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Examiners' Report Summer 2008

GCSE

GCSE Engineering 2316

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Chief Examiner's Report June 2008

There were two qualifications examined in this series at GCSE level.

GCSE Engineering (Double Award) and GCSE Manufacturing (Double Award)

Unit 3: Application of Technology (5318)

The award of this unit was split into six sectors with an individual paper for each

5318/01	Printing and Publishing Paper and Board
5318/02	Food & Drink, Biological & Chemical
5318/03	Textiles and Clothing
5318/04	Engineering and Fabrication
5318/05	Electrical and Electronic, Process Control, Computers, Telecommunications
5318/06	Mechanical, Automotive

All six papers were harmonised for structure and difficulty.

Each paper had two sections. Questions in Section A related generally to information about the chosen sector. Section B illustrated a product from the chosen sector and questions were related to that product. The product was pre-released in October 2007 and acted as a focus for research in preparation for the exam. Again this year a Support Paper was available to help centres prepare for the exam. This paper was widely available on the website as a 'stand alone document' and was also attached to the pre-release material so every centre had access to this. It was also attached to this report for last year. Candidates were able to take their own research notes into the examination, but this was not to be submitted with the examination paper for marking.

The question paper within both sections was ramped in difficulty throughout.

All Principal Examiners' reports indicate that all the questions within the respective paper were accessible to their intended candidature, although all indicated that some lower achievers were able to access marks from the later questions in the paper. This was particularly the case for question 13 where in the first part it involved knowledge about the care of the environment and obviously the general and media exposure to these issues enabled candidate responses.

Generally speaking those candidates who had had opportunities to study and research the target product answered well. It was clear in their responses that they understood the process of manufacturing/engineering when applied to their product and sector. Good candidates were also able to give variety in their responses across the range of questions.

It was pleasing to note that all Principal Examiners reported a view that this year candidates performed better than previous years. This was confirmed by a general increase in the mean mark for all sectors except paper 02 Food and Drink where there was a very slight drop in the mean mark.

In general terms a typical grade F candidate was able to identify products from a given sector, name and describe, with some exceptions in some sectors, the use of components/equipment etc and in nearly all cases link applications of technology to key areas of technology. In a range of other questions where explanations and descriptions were required often candidates were only able to give one word if not simple answers. Variations in answers throughout the paper were limited. Application of technology was also limited throughout their responses. Often no responses were suitable for the latter questions in the paper particularly question 11. They showed limited recall and application of knowledge and understanding.

In general terms a typical grade C candidate was able to gain a range of marks from the same areas and aspects of the paper as a grade F candidate, but with further detail in their responses to those questions demanding an explanation or description. They were able to explain a range of benefits of using ICT and communications technology. Their responses when explaining the benefits of systems and control technology were limited. Good responses were given when explaining the aspects of the product through sketches and notes. Some were still unsure of the stages in manufacture, particularly what happens in some of the stages of manufacturing. There was a limited range of responses when demonstrating their knowledge of the use of automation in the production stage of their product; many were not able to even give a second example.

In general terms a typical grade A candidate was able to access marks for many aspects of the paper including most of those achieved by grade C candidates. Their explanations and descriptions were complete and had many references to the "real" manufacturing and application of technology of their product. Throughout the papers candidate responses evidenced a variety of application of technology. Many candidates were able to explain the effects of the use of CAM and quality control. Often their evaluations on the effect modern materials have had on the environment and product costs were well presented.

All of these points were considered during the awarding of the results. Overall there was a decrease of around 24 % in candidature over that for June 2007.

The Support Paper that had been prepared for centres is included as appendix 1 of this report. This in turn will be updated and available to help centres prepare for the use of the pre-release material. A 'Revision Guide' is also available and can be found on the SEMTA websites www.gcseinengineering.com and www.gcseinmanufacturing.com.

Comments on individual sectors are given on the next pages.

Principal Moderator's Report Summer 2008
GCSE Engineering

Introduction

Witness Testimony

Assessment of the Units

Unit 1: Design and Graphical Communication
Unit 2: Engineered Products

Introduction

A team of twenty four moderators was involved in the moderation of portfolios from 250 centres covering the two internally assessed and externally moderated units. There was a good level of consistency within the moderation process and this was assisted by the use a standardisation event at which it was possible to share expertise and understanding, and the tutorship of the senior moderators, Chief Examiner and Chair of Examiners.

Moderators reported a general improvement in the standard of evidence produced by some of the candidates. However it disappointing to report that there are still a significant number of centres who misinterpret the content of the specifications and do not conform to the procedures laid down by the awarding body. Where ever possible moderators ensured that candidates were not unfairly disadvantaged by incorrect procedures, however where the specification was not interpreted correctly, as identified later in this report, candidates were inevitably disadvantaged.

This report will highlight areas of good practice, but unfortunately it will also be necessary to reiterate problems identified in previous reports and moderators expressed their disappointment in the number of centres that repeated poor practice recognised in previous years.

The majority of the comment relating to failure to observe general procedures is common to both GCSE Engineering and Manufacturing, suggesting that centres are possibly working to requirements and instructions relating to other qualifications

In many cases centres appear to be following a Design & Technology approach to the delivery and assessment of this programme and are therefore sometimes using assignments which do not accurately address the assessment criteria listed in the specification. Moderators have frequently reported that candidates have undertaken a worthwhile engineering activity that unfortunately did not address the assessment criteria and therefore did not provide evidence of achievement for this qualification. Invariably this was because inappropriate assignments had been presented to the candidates.

