OCR
Oxford Cambridge and RSA

GCSE

Engineering (Double Award)

General Certificate of Secondary Education (Double Award) **J344**

General Certificate of Secondary Education **J322**

OCR Report to Centres June 2015

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

CONTENTS

General Certificate of Secondary Education

Engineering (J322)

General Certificate of Secondary Education (Double Award)

Engineering (J344)

OCR REPORT TO CENTRES

A621 Engineered products

General Comments:

Administration procedures for the submission of work should be carefully followed as failure to adhere to these slowed down the moderation process in several cases. Candidate marks should be submitted using a MS1 form or equivalent and be accompanied by a CCS160 and a candidate breakdown form CSF/A621. It is important that when marks are entered manually on the forms that these are checked as arithmetical errors cause further delays.

Work submitted for Engineering Unit A621 must contain evidence of studying a product from the list provided by OCR as detailed in the subject specification.

All evidence for assessment must be contained within the candidate's portfolio; this should include a range of quality photographs showing the product produced from a variety of angles. The photographs should be of a reasonable size so that the moderator can approve marks awarded by the Centre.

It is essential that Centres closely refer to the statements contained on the Unit Assessment grid (A621/URS) when allocating marks for the candidates work. A best fit approach is recommended but when awarding marks evidence for the grade descriptors must be contained within the folder. In order to avoid confusion it would be beneficial if page references for the work were recorded in the appropriate section on the A621/URS form. It should be noted that witness statements are valued but these are only seen as supportive, the specification requires candidates to provide their own evidence of health & safety issues and quality control procedures, photographic evidence of these aspects being carried out is an excellent way to record and show how they have been applied to the project.

Centres should note that writing frames are not encouraged as it felt that these inhibit middle to high ability candidates preventing them from displaying their flair or understanding as they work through the required sections of the assessment grid. It may be beneficial to direct the candidates towards areas that need to be covered. It may be more appropriate to use page headers rather than grids as candidates then have unrestricted space to provide their responses which can be developed over a number of pages.

When work is submitted for Unit A621 it would be helpful if it was securely bound with individual pages clearly visible and not all inside a single plastic wallet. Good practice was evident through the use of numbering pages and dividing work into sections following the assessment grid descriptors. This allowed page references to be entered on the URS form directing the moderator towards relevant evidence which supported the marks awarded.

Comments on Individual Questions:

Unit A621 1A Study of an Engineered Product

Candidates must identify a product to study from the list published by OCR. Once they have identified the product they should analyse it and two other similar products. Good practice saw candidates comparing three products that had evolved over a period of time.

When using the assessment grid it is important that Centres consider the introductory requirement at the beginning of each section. In the first column of the assessment grid a basic description or a basic explanation may include brief notes or a list of key words. For candidates to progress to the second column they must describe and explain their work and should present more text in order to support their findings and to show their knowledge and understanding of the topic being covered. Candidates who are awarded marks from the third column of the assessment grid must provide detail to their descriptions and explanations as well as justifying the information provided.

A621 1A Section 1

This section requires the candidate to reflect upon the products identified for study. The focus should therefore be directed towards analysing the product and not purely presenting information in generic terms, although some general information may be appropriate as a starting point or background to the study. This strand is an opportunity for candidates to show their understanding of how technology has had an impact on society as well as how components have developed/evolved over a period of time.

Candidates should analyse each of the products identified and give consideration to the following areas; the impact of modern technologies, smart materials and components on their development. Modern materials, smart materials and components should be relevant to the products studied and should not be only presented in generic terms.

Candidates should provide written evidence to show that they have considered the advantages and disadvantages that the use of modern technology has brought to society. Once again this aspect should relate to the product being studied and how it has benefitted from technological developments.

Good practice was evident when candidates broke down each of the requirements of this section and addressed them as separate topics presenting the information in a written format or as a table, with images of the selected products provided to support the text.

A621 1A Section 2

In this section candidates need to select appropriate materials and components to analyse. They should consider the product being studied and list materials that have been used in its manufacture, similarly appropriate components should be identified. Once materials and components have been identified candidates should explain their use, including reference to properties, characteristics, performance and cost. With components an explanation of how they work and their application may be appropriate. Depending upon the products studied it may be impossible to identify all the components therefore a range of key components should be selected and analysed. Throughout this section images of components may assist candidate explanations of their function and characteristics.

