RECOGNISING ACHIEVEMENT

GCSE

Engineering (Double Award)

General Certificate of Secondary Education **J322**

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

Examiners' Reports

January 2011

J322/J344/R/11J

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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

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 sometimes limited in certain areas, details of which are given later in this report.

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 by centres in the majority of cases.

Unit A621 – Controlled Assessment

In the first part of this unit, candidates are required to select a product from the list provided in the specification and analyse the development of that product since its introduction. When analysing the product, candidates should identify two similar products that have subsequently been developed using modern technology.

In Part B of the unit, candidates 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.

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 these statements that disagreements occurred during the moderation process, with some candidates having been marked leniently and others harshly. In the first band 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 band they must describe and explain their work and show their knowledge and understanding of the topic being covered. Candidates who are awarded marks from the third band of the assessment grid must have added detail to their descriptions and explanations, in addition to justifying the information provided.

It would be helpful if work submitted for Unit A621 were 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. Page references could be entered on the Unit Recording Sheets to direct the moderator towards evidence supporting the marks awarded.

A621 1A Engineering a Product

In general, work presented followed the requirements of the specification, with a range of products being 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 gaps 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

It is important that candidates analyse each of the products identified and give consideration to the impact of modern technologies, smart materials and components on their development. It is important that modern materials, smart materials and components are relevant to the products studied and not presented in generic terms.

Candidates should also present evidence 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 were provided of the selected products in order to support the information given.

A621 1A Section 2

For their selected products, candidates should explain the use of materials and components. This should include reference to properties, characteristics, performance and cost.
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 often presented in the form of tables that identified each of the products and the properties, characteristics, performance and cost of materials and components used in their manufacture.

A621 1A Section 3

Candidates are expected to identify, explain and justify engineering processes that are used in the production of their selected products. It is important that candidates do identify and explain a range of processes that could have been used to manufacture the products. In the samples moderated, some candidates had been awarded high marks for this section but had only identified, and briefly explained, two or three processes.
Good practice was shown 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 selected product had evolved.

A621 1A Section 4

Candidates are expected to suggest modifications that could 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 relevant information being recorded and presented.

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

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 highlights the key points. Many of the coursework folders presented for moderation had not featured any input from a client and in some cases the input had been 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 specification.

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 design should be selected and the reasons for its choice explained and justified. The final idea should be presented to the client and feedback sought. The candidate should give evidence of responding to the feedback, with any changes made explained and justified.

A number of folders presented for moderation did not provide a sufficiently wide range of different ideas, with candidates only showing one or two ideas with limited development evident. Some candidates also failed to produce a presentation of the final idea to the client in order to obtain feedback.

Good practice showed a wide range of ideas being presented, with annotation referring to key points from the specification. 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, then evaluated and presented to the client. Feedback from the client was used as guidance for modifications to be carried out.

Unit A621 1B Section 3

Candidates are expected to complete a high quality prototype of the final idea.
Many candidates did include 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. It is most important that photographs included in the portfolio are of sufficient size and quality to give a clear indication of the work produced.

Unit A621 1B Section 4

Candidates working on this section should show evidence that they have selected and used a wide range of appropriate materials, parts and 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, and 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 that were not generic, but were related to the product being produced. Detail was 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 risk assessments on equipment to be used. Good use was made of photographic evidence to support safe practice, and to highlight quality control checks.

Unit A621 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.
Good practice was carried out by candidates who used diagrams and modelling to suggest and explain modifications to their final product. Modifications not only suggested how the design of the product could be improved, but often also considered production methods, the use of 21st century equipment and smart materials.

A622B Engineering Processes

General Comments

Most candidates attempted all of the questions on the paper but, in some cases, questions with no response indicated gaps in candidates' knowledge of the specification content. There was some evidence of candidates not having read questions carefully before answering. Questions relating to Health and Safety issues were well answered by the majority of candidates, and knowledge of general engineering materials was reasonably sound. This was not the case with the more modern materials, however, with knowledge of composite materials being generally weak.

Detailed knowledge of engineering components remains limited in some cases, as does a clear understanding of Systems and Control technology.

Comments on Individual Questions

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

1 (b) The majority of candidates were able to name two engineering sectors not given in part (a), but only the higher achievers gave three different sectors and appropriate products. Where candidates had repeated a sector from part (a), a mark was awarded for an appropriate product, providing it was different to the one given in that part.

2 (a) Most candidates identified a darkened glass face mask as being essential for electric arc welding, but a considerable number gave PVC gloves as the second item of PPE. Whilst gloves could be appropriate wear for electric arc welding, these would normally be of leather rather than PVC.

2 (b) This question was quite well answered, although a number of candidates lost marks by making further reference to PPE. The better responses gave examples of good working practice, such as the use of screens and safe working areas.

2 (c) Responses to this question were generally quite disappointing. Most answers given were very simplistic, and few candidates gained full marks on the question by describing a recognised test for a welded joint.

