OCR
Oxford Cambridge and RSA

GCSE

Engineering (Double Award)

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

General Certificate of Secondary Education **J322**

OCR Report to Centres June 2014

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

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

This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

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

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Administration procedures for the submission of work should be carefully followed as failure to adhere to these slowed down the moderation process in several cases. Candidate marks should be submitted using an MS1 form or equivalent, and this should be accompanied by a CCS160 and a candidate breakdown form CSF/A621. It is important that when marks are entered manually on the forms that these are checked as arithmetical errors caused further delays. Work that is recorded on CD or memory pen should be entered for moderation using the same entry codes as portfolios (A621/02) as it is still being posted to the moderator despite being produced in electronic format, whilst work submitted using the repository should be entered using the code A621/01. Entering for the wrong component code causes major delays in moderation being carried out, which was a major concern this year.

When work is submitted for Unit A621, it would be helpful if it was securely bound with individual pages clearly visible and not all inside a single plastic wallet. Good practice was evident through the numbering of 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 relevant evidence to support the marks awarded.

All evidence for assessment must be contained within each candidate's portfolio, and this should include photographic evidence of the product produced. It assists the moderation process if the final product is photographed from a variety of angles and the photographs are well reproduced so as to best represent the final product and support the marks awarded by the Centre.

It is essential that Centres closely refer to the statements contained on the Unit Recording Sheet (A621/URS) when allocating marks for the candidates work. A best fit approach is recommended but when awarding marks evidence for the grade descriptors must be evident within the folder. In order to avoid confusion it would be beneficial if page references for the work were recorded in the appropriate section on the A621/URS form. When using the URS it is important that Centres consider the introductory requirement at the beginning of each section. In the first column on the grid a basic description or a basic explanation may include brief notes or a list of key words. For candidates to progress to the second column they must describe and explain their work and should present more text in order to support their findings and to show their knowledge and understanding of the topic being covered. Candidates who are awarded marks from the third column of the URS must provide detail to their descriptions and explanations as well as justifying the information provided.

It should be noted that witness statements are valued as supporting information but are not rewarded directly with any marks. The requirements of the specification are that candidates should provide evidence and therefore health & safety issues and quality control procedures should be documented and explained. Photographic evidence of these aspects being carried out is an excellent way to record and show how they have been applied to the project.

Centres should note that in this assessment writing frames are not permitted as this contravenes JCQ regulations for controlled assessment. It is also felt that writing frames or templates often inhibit middle to high ability candidates who are restricted and cannot fully show their flair or understanding as they work through the required sections. It may be beneficial to direct the candidates towards areas that need to be covered, but it could be more appropriate to use page headers or prompts rather than grids as candidates then have unrestricted space to provide their responses which could be developed over a number of pages.

Comments on Individual sections

Unit A621 1A Study of an Engineered Product

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

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 (e.g. at ten year intervals or longer gaps depending upon which item was 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

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

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

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

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

A621 1A Section 2

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

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

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

A621 1A Section 3

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

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

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

In this section candidates should 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. The work presented in this section could allow candidates to do some "blue sky" thinking and give their opinions of how the product studied may develop in the future. Reference to design concept ideas may be a good starting point.

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

Good practice in this section saw candidates dividing their work into two parts, the first addressing modifications to the design solution and the other dealing with sustainability. Images were often used to support all written explanations.

Unit A621 1B Engineering a Product

Candidates submitting work for this element must select a client brief from the list given in the specification as the starting point for their exercise.

Unit A621 1B Section 1

In this this section the client design brief should be analysed and researched, and a specification produced which highlights the key points. The specification should be more that a list of keywords or bullet points, and should have each point explained and justified. The specification should be referred to, and comments recorded, during the design stage, as this supports the statement on the assessment grid that the candidate "produces and applies a specification".

A continuing concern is that many of the folders presented for moderation did not contain any input from a client, or that the input was very limited. This lack of a client input is a barrier to candidates gaining higher level marks in later sections.

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

Unit A621 1B Section 2

In this section candidates are expected to develop a range of ideas that will answer the design brief. A starting point is a range of freehand sketches that should be developed into pictorial views leading to a final selected idea. Annotation and justification of thinking is a key element of this section. Ideas should be presented using a range of techniques including annotated sketches, 3D views and engineering drawings that meet current industry standards.

