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 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.

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

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A621 Study of an Engineered Product (1A) and Engineering a Product (1B)

General Comments:

As in the previous year it was pleasing to see that the majority of Centres were working closely to the OCR Specification Assessment Grid and that work presented was organised in a manner that followed the identified strands from the grid. This made the moderation process easier as moderators could follow the candidates flow through the process and recognise judgements made by the Centre. Difficulties arose when Centres approached units, especially Unit A621, in a “scattergun” manner integrating the different assessment strands in a document that was difficult to follow especially when there were no teacher notes to guide moderators as to where credit had been given. Where Centres had used this approach in A621 1A it was sometimes difficult to distinguish between marks awarded for strands A and B especially where candidates were presenting information regarding materials and components. On several occasions it was felt that the same piece of work had been rewarded twice, both in strand A and then again in strand B. It is therefore recommended that future submissions approach each assessment strand separately in order to give candidates the opportunity to attain to the best of their ability.

It was beneficial to candidates when A621/URS forms had been annotated with page references to highlight where marks had been awarded for key pieces of information identified in the strand descriptors.

Arithmetical errors were an issue as well as transcription errors when Centres transferred marks from CSF/A621 forms onto MS1 submissions. It is highly recommended that Centres use the electronic version of CSF/A621 to when recording a breakdown of Candidates marks.

Work submitted for Engineering Unit A621 1A must contain evidence of studying a product from the list provided by OCR as detailed in the subject specification.

As with the previous unit, work submitted for A621 1B should be taken from the list provided by OCR as detailed in the subject specification. This year the main issues in Unit A621 1B concerned strands A and E. In strand A it is beneficial if candidates identify a client as in doing so vital points can be met on the assessment grid where client feedback is required as well as showing evidence in the folder of responding to the feedback. In strand E it is required that candidates review their work reflecting on how modern technologies, processes and materials may have been used in the manufacture of their chosen product. Also in this strand candidates should suggest and justify changes/modification that could be made to their final product. It is not enough to present a “traditional” review of the work comparing and/or testing it in relation to the original 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 was pleasing that very few witness statements were used in folders, and where they were they used additional evidence (as required by the specification) was provided by the candidate highlighting how they had followed health & safety issues and quality control procedures. Photographic 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.

Comments on Individual Sections:

Unit A621 1A Study of an Engineered Product

Candidates should identify a product to study from the list published by OCR. Once the product has been identified it should be analysed with two other similar products from different periods on its evolution timeline.

When using the assessment grid it is important that Centres consider the introductory requirement at the beginning of each strand. 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 a development of 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.

When answering this Unit of work it is recommended that candidates address each strand separately.

A621 1A Strand 1
This section requires the candidate to reflect upon the products identified for study. The main 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.

Written evidence should be provided to highlight 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 strand 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 Strand 2
In this strand candidates should identify appropriate materials and components to analyse. The main materials used in the production of the product studied should be listed; similarly appropriate components should be identified. Once this has been done 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 be appropriate to support 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 and an additional table for 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 Strand 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.

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 Strand 4

In this strand 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" however to gain marks in the higher band this knowledge should be applied 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

Unit A621 1B Strand 1
In this this strand a client design brief should be selected from the list given in the specification. The brief 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 strand 2, the design stage, the specification should be referred to with comments recorded fulfilling the requirements of the assessment grid statement "produces and applies a specification" will be met.

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 this and in later strands.
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 Strand 2
Candidates are expected to develop a range of ideas that will answer the design brief. A good starting point is a range of freehand sketches that can be developed into pictorial views leading to a final selected idea following a discussion with the client. Candidate annotation and justification of their thinking is a key element of this strand.

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 strands descriptors, "considers clients feedback, responds appropriately and justify changes made".

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 saw candidates presenting 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 Strand 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 performing the function for which it was designed. In some of the moderated folders it was difficult to judge the quality of candidates work as a single photograph was presented and sometimes it was only very small and only featured in the diary of making on other occasions 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 candidates 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 A621 1B Strand 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. It is important that health and safety procedures and quality control checks are not presented in generic terms but relate to the product being produced.

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. With evidence 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 A621 1B Strand 5
In this strand 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 and present information to show how modern materials, processes and technologies could have been used if they had been available or if the product was to be made in industry.

Good practice was seen when candidates 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 some cases a lack of response to questions indicated candidates' limited knowledge of parts of the specification. There was also 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 as marks can easily be lost simply by not answering the question as it was asked.

Knowledge of general engineering materials showed some improvement over previous years, and the application of appropriate health and safety precautions relating to basic workshop procedures was also well known. In the case of engineering processes, however, candidates' knowledge was rather more limited, particularly with regard to processes less frequently used by candidates.

Knowledge of engineering components continues to be limited in many cases, as does a clear understanding of the application of modern technologies in the various stages of engineering manufacture. Specific examples and details of these points are given later in this report.

Comments on Individual Questions:

Question No.

1(a)(i) Most candidates did well on this question, with many scoring full marks on it. The majority of responses seen related to sectors named in the specification, but marks were also awarded where other viable sectors were given, together with relevant examples of products made in the sector. Shortened versions of sector names were quite frequently seen, such as civil for structural and civil, but candidates were not penalised for this, or for miss-spelt sector names.