It may be to the candidate's advantage to address materials and components as two separate parts. With part one analysing appropriate materials and their relevant properties, characteristics, performance and cost. Part two would follow a similar approach to part one but with reference to components.

Good practice for this section saw candidates identifying, explaining and justifying a range of different materials and components that had developed over a period of time. Information was presented in the form of a table that identified materials (or components) that had been used in the manufacture of the product studied with an explanation given regarding their properties, characteristics, performance and cost. Other candidates began the section by presenting photographs of disassembled products, labelling and explaining the function of components.

A621 1A Section 3

Candidates are expected to identify, explain and justify a range of engineering process that have been used in the production of their selected products. The processes presented should be used in some part of the selected products manufacture and should not include general processes that have been studied as part of examination preparation which have no relevance to the product.

In the samples moderated far too many candidates had been awarded high marks for this section but had only identified, and briefly described, two or three processes. It is important that a range of relevant processes are included and that a detailed explanation is given as to how the process is carried out stage by stage, images to support the information may be beneficial.

Good practice was evident by candidates who identified and explained a range of different engineering processes. Information and images were used to help explain a variety of engineering processes that had been used over a period of time as the product had evolved.

A621 1A Section 4

In this section candidates should suggest modifications that can be carried out on the selected product so that the needs of present and future users are met. The use of modern technology should be considered in the development of the selected product. The material presented in this section could allow candidates to do some "blue sky" thinking and give their opinions of how the product studied may develop in the future. Reference to design concept ideas may be a good starting point.

Sustainability issues should be explained and evaluated. Topics such as recycling, other green issues, selection of materials and resources should be considered with information recorded and presented. This is not an opportunity to discuss the benefits of sustainability and "green issues" in generic terms as information presented must relate to the product studied. Many candidates showed evidence of their awareness of the "6Rs" listing or describing these however to meet the requirements of the high levels of the assessment grid such descriptions must relate to the product being studied.

Good practice saw candidates dividing their work into two parts one addressing modifications to the design solution and the other dealing with sustainability. With images used to support all written explanations.

Unit A621 1B Engineering a Product

Candidate should work closely with the assessment grid applying the grade descriptors so that work presented meets the requirements of this unit. In the first column of the assessment grid a basic analysis or a basic explanation may include brief notes or a list of key words. For candidates to progress to the second column they must present their findings giving detail by describing and explaining their work highlighting their knowledge and understanding of the topic being covered. Candidates who are awarded marks from the third column of the assessment grid must fully explain their work as well as justifying the information presented.

Unit A621 1B Section 1

In this this section a client design brief must be selected from the list given by OCR. It should be analysed, researched and a specification produced which highlights the key points. The specification should be more that a list of keywords or bullet points. It is expected that key points will be explained and justified. In section 2, the design stage, the specification should be referred to, and comments recorded, as this supports the assessment grid statement "produces and applies a specification".

A continued concern is that many of the coursework folders presented for moderation do not contain any input from a client or in some cases the input was limited. This lack of a client input prevents candidates from gaining higher level marks in later sections.

Good practice saw candidates analysing a design brief, carrying out relevant research on the topic, analysing existing items and then presenting a revised specification. The specification was then used, and referred to, in the following section when the candidate presented a range of ideas that met the client's requirements.

Unit A621 1B Section 2

In this section candidates are expected to develop a range of ideas that will answer the design brief. A starting point is a range of freehand sketches that should be developed into pictorial views leading to a final selected idea, annotation and justification of thinking is a key element of this section.

Ideas should be presented using a range of techniques including annotated sketches, 3D views and engineering drawings that meet current industry standards.

Once suitable solutions have been developed a final product should be selected and the reasons for its choice explained and justified. This should be presented to the client with feedback sought. The candidate should present evidence of their response to the clients feedback with any changes made explained and justified. It is important that reference is made to client feedback here as without it candidates are unable to gain higher marks having failed to meet one of the sections descriptors, "considers clients feedback, responds appropriately and justify changes made".