Once suitable solutions have been developed, a final product should be selected and the reasons for its choice explained and justified. The final idea should be presented to the client with feedback sought. The candidate should present evidence of their response to the client's feedback, with any changes made explained and justified. It is important that reference is made to client feedback here, as without it candidates are unable to gain higher marks as they will not meet one of the sections descriptors, "considers clients feedback, responds appropriately and justifies changes made".

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

Design ideas should be cross-referenced to the points made in the specification, and this can be achieved through annotation of drawings or a table where drawings are numbered and given a rating against key points from the specification. Some candidates did not include a presentation of the final idea or, when it was included it lacked feedback from a client regarding its suitability.

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

Unit A621 1B Section 3

Candidates are expected to complete a high quality prototype of the final idea. As the folder is the only place that evidence of the product can be seen, it is important that every candidate includes a good range of photographs, preferably from different views and possibly with the product in use. Where photographs were not included and marks had been awarded, the moderation process came to a halt whilst requests for evidence were made to Centres.

In the sample of folders observed during the moderation process, it was difficult in some cases to judge the quality of candidates' work as only single photographs were presented or the quality of the photograph was poor.

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

Unit A621 1B Section 4

Candidates should show evidence that they have selected and safely used a wide range of appropriate materials, parts and components, processes, tools and equipment.

They should also appropriately apply and explain a range of quality control techniques.

Witness statements are not acceptable as the only evidence 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.

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

Good practice saw candidates using production plans that identified health and safety issues and quality control checks. Such information was not generic but was related to the product being produced, and detail was given as to what the checks would be, how they would be carried out and why they were necessary. Evidence was presented to show that candidates had carried out and 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.

Unit A621 1B Section 5

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

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 smart materials.

A622 Engineering processes

General Comments

Most candidates attempted all of the questions on the paper but in a number of cases there was some evidence that candidates had not read questions carefully enough before answering. It is most important that candidates take the time to read through the question paper before attempting to answer questions. Marks were all too frequently missed by candidates not giving examples where asked for or providing sufficient detail in their responses.

Questions relating to basic engineering materials were less confidently answered than has been the case in recent examinations, and knowledge of smart materials was also quite limited. The application of basic processes, tools and equipment was generally well evidenced, and health and safety requirements are obviously well known by candidates.

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

Comments on Individual Questions

1(a) Most candidates were able to give examples of products made in the sectors named in the table, often quoting those listed in the specification. In a number of cases, however, responses for the Rail and Marine sector were either inappropriate or missed out completely.

1(b) The majority of candidates were able to name two engineering sectors different to those given in part (a), although the names of the sectors were not always given with complete accuracy.

2(a) Responses to this question were quite disappointing, with many candidates scoring only one or no marks. The only part of the centre lathe that was regularly recognised was the chuck but in a number of cases it appeared that parts had been chosen from the list at random. Only a limited number of candidates gained full marks by naming all three parts correctly.

2(b) Whilst the majority of candidates were able to give two appropriate safety precautions, in many cases the responses were limited by a lack of detail in the description. A typical example of this was stating that the guard should be used but not offering a reason for this. A significant number of candidates did not read the question carefully enough, making reference to the use of PPE in their response.

2(c) Most candidates scored at least one mark on this question, invariably by giving a rule as a response. In many cases this was the only response given, and references to micrometers and digital/vernier calipers were few and far between.

3(a) Responses to this question were very varied, and marks across the whole range were awarded. Many candidates had difficulty in naming two alloys, with copper and aluminium frequently being offered as examples, and only the more able candidates scored five or more marks on the question.

3(b) Some good answers to this question were seen but in most cases knowledge of smart materials was limited and a number of candidates did not offer a response at all. Where appropriate examples were given, these were normally related to the use of shape memory alloys or thermochromic pigments in plastics materials.

4(a) The full range of marks was covered by responses to this question, with some detailed answers being seen from the more able candidates. In a number of cases, however, marks were limited by lack of relevant detail in the responses, particularly with reference to the design stage.

