RECOGNISING ACHIEVEMENT

GCSE

Engineering (Double Award)

General Certificate of Secondary Education **J322**

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

OCR Report to Centres

January 2012

J322/J344/R/12J

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, OCR Nationals, 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.

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OCR REPORT TO CENTRES

Overview

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.

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.

A621 1A/1B Engineering Product

Good practice will include the use of numbered pages and division of work into sections following the assessment grid descriptors Work submitted would benefit form securely bound folders, with individual pages clearly visible and not all inside a single plastic wallet.. Page references can then be entered on the Unit Recording Sheet 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. 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 use 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. The chosen product should then be analysed, together with two other similar products.

Good practice showed candidates studying the development of the three 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 such a 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, smart materials and components on their development. It is important that the modern materials, smart 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 will show candidates breaking down each of the requirements of this section and addressing them as separate topics, presenting the information in written format or as a table. Images should be provided of the selected products in order to support the information given.

A621 1A Section 2

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

Good practice for this section will see candidates identifying, explaining and justifying a range of different materials and components that have developed over a period of time. Information will be presented in the form of a table, or other similar format, that identifies each of the products and their properties, characteristics, performance and cost.

A621 1A Section 3

In this section, candidates are expected to identify, explain and justify a range of engineering processes that are used in the manufacture of their selected products. Candidates should present a range of processes and explain how the process is carried out. Further explanation could be given as to what particular part(s) of the product would be manufactured this way, and the benefits of the particular process.

Good practice will see candidates identifying and explaining a range of different engineering processes. Written information and images could be used to help explain a variety of engineering processes used over a period of time as the selected product has 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 will show 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

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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.

Good practice will show candidates analysing a design brief, carrying out relevant research on the topic and then presenting a revised specification. The specification will be used and referred to in the following section, when the candidate presents a range of ideas that meet 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 and feedback sought. The candidate should give evidence of responding to the feedback, with any changes made being explained and justified.

Good practice will see the presentation in folders of a wide range of ideas, with annotation referring to key points from the specification. These ideas will be developed to include notes on materials, construction details and components. A final idea will be selected, drawn using a variety of techniques including CAD, and evaluated before being presented to the client. PowerPoint slides may be used for this presentation, in which case thumbnails should be included in the folder. Comments made by the client should be recorded, with further modifications presented, explained and justified.

Unit A621 1B Section 3

In this section, candidates are required to produce a high-quality prototype of the final idea and provide photographic evidence of its completion.

A range of photographs that give different views of the completed product should be included in the folder.
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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 will see candidates using production plans that identify health and safety issues and quality control checks. Such information should be related to the product being produced, with detail given as to what the checks would be, how they would be carried out and why they are necessary. This is an ideal opportunity to use photographic evidence to support safe practice and to highlight quality control checks.

Unit 621 1B Section 5

In this section, candidates should detail and justify modifications that could be made to the design solution. They should include 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.

Good practice will see candidates using diagrams and modelling to suggest and explain modifications to their final product. They will also consider production methods, and 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, resulting in an unnecessary loss of marks.

Questions relating to Health and Safety issues were generally well answered, and knowledge of basic engineering materials was reasonably sound. This was not the case with the more modern materials however, with knowledge of ceramics being quite weak.

Detailed knowledge of engineering components remains limited in many cases, as does a clear understanding of the application of Information, Communications and Digital Technologies.

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.

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. In some cases, candidates had repeated the sectors in part (a) for their responses, and a small number had made up sector names for themselves

2(a) This question was well answered, and virtually all candidates gained full marks for it, except where only one of the two items asked for had been identified.

2(b) Only the higher achieving candidates gave adequate descriptions of two safety precautions relating to the use of a centre lathe, with the weaker candidates merely presenting simple, unqualified statements, such as 'put the guard down'. Marks were also lost where candidates had not taken account of the requirement to give precautions 'other than PPE'.

2(c) Responses to this question were generally quite disappointing. Most answers given were very simplistic, and named a piece of measuring equipment without describing how it would be used. Full marks were awarded where candidates had made reference to the equipment and also the feature it was used to measure.

3(a) Although most parts of this question were answered correctly, a significant number of candidates gave 'brass' as a ferrous metal. Marks were allowed for a correct second use of a material, such as 'mild steel' as a ferrous metal and an alloy. In a number of cases, it appeared that candidates had very limited real knowledge of material types.

3(b)(i) Few candidates gained full marks for this question, as most responses failed to explain reasons clearly. The most common reasons given for mild steel being unsuitable related to it rusting and its comparative weight.