A small number of centres did not manage to send work to moderators before the deadline of 15th May '08, and the moderation team endeavoured to deal with late work in order to issue results on time. It was also noted that a few centres appeared to be unsure whether candidates had been entered for GCSE Engineering or GCSE Manufacturing. This caused a significant work load for moderators who tried to ensure that candidates were not disadvantaged by centres inability to conform to Awarding body requirements.

There continues to be confusion over the form of assessment for this qualification. Although candidates are expected to produce a portfolio of evidence to meet the assessment criteria, this should be as the result of assessment activities which are separated from teaching and learning activities. The portfolios should not be a record of course work, but should record what the individual candidates did during assessment processes and how they met the assessment criteria. Candidates should be taught the content of the 'What you need to learn' section of the specification, and be provided with the opportunity to practice skills and techniques before being presented with an assignment designed to assess their knowledge and skills. In many cases it is clear that teaching is undertaken at the same time as assessment. This is inappropriate and frequently resulted in significant loss of marks.
The assessment of these units is best carried out after all teaching and learning activities have been undertaken. This enables candidates to perform to the highest possible degree of skill and independence. If teaching and learning takes place during the assessment activity it is difficult for candidates to work independently and also they will not have had the opportunity to practice their skills.

Some centres clearly used group discussion and statements provided by teachers in the portfolios. This resulted in severe loss of marks since the portfolio should record the individual's achievement during the assessment process. Assessors should refer to pages 9 and 10 of the specification for guidance on supervision of students, authentication of work submitted and application of the mark bands.

Both of the internally assessed unit require candidates to build a portfolio of evidence. Where candidates produced clearly ordered portfolios which grouped evidence to meet individual assessment criteria, assessors' tasks appeared to have been very much simplified and also candidates presented evidence to meet each of the assessment criteria. However some centres did not develop portfolio building skills and candidates presented collections of ill-defined work. In these cases assessment was frequently not accurate and candidates were assessed incorrectly.

Portfolios should be securely bound and include:

- Candidate Authentication Sheet
- Title page with the relevant specification name and number, candidate name, candidate number, centre name, centre number, and date;
  The title page must be in addition to the Mark Record Sheet which does not form part of the portfolio and is removed when the work has been moderated. In many cases work did not carry any means of identification after the Mark Record Sheet had been removed.
- Mark Record Sheet for the unit to be moderated
- Clear page numbering
- Contents list

It is disappointing to note that in many cases this information was either not available or, in some cases, was incorrect.
It is inappropriate to use plastic wallets as binders for multiple sheets of evidence. The use of plastic wallets is not forbidden, but should be restricted to containing materials which can be read without removal. Similarly bulky folders, such as lever arch files, are not acceptable because they are difficult to transport and frequently become damaged, subsequently failing to bind sheets adequately. Moderators reassembled these portfolios in an appropriate order wherever possible. However this was not always possible.

Some moderators reported that it was difficult to reconcile marks awarded by assessors with the evidence provided by the candidates. This may be due to assessors' judgements being formulated in respect to other criteria than those prescribed by the specifications. Centre should recognise that moderators can only recognise achievement where there is clear and auditable evidence to meet the criteria of the relevant units.

Some assessors continue to fail to provide indication of where achievement had been recognised. It is a regulatory body requirement that assessors provide page numbers to indicate where evidence had been recognised. In cases where page numbering was not provided the moderators applied individual judgement to identify where evidence was considered to have been recognised. However in these cases it was not possible to comment on assessment decisions with any certainty.

A few centres failed to provide any indication of where achievement had been recognised and moderators found it necessary to remark work instead of trying to agree assessment decisions. All portfolios should include an annotated Mark Record Sheet and the assessor should ensure that:

- All marks are recorded accurately and the arithmetic is correct
- The total mark is transferred correctly onto the OPTEMS or via EDI
- The candidate and the assessor, as appropriate, sign any required authentication.
- Consistent and accurate assessment usually occurred when assessors identified sections of portfolios which met the two different features of each assessment criterion.

It is disappointing to continue to report that some centres failed to record marks accurately, moderators noting that marks recorded on candidate work did not agree with those recorded on OPTEMS forms and also that some centres were not able to provide accurate totals for marks awarded. In these cases moderators sometimes were able to verify appropriate marks by communicating with the centre or assessor individually. However in some cases it was necessary to use the marks recorded on the Awarding bodies system.

Some centres still did not provide any evidence of Candidate Authentication and moderators spent considerable amounts of time contacting centres in order to obtain the necessary authentication forms. In many cases these forms submitted were not correctly signed either by the candidate or the assessor/teacher. It is a JCQ requirement that all candidate work should be accompanied by a correctly completed Candidate Authentication Sheet.

Assessor Annotation

Assessor annotation continues to cause problems. The GCSE Code of Practice requires that assessors record full details of the nature of any assistance given to individual candidates that is beyond that of teaching the group as a whole. Many assessors did not record the degree of assistance provided to individual candidates and significantly similar pieces of evidence for different candidates were often awarded different grades without the assessor substantiating the decisions. This frequently resulted in moderators awarding substantially lower marks due to the lack of appropriate evidence.

Assessor annotation to identify where achievement has been recognised is a mandatory requirement for internally assessed work. The minimum requirement for annotation is to complete the annotation column on the Mark Record Sheet by listing the portfolio page numbers where evidence can be found for each of the assessment criteria. A significant number of centres did not provide annotation and therefore moderators were not able to identify where assessors had recognised achievement. In these cases it was necessary for the moderator to remark the work in order to provide a reliable moderator mark for the available evidence.

It is disappointing to report that some centres failed to record marks accurately, moderators noting that marks recorded on candidate work did not agree with those recorded on OPTEMS forms and also that some centres were not able to provide accurate totals for marks awarded. This lack of attention to detail is unexplainable.

