OCR
RECOGNISING ACHIEVEMENT

GCSE

Engineering (Double Award)

General Certificate of Secondary Education **J322**

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

Examiners' Reports

June 2011

J322/J344/R/11

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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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General Comments

Work presented in the controlled assessment units (A621 and A623) followed the requirements of the specification closely and good practice was seen in a number of portfolios presented for moderation. The Assessment Criteria for these units were applied appropriately in the majority of cases when assessing candidates' work, but there were some instances where insufficient evidence had been provided to support the marks awarded.

Candidate responses in the examinations for Units A622 and A624 indicated that the specification content for these units had been generally well covered by centres. Candidates' knowledge and understanding was somewhat limited in certain areas, however, details of which are given later in this report.

A621 1A/1B Engineering product

Unit A621 – Controlled Assessment

When work is submitted for Unit A621, it would be helpful for it to be securely bound with individual pages clearly visible and not all inside a single plastic wallet. Good practice was evident in the use of numbered pages and division of work into sections following the assessment grid descriptors. Page references can then be entered on the URS form to direct the moderator towards evidence supporting the marks awarded.

When using the assessment grids, it is important that centres consider the introductory requirement at the beginning of each section. It was in the application of such statements where disagreements occurred during the moderation process, with some candidates being marked leniently or harshly. 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 in order 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 add further detail to their descriptions and explanations as well as justifying the information provided.

Unit A621 1A Study of an Engineered Product

Candidates submitting work for this element must select a product from the list given by OCR. When analysing the product, candidates should identify two similar products that have been subsequently developed using modern technology.

In general, work presented did follow the requirements of the specification, with a range of products studied by the candidates. Good practice saw candidates studying the development of three similar products at identified periods in time, maybe at ten year intervals or longer depending upon the product selected from the OCR list. By following this procedure it was easier for candidates to identify developments in materials, components and technology.

A621 1A Section 1

Each of the products identified should be analysed by the candidate, giving consideration to the impact of modern technologies, materials and components on their development. It is important that modern materials and components are relevant to the products studied and not presented in generic terms.

Candidates should present evidence to show that they have considered the advantages and disadvantages that the use of modern technology has brought to society.

Good practice was evident where candidates had broken down each of the requirements of this section and had addressed them as separate topics, presenting the information in written format or as a table. Images of the selected products were provided in order to support the information given.

A621 1A Section 2

Candidates should identify and explain the use of materials and components in the assembly of their selected product. This should include reference to properties, characteristics, performance and cost.

Good practice in 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 often presented in the form of a table that identified the products and their properties, characteristics, performance and cost.

A621 1A Section 3

Candidates are expected to identify, explain and justify a range of engineering processes that are used in the production of their selected products. On a number of occasions candidates had been awarded high marks for this section but had only identified two or three processes with limited explanation of the stages involved, or had provided text that had been downloaded without modification from external sources. Candidates should present a range of processes and explain how each one is carried out. Further explanation could be given as to what particular part(s) of the product would be produced in this way and the benefits of this procedure.

Good practice was evident from 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 selected product had evolved.

A621 1A Section 4

Candidates are expected to 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.

Sustainability issues should be explained and evaluated. When carrying out work on this topic, issues such as recycling, selection of materials and resources, and other green issues should be considered, with information recorded and presented. It is important that sustainability issues are related to the product being studied and not given as a list of generic points.

Good practice in this section saw candidates dividing their work into two sub sections one addressing modifications to the design solution and the other dealing with sustainability.

Unit A621 1B Engineering a Product

Candidates submitting work for this element are required to design and make an engineered product to meet the needs of a client brief selected from those listed in the specification. The outcome of this part of the unit should be a high-quality prototype of the design solution.

Unit A621 1B Section 1

Candidates working on this section, must select a client design brief from the list given by OCR. Once a design brief has been selected it should be analysed and a specification produced which identifies the key points of the product. Many of the coursework folders presented for moderation had not featured any input from a client, or the input had been very limited.