3(b)(ii) This question was quite well answered, with most candidates being able to identify at least one more suitable material for a small boat. Frequently seen correct responses were 'carbon fibre' and 'aluminium', the latter being accepted despite not being qualified by the term 'alloy'. The higher achieving candidates demonstrated good knowledge by suggesting two materials that were entirely suitable rather than simply possible for use.

4(a) Responses to this question were disappointing. Very few candidates gained both marks in each part and, in a number of cases, no response was offered at all. 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) Most responses made reference to the use of the Internet in one way or another, but few gave a description of how the technology would be used in marketing an engineered product. Those candidates that did score full marks referred to the use of websites and on-line advertising to contact a greater number of potential customers.

(ii) Only a very limited number of candidates scored well on this question. Some candidates referred to the use of spreadsheets, but knowledge of production planning itself appeared very limited.

4(b) Few candidates scored full marks on this question and, again, descriptions were generally quite weak. The majority of responses made rather simplistic reference to the speed of digital communication without making any comparison with other methods.

5(a) Responses to this question were disappointing, and a significant number of candidates did not attempt the question at all. Many candidates lost a mark by failing to give an example of an electro-plated product or component in their response. Some good responses were given by higher achieving candidates, such as the silver plating of electrical contacts to improve conductivity, and the electro-plating of products to improve the quality of their appearance, or their resistance to corrosion.

5(b) Both parts (i) and (ii) were answered in rather simplistic terms, and few responses worthy of full marks were seen. The majority of candidates made brief reference to simple visual and tactile tests to check surface smoothness and quality of surface finish.

6 In many cases, responses to this question suggested that detailed knowledge of engineering components was rather limited. Most candidates gave reasonable responses for two components, but a significant number did not attempt a third.
The most frequently chosen components were the fuse, the spring and the switch, these being the most basic in the list, but explanations of their function were frequently lacking in detail.

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. Only a very limited number of candidates had confused the values in the table and had, therefore, given incorrect responses.

7(b) This question was very well answered, with virtually all candidates using the information in the table to give two reasons for the suitability of the material for producing large batches at short notice. Most responses gave the availability of the material and the ease of storing it as the most relevant factors, but the fact that it was good value for money was also acceptable.

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. A small number of candidates repeated factors given in the table and lost a mark here, but some credit was given where the importance had been well explained in the next section of the question.

The explanation of the factor's importance was rather limited in most cases, and only the higher scoring candidates gained full marks for the question.

8* Whilst almost all candidates attempted this question, a considerable number did not gain any marks at all, as their responses did not relate to the impact of modern technologies on the environment. In many cases, candidates made general points about the use of modern technologies in production, often referencing the use of CAM in manufacturing and the subsequent loss of jobs. Only the higher achieving candidates discussed issues relating to advantages and disadvantages brought about by modern technologies, such as pollution control and the reduction of energy use.

A623 Controlled Assessment

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 is evident in the use of numbered pages and the division of work into sections following the assessment grid descriptors. Such numbering systems or sections can then be referred to as locations for evidence on the Unit Recording Sheets, directing the moderator to the evidence supporting the marks awarded.

When using 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 use 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.

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 is evident where candidates have 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 could be provided in order to support the information given.

A623 3A Section 2

In this section, candidates are required to identify, explain and justify a range of engineering process and quality control techniques that are used in the production of their selected product.

Good practice will see candidates identify and explain a range of different engineering processes. Written information and images will be provided to help explain a variety of engineering processes and quality control checks.

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.

Good practice will see candidates providing a table with column headings of function, property and characteristics in order 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 be addressed purely in generic terms.

Good practice will see candidates identifying a list of stages and highlighting key systems and stages of production that use control technology in engineering the product studied. Images will be used to support written text, helping candidates to 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 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 the modern technologies has changed the production of their selected product and evaluate if 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 the modern technologies 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 the making of a high-quality prototype of the engineered product.

Good practice will see candidates analysing a design situation and producing a production plan that identifies an appropriate sequence of making, suggesting time estimates for each stage. Materials, tools, equipment and processes to be used should be highlighted in the production plan. Health and safety aspects as well as quality control checks to be carried out could be included in the plan.

Unit A623 3B Section 2

Candidates are expected to produce a prototype which will answer the design situation identified from OCR lists. This prototype should be produced from appropriate materials and should be able to function as required. As this product can only be moderated through the use of photographs, it is important that candidates present a range of images. It would help the moderation process if several photographs of the product were included in the folder showing different views, different angles and close-ups.

Unit A623 3B Section 3

In this section, candidates need 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, including a log or diary of making.