Electronic evidence is currently not admissible for this qualification and therefore it is inappropriate to provide and make reference to evidence contained in electronic storage media such as 'floppy disks' and CD-ROMs.

Witness Testimony

The preparation and provision of Witness Testimony continues to cause major problems in assessment. Candidates should assemble their portfolio and include in it all relevant Witness Testimony. Assessors should then assess the evidence produced.

Frequently assessors' decisions did not match the evidence provided by Witness Testimony. This was probably due to assessors awarding marks based on holistic decisions made during the delivery and assessment of the unit. It is important that assessors recognised that they should only make assessment decisions based on the content of the portfolio.

Whenever process skills are assessed, it is vitally important that Witness Testimony is completed by assessors in order to authenticate Candidate work and provide evidence that Candidates have achieved the level of performance required in the assessment grid. This Witness Testimony must be detailed and state exactly what a Candidate has done and how this meets specified assessment criteria during assessment activities.

In many cases assessors commented on candidate performance during teaching and learning activities. This form of evidence is not relevant. The witness testimony should relate to candidate performance during assessment.

It is strongly recommended that assessors use the appropriate forms provided in order to record in detail Candidate activity and the degree of independence demonstrated in the activities.

All witness testimony must be signed and dated by the witness.

Witness testimony should normally be supported by other forms of evidence such as annotated photographs, records of measurements etc. In some cases assessors provided statements that Candidates had met all required quality standards. In these instances the statements should be supported by records of measurements and comparison with the required standards. Similarly it is inappropriate for an assessor to record that a Candidate worked safely at all times. Witness testimony must state details of Candidate activity and equipment used accompanied by dates when observations were made. General 'all encompassing' statements are inadmissible.

It should be noted that the Mark Record Sheet does not form part of the Candidates portfolio and therefore it is not appropriate to use this form to record assistance provided and skills achieved.

There is a wealth of teacher support materials which include templates suitable for the presentation of evidence. However some teachers appear to have provided too much assistance and guidance on the completion of these templates. It is inappropriate to advise candidates on the statements and content of sections of the templates. The candidates should be able to complete templates such as tables without guidance such as banks of possible statements.

Assessment of the Units

Many centres provided evidence of having benefited from the wealth of exemplar materials now available. This included the use of templates which greatly assisted the candidates in the documentation of suitable evidence. However a significant number of centres still do not appear to have availed them selves of this valuable material. This has inevitably disadvantaged some candidates.

A significant number of centres failed to differentiate between learning and teaching activities and assessment activities. Candidates who performed well generally showed clear evidence that they had been taught and provided with opportunity to practice their skills before being presented with an assignment intended to provide the evidence to meet the assessment criteria. Candidates who were subjected to continuous assessment whilst still undergoing teaching and learning activities generally performed poorly. The assessment of these units is best carried out after all teaching and learning activities have been undertaken. This enables candidates to perform to the highest possible degree of skill and independence. If teaching and learning takes place during the assessment activity it is difficult for candidates to work independently and also they will not have had the opportunity to practice their skills.

It continues to cause disappointment to find a greater number of low ability candidates selected for this programme. The programme should reflect the rigours of any other GCSE programme and should also reflect vocational practice found throughout the manufacturing industry. Where centres subjected candidates to simple handicraft exercises candidates achieved poor results.

This is a vocational qualification and centres need to provide candidates with access to up-to-date vocational resources. Where teachers do not have industrial knowledge it is important that centres generate good links with industry in order that candidates may understand industrial processes. Too often candidates demonstrate little understanding of engineering industrial practices other than those applicable to the school workshop. In order to meet the higher grades candidates must be able to show some application of industrial procedures.

The assessment of these units is best carried out after all teaching and learning activities have been undertaken. This enables candidates to perform to the highest possible degree of skill and independence. If teaching and learning takes place during the assessment activity it is difficult for candidates to work independently and also they will not have had the opportunity to practice their skills.

In general terms progression across the mark bands is characterised by:

- Increasing breadth and depth of understanding
- Increasing coherence, evaluation and analysis
- Increasing independence and originality.

Therefore summative assessment should occur after all teaching and learning experiences have been undertaken in order that the candidate may demonstrate the highest achievable levels of understanding and independence and originality.

When considering work to meet the higher mark bands it may be helpful for centres to consider the following explanations which are provided in the specification:

Breadth:	Range of ideas Alternative Solutions Range of information services
Coherence:	Structured and consistent work
Evaluation:	Judging the validity of results Self criticism Identifying solutions
Independence:	Free from outside control; not subject to another's authority, Without support and guidance
Originality:	Inventiveness, ingenuity, creativity, innovation, imaginativeness, uniqueness.

Candidates achieved most success when they were presented with completely unrelated assignments for each of units one and two.

Moderators generally recognised an improvement in the quality of evidence provided by many candidates. However many centres still failed to award marks as explained in the Guidance for Teachers - Assessment Guidance – Awarding Marks.

When assessing the evidence assessors must refer to the evidence requirements for the unit. Marks are awarded for evidence to meet the bullet points listed in the evidence requirements (listed on pages 22 to 27 for unit 1, pages 35 to 40 for unit 2. This guidance identifies two aspects to each assessment criterion, and also explains the procedures for awarding marks when a particular criterion has not been fully met. Therefore in order to be awarded full marks for any individual criterion a Candidate must produce evidence to meet both of the bullet points identified in the specific criterion in the evidence requirements for that unit.

Unit 1: Design & Graphical Communication

Moderators were again instructed to work very closely with the evidence descriptors provided in the Guidance for Teachers section of the specification. This section provides examples of the type and level of evidence required to meet each of the mark bands for specific assessment outcomes. Moderators also used the Portfolio Marking Guidance to identify the type of evidence required to meet mid band requirements.