Several folders presented for moderation provided only a limited range of ideas, with ideas being similar to each other.

Design ideas should be cross referenced to the points made in the specification, this can be achieved through annotation of drawings or a table where drawings are numbered and given a rating against key points from the specification. Some candidates failed to provide a presentation of the final idea or sometimes when it was included it lacked feedback from a client regarding its suitability and how it met initial needs.

Good practice showed a wide range of ideas, normally five or more, being presented with annotation referring to key points from the specification. Such ideas were developed to include notes on materials, construction details and components. A final idea was then developed, drawn using a variety of techniques including CAD and evaluated. It was then presented to a client using a power point presentation. Comments from the client were recorded and considered with modifications to the design carried out, presented and justified.

Unit A621 1B Section 3

Candidates are expected to complete a high quality prototype of the final idea. As the folder is the only place that evidence of the product can be seen it is important that every candidate includes a good range of photographs, preferably from different angles and possibly with the product carrying out the work for which it was designed. In some of the moderated folders it was difficult to judge the quality of candidates work as single photographs were presented and these were only very small or the quality of the photograph was poor.

The expectation in this section is that a quality/high quality product is produced especially for the mid to high range marks to be awarded. Centres should carefully consider the quality and level of completion of work when awarding marks as incomplete models or products that have only used one or two processes do not necessarily constitute quality or high quality prototypes.

Unit 621 1B Section 4

Candidates should show evidence that they have selected and safely used a wide range of appropriate materials, parts and components, processes, tools and equipment. They should appropriately apply and explain a range of quality control techniques. Witness statements are not acceptable for health and safety issues or quality control procedures, the candidate must provide his/her own evidence for these aspects through the use of text, photographs or a log of events.

It is important that health and safety procedures and quality control checks are not presented in generic terms but relate to the product being manufactured.

Good practice saw candidates using production plans that identified health and safety issues and quality control checks. Such information was related to the product being produced with detail given as to what the checks would be necessary and how they would be carried out. Evidence was presented showing that candidates had carried out or applied risk assessments on equipment to be used. Good use was made of photographic evidence to support safe practice and to highlight quality control in action.

Unit 621 1B Section 5

In this section the candidate should reflect on what they have done and what could be changed if they were to attempt the project again. It is also a place where they should consider how modern materials, processes and technologies could have been used if they had been available. In order to gain mid to high marks candidates should present evidence considering both of these aspects it is not enough for them to carry out a basic product evaluation.

Good practice was seen by candidates who used diagrams and modelling to suggest and explain modifications to their final product including alternative production methods, the use of 21st century equipment and smart materials.

A622 Engineering processes

General Comments:

Most candidates attempted all of the questions on the paper but, in a number of cases, there was some evidence that candidates had not read questions carefully enough before answering. It is most important that candidates take the time to read through the question paper before attempting to answer questions.

Knowledge of basic engineering materials was quite limited in many cases, with a number of candidates confusing ferrous and non-ferrous metals. Engineering processes, on the other hand, were generally well known, as were health and safety precautions relating to them.

Knowledge of engineering components continues to be limited in many cases, as does a clear understanding of the application of information, communication and digital technologies in the various stages of engineering manufacture.

Comments on Individual Questions:

Question No.

1(a) Most candidates were able to correctly name three engineering sectors. Occasionally the sectors were only partially named, such as 'chemical' rather than 'chemical and process, but this did not result in any loss of marks.

1(b) This question was well answered with, many candidates scoring full marks on it. In some cases, however, marks were lost where candidates had given inappropriate responses that did not relate to either sectors or products.

2(a)(i) & (ii)

Responses to these two questions were quite disappointing and, in a number of cases, it appeared that materials had been chosen from the list at random. Aluminium and copper both appeared as examples of alloys, and titanium could be found in either part (i) or part (ii).

2(b) Only the higher achieving candidates scored both marks on this question. Most candidates made some reference to the fact that stainless steel does not rust, but few related this to its use in food preparation and the prevention of contamination of the food. In a number of cases, candidates had based their response on the name 'stainless steel' and made simple references to the fact that it doesn't stain or is easy to clean.