4(b) This question was not well answered generally, with many candidates missing the focus on marketing and giving responses relating to the use of information, communications and digital technologies in production. In some cases candidates appeared to think that 'information', 'communications' and 'digital technologies' were three entirely separate entities, and divided their response up accordingly.

5(a) Most responses to this question were based around the use of CAM/CNC machines in manufacturing, with laser cutting being a popular example. In a significant number of cases, however, marks were missed by not giving a relevant example as asked for in the question.

5(b) This question was generally not well answered, with most responses having very limited reference to the effects of modern technologies on working conditions. In many cases vague reference to the use of robots was made, but few responses gained more than one or two marks.

6(a) A significant number of candidates scored no marks on this question by simply giving three of the types of processes from the list at the start of the question. Where responses did give examples of material removal processes, these were normally basic processes such as drilling, sawing and turning/lathework, but references to more advanced processes like laser cutting and water jet cutting were also seen from a few candidates.

6(b) Where candidates had answered part (a) incorrectly as stated above, error carried forward (ecf) marks were allowed for tools or pieces of equipment relevant to the process named. In many cases marks were lost where candidates had given consumables and/or items of PPE as part of their response

6(c) This question was quite well answered by most candidates, with 'joining and assembly' and 'surface finishing' being the most popular choices. Welding, brazing and riveting were commonly seen examples of joining and assembly processes, while painting, polishing and plating were the most common examples of surface finishing.

7(a) Most candidates scored some marks on this question, but generally the responses were quite disappointing. In many cases, candidates gained marks only by ticking the correct 'type of component' boxes, but were unable to name any of the components. Where components had been named, only the pressure gauge and the LDR were correctly identified with any frequency, and only very few candidates were able to name the circlip In a number of cases candidates had confused the LDR with an LED and scored a mark only for giving it as an electrical/electronic component.

7(b) The majority of candidates chose the pressure gauge for this question, even if they had been unable to name it correctly, and the explanation of its use was generally based around the use on a pump for inflating car tyres. A number of responses were lacking either detail or an appropriate example which would have gained additional marks.

8* Almost all candidates attempted this question, but marks awarded were generally quite low as responses were often rather vague or too simplistic.

Candidates were required to discuss the advantages and disadvantages to a manufacturer of introducing modern technologies, but most responses were limited to rather simplistic references to higher production rates and the cost of the new technologies. A frequently mentioned disadvantage focused on the loss of jobs amongst the employees, but only the higher achieving candidates made any reference to the improvements in accuracy and consistency of products brought about by the use of the new technologies.

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

A623 Real world engineering

General Comments

Administration procedures for the submission of work should be carefully followed as failure to adhere to these slowed down the moderation process. Candidate marks should be submitted using an MS1 form or equivalent, and this should be accompanied by a CCS160 and a candidate breakdown form CSF/A623. It is important that when marks are entered manually these are checked as arithmetical errors cause delays. Work that is recorded on CD or memory pen should be entered for moderation using the same entry codes as portfolios (A623/02) as it is still being posted to the moderator despite being produced in electronic format, whilst work submitted using the repository should be entered using the code A623/01. Entering for the wrong component code causes major delays in moderation being carried out, which was a major concern this year.

When work is submitted for Unit A623 it would be helpful if it was securely bound. Good practice was evident through the use of numbering pages and dividing work into sections following the assessment grid descriptors. Such numbering systems or sections could be referred to as locations for evidence on the Unit Recording Sheets assisting the moderation process and to the benefit of the candidates.

All evidence for assessment must be contained within each candidate's portfolio, and this should include photographic evidence of the product produced. It assists the moderation process if the final product is photographed from a variety of angles and the photographs are well reproduced so as to best represent the final product and support the marks awarded by the Centre.

It is essential that Centres closely refer to the statements contained on the Unit Recording Sheet (A623/URS) when allocating marks for the candidates work. A best fit approach is recommended but when awarding marks evidence for the grade descriptors must be evident within the folder. In order to avoid confusion it would be beneficial if page references for the work were recorded in the appropriate section on the A623/URS form. When using the URS it is important that Centres consider the introductory requirement at the beginning of each section. In the first column on the assessment grid a basic description or a basic explanation may include brief notes or a list of key words. For candidates to progress to the second column they must describe and explain their work and should present more text in order to present their findings and to demonstrate their knowledge and understanding of the topic being covered. Candidates who are awarded marks from the third column of the URS must provide detail to their descriptions and explanations and justify the information provided.