Good practice will see candidates incorporating real-time photographs of each stage, with details next to them identifying tools, materials and equipment that has been used.
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 will show candidates using images that support health and safety issues and quality control checks. Such information should be related to the product being produced, with explanations given as to what the checks would be, how they would be carried out and why they were necessary.

Unit 623 3B Section 5
Candidates should detail and justify modifications that could be made to the design solution. They should include consideration of the use of modern materials, processes and technologies.

Good practice will see candidates using diagrams and models to suggest and explain modifications to their final product. Such modifications will not only suggest how the design of the product could be modified, but will also consider alternative production methods and materials and 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. The importance of effective examination technique cannot be over-emphasised, as there was some evidence of candidates not having read questions carefully before answering.

Candidates' knowledge of the stages of production was generally good, but responses relating to the application of computer control of engineering processes were rather disappointing.

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

Comments on individual questions

1(a) This familiar style of question was well answered, and the majority of candidates gained full marks on it. Occasional errors were made, the most common being confusion between the products made in the Aerospace and Rail and Marine sectors

1(b) Very few good responses to this question were seen, with a number of candidates failing to identify a modern technology used in the production of the chosen product. The most frequently chosen product was the parking sensors, but responses mostly described their use and made no reference to the technology used.

2(a) The majority of responses to this question made reference to the speed of production by machines and the fact that 24/7 working was possible. In some cases marks were lost where descriptions were too simplistic, or when points were repeated in the second response.

2(b) This question was generally well answered, with most candidates referring to the initial cost of introducing the modern technologies and the cost of breakdowns. Credit was given where candidates had quoted the loss of jobs in the workforce as an overall disadvantage to an engineering company.

3(a) All candidates scored full marks in this question by correctly identifying CAM

3(b) This question was quite poorly answered. The most frequently recognised examples of computer control were the use of robots in assembly, and the computer control of machines for production. In a number of cases, only one example was given.

4 The majority of candidates scored well on this question, with many gaining full marks in all four parts.

4(a) Most candidates were able to give two machines used for material removal, with only a small number giving one or less. Lathes, milling machines, powered hacksaws and bandsaws were all popular responses to this question.

4(b) This was the least well answered of the four parts, with some candidates not addressing hazards present in the shaping and manipulation stage of production. In some cases, simple repetition resulted in the loss of one of the two marks available.

4(c) Few candidates scored less than full marks on this question, with the most frequently quoted examples of tools being screwdrivers, hammers and rivet guns.

4(d) Most candidates were able to give at least one example of a finishing process used on engineered products. Painting and varnishing were the most popular choices, but powder coating and galvanising were also seen.

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

5(a) This part of the question was generally well answered by candidates, and some very interesting responses were seen. Most responses centred around air pollution from chimneys and waste disposal, but noise pollution and water contamination also appeared in a small number of responses.

5(b) Less detailed responses were presented for this part of the question, and marks gained were consequently slightly lower than those for part (a). Most candidates gave reducing waste and recycling as ways to reduce landfill, while others made reference to renewable energy sources and a reduction in energy usage by factories.

6 This question was generally well answered, although there was considerable variation across the three parts.

(i) The majority of candidates gave a good description of a health and safety consideration for drilling, many making reference to the need to securely clamp work and use machine guards. Where reference to PPE was made, justification was needed to gain full marks.

(ii) Most candidates scored well on this part of the question, making reference to the dangers of the hot iron and the molten solder. Where marks were lost, this was normally due to candidates using PPE in their response without justification.

(iii) This part of the question was less well answered by candidates, with only a small number gaining full marks. Responses seen were mostly generic, referencing the use of PPE without relating it to the vacuum forming process.

7(a) Very few candidates scored full marks on this question, with many showing some confusion between steels and non-ferrous metals. The most frequently given response related to mild steel being cheaper than non-ferrous metals, but often no example was given to qualify for the additional mark.

7(b) Understanding of the term polymer seemed to be very limited, and responses seen simply referred to them as 'plastics'. Candidates did gain marks, however, by giving an appropriate example in their response.

7(c) This question was well answered by a number of candidates, with most scoring two marks or more. The majority of correct responses referred to the suitability of plastics for mass-production and the ease of producing complex shapes by moulding.

8* Only the higher achieving candidates scored well on this question, as the majority of responses seen did not address the question content fully. Candidates were required to discuss the effects of modern technologies on working conditions, but many candidates simply referred to the loss of jobs when modern technologies are used. A few very good

responses were seen where candidates discussed issues such as robots reducing work in hazardous conditions, and the improvement in air condition brought about by modern filtration systems.

This type of question is a very good example of the need for candidates to read questions carefully before attempting a response.

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