Candidates must be provided with a written client brief which should be included in their portfolio. Many candidates failed to include a copy of the client brief in the portfolio. This made it difficult to identify how the candidates had analysed this brief.

It is not appropriate to allow candidates to choose their own design topic. However it is acceptable to provide candidates with a number of different briefs from which they are required to select one most appropriate brief, since this approach helps to ensure candidates undertake individual, rather than group, design activities.

It is not appropriate to undertake the design activity as a group.

The design activity must be based on an Engineering solution. This is not a general product design but should be based on an Engineering problem. Therefore the design options should include various methods of overcoming engineering problems. The solutions should include the use of some scientific principles and calculations. Those candidates undertaking general product design and mainly considering only aesthetic values were significantly disadvantaged. Candidates who were set simple engineering problems to overcome frequently achieved better results than those being asked to design, or redesign, an engineered product. Candidates who were set the task of designing products such as MP3 players and 'personal communications devices' were frequently only able to consider aesthetic values and therefore generally failed to meet many of the higher mark bands. These types of products would often be difficult for an experience and fully qualified engineer to meet many of the assessment criteria at the higher levels.

In many cases candidates failed to demonstrate how specific features of the products or systems were intended to work. Therefore simple statements such as 'switch' were considered as low level responses. In order to meet the requirements of a high level response a candidate would be expected to provide details such as a circuit diagram which indicated the electrical source and how the circuit would be completed.
Many candidates only identified features in outline, even though assessors appeared to recognise high level achievement.

It is disappointing to note that many candidates are still being requested to design articles such as bottle openers, CD racks, shelves and stands. This type of focus usually triggers a simple 'product design' approach which mainly involves aesthetic appreciation. Also in these cases candidates were frequently not able to consider appropriate scientific principles. Candidates must consider engineering features in order to succeed in this unit. The engineering features relating to a 'cycle stand' would most probably include an appreciation of stability, centre of gravity, strength, maximum stress and possibly strain. Therefore they must be taught the appropriate scientific principles before undertaking the design activity.

Many centres failed to provide the candidates with an opportunity to use typical standard symbols. A good design brief would require a candidate to consider mechanical and either electrical/electronic or pneumatic/hydraulic features. A product or service that only includes mechanical features would limit candidates' ability to achieve some of the higher mark bands. Candidates should be able to recognise and use symbols for components and features such as:

- Electrical/electronic components – resitors, thermistors, LEDs, capacitors, bulbs, batteries, motors, buzzers, variable resistors, diodes
- Mechanical features – holes, screw threads (internal and external)
- Dimensions – toleranced dimensions, radii, centres, springs
- Pneumatic/hydraulic valves, cylinders, reservoirs, pipework, filters.

It is important that centres recognise that is not a 'design and make' activity, although the manufacture of a prototype could demonstrate that the product meets the clients brief, and could form a useful part of the presentation.

Some candidates work identified unfair leading by teachers. In order to meet the higher mark bands the majority of the work should be produced by the individual Candidate, assistance by the teacher inevitably restricting achievement to the lower levels. Group work and brainstorming may be appropriate at the very beginning, but the generation of ideas and solutions must be that of the individual. Where moderators recognised significant similarities, the portfolios were referred to the awarding body for appropriate action. It is disappointing to note that a significant number of assessors failed to recognise individual work. In some cases assessors continued to award high marks when the candidates work recognised that group work, sometimes led by the teacher, had been undertaken. There was also frequently evidence that banks of possible statements had been provided for candidates. In some cases teachers attempted to justify this approach by explaining that the candidates had difficulty with written English. The evidence should be the candidates own work. If the candidate cannot adequately explain their understanding in a written format, it may be possible to use witness testimony to record a candidate's oral performance to support written evidence.

a) An analysis of the brief with key features of the product or service

The specification recognises the following as client's needs: Cost, Quantity required, Intended market, Timescales, Function,
The key features include: styling, aesthetics, size, quality standards and performance.

It is not expected that a candidate should explain all of the key features and client needs in order to be awarded higher achievement. However a candidate should have listed a significant number of the key features of the design brief and also explain the main clients' needs and the main key features of the product.

In order to demonstrate high level achievement candidates should be able to recognise how the different needs and features would affect the design.

b) Details of the product criteria and production constraints

The criterion demands that the candidate produce a design specification which includes details of the product criteria and production constraints.

Product criteria include: criteria related to the products function, styling aesthetics, size, performance, intended markets and maintenance.
Production constraints include: criteria related to scale of production, cost, production methods and materials, quality standards and regulations.

Many candidates found difficulty in meeting the higher mark bands of this objective, concentrating significantly on aesthetic values.

A design specification is generally a list of all the relevant details which must be included in the design. This list is necessary to help candidates to produce suitable design solutions and to check that possible design ideas will meet the client's needs. Therefore it will be useful in achieving success against assessment criteria (c), (d) and (g).

However in order to achieve the highest marks it is essential that candidates explain these details and demonstrate an understanding of how they will affect the design activity.

c) A range of ideas and design solutions

Candidates continued to produce design ideas which lacked sufficient detail, frequently making reference to features which were not subsequently explained. A product designer may suggest that a feature should be provided. However the design would then be referred to an engineer to demonstrate how this feature would be achieved. It is this information which would attract the higher marks. Therefore, for example, the positioning of wheels should be accompanied by an explanation of how these would be attached, including features such as bearings, stub axle, and suspension details.

