “natural”, thus colouring their response accordingly.

Q16d Required candidates to *explain* why an alternative to plastic bags should be considered; they were not required to come up with an alternative. Thus, only about one third of candidates managed to achieve the 2 marks available here. Most talked about bags in landfill but failed to explain this fact – that they take a very long time to break down – for the second mark. Many came up with points such as plastic bags are weak and the rubbish would then fall out.

Q16e Candidates were asked to *modify* the original design of the bin to make recycling of the contents easier. Those who came up with round bins (dustbins?) penalised themselves, as this was considered to be a total re-design, not a modification of the cuboid original. Candidates were not penalised for poor sketching skills, but we needed some evidence of a partition between compartments, labelling/colouring of each compartment for identification, facility for emptying and clear use of a sustainable material – repetition of the original design details was not acceptable.

Few candidates scored zero marks (usually by making no attempt to answer the question) and over half achieved three marks, most of these missing out on the material component.

- Q16f* Was the first of the two QWR questions in the paper, this one requiring a discussion relating to social and environment implications of built-in obsolescence. As stated in the preamble to this paper, bulleted points would only achieve Level 1 (1-2 marks) no matter how good the technical content might be. One paragraph of quality content taking up all the space available would not gain full marks, as this would not be “presented in a structured format”. Only the combination of technical content, structured discussion, spelling, punctuation and grammar would gain full marks. Almost half the candidates achieved no marks at all, and less than 10% reached Level 3. Many candidates did not understand the term “built-in obsolescence” believing it to be some component that had been incorporated into the product by the manufacturer, or to be some way of building the product into a household – as if it were a built-in kitchen. Too many of the responses discussed “the environment” in extensive terms, but with no reference to the subject topic they gained no marks.

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 timber and Q19 on acrylic.

Question 17 focused upon metalworking for making a garden gate latch (Suffolk latch). It was evident that many candidates were unfamiliar with mild steel, its properties and its working characteristics. As such, some responses to Q17 were more appropriate for woodworking rather than for metalworking. It would appear that many students have had little practical experience of working with – or even looking at – ferrous metals.

- Q17a The question asks specifically for a property of mild steel that makes it suitable for the gate latch. As in so many questions of this type, unqualified responses (Strong, Cheap, Hard, etc.) would not gain a mark. Neither would the many candidates be credited with “Won’t rust”, which was surprising given the responses to Q17di (see below). Thus, only 10% of candidates managed to gain a mark.
- Q17b However, the tools needed to work the metal were well-known, although there were still evidence that woodworking techniques were more familiar to the candidates. Tenon saws, coping saws, band facers, sandpaper, pencils and rulers were seen often, that said, almost half the candidates achieved three marks or better.
- Q17c The relevant word here was “permanent”, as nuts, bolts and screws are all temporary metal fixings, and glues – even epoxy resins – are not appropriate for such a small surface area of the meeting faces. Thus, only soldering or brazing were possible, given that welding was given in the question and only about 1/3 of candidates achieved the mark.
- Q17di Despite the assertion in Q17a that mild steel does not rust, the same students agreed that the steel needed to be prevented from rusting by the application of a protective coating. Others equally were certain that a coating would make the steel “look nice”. Over 80% of candidates gained the mark here.

- Q17dii Safety is normally at the forefront of any workshop process, but correctly naming the method of protection tested almost half the candidates. Again, simplistic answers (“Wear a mask”, “Goggles”, “Apron”) gained no marks. The point of spray painting is that fine particles are distributed into the atmosphere around the operator, together with solvent fumes, both of which have to be removed or stopped from being inhaled. Thus, “Wear a mask” is insufficient; “Wear a face mask” is just about correct. “Wear a mask to prevent inhaling paint fumes/droplets” is easily creditable.
- Q17diii The question has to be read carefully, and completely. The last clause “... apart from painting” is critical, and many candidates would not have written “Spray paint”, “Varnish”, “Oil” or other forms of liquid application had they read the question properly. As a result, even able candidates missed out on this question, and less than 1/3 of them gained a mark.
- Q17e* This, the other QWR in the paper, asked for comparisons between one-off and mass production methods. Unlike other years, the technical QWR this year was poorly answered due, in part, to the possibility that the question did not focus upon a specific material. Thus, the responses here were seen to be based more upon opinion and supposition, rather than fact. Apart from the responses that gave a list of pros and cons (Level 1, max. 2 marks), many answers assumed that: one-off production is slow/high quality/expensive/bespoke/less wasteful and mass-production is fast/poor quality/cheap/inflexible/wasteful. Any **one** of these points, properly discussed and argued, would have gained Level 3 (5-6 marks). **All** of these points, glossed over, gain no more than Level 2 (maybe only 3 marks not 4). Only 1/3 of responses gained more than half marks, even though the actual technical content was correct.

For Question 18 centres on a wooden tray to carry crockery and utensils. Because of the materials involved, this question was answered better than Q17, with the majority of candidates gaining at least three marks more than in the metal-based section.