3(a)(i) This question was poorly answered, with knowledge of engineering components appearing to be very limited. Of the three components shown, only the pulley was correctly named with any frequency, and the nyloc (self-locking) nut was most commonly simply referred to as simply a nut. In many cases, candidates gave the type of component shown rather than the name of the component.

3(a)(ii) Although few candidates named the nyloc nut correctly, most candidates chose it as the subject of this part of the question, and an 'error carried forward' (ecf) mark was awarded for a suitably detailed description in these cases.

3(b) Most candidates were able to name at least one electrical/electronic component, and many scored full marks on this question.

3(c) This question was generally well answered, although marks were sometimes lost by candidates giving examples of products rather than actual pneumatic/hydraulic components.

4(a) Some good responses to this question were seen, with references being made to the strength of the material and the fact that it is readily shaped or machined. Most candidates scored at least one mark on the question, although this was all too often as a result of presenting responses that were one-word answers that combined to gain a single mark.

4(b) This question was well answered and many candidates scored full marks by giving three fully relevant safety precautions. In addition to the usual references to PPE, the importance of training on the use of the machine and the use of guards were also frequently quoted.

4(c) Most candidates scored at least two marks on this question, and this was often as a result of simply using a milling machine for this operation. Some candidates did recognise the fact that the process was being carried out using hand tools, in which case sawing the corners off and then filing the curve were carried out using appropriate tools at each stage.

5(a)(i) & (ii)
Both parts of this question were well answered, and most candidates scored at least one mark on each of them. The most popular examples of shaping and manipulation processes were injection moulding and bending, with welding and brazing appearing in most responses to part **(ii)**.

5(b) This question was generally quite well answered, although marks were often lost where candidates had not read the question carefully and gave responses that related to the use of PPE.

5(c) Few candidates scored well on this question, often as a result of referring to general quality control checks such as checking dimensions and shapes. The focus of the question was preparing for a surface finishing process and the better responses made reference to the need for a smooth surface with no imperfections, but rarely mentioned the effects of these on the quality of the finish applied.

6(a) This question was quite well answered, with many candidates scoring good marks. The most popular stages chosen to describe were ‘Producing a design specification’ and ‘Generating design solutions’, and the higher achieving candidates presented quite detailed descriptions. Where marks were lost, this was usually as a result of a candidate giving insufficient detail, or presenting responses that were simple repetition of the name of the stage chosen.

6(b) Responses to this question were quite varied, and only the higher achieving candidates gave sufficiently detailed explanations to warrant full marks. The use of email and PowerPoint presentations were mentioned in most candidates responses, and two of the three marks available for the question were commonly awarded.

7(a) Responses to this question were quite disappointing in many cases as candidates had not addressed the focus of the question correctly. A significant number of responses gave general benefits of the use of modern technologies in manufacturing without referencing the improved safety of workers. Where candidates had read the question carefully enough, responses made reference to the use of robots in hazardous conditions, sensors to automatically shut off machines and, occasionally, the improved air quality in factories.

7(b) This question on workforce training was not well answered generally, with only the more obvious points being mentioned in responses. The need to know how to operate machines and the safety of workers were frequently referred to, but very few candidates scored more than two marks on the question.

8* Almost all candidates attempted this question, but marks awarded were generally quite low as responses were often rather vague or too simplistic. Most responses contained references to recycling, but were very repetitive, and few other issues were addressed. A number of the higher achieving candidates discussed issues relating to the use of landfill sites and environmental effects, but these were the exception rather than the norm, and few candidates scored more than half marks on the question.

The candidate's Quality of Written Communication (QWC) was assessed in this question, and marks were awarded for well written answers, despite technical content often being limited.

A623 Real world engineering

General Comments:

All evidence for assessment must be contained within the candidate's portfolio, this should include photographic evidence of the product produced. It would assist the moderation process if the final product was photographed from a variety of angles and that the quality of photographs were well reproduced and of a reasonable size so that the moderator can approve marks awarded by the Centre.

It is essential that Centres closely refer to the statements contained on the Unit Assessment grid (A623/URS) when allocating marks for the candidates work. A best fit approach is recommended however when awarding marks evidence to meet the grade descriptors must be contained within the folder. In order to support the moderation process it would be beneficial if page references for the marks awarded were recorded in the appropriate section on the A623/URS form.