A common failing was that candidates produced only one design idea, or produced one idea in greater detail and others in outline only. This made it difficult for them to achieve at the higher levels for criterion (d), testing and selection of the final design solution. It is expected that candidates produce a minimum of two design ideas which should be developed in sufficient detail to enable objective decisions on which design most accurately meets the clients' needs.

Many candidates again concentrated on aesthetic qualities and failed to consider engineering details or simple scientific principles. However in some cases the scientific principles involved were of such complexity that candidates would not be expected to be able to understand them. In these cases the focus of the assignment was inappropriate. In many cases candidates were disadvantaged by a being asked to design a product which utilised scientific principles which were too complex for this level of candidate. It is recognised that candidates may be motivated to design a product such as 'a personal communication device'. However it is unlikely that they would have sufficient detailed knowledge to facilitate this activity. Similarly the design of systems of electricity generation should include an understanding of the basic principles involved. However it would be acceptable for candidates to incorporate in their designs some components or features which incorporate scientific principles which they do not understand. If a candidate incorporated a PLC (programmable Logic Controller) into a locking system it would not be necessary to be able to explain how the PLC worked. However it would be necessary to understand such features as input and output signals and appropriate voltages.

The use of scientific principles does not necessarily involve the application of complex formulae; however simple statements such as 'I think that it should be strong enough' cannot meet the higher levels for this aspect of the criterion. Similarly, when considering electrical or electronic circuits, candidates should be able to identify suitable energy sources and to be able to show how features such as input voltage would be achieved.

In order to demonstrate high levels of achievement candidates must produce 'imaginative' designs which do not rely on established market-leading products, or that offer a new slant on an existing product or service. A significant number of candidates continued to research existing products in order to select the 'best' solution. This approach did not necessarily meet the highest levels of achievement, unless the candidate provided evidence of individual design activities.

Some centres continued to set inappropriate design tasks such as the design of simple vices. It is important that candidates are asked to design some engineered product or engineering system which is sufficiently complex to require the inclusion of a range of different components as identified on page 21 of the specification.

Some candidates were provided with design briefs which were so open-ended that almost anything would meet the clients' needs. A holding device might conceivably be a 'zip-tie' or a computer controlled fixing device incorporated in a machine centre.

d) Evidence of how you tested and selected the final design solution

In order to meet this criterion candidates are required to devise suitable methods to compare the characteristics and features of their different design solutions with the design specification in order to identify the solution that best meets the client requirements. Frequently candidates were not able to use the design specification as a basis for these testing activities. In many cases assessors awarded high marks when candidates had failed to consider some of the more important aspects of their analysis of the clients brief. The purpose of a design specification is to clearly state the criteria which any design solution should/must meet.

Those centres which used modified forms of the template produced in the Resources Pack appeared to have benefited the candidates since it provided a structured approach to the testing procedures. However it must be recognised that the use of simple tables with the awarding of arbitrary scores would be sufficient to meet low level achievement. In order to meet the higher levels the specification recognises a need for objective testing and an explanation and justification of how the final design solution was chosen, and how it meets the design criteria. This may be achieved by an explanation of why the design met specific design criteria.

Many candidates failed to state which design solution best met the design criteria. It is important that candidates state clearly which design idea is to be selected as best meeting the design criteria. In order to meet this aspect of the assessment criterion at level 1, candidates are required to provide a brief outline of how their chosen final design solution meets the design criteria. This could be a simple statement recognising which design criteria are, or could be met. Once this statement has been made it should be possible for candidates to then provide a detailed description or justification of how the final design solution meets the design criteria.

If this criterion were to be addressed in respect of an 'inspection lamp' it would be necessary for the candidate to be able to show, not only that the product would provide appropriate light conditions, but also that it meets criteria such as stability i.e. that the light would be secure and that it could be appropriately positioned. This might entail mathematical modelling or manufacture of a working prototype. Similarly the candidate would be expected to demonstrate a consideration of such features as: cost, size, weight, maintenance, corrosion resistance etc.

e) Evidence of how you selected and used engineering drawing techniques

It is not a requirement that candidates should make a verbal presentation to an identified audience. However the final design solution should be submitted to a client audience and knowledge of the make up of the client audience will help candidates to meet the higher mark bands of part of this criterion. Candidates may be significantly helped by a brief which identifies the make up of the group to whom the final proposals will be submitted.

Candidates often failed to state why they were using different techniques within the range. In order to meet the higher mark bands candidates should present evidence to demonstrate that they have considered the purpose of the drawing and the intended audience In order to meet the higher mark bands candidates would normally be expected to use a significant number of techniques from the range identified on page 17 of the specification. This range includes: freehand sketches, perspective views, block and flow diagrams, schematic and/or circuit diagrams, orthographic projection, assembly and exploded diagrams. In many cases only two of the above lists of techniques were used by candidates who were wrongly recognised as achieving mark band 3 by assessors. An appropriate range of techniques will have been used if all aspects of the design and design specification have been adequately explained.

Centres should recognise that the use of CAD is to be encouraged. However CAD does not constitute a drawing technique in itself. Candidates should recognise which technique they are to use through the application of CAD. Many assessors wrongly recognised higher achievement for a candidate stating the reasons for using a specific CAD software package.

f) Engineering drawings and technical details

Once again many candidates provided high quality graphic illustrations produced both manually and with the aid of CAD. These illustrations mainly consisted of various perspective drawings. Unfortunately these illustrations do not constitute engineering drawings and do not conform to any specific convention.

This criterion specifically relates to Engineering Drawings which comply to appropriate sector specific standards. These standards may be:

BS8889 – which mainly relates to orthographic projection
BS3939 – which mainly relates to circuit diagrams
BS2917 (or other acceptable Fluid Power Standards such as DIN and CETOP) - which mainly relate to fluid power circuit diagrams.