3 (a) Although most parts of this question were answered correctly, a significant number of candidates gave 'teak' as a ceramic and 'aluminium' as an alloy. Marks were allowed for a correct second use of a material, such as 'bronze' as a non-ferrous material and an alloy.

3 (b) Generally this question was poorly answered, with only a small number of candidates showing understanding of the technicalities associated with 'composite materials' as opposed to 'alloys'.

3 (c) This question was also quite poorly answered, although it was noted that some candidates who were unable to describe composite materials in part (b) did name at least one appropriate material in this part of the question. The most common correct responses seen were 'concrete' and 'fibreglass'.

4 **(a)** Responses to this question were disappointing, and very few candidates gained both marks in each part. Whilst the use of computers is well known in general terms, their application in the wider field of 'information, communication and digital technologies' is less well understood.

(i) This was the best answered of the three parts, with candidates forming their responses around the use of CAD packages in designing.

(ii) Spreadsheets were mentioned in a number of responses, but only the more able candidates made reference to the use of databases or the Internet in 'material supply and control'.

(iii) Some candidates gave 'bar coding' as an example of the use of ICDT in packaging and dispatch, but descriptions were generally very limited. The higher achieving candidates related the bar codes to 'scanning' and, occasionally, the application of GPS technology to the tracking of products after dispatch.

5 **(a)** Most candidates scored marks in this question, but only the better responses contained suitable examples of the use of systems and control technology in joining and assembly. Where an example was given, this was most commonly the robot welding of car bodies or the application of 'pick and place' to the assembly of printed circuit boards.

5 **(b)** This question was generally quite well answered, with references being made to speed and accuracy of production, minimised wastage, and reduction in workforce costs. In some cases, candidates were prevented from gaining full marks in the question by repetition across the two answers.

6 Responses to this question were disappointing, with detailed knowledge of engineering components appearing to be very limited.

The most frequently chosen components were the LED, the resistor and the split pin. The LED was confused with a simple diode by some candidates, and the resistor was often said to control 'voltage' rather than current flow in circuits.

Many candidates took the simple paper fastener as being an example of a split pin, and some confused it with the standard 'R-clip'.

7 **(a)** Both parts of this question were well answered, with the majority of candidates being able to interpret the information in the table and relate it to the required engineering task.

7 **(b)** Although explanations were generally weak, most candidates were able to gain full marks by identifying factors in the table that were relevant to the choice of material.

7 **(c)** The majority of candidates were able to give a relevant factor for consideration when selecting materials for products, in many cases this being a physical property of a material. The explanation of the factor's importance was rather limited in most cases and few candidates gained all three marks for the question.

8 Questions of this type are examples of the need to read questions carefully before beginning a response.

In many cases, candidates failed to relate their responses to 'working conditions' and made general points about the use of modern technologies in production. The higher achieving candidates discussed issues relating to working in hazardous environments, and how modern technologies have enabled this to be reduced.

Unit A623 – Controlled Assessment

In general, work presented followed the requirements of the specification, with a range of products studied by the candidates. Centres that have produced writing frames in order to guide candidates towards meeting the requirements of the assessment criteria should use these with caution as, where they may offer support, they often are restrictive for more able candidates.

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 these statements that disagreements occurred during the moderation process, with some candidates having been marked leniently and others harshly. In the first band 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 band they must describe and explain their work, and show their knowledge and understanding of the topic being covered. Candidates who are awarded marks from the third band of the assessment grid must have added detail to their descriptions and explanations, in addition to justifying the information provided.

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 in the use of numbered pages and the division of work into sections following the assessment grid descriptors. These numbering systems or sections could then be referred to on the Unit Recording Sheets, directing the moderator towards evidence supporting the marks awarded.

Unit A623 3A Real World Engineering

Candidates submitting work for this unit must select a product from the list given by OCR in the specification.

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.

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

Candidates are expected to identify, explain and justify a range of engineering processes and quality control techniques that are used in the production of their selected product.

Good practice was shown by candidates who identified and explained a range of different engineering processes. Written information and images were often provided to help explain 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 manufacture of their selected product. For candidates to perform well in this section they should provide an explanation of the information and not simply a list of key words. The functions, properties and characteristics of the materials and components should be detailed.

In a number of cases, candidates provided tables with column headings of function, properties and characteristics in order to analyse each identified material and component.

A623 3A Section 4

Candidates are expected to explain systems and control technology used to organise, monitor and control the production of the product.

Good practice saw candidates highlighting key systems and 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 the product evolved.

A623 3A Section 5

Candidates are expected to identify and explain the impact of modern technologies when engineering their product. When carrying out work on this topic, candidates should identify and explain a range of modern technologies, explaining how the use of those technologies has changed the production of their selected product. To justify marks in the top band, they should also evaluate the effect of such changes on production times, workforce, quality, value for money and resources.

Unit A623 3B Making an Engineered Product

Candidates submitting work for this unit must select a product from the list given by OCR in the specification.

Unit A623 3B Section 1

Candidates are required to select a product from the list given by OCR and produce a detailed plan for its manufacture.