It should be noted that witness statements are valued but are not rewarded with any marks. The requirements of the specification are that candidates should provide evidence and therefore health & safety issues and quality control procedures should be documented and explained. Photographic evidence of these aspects being carried out is an excellent way to record and show how they have been applied to the project.

Centres should note that in this examination writing frames are not permitted and it is felt that these inhibit middle to high ability candidates who are restricted and cannot fully show their flair or understanding as they work through the required sections of the assessment grid. It may be beneficial to direct the candidates towards areas that need to be covered but it could be more appropriate to use page headers or prompts rather than grids as candidates then have unrestricted space to provide their responses which could be developed over a number of pages.

Comments on Individual sections

Unit A623 3A Real World Engineering

Candidates submitting work for this element must select a product to study from the list published in the specification by OCR.

A623 3A Section 1

Candidates should present and analyse their selected product for study. They should then identify and explain the stages that are carried out in the manufacture of the product.

Good practice was evident where candidates had broken down the production process, listing the various stages and then explaining each in turn. Information was provided in a written format or as a table, with images provided of the selected stages in order to support the information given.

A623 3A Section 2

Candidates are expected to identify, explain and justify a range of engineering process and quality control techniques that are used in the manufacture of their selected product. A range of processes that could be used to make the product should be identified, with the stages of carrying out the process fully explained. The range of processes should include at least five different examples depending upon the complexity of the product studied. It is important that candidates consider and explain quality control procedures that may be carried with each process.

Good practice was evident from candidates who identified and explained a range of different engineering processes, with information and images provided to help explain the processes and quality control checks that had been used.

A623 3A Section 3

Candidates should provide details of the materials and components used in the manufacture 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.

Appropriate materials that may be used in the production of the product should be identified, and then for each material their functions, properties and characteristics explained. A similar procedure should be carried out for components, with appropriate items listed and/or images presented with their characteristics, function and application explained.

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

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

A623 3A Section 4

Candidates should identify and explain systems and control technology that is used to organise, monitor and control the manufacture of the selected product. Systems and control technology identified in this section must not be explained purely in generic terms, but must be related to the product studied and the methods of production used.

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

A623 3A Section 5

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

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

Unit A623 3B Making an Engineered Product

Candidates must select a design situation from the list given in the specification by OCR. Once a design situation has been selected it should be analysed and a production plan produced. The outcome for this element should be a good quality prototype of the selected product.

Unit A623 3B Section 1

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

Unit A623 3B Section 2

Candidates are expected to produce a prototype which will answer the design situation identified from OCR lists.

It is important that a solution is presented in this section and that it is evidenced in the portfolio, as without such evidence the moderator cannot approve any marks awarded by the Centre. A range of photographs taken from a variety of views should be presented in the candidate's folder. If possible images should be included of the product being used for the purpose that it was made, as this will help later sections when the candidate is expected to reflect on processes and function. The prototype should be produced using appropriate materials and should be able to function as required in order to fulfil the design situation.

In the folders observed during the moderation process it was sometimes difficult to judge the quality of candidates' work. On occasions photographs were included but were only small due to them being a part of a diary of making, or poor quality photographs were presented.

Unit A623 3B Section 3

Candidates are expected to show, explain and justify use of a wide range of appropriate processes, materials, parts, components, tools and equipment. No marks are awarded for witness statements, and it is important that evidence is presented in the folder showing candidates actually using tools, equipment and processes.

The information in this section can be presented in a variety of formats, and good practice saw candidates presenting a log or diary of making. Photographs were included for each stage and also columns of text explaining tools, materials and equipment that had been used. Some table formats included columns referring to the production plan, and explanations as to why the items used were appropriate. Details and justification of any changes that had been made were presented, with sketches added where necessary to clarify a point.