Therefore the drawings produced to meet this criterion must be:

- Orthographic projection
- Circuit diagrams.

Many candidates continue to use commercial software packages which do not produce technical drawings which conform to any sector specific standard. It is important in these cases that they recognise where these drawings depart form the standard.

Candidates are not expected to have occupational competencies or to be working to commercially accepted standards. However all engineering drawings and diagrams should comply with sector specific standards and conventions. Many candidates produced drawings that did not have the minimum of title, name block, scale and borders.

Many candidates were not provided with a client's brief which encouraged them to use a suitable range of components. Candidates must be given the opportunity to use common standard symbols for electrical, electronic or mechanical features.

g) Evidence of how the solution meets the criteria with suggested modifications to improve its fitness for purpose

This criterion is best treated as the candidates' opportunity to 'sell' their design solution to a client by presenting the final design solution and also by explaining why this solution was considered to most accurately meet the clients' requirements in comparison with other rejected ideas. Candidates should explain how their solution met the key features of the design brief and the design specification. This activity may also provide an opportunity for feedback from the client and for the candidate to identify relevant modifications to possibly improve the products fitness for purpose.

Modifications should be made in response to feedback. However this feedback need not necessarily be provided at the end of the activity. The most practical, and industry standard, method of obtaining feedback is to refer to the client/s during the design process. Records of this contact could be used as evidence of having made modification in response to feedback.

Unit 2: Engineered Products

The assessment requirements of this unit demand that the candidate produces one engineered product using engineering drawings and a product specification. During the teaching and learning activities it is acceptable to make a range of products which use various processes. However the assessment activity should be related to one product which uses each of the following processes:

- Material removal, such as turning, drilling, etching , milling and grinding
- Shaping and manipulation, such as hammering, forming and bending
- Joining and assembly, such as crimping, soldering, adhesion, wiring, threaded fasteners, welding and brazing
- Heat and chemical treatment, such as annealing, tempering, hardening, etching, plating
- Surface finishing, such as polishing and coating.

Where candidates provided evidence of making a range of products, moderators exercised Benefit of the Doubt and selected the product which covered the widest range of assessment criteria to the highest level. However some candidates inevitably were disadvantaged because not all assessment criteria were covered to their greatest ability in the selected product. It should be recognised that this situation is more advantageous than the return of the portfolios because the requirements of the specification were not met.

Unfortunately some centres continue to produce evidence of the manufacture of products which did not allow the candidates to use an appropriate range of processes. The guidance for teachers explains that the product should endeavour to reflect the diverse realms of engineered products, for example by including mechanical and electrical components where feasible to do so.

A number of centres continue to disadvantage candidates by undertaking simple handicrafts/metal-work activities which did not provide sufficient opportunity to meet many of the assessment criteria. The most successful products were those that incorporated mechanical and electrical/electronic features. However some centres concentrated on local skills and specialities such as hydraulics and pneumatics with equal success. The least successful products were traditional apprentice tests such as plumb-bobs, Gee clamps and tool-makers vices. In some cases products were artificially extended to include simple electrical circuits such as lights and alarms. These products frequently failed to attract the highest marks and in some cases candidates only presented evidence of having undertaken one aspect of the project.

It is essential that candidates be provided with a detailed product specification and the necessary engineering drawings to enable the product to be made to the required standards. These documents should be included in the portfolio in order to identify the information provided by the centre. Some centres again failed to provide candidates with the required information and therefore candidates were severely disadvantaged. In many cases it was not possible to understand how the candidates had met the quality requirements for the product because they were not included in the product specification (or Drawings). This failing also raised doubts about the candidates' ability to interpret drawings and specifications, since the information would most probably have been provided by the teacher. This would imply that independence was not demonstrated.

The drawings supplied to the candidates should conform to an appropriate sector specific standard. In many cases the drawings provided by the centres did not conform to any sector specific standard or convention and were frequently in the form of perspective views. It is recognised that in many small engineering situations 'fag packet' sketches are used to produce acceptable products. However this unit requires that candidates can interpret technical drawings and therefore orthographic projection to an appropriate standard (BS8888) should be used.

Witness testimony frequently lacked sufficient detail. Many of the assessment criteria depend on assessment decisions relating to the degree of guidance and support provided by the teacher. However in many cases the assessors made statements implying that candidates worked independently even though portfolios contained evidence of assistance and guidance.
It is inappropriate to make general statements such as 'worked independently throughout the activity'.

a) How you used a product specification and interpreted engineering drawings

Candidates were most successful when good, clear orthographic projection was used to provide manufacturing details and production requirements and a separate product specification was provided. However it is also essential that assessors provide evidence of the degree of guidance and support needed by the candidates. It must be recognised that simple statements that indicate 'independence' are not reliable and therefore should be accompanied by other forms of evidence. This may be in the form of reference to other activities undertaken such as determining tapping sizes or turning speeds.

Candidates generally achieved higher marks when they were posed specific questions which relied on interpretation of either the drawings or the specification for detailed answers. In many cases it was difficult to identify any specific evidence which supported the assessors' marks. Sometimes this was recognised by the assessor and statements such as 'throughout the portfolio' was intended to support high level marks. In these cases candidates were disadvantaged.

b) Information about details of resources and processing requirements and c) information about production details and constraints

These two criteria relate to production planning activities. Candidates were most successful when they were provided with a template for an industry standard production plan, such as those provided in the resources pack, and were then required not only to complete this production plan, but also to provide justification for the selection of resources and processing requirements. Too often assessors recognised the highest level of achievement for production plans which consisted of simple statements without the extra justification for the resources and processing requirements.

Teachers and assessors are recommended to visit the various web sites available which include exemplar materials generated to provide examples of how this criterion might be fully met.