Centres should note that writing frames are not encouraged as it felt that these inhibit middle to high ability candidates preventing them from displaying their flair or understanding as they work through the required sections of the assessment grid. It may be beneficial to direct the candidates towards areas that need to be covered. It may be more appropriate to use page headers rather than grids as candidates then have unrestricted space to provide their responses which can be developed over a number of pages.

When work is submitted for Unit A623 it would be helpful if it was securely bound with individual pages clearly visible and not all inside a single plastic wallet. Good practice was evident through the use of numbering pages and dividing work into sections following the assessment grid descriptors. This allowed page references to be entered on the URS form directing the moderator towards relevant evidence which supported the marks awarded.

Comments on Individual Questions:

Unit A623 3A Real World Engineering

Candidates must select a product to study from the list published by OCR.

When applying the assessment grid it is important that Centres consider the introductory requirement at the beginning of each section. In the first column on the assessment grid a basic description or a basic explanation may include brief notes or a list of key words. For candidates to progress to the second column they must describe and explain their work and should present more text in order to present their findings and to demonstrate their knowledge and understanding of the topic being covered. Candidates who are awarded marks from the third column of the assessment grid must provide detail to their descriptions and explanations, justifying the information provided.

A623 3A Section 1
In this section candidates should present and analyse their selected product for study. They should identify and explain the stages that are carried out in the production of the product. Good practice was evident when candidates had broken down the production process, listing the various stages and then explaining each in turn with information provided in a written format or as a table. Images were provided of the selected stages in order to support the information given.

A623 3A Section 2
Candidates are expected to identify, explain and justify a range of engineering process and quality control techniques that are used in the production of their selected product. A range of processes that could be used to produce the product should be identified. Each process should be fully explained stage by stage. The range of processes should include at least five different examples depending upon the complexity of the product studied. It is important that candidates identify and explain quality control procedures that may be carried with each process.

Good practice was evident by candidates who identified and explained a range of different engineering processes. Information and images were provided to help explain a variety of engineering processes and quality control checks that had been used.

A623 3A Section 3
Candidates should provide details of the materials and components used in the production of their selected product. For candidates to perform well in this section they should present a detailed explanation of the information and not only a list of key words. Appropriate materials that may be used in the production of the product should be identified and then for each material their functions, properties and characteristics explained. A similar procedure should be carried out for components, with appropriate items listed and/or images presented and explained.

Good practice saw candidates dividing this section into two parts - one dealing with appropriate materials and the other with relevant components. Candidates then explained, analysed and justified materials and components identified in part 1 and part 2 using a table with column headings of function, property and characteristics. Some candidates presented images of products that had been disassembled in order to identify components.

It should be noted that in this section unless both materials and components are considered mid to high marks cannot be gained.

A623 3A Section 4
In this section candidates should identify and explain systems and control technology that are used to organise, monitor and control the production of the selected product. Systems and control technology identified in this section must not be explained purely in generic terms it must be relevant to the product studied and to the methods of production used.

Good practice saw candidates identifying a list of stages to highlight key systems and various stages of production that used control technology in engineering the product. Images were used to support written text and this helped candidates fully explain how their product was created.

A623 3A Section 5
Candidates are expected to identify and explain the impact of modern technologies when engineering their product, the work presented must relate mainly to the product studied and not be purely explained in generic terms.

When carrying out work on this topic candidates should identify and explain a range of modern technologies. They should explain how the use of the modern technology has changed the production of their selected product and evaluate if such changes are good or bad explaining how this has effected; production times, workforce, quality, value for money and resources.

Unit A623 3B Making an Engineered Product

Unit A623 3B Section 1
Candidates working on this section must select a design situation from the list given by OCR. Once a design situation has been selected it should be analysed and a production plan produced.

Good practice saw candidates analysing a design situation and producing a production plan that identified an appropriate sequence of making with time estimates given for each stage. Materials, tools, equipment and processes to be used were highlighted in the production plan. Health and safety aspects and quality control checks to be carried out were often included.