Unit A623 3B Section 4

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

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

Unit A623 3B Section 5

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

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

A624 Impact of modern technologies on engineering

General Comments

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

Responses to questions relating to engineering materials were again quite disappointing in many cases, but some improvement was seen in candidates' knowledge of engineering components. Candidates' knowledge of engineering processes used in high-volume manufacturing appeared to be quite limited in many cases, although the more basic processes were generally well known, as were health and safety issues relating to them.

Comments on Individual Questions

1(a) All candidates attempted this question and many scored full marks on it although, in a number of cases sectors had not been named completely accurately. A typical example of this was the Electrical and Electronics sector being described as simply 'Electrical', and credit was given for this response. Where marks were lost, this was normally as a result of giving only two sectors, or inappropriate products.

1(b) This question was not well answered generally, and few candidates scored full marks on it. In many cases candidates had described how modern technologies were used in an actual product, rather than in its manufacture.

2(a) Responses to this question were very varied, with a number of candidates scoring only two marks or less on it, which was quite disappointing for a question on engineering materials. There was some confusion between ferrous and non-ferrous metals, and a number of candidates gave 'china' as an example of a ceramic. Most candidates were able to give an appropriate example of a polymer, and concrete was the most frequently seen example of a composite material.

2(b) Almost all candidates recognised the fact that injection moulding is associated with polymers.

3(a) Responses to this question were generally good, but marks were quite frequently lost where candidates had given examples of what were effectively products rather than component parts. Examples of this were car brakes and engines which are, of course, sub-assemblies.

3(b) All candidates attempted this question, but in most cases responses consisted of rather vague references to single issues such as cost. Only the higher achieving candidates gained full marks by giving a justified explanation that detailed other benefits of bought-in components.

4(a)(i) All candidates attempted this question, but many responses were in the form of simplistic one-word answers rather than reasons. The most common outcome was the awarding of a single mark, often gained by combining two simplistic responses.

4(a)(ii) Very few candidates scored well on this question, with most suggesting that the crank should simply be milled out of a solid block. Where casting was mentioned, this was normally basic sand casting rather than pressure die casting, and forging was very rarely offered as a response.

4(b) This question was generally well answered, with most candidates showing good understanding of health and safety issues relating to heat or chemical treatment processes. The application of safety goggles and leather aprons featured in a number of the higher scoring responses.

5(a) All candidates answered this question, and almost all were able to interpret the information shown on the chart correctly and name 'normal use' as the stage that uses the least energy.

5(b) This question was poorly answered, with very few candidates scoring more than half marks on it. Most responses contained rather vague references to machines using a lot of electricity or running 24/7, but only the higher achieving candidates recognised the fact that the complexity of the product and the number and type of processes used in its manufacture could have a bearing on energy usage.

5(c) Responses to this question were generally quite good and a number of candidates scored well on it. Most candidates made reference to the energy used in transporting products to disposal sites, and also that used in dismantling products for recycling parts and materials.

6(a) This question was well answered generally and a significant number of candidates scored five marks or more of the seven available. Marks were occasionally lost through confusion between 'material removal' and 'shaping and manipulation', and also where a response was too vague, such as 'cutting' or 'hammering'.

6(b) Responses to this question were generally good and most candidates were able to give two appropriate safety precautions for their chosen process. A number of candidates lost marks, however, by including the use of PPE, this being particularly the case where welding had been chosen for the focus of the response.

7(a)(i) Responses to this question were quite disappointing, with less than half of the candidates knowing that PLC stands for Programmable Logic Controller, and some offering no response at all.

7(a)(ii) A number of candidates did not attempt his question, but some scored well by giving reasonably detailed descriptions of PLC use, normally relating to car manufacture or crisp making. In some cases these descriptions followed an incorrect response to part (a)(i).

7(b) Most candidates scored well on this question, with many of the higher level responses making reference to automatic ordering systems and JIT. Where marks were lost, this was generally as a result of there being some repetition of detail in the second response.

8* Although all candidates attempted this question, a few did not score any marks on it due to the fact that their responses did not relate to the specific focus of the question. References to the use of email and the Internet were frequently seen, and some candidates also included video conferencing as one of the benefits of using modern technologies. Only a limited number of responses mentioned disadvantages, and the only ones mentioned were the loss of personal contact and the effects of a breakdown in the technology used.

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

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