- Q18a Asked for a name of a joint that would conform to the sketch shown. Thus, lap, butt, bridle and mortice/tenon joints were all uncredited but any multi-pinned joint named was given the mark, and the majority of candidates achieved this.
- Q18b Again, because of the subject matter, this question was generally well answered, with PVA being the lead. Clearly, responses such as “Glue” were not acceptable.
- Q18c Virtually any hardwood would be acceptable, and over $\frac{3}{4}$ of candidates managed to find a suitable material, with Oak being the most popular. However, maybe due to poor understanding of the question (or the material), “Plywood” was also the most common incorrect response.
- Q18d It was apparent that few candidates knew the differences between the various drill bits offered, although approximately 1/3 were able to identify the Forstner bit as the correct one.
- Q18e However, once the two holes had been made, most candidates devised a suitable method of removing the waste wood from the cut-out. However, they neglected to recognise that three marks were available, and wasted this opportunity by simply describing one of the processes involved – usually the coping saw.
- Q18fi In line with the theme of the question and the candidates’ familiarity with it, the great majority of them gained the mark here, most of them by the use of “MDF”. Pine, oak and timber were also offered by a few.

Q18fii On the other hand, the great majority failed to gain the mark here, and such answers as “Light”/“lighter” or “Strong” were discounted. There appeared to be a popular misconception that plywood is lighter than solid timber without qualifying the statement, but a comparison of relative densities will soon dispel this idea (English Oak 740kg/m³, Birch ply 680kg/ m³, European Redwood 510kg/ m³). Good answers recognised that the opposing grain direction of adjacent veneers in the plywood gave the board stability and non-directional strength.

Q18g Most candidates achieved 50% on this question, but less than 5% gained the full 6 marks. Most missed out by neglecting the constructional details and/or named materials, and many merely repeated several features of the original tray without modification. Whatever the response, it had to be seen to be workable and/or able to be made.

Question 19 Is concerned with the use of acrylic plastic to form a small games rack.

Q19ai Was able to be accessed by most candidates, and the majority gained the necessary mark, There were, however, enough responses to indicate that the term CAD may not be elaborated upon in centres, and both the “C” and the “A” were the precursors of some imaginative responses.

Q19aii As many candidates who achieved a mark in 19ai also gained a mark here. The incorrect responses ranged equally amongst the three incorrect choices ...

Q19b ... and the same number achieved a mark here, laser cutter being the almost unanimous answer.

Q19c Almost 2/3 of candidates managed one mark here, generally by citing accuracy as an advantage of CAM. (References to CAD were ignored as the question relates to cutting out the acrylic, not designing or marking it out.) Many candidates let themselves down by stating that CAD was quicker, when this was given in the question.

Q19d Although the majority of candidates had some cursory knowledge of heat-bending acrylic, few were able to achieve the full 5 marks available. Lack of specific detail was the main downfall of many (name of a line bender/strip heater, placement of acrylic sheet on top of the heating element, bending around a 90° former, repetition of heating and bending to achieve the required square cross-section were all missed from many responses). Lack of general knowledge was also evident (use of an oven or blow-lamp to heat the acrylic, vacuum forming, bending in a vice without heating as examples).

Q19ei Many candidates took the drawn square as an area into which a response was to be drawn, rather than an outline of Part B. Others assumed that Part A had to be somehow fitted into the face of Part B and drew fingers, mortices or other (wood-based) joints. Most, however, merely rounded the two bottom corners of the square to gain the mark.

Q19eii To avoid the “double-whammy”, candidates who incorrectly answered 19ei were not penalised here, provided that their answer could be related practically to their previous suggestion – few, however, managed a practical solution to their idea. Only a minority of candidates achieved the full 2 marks here, however. Many considered the use of a chisel, or sandpaper, or a plane to shape the round on the bottom corners. Some offered band-saw, scroll saw or band facer, ignoring the fact that the question asked for a hand tool solution. Some simply ignored the question entirely (No Response).

- Q19f Like Q17, many candidates answer plastics questions as if they were dealing in wood. Thus, responses to this part of Q19 included contact adhesive, PVA, epoxy resin and other unsolvent systems. Only adhesives containing acetone or chloroform were considered suitable enough to glue Part B inside Part A, but many candidates missed out on this.
- Q19g Similarly, responses to this question appeared to relate to wood products with plywood being a common answer. Some answers related to thermosetting plastics, or to adhesives, indicating possibly that the question was not fully understood. However, a majority managed a correct material response.

As we stated in 2016, questions focusing upon a metal are the least well answered by candidates, indicating that these techniques are still unfamiliar to them. This may be a matter of choice/funding for many centres when using a resistant material. While this is understandable, the other two main materials (wood and plastics) must be introduced in equal measure and taught and used alongside metals (if only thin aluminium sheet) if candidates are to achieve their full potential in this subject.

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