Unit A623 3B Section 2
Candidates are expected to produce a prototype which will answer the design situation identified from OCR lists.

It is important that a solution is presented in this section and that it is evidenced in the portfolio, without such evidence the moderator cannot approve any marks awarded by the Centre.

The prototype should be produced using appropriate materials and should be able to function as required in order to fulfil the design situation. As this product can only be moderated through the use of photographs it is important that candidates present a range of images. Many candidates did include a photograph of their product. However it would be beneficial if several photographs of the product were included in the folder showing different views, different angles and included close ups. In the folders observed during the moderation process it was sometimes difficult to judge the quality of candidates work as on occasions photographs were included but were only small due to them being a part of a diary of making or photographs were included and the quality was poor.

Unit A623 3B Section 3
Candidates are expected to show, explain and justify that they have used a wide range of appropriate processes, materials, parts, components, tools and equipment. It is important that evidence is presented in the folder of the candidates using tools, equipment and processes as marks cannot be approved for witness statements. The information can be presented in a variety of formats, however good practice saw candidates presenting information as a log or diary of making. With the log including photographs for each stage and next to it columns that allowed tools, materials and equipment used to be included. A further column required candidates to explain why the items used were appropriate. A final column referred to the production plan identifying and justifying changes that had been made, with sketches added when necessary to justify a point.

Unit 623 3B Section 4
In this section candidates are expected to show evidence that they have applied appropriate health and safety procedures. They should also appropriately apply, explain and justify a range of quality control checks that have been carried out during the production of their product. Health and safety procedures and quality control checks should be relevant and related to the product being made and not be presented in generic terms.

Good practice in the folders moderated saw candidates using photographic images that supported health and safety issues and quality control checks. Detail was given as to what the quality control checks would be, how they would be carried out and why they were necessary. Health and safety issues were identified and how the user would be protected was explained. Evidence was presented showing that candidates had carried out or applied risk assessments on equipment to be used and explanations given as to why such procedures were necessary.

Unit 623 3B Section 5

Candidates should detail and justify modifications that can be made to the design solution. Sketches could be incorporated of a modified and maybe more appropriate solution with an explanation given as to why this would be so. Consideration could also be given as to why the use of modern materials, processes and technologies would be beneficial to the product and its production.

Good practice was seen by candidates who evaluated their final product and went on to use diagrams and modelling in order to suggest and explain modifications that could be made. Such modifications not only considered how the design of the product could be improved but also considered alternative production methods and materials, the use of 21st century equipment and smart materials.

A624 Impact of modern technologies on engineering

General Comments:

Most candidates attempted all of the questions on the paper but, in some cases, there was evidence of candidates not having read questions carefully before answering. It is most important that candidates take time to read through the question paper thoroughly before attempting to answer questions. This is particularly the case where questions have a very specific focus and require extended writing in the response, such as in Quality of Written Communication (QWC) questions.

Some of the responses to questions relating to engineering materials were quite disappointing, with knowledge of composites being particularly limited. Candidates' knowledge of engineering processes was generally quite good, and health and safety issues relating to them were also well known.

An improvement was seen in the responses relating to engineering components, but the application of modern technologies is an area where detailed knowledge and understanding remains quite limited.

Comments on Individual Questions:

Question No.

1(a) All candidates scored well on this question, with many gaining full marks. In a small number of cases, candidates had confused the 'computers, communication and IT' sector with the 'electrical and electronics' sector, resulting in the loss of a mark.

1(b) Only the higher achieving candidates scored well on this question. Most candidates were able to name a modern technology, but in many cases the description of its use lacked any detail. Marks were also lost where the candidate had related the response to a technology used in the making of the product rather than in the product itself. The most popular choice of product was the mobile phone, with a description of the use of touch-screen technology provided as the example.

2(a) (i), (ii) and (iii)
Parts **(i)** and **(ii)** of this question were generally well answered, with many candidates gaining full marks on both of them. Part **(iii)**, however, was not well answered, and some candidates did not offer any response to it at all, while others appeared to choose a material at random from the list.