Good practice saw candidates producing a production plan that identified an appropriate sequence of making and suggesting time estimates for each stage. Materials, components, 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 also included in better examples. Production plans can be presented in a variety of ways, but the most popular was the use of tables, with the various stages listed and columns used to give details of all aspects of the production.

Unit A623 3B Section 2

Candidates are expected to produce a prototype that is able to function as required, using appropriate materials. As the assessment of the product is moderated through the use of photographs, it is important that candidates present a range of images. Candidates did include one photograph of their finished product, but it would be beneficial if several photographs were included, showing different views, different angles and close-ups. It is most important that photographs included in the portfolio are of sufficient size and quality to give a clear indication of the work produced.

Unit A623 3B Section 3

Candidates are expected to show, explain and justify the use of a wide range of appropriate processes, materials, parts, components, tools and equipment.

This information can be presented in a variety of formats, and many candidates produced a record, or diary, of making, often in tabular form. Photographs of each stage of making were included by the higher achieving candidates, with columns used to give details of tools, materials and equipment used, explanations of why these items were appropriate and details of changes made to the production plan during manufacture

Unit A623 3B Section 4

In this section, candidates should show evidence that they have applied appropriate health and safety procedures. They should also apply, explain and justify a range of quality control techniques that have been carried out during the manufacture of their product.

Good practice saw candidates using images that supported health and safety issues and quality control checks that were directly related to the product being produced. Detail was given as to what the checks would be, how they would be carried out and why they were necessary. Evidence was also presented to show that candidates had carried out and applied risk assessments on equipment used.

Unit A623 3B Section 5

Candidates should detail and justify modifications that could be made to the design of the product, include consideration of the use of modern materials, processes and technologies. 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 materials, the use of 21st century equipment and smart materials.

A624B 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. There was some evidence of candidates not having read questions carefully before answering.

Candidates' knowledge of the classification and possible uses of engineering materials was disappointing in some cases, and responses relating to the application of basic engineering processes were also rather limited in their content.

Questions referring to Health and Safety were generally well answered, as were those dealing with environmental issues relating to transport.

Comments on Individual Questions

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

1 (b) A number of candidates failed to identify a modern technology used in the production of the chosen product, and few candidates scored full marks on this question. The most frequently chosen product was the laser printer, and some responses indicated that candidates had confused laser printers with laser cutters. Injection moulding was often given as a modern technology and, whilst this was not rewarded, a mark was given if an appropriate benefit to using the process was given.

2 (a) The majority of candidates failed to relate their answers directly to working conditions and few scored more than half marks on this question. A number of candidates gave responses that considered improvements to speed and quality of output, rather than working conditions. A small number of better responses described measures to reduce the dangers to workers in hazardous environments.

2 (b) This question was generally well answered, with most responses describing negative effects on the workforce in the form of redundancies and the need for re-training. A number of candidates referred to the initial cost of introducing the modern technologies rather than their use, but this was taken as an acceptable response and marks were awarded for it.

3 (a) It was disappointing to find that many candidates were unable to identify CIE as standing for Computer Integrated Engineering.

3 (b) This question was quite poorly answered, with most candidates simply suggesting that 'computer controlled' just means that everything is done automatically. Descriptions of benefits were generally limited, and only a minority of candidates recognised benefits such as consistency of quality, reduced workforce costs, 24/7 working and increased output.

4 (a) Although the majority of candidates scored more than half marks in this question, the quality of responses was generally quite disappointing. The question dealt with basic engineering processes used at stages of production, and a significant number of candidates were unable to differentiate between the various stages.

5 Both parts of this question were well answered, with candidates showing a good degree of environmental awareness.

(a) The most popular responses for the causes of environmental damage related exhaust emissions to global warming and the ozone layer, and also the effects on reserves of fossil fuels. Noise pollution also appeared in a small number of responses.

(b) A number of suggestions were put forward for ways to reduce environmental damage, including electric power, hydrogen cells, better fuel efficiency and improved public transport.

6 **(a)** This question was generally well answered, although a number of candidates did not offer a response for part (i) 'Milling'. Those candidates that did give a response for the milling process tended to describe rather generic considerations that would apply to most machine tools. These were perfectly acceptable responses and were rewarded accordingly.

7 **(a)** Most candidates were able to present a good definition of the term 'alloy', but many failed to offer an example, restricting their marks for the question. Some candidates made the basic mistake of giving 'aluminium' as an example of an alloy.

7 **(b)** This question was generally well answered but, again, marks were restricted by a failure to give an example. The majority of candidates based the preference for a non-ferrous metal on rust-resistance and non-magnetic properties.

7 **(c)** This was less well done than (i) and (ii), with most responses being too simplistic for an explanation. A common response made reference to plastics being 'available in many colours', and lack of examples again restricted candidates' marks.

8 Questions of this type are examples of the need to read questions carefully before beginning a response.

The majority of candidates formed their responses around working procedures or benefits to a company rather than specifically the processing and production of engineered products. Where processing and production had been considered, responses included issues relating to the benefits of using CAM in production processes.

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