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

Unit A621 1B Section 2

Candidates are expected to present a range of different ideas that will answer the client brief and meet the requirements of the specification. Ideas should be presented using 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. The final idea should be presented to the client with feedback sought. The candidate should give evidence of responding to the feedback with any changes made being explained and justified.

Folders presented for moderation did not always provide a wide range of different ideas, many candidates only showing one or two ideas with limited or no development evident. Candidates also failed to include a presentation of the final idea or, when it was produced, it tended to lack feedback from a client.

Good practice showed a wide range of ideas being presented, with annotation referring to key points from the specification. These ideas were developed to include notes on materials, construction details and components. A final idea was then selected, drawn using a variety of techniques including CAD, and evaluated. It was then presented to a client, sometimes using PowerPoint slides. Comments from the client were recorded, with further modifications presented, explained and justified.

Unit A621 1B Section 3

Candidates are expected to produce a high-quality prototype of the final idea and provide photographic evidence of its completion.

Whilst most candidates did include a photograph of their product, it would be beneficial if several photographs were included in the folder, showing different views, different angles and close-ups. In the sample of folders seen during the moderation process, it was difficult to judge the quality of some candidates' work, as single photographs were presented or the quality of the photographs was poor. It is vital that evidence of the product is presented in the candidates' folders, as without it marks cannot be awarded.

Unit 621 1B Section 4

Candidates working on this section should show evidence that they have selected and used a wide range of appropriate materials, components, processes, tools and equipment. They should also appropriately apply and explain a range of quality control techniques.

Centres should note that witness statements are not acceptable for health and safety issues or quality control procedures. The candidate should provide his/her own evidence for these aspects through the use of text, photographs or a log of events.

Good practice in the folders moderated saw candidates using production plans that identified health and safety issues and quality control checks. Such information was not generic but was related to the product being produced with details being given as to what the checks would be, how they would be carried out, and why they were necessary. 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 checks. Where photographs are used to support health and safety issues, the candidate must be shown to be following the required procedures. In some cases photographs showed candidates operating machines without wearing goggles or using appropriate holding devices or guards.

Unit 621 1B Section 5

Candidates should detail and justify modifications that could be made to the design solution, including consideration of the use of modern materials, processes and technologies.

Explanations should also be given as to why changes were made during the production of the candidate's product.

Many candidates evaluated their particular product but failed to fully answer the requirements of the assessment grid, making limited or no reference to modern materials, processes or new technology.

Good practice was carried out by candidates who used diagrams and modelling to suggest and explain modifications to their final product. Such modifications not only suggested how the design of the product could be modified, but also considered production methods and the use of 21st century equipment and materials.

A622 Engineering processes

General Comments

Most candidates attempted all of the questions on the paper, but there was some evidence of candidates not having read questions carefully before answering, and the importance of effective examination technique cannot be over-emphasised. In a number of cases, questions with no response indicated gaps in candidates' knowledge of the specification content.

Knowledge of general engineering materials was reasonably sound, with the exception of the more modern materials, such as composites, which were less well understood. Questions relating to engineering processes often showed a lack of detailed knowledge and experience of basic workshop processes.

Comments on Individual Questions

1(a) Candidates are familiar with this style of question, and all but a very small minority of candidates gained full marks on it. Occasional errors were made, and crossings-out by some candidates suggested a hurried approach to the question.

1(b) The majority of candidates were able to name two engineering sectors different from the ones in part (a), with only those sectors given in the specification being awarded marks. Where candidates had correctly identified a sector, this was normally accompanied by an appropriate product.

2(a) All candidates attempted this question and the correct answer of overalls and a safety visor was given in the majority of cases. The most common incorrect response was a darkened glass face mask as one item of PPE to use when operating a grinding machine.

2(b) This question was generally well answered, with safety cut-off switches and machine guards being recognised by many candidates as being important safety measures. A number of candidates lost marks by making further reference to PPE, indicating that the question had not been read carefully before answering.

2(c) Few candidates gained full marks on this question, the most common reason for loss of marks being a simplistic statement such as 'check it against the specification'. Statements such as this need to be qualified on order to justify a mark, and reference to measurements, performance, alignment of parts and surface finish were all acceptable responses.