At the lower levels candidates need to produce a production plan that identifies details of resources used, processing requirements, production requirements and production constraints. The specification recognises these as:

- Resources – materials, parts and components
- Processing requirements – processes, tools, equipment and machinery,
- Production details – sequence of production, scheduling, health & safety factors
- Production constraints – realistic deadlines, how quality will be checked and inspected, health & safety factors.

In order to meet the highest level candidates must be able to explain and justify the features. This justification might include an explanation of why a particular process or piece of equipment was appropriate and why other methods were not used.

Moderators have noted that candidates have completed the production planning aspects after the product has been made. This has been recognised by statements such as 'we marked out the plate…' The production plans should not be a record of what candidates did. Centres must recognise that production planning should take place before the commencement of manufacturing operations. It is recognised that candidates have limited experience in the field of manufacture. However if they have been provided with the opportunity to practice production planning before the assessment process, they should have sufficient knowledge and experience to make realistic plans from analysis of the drawings and specifications at the appropriate time.

Where candidates received substantial assistance from the assessor or other supervisors their achievement was not considered to be at the higher mark band.

d) How you selected and used materials to safely make your product

Candidates frequently provided little evidence to meet this criterion even though assessors awarded high marks.
Engineering product specifications and drawings normally detail which materials are to be used in making an engineered product. This particular assessment objective relates to the candidates ability to select from a range of engineering materials the appropriate materials to meet the product specification and to use them safely. This could mean that a candidate can identify aluminium from a range of materials and choose a suitable piece of raw material to ensure the minimum amount of waste. Candidates would also be expected to be able to identify other suitable materials and to justify why the chosen materials would be most appropriate.
The evidence of safe use and skill and accuracy was most effectively provided by a combination of annotated photographs and witness testimony.

It was disappointing to note that in many cases assessors had accepted statements which were clearly incorrect. Aluminium is not strong or hard. During the teaching and learning activities it is expected that candidates would have the opportunity to explore the typical engineering properties such as hardness, toughness, elasticity, conductivity etc of a range of common engineering materials. This would also provide the necessary understanding for parts of unit 3 assessment.

e) How you selected and used parts and components to safely make your product

It continues to be disappointing to note that many candidates are required to make inappropriate products which did not include the use of a sufficient range of components.
In these cases it is difficult for candidates to achieve success in this assessment objective. However many assessor continued to award high marks for this criterion even though components were clearly not included in the product.
As with all other assessment criteria, it is essential that candidates produce specific and auditable evidence to meet the criterion. If witness testimony is to be used, it must be supported by other forms of evidence and at bare minimum should identify which materials have components and parts have been selected and how they were used safely to make the product.

Candidates were most successful when they made a product involving the use of electrical/electronic components.

f) How you selected and used processes, tools and equipment to safely make your product

Many candidates again did not provide sufficient evidence to meet the assessment decisions made by centres. Frequently there was no specific evidence of selection of processes, tools or equipment. In many cases candidates were clearly instructed which processes to use, but assessors continued to award high marks. This assessment objective was most successfully met by a combination of annotated photographs and witness testimony.
Witness testimony should state:

- What the Candidate did
- The degree of skill and accuracy demonstrated
- How they worked safely
- What safety equipment was used
- The degree of independence and confidence demonstrated
- The degree of assistance and guidance provided/needed.

The inclusion of a diary of candidates' activities in the manufacture of the product was often useful. However is should be recognised that these diaries need to be supported by evidence of assessment decisions relating to:

- The degree of independence demonstrated when selecting appropriate processes
- The safe use of processes, tools and equipment
- The degree of skill of skill and accuracy exercised.

Statements such as 'John was the most able student in the group' do not justify high marks.

Assessors must recognise that specific evidence of achievement is essential.

g) How you tested your product and how it complied to the standards required

Candidates are expected to test all aspects of their work to ensure that it meets the standards required. These standards must be clearly stated in the form of acceptable tolerances. The specification should also clearly state what performance is expected from the finished product. Assessors frequently awarded the higher mark band to candidates who clearly had not consistently achieved the main standards required of the product. Similarly candidates should demonstrate objective testing against all requirements of the product specification.
The provision of a detailed product specification assisted many candidates to tabulate results of testing procedures to ensure that the product met the required standards. Unfortunately a significant number of centres still did not provide the candidates with sufficiently detailed quality standards and this disadvantaged the candidates significantly.

Centres should recognise that the final product needs to be checked to ensure that it meets the requirements of the specification in relation to its function.

Principal Examiner's Report Summer 2008
GCSE Engineering/Manufacturing
Unit 3: Application of Technology (5318)
Sector 01 – Printing and Publishing, Paper and Board

General Comments:

Overall, the two sections within this paper produced a good range of responses.

Lower ability candidates often gave generic responses to questions, such as 'quick/fast/cheap' which gained limited marks. Some candidates based their responses on an incorrect context and therefore did not gain marks. The more demanding questions at the ends of Section A and B were difficult for many candidates and consequently many gave inappropriate responses.

It was extremely pleasing, however, to see that the majority of candidates attempted all questions and empty spaces were kept to a minimum throughout the paper.

Most candidates would benefit from being taught examination skills and techniques as often they do not read the questions properly and questions were not answered using the 'state, describe, explain' method.

Section A

Question 1

The majority of candidates correctly identified the products belonging to the Printing and Publishing sector in part (a) and Paper and Board sector in part (b).

Question 2

The majority of candidates correctly identified one of the symbols that represent environmental features on some packaged products, namely the 'recycling symbol' or 'Möbius Loop'. Very few candidates identified the 'Green Dot' as the second symbol, which is surprising, as this has been an established symbol since the early 1990s.