1(a)(ii) This question was generally well answered, but in a number of cases candidates failed to choose a sector from the table in part (i) and gave another sector entirely, with examples of products made in that sector. Where this was the case, error carried forward (ecf) marks were awarded for products relevant to the sector given.

2(a) This question differentiated quite well, with marks from zero to the full six marks being awarded. Where marks were lost, this was often as a result of giving copper and aluminium as examples of non-ferrous alloys, but some weaker candidates appeared to have completed the table by guesswork, mixing the names of metals and plastics across the answer cells at random.

2(b) Most candidates scored well on this question by mentioning the two essential features of an alloy – 'mixture' and 'metals'. A small number of candidates did not give any response to the question at all, and occasionally a mark was lost when a candidate referred generically to materials rather than metals.

2(c) Knowledge of ceramic materials was limited and less than half of the candidates answered this question correctly. The most popular correct examples given were glass and tungsten carbide, but both clay and concrete were thought to be ceramics by a significant number of candidates.

2(d) Most candidates had good knowledge of composite materials and correctly identified carbon fibre as the example in the question. Marks were quite frequently lost, however, by
candidates placing two or three ticks, in which case no mark could be awarded, even if one of the ticks identified the correct answer.

3(a) Surprisingly few candidates scored full marks on this question about this most basic of engineering machine tools and many scored no marks at all. Only the higher achieving candidates correctly identified part C as being the drilling table, although a number of suitably descriptive responses were awarded the mark. The chuck (or chuck guard) was the most frequently seen correct response, but the motor was often incorrectly referred to as a battery.

3(b) Most candidates were able to gain two marks or more on this question about safety precautions, but disappointingly a small number did not offer a response at all. Marks were lost where responses were overly simplistic, and where candidates had mentioned goggles and aprons, despite the question specifically ruling out the use of PPE. Many candidates sensibly suggested tying long hair back, but occasionally responses like 'keep away from the work' were seen. Overall less than half of the candidature scored three marks or more on the question.

4(a) This question about engineering processes was not well answered generally and very few candidates scored more than two of the four marks available on it. Only the higher achieving candidates were able to give two valid examples of heat and chemical treatment processes, these normally being hardening and annealing, but many others simply gave examples of any processes that involved heat, such as welding and brazing. Surface finishing processes were much better known, with painting, polishing and galvanising all being seen in responses, but some of the weaker candidates seemed to apply guesswork to all their responses, often repeating examples in a number of the answer cells.

4(b) This question was generally well answered and most candidates scored full marks on it, but it was again disappointing to see that a small number of them did not attempt a response. Goggles and apron were by far the most popular examples of PPE, but some candidates repeated their answer from question 3 by suggesting that long hair should be tied back.

5 Marks across the whole range from zero to the full nine marks were awarded for responses to this question about engineering components. The LED, resistor and cable tie were the most frequently chosen components to name and exemplify their use, but the three-port valve and spring washer were very rarely seen. Weaker candidates often only managed to name one or two components, without giving an example of use, and the mid-range candidates gave examples that were not well described. One component that was chosen but not correctly identified was the pop-rivet, which was often described as a soldering iron. Only the higher achieving candidates showed clear understanding of the components and their uses and gained two marks or more for each of the three that they had chosen.

6 Knowledge and understanding of quality control and its procedures was generally quite limited, and few candidates scored well on the three parts of this question, with a significant number not offering a response on one or more of the parts.

6(a) Many candidates seemed to be aware of the sampling aspect of quality control, but this was often not followed up by the testing of the product to determine batch suitability. Weaker candidates thought that sampling meant giving products to third parties to get

their opinions. Less than half of the candidates scored full marks by giving a clear description of the whole sampling process.

6(b) Even fewer candidates scored well on this question, with many simply naming an appropriate modern technology, but not developing their answer by describing its use. Scanners, robots and X-rays were all seen in responses, but only the higher achieving candidates gave valid descriptions of their use in quality control.

6(c) Detailed explanations were rare in the answers to this question. In most cases reference was made to the effect of poor quality products on the company's reputation, but the internal effects on the manufacturer were less well covered. In a number of cases marks were lost where responses were given as a series of bullet points, and only a limited number of candidates scored full marks for a fully justified response.

7 Most candidates that attempted the two parts of this question showed a reasonable awareness of modern technologies, but were rarely able to give clear descriptions of their application.

7(a) In a number of cases the technologies used were named without explaining their use at all, and in others the focus of the question on designing new products was not addressed. The most frequently seen technologies were the Internet and emails, and many candidates also made reference to the use of CAD and 3D printing. Descriptions of use were often quite weak, however, and two marks out of the three available for the question was the norm.

7(b) Modern technologies seen in the responses to this question included robots, barcodes and AGVs, but again the descriptions of their use were quite weak. As the focus of the question was packing and despatch, some of the weaker candidates gave bubble wrap, cling film and conveyor belts as their examples of modern technologies, and only a very limited number of the better candidates made mention of RFIDs or RCVs.

8* Almost all candidates attempted this question, but marks awarded were generally quite low as responses were often rather vague or too simplistic. In many cases candidates deviated from the focus of the question and gave responses that referred mostly to the more general benefits of using modern technology, particularly in manufacturing. Responses that took account of the advantages and disadvantages to society saw reference being made to the use of modern technologies in communications, and to the effects on peoples' working lives.

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

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