3(a) Most parts of this question were answered correctly, but less than half the candidates were able to identify MDF as the composite material in the list. Marks were allowed for a correct second use of a material, such as 'brass' and 'duralumin' as non-ferrous materials and alloys, and 'medium carbon steel' as an alloy and a ferrous material.

3(b) Most candidates answered this question correctly by stating that ferrous means that a metal contains iron. A number of candidates, however, did not offer a response of any kind for the question.

3(c) Only a limited number of candidates scored full marks for this question, with many giving only one correct ferrous metal, and some giving no response at all. In a number of cases 'iron' was given as a response and this was not awarded a mark as the metal is not commonly used in the engineering industry in its pure form.

4(a) Most candidates were able to identify a product made using robots, the most common response being cars.

4(b) Although most candidates were able to give a use for robots, descriptions of that use were rather limited. Reference was again made to the use of robots in car manufacture, but a simplistic response such as 'welding cars' was only awarded one of the two marks available.

4(c) This question was answered well by most candidates, the most commonly quoted benefits of using robotics being increased production, consistency and 24/7 operation.

4(d) Fewer candidates answered this question as well as they had part (c), with the majority only giving one disadvantage of robotics. Acceptable responses made reference to the high set-up costs, staff training requirements and need for redundancies.

5(a) A significant number of candidates were unable to identify processes in terms of the category they fitted into. Responses to the 'surface finishing' section were particularly disappointing, with some candidates not offering a response of any kind.

5(b) Few candidates scored well on this question, with marks often being lost as a result of a failure to relate responses to the 'supply' of engineering components. Responses presented were mostly of a generic nature, making vague references to email and the Internet. More specific detail, such as the use of bar-coding and tracking, was required for the higher marks in the question.

6 Responses to this question were generally quite disappointing, with detailed knowledge of engineering components appearing to be very limited. The most frequently chosen components were the filter, the LDR and the spring, with the pop rivet also appearing in a number of cases. Whilst many candidates were able to offer reasonable responses for two components, only a limited number covered three in any detail.

7(a) Most candidates were able to identify material D in the table as the safest to use.

7(b) The majority of candidates gave 'Availability' and 'Value for money' as the two reasons for choosing material B for the manufacture of a prototype, and 'Ease of handling' was also accepted as an appropriate response.

7(c) To gain full marks for this question, candidates needed to give a reasoned explanation that related to the data in the table and the workforce. Most responses made vague references to safety without giving any detail, and only a limited number of candidates scored well on the question.

8 Questions of this type are good examples of the need to read questions carefully before beginning a response. The question is also used to assess a candidate's quality of written communication.

In most cases, candidates failed to relate their responses to 'the range of engineered products available' and made general, unconnected comments about the use of modern technologies.

Overall the performance in the question was poor, and only a small number of candidates gained half marks or more for it.

A623 3A/3B

Unit A623 – Controlled Assessment

When work is submitted for Unit A623 it would be helpful for it to be securely bound with individual pages clearly visible and not all inside a single plastic wallet. Good practice was evident in the use of numbered pages and the division of work into sections following the assessment grid descriptors. Such numbering systems or sections could then be referred to as locations for evidence on the Unit Recording Sheets, directing the moderator towards evidence supporting the marks awarded.

When using the assessment grids, 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 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.

Unit A623 3A Real World Engineering

Candidates submitting work for this element must select a product from the list given by OCR. In general work presented did follow the requirements of the specification, with a range of products studied by the candidates. Centres that produce writing frames in order to guide candidates towards meeting the requirements of the assessment criteria should use these with caution. Whilst they may be beneficial for some candidates, they could restrict the performance of other, more able, candidates.

A623 3A Section 1

It is important that candidates analyse the product identified and give consideration to the stages carried out in the production of it. It is vital that candidates shows their understanding of the processes and explain the stages of production in their own words. On a number of occasions marks had been awarded for work that had simply been copied and pasted from external sources.

Good practice was evident where 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 of the selected stages were provided in order to support the information given.