2(b) It was disappointing to see that a number of candidates did not attempt this question, particularly as it dealt with such a basic fact relating to metals. In a small number of cases, one of the two marks was lost where candidates failed to give an example of a non-ferrous metal.

3(a)(i) Most candidates were able to give at least one suitable finish for the aluminium alloy mounting panel, and many scored full marks on the question. Painting, plastic coating and polishing were the most popular responses, and it was good to see anodising also mentioned by some candidates.

3(a)(ii) Safety precautions were generally well covered in the responses to this question but, in a number of cases, marks were lost by precautions involving the use of PPE being suggested.

3(b)(i) Whilst many candidates are obviously familiar with laser cutting as a process, the responses to this question generally gained few marks. Credit was given where reference was made to the reduction in waste material and the ability to 'tessellate' shapes on sheets of material, but the suggestion that it was 'quicker' was not accepted, and neither was 'cheaper' without relevant justification relating to the scale of production.

3(b)(ii) Most candidates recognised laser cutting as a material removal process but, in a number of cases, a box appeared to have been ticked entirely at random.

4(a) This question was generally well answered, with some higher achieving candidates scoring maximum marks on it. Where marks were lost, this was normally as a result of naming the self-tapping screw as simply a 'screw', or confusing the resistor with a fuse. A number of lower achieving candidates scored marks by just giving the type of the chosen components without naming them.

4(b) Most candidates attempted this question, but very few scored full marks on it. Responses generally referred to manufacturers having components made by specialist companies rather than making them 'in-house', but explanations often lacked detail. Marks were also lost where candidates failed to give the example asked for in the question.

5(a) This question was well answered by most candidates, with ABS and HIPS being the most popular plastics materials chosen as being suitable for the charging station shown.

5(b) Injection moulding was correctly named by most candidates as the process used to mass produce the charging station. A number of candidates suggested vacuum forming, which was not accepted as suitable for the type of product and the quantities involved.

5(c) Responses to this question were quite disappointing, with a number of candidates scoring one mark on it or less, and only a limited number of candidates gaining maximum marks. The usual benefits of using CAD packages appeared in most responses, but some candidates related these to the use of CAM in the manufacturing stage, and not to the designing stage referred to in the question.

5(d) This question was generally not well answered, and some candidates did not attempt a response. A significant number of candidates suggested vacuum forming as a modern technology that could be used to produce a prototype, and injection moulding was also seen. Some of the higher achieving candidates, however, gave fairly detailed responses relating to 3D printing, and a small number described the whole process from CAD design to 3D prototype manufacture.

6(a) Risk Assessment procedures were generally not well known, and most candidates scored two marks or less on this question. The identification of risks appeared in almost all responses, but all three elements of the procedures (Identify, Evaluate, Action) were required for full marks.

6(b) This question was well answered by most candidates, with many scoring full marks for a clear and justified response. A reduction in accidents and payment of compensation to workers was referred to in many responses and the avoidance of any legal action against manufacturers was also mentioned by some candidates.

6(c) Only the higher achieving candidates scored two marks or more on this question as responses often failed to focus on the improvements in working conditions asked for in the question. Many responses seen dealt with safety issues or the more general effects of using modern technologies, such as faster production and the use of emails for communication.

7(a) This question was well answered by many candidates, with some scoring maximum marks on it. Where marks were lost, this was normally as a result of a candidate failing to mention the specific modern technology used, or giving insufficient detail of how it is applied in the area chosen.

7(b) Responses to this question were very varied, and a number of candidates did not attempt to answer it. In some cases, candidates had taken Information, Communication and Digital Technologies as separate entities and gave an individual response for each one. Only the higher achieving candidates provided a sufficiently detailed explanation to qualify for full marks on the question.

8* Although almost all candidates attempted this question, most scored only half marks or less on it. General benefits of recycling were quite well known, but responses were often not directly related to the environment, which was the main focus of the question. Some of the better responses made reference to a reduction in the use of landfill sites and the excavation of raw materials, but clear and detailed discussions were rare.

The candidate's Quality of Written Communication (QWC) was assessed in this question, and marks were awarded for well written answers where technical content was limited but relevant.

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

OCR Customer Contact Centre

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

www.ocr.org.uk

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Facsimile: 01223 552553