A623 3A Section 2

In this section, candidates are required to identify, explain and justify engineering processes and quality control techniques that are used in the production of their selected product. It is important that a range of processes are presented and explained. Marks had to be adjusted in some cases where candidates had been awarded high marks for presenting only two or three processes and had bullet-pointed lists of key words rather than presenting detailed explanations.

Good practice was evident where candidates had provided information and images to help explain a variety of engineering processes and quality control checks that had been used.

A623 3A Section 3

Candidates are expected to 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 provide a detailed explanation of the information and not merely a list of key words. Justification of the selection of the materials and components should be included by candidates in order for them to gain maximum marks in this section. The functions, properties and characteristics of the materials and components should be detailed.

One appropriate method of presenting this information is the use of tables, with column headings of function, properties and characteristics to analyse each identified material and component.

A623 3A Section 4

In this section, candidates should explain systems and control technology used to organise, monitor and control the production of the product. The systems and control technology identified should be related to the product studied and not addressed purely in generic terms.

Good practice saw candidates highlighting key systems and various stages of production that used control technology in engineering the product studied. Images were used to support written text, helping candidates to fully explain how the product evolved.

A623 3A Section 5

Candidates are required to identify and explain the impact of modern technologies when engineering their chosen product. When carrying out work on this topic, candidates should identify and explain a range of modern technologies. They should explain how the use of these technologies has changed the production of their selected product, and evaluate whether such changes are good or bad. In doing this, candidates should consider the effects on production times, workforce, quality, value for money and resources.

The impact of modern technology must be related to the product studied and not simply discussed in general terms.

Unit A623 3B Making an Engineered Product

Candidates submitting work for this element must select a product from the list given by OCR as a starting point for the project.

Unit A623 3B Section 1

Candidates should analyse the chosen product and produce a production plan for a high-quality prototype of the engineered product.

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

The production plans can be presented in a variety of ways but many were presented in the form of a table, with the stages listed and columns used to identify the aspects mentioned above.

Unit A623 3B Section 2

Candidates are required to produce a prototype that will meet the requirements of the design situation identified from OCR lists. This prototype should be produced from appropriate materials and should be able to function as required. Most candidates included a photograph of their product, but it would be beneficial if several photographs of the product were included in the folder, showing different views, different angles and close-ups. In some folders seen during moderation, it was difficult to judge the quality of the work, as a single photograph was presented or the quality of the photographs was poor.

In order for marks to be approved during moderation it is vital that photographic evidence is presented in each candidate's folder.

Unit A623 3B Section 3

In this section, candidates need to identify, explain and justify the use of a wide range of appropriate processes, materials, components, tools and equipment.

Information can be presented in a variety of formats, and good practice saw candidates presenting the information as a log or diary of making, including real-time photographs of each stage and often presented in table form. The more able candidates gave detailed justifications and also identified changes that had been made to the initial production plan.
All evidence should be provided in the folders presented, and candidates need to explain the work that they have carried out, as external witness statements are not accepted.

Unit 623 3B Section 4

Candidates working on this section should show evidence that they have applied appropriate health and safety procedures relevant to their product. They should also appropriately apply, explain and justify a range of quality control techniques that have been carried out during the production of their product.

Good practice in the folders moderated saw candidates using images that supported health and safety issues and quality control checks. Such information was not generic but was related to the product being produced, detail being given as to what the checks would be, how they would be carried out and why they were necessary. Evidence was presented showing that candidates had carried out or applied risk assessments on equipment to be used.

Unit 623 3B Section 5

Candidates should detail and justify modifications that can be made to the design solution, including consideration of the use of modern materials, processes and technologies. Most candidates evaluated their product, with some also explaining changes that they had made, but many failed to consider how modern materials, and 21st century processes could influence future developments of their product.

Good practice was carried out by candidates who used diagrams and modelling to suggest and explain modifications to their final product. Such modifications not only suggested how the design of the product could be modified, but also considered alternative production methods and the use of 21st century equipment and materials.

A624 Impact of modern technologies on engineering

General Comments

Most candidates attempted all of the questions on the paper but, in some cases, responses seemed to have been hurried and did not always address the questions fully. The importance of effective examination technique cannot be over-emphasised, as candidates can all too easily lose marks through simply not reading questions carefully enough.

Responses to questions relating to the application of basic engineering processes were weaker than expected in many cases, as were those for questions covering quality control checks. Whilst most candidates demonstrated good knowledge and understanding of ICT and CAD, knowledge of Programmable Logic Controllers (PLCs) was very limited in the majority of cases. Where responses were presented, many simply referred to computer control of machines, and only a limited number of candidates scored well on these questions.

Comments on Individual Questions

1(a) This familiar style of question was well answered, and all but a very small minority of candidates gained full marks on it. Occasional errors were made, and crossings-out by a number of candidates suggested a hurried approach to the question.

1(b) The majority of candidates scored well on this question, but a small number failed to read the question carefully and selected sectors not in the original list.

2(a) The most frequent response to this question related the speed of production to the availability and cost of products. Candidates also correctly identified the Internet as a means of making products more available. Marks were often lost where candidates stated, but did not describe, the benefits, and where only one benefit was given.

2(b) This question was less well answered than part (a), with most responses referring to technologies that could not be accepted as 'modern'. The application of modern and smart materials in products was only infrequently mentioned, and only a limited number of candidates scored well on the question.

3(a) Computer Aided Design was given as the correct response to this question by the majority of candidates.

3(b) Most candidates were able to name at least one type of engineering drawing, but a minority of candidates gained full marks by correctly naming two. Simplistic reference to '3D' drawing was not accepted and only one mark was awarded for reference to both one and two point perspective.

3(c) All three parts to this question were well answered, and a good percentage of the candidates scored full marks in it. The use of email was by far the most popular choice of methods used to share CAD files with companies, and CDs, external drives, memory sticks and networks were all seen as examples of making back-up copies of files.

4(a) All candidates attempted this question, and parts (i) and (ii) were generally well answered. In part (iii), however, a significant number of candidates appeared to confuse 'heat treatment' with other processes involving heat, and processes such as welding, brazing and soldering appeared frequently as responses to this part of the question.

5 Responses to all three parts of this question appeared to suggest that candidates' knowledge of Programmable Logic Controllers is very limited in the majority of cases. Marks were awarded for benefits such as speed and consistency of production, and for reference to applications such as sensing products and the controlling of conveyor systems, but it was apparent that most candidates did not differentiate between PLCs and computer controlled machines.

6(a) Quality control is fundamental to work done in this specification, and a significant number of candidates scored no marks at all in some of the parts of this question, particularly in part (i) relating to 'Turning'. Marks were also lost in some cases where candidates had not taken note of the fact that a 'different' quality control check was required for each of the three processes.

7(a) Most candidates scored two or more marks on this question, but only a limited number gained full marks. The most common mistake made was the failure to recognize the pump, reservoir and flow control valve as 'pneumatic/hydraulic' rather than 'mechanical' components. In the case of some of the lower achieving candidates, it was apparent that components and table positions had been chosen at random in an attempt to gain marks.

7(b) Although almost all candidates attempted this question, a significant number failed to score any marks. Responses tended to suggest that candidates had not fully taken account of the definition of a 'smart' material as one that responds to external changes such as temperature or light.

7(c) Where candidates had some knowledge and understanding of smart materials, they were able to gain full marks by making reference to the two main factors, change in shape in response to a change in temperature. Candidates with limited knowledge of smart materials scored a mark by referring to the material 'going back to its original shape'.

8 Questions of this type are good examples of the need to read questions carefully before beginning a response. The question is also used to assess a candidate's quality of written communication.

The majority of candidates formed their responses around computer control of machines, and robotics being used to perform tasks in hazardous conditions. The application of safety guards was frequently mentioned, but less common was reference to the use of sensors in the control of air quality and the automatic shut-down of 'danger zones' within a factory.

Only the higher achieving candidates scored well on this question and marks for the question were generally quite low, with three marks or less being the norm.

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