Many candidates could not describe the use of the 'Reminder symbol' or the 'Horseshoe magnet'; for the former, many responses were associated with 'Keep Britain Tidy' or 'throw away in bins', as opposed to recycle in bottle banks (which is the correct answer); for the later, many 'magnetic contents' type responses were evident, which gained no credit as the symbol is intended to inform that the content is steel which can be recycled.

Question 3

A straightforward and generally well answered question. However, a significant element confused ICT terms with Control terms and vice versa. The term 'Assembly robot' was identified as belonging to the ICT Key area by a significant proportion of candidates, which is incorrect.

Question 4

Good responses to (a) included products used in the pre-release materials for past papers or specimen assessment materials, but a number of candidates insisted on using the excluded product, fast food packaging, as the subject for the question. In part (b), candidates generally provided answers based upon processes used within the production stage for the given product.

An explicit manufacturing stage was seen less than the aforementioned, but often resulted in a more detailed answer for (b)(ii). A broad range of answers in the mark scheme meant that generally good marks were awarded for part (b). Part (c) was well answered by the majority of candidates, with 'cardboard' the most popular answer for (i) and strength/durability or improves appearance/colour type answers the most popular for (ii).

Question 5

For part (a)(i), many responses were related to stock control/levels or accessing the contact details of a supplier, and hence the explanation in (ii) was generally appropriate, i.e. 'reduced ordering times'.

For part (b), 'mobile phone' or 'e-mail' were the most popular responses, however, a significant proportion stated computer software such as spreadsheets, which is incorrect. Many responses to the associated benefits were simple terms such as 'quicker' or 'easier', but a good proportion of these answers were qualified, i.e. 'easier as you can roam around whilst talking', and this explanation allowed access to second mark.

For part (c), many candidates noted the general benefits of ICT, i.e. work can be saved, edited/changed more easily, without relating the benefit to the retailer, and hence responses that were awarded good marks included 'can see 3D virtual models of a brand new product before deciding whether or not to sell it' and 'shorter ordering times as ordering is done Just In Time'.

Question 6

Most candidates were able to name an example of at least one systems and control technology, the method it has replaced and explain a benefit.

A significant proportion of candidates gave answers associated with communications technology for (a); otherwise this section was reasonably well answered, with 'robots' the most popular answer.

Part (b) was quite well answered with a lot of candidates using the term 'manual', i.e. 'manual placing', for which credit was awarded. For Part (c), the benefit was generally written in simple terms, such as 'quicker production' or 'more accurate', although it is pleasing to note that some candidates did mention JIT techniques in context.

Question 7

Centres are reminded that the paper is ramped in difficulty and the latter questions in each section are aimed at the more able candidates.

The question required an ability to provide specific responses, by drawing upon specialist knowledge.

Candidates who provided answers that related to the benefits of CAM for the manufacturer and the consumer scored well.

Many candidates provided highly generic responses.

For Part (a) responses such as 'lower costs because less staff are needed as the machines can manufacture automatically once set up' were awarded full marks; a small proportion of candidates read the question as CAD and answered accordingly, which was incorrect.

Part (b) was not answered as well, as lots of responses focused on the manufacturer again, as in part (a); the most popular responses for those who recognised the consumer angle were 'products made to a good standard so less are taken back to the shop' or 'products cost less as the manufacturer can make them more efficiently'; again, a small proportion of candidates read the question as CAD and answered accordingly, which was incorrect.

Section B

Based upon the 'mass produced fast food packaging'

Question 8

A well answered question for both parts. Candidates were able to effectively explain, using notes and sketches, the function of both the expanded polystyrene container and the lid.

The vast majority of candidates had clearly undertaken research based upon the pre-release material; those that provided incorrect responses described the manufacturing process rather than the function.

However, it should be noted that full marks can only be attained with both notes and sketches; a significant number of candidates omitted one or the other.

Question 9

A number of candidates were unable to correctly identify the missing stages in the list. Many tried to give 'Quality Control' as a stage. The correct sequence of stages is clearly outlined in the specification and centres should refer to it. Typically, such candidates were unable to correctly identify the stage where the fast food packaging would be advertised in catalogues.

A very significant percentage of candidates could not adequately describe the Production stage in part (b)(i), providing only generic responses such as 'making it'; some candidates were able to note specific processes, such as cutting/folding/vacuum forming, and others gave responses such as 'inspecting its okay' or 'checking quality', which were awarded credit, but only the highest ability candidates qualified the answer 'following a sequence'.

Part (b)(ii) was generally well answered, with many candidates gaining at least 2 marks, through responses associated with packaging in quantity and transportation.

Few candidates gained full marks as responses such as invoicing and bar coding were rarely seen and answers were rarely developed.

Question 10

Part (a)(i) was well answered. However, many candidates gave generic responses such as 'plastic' when a specific material was required. Popular responses for (a)(ii) included 'more lightweight', 'better at keeping food warm', and 'easier to recycle'; few candidates noted improved hygienic qualities of the given material, which is surprising, considering the pre-release product in question.

Part (b) was also generally well answered; those that had studied the pre-release material were able to offer detailed responses in relation to why vacuum forming is a suitable process for the production of the lid of the cup.

The most popular answers were 'because it's a fast process and you know you will get the same shape every time' or 'as it can be left to manufacture large quantities of packaging automatically and there is very little waste'. Some candidates only gained 1 mark as there was no explanation or second reason given and poor answers explained how the vacuum forming process operates or the suitability of the material.

Part (c) was very well answered with popular responses including cutting, printing, moulding (sometimes more specific), folding and gluing. Part (d) was also generally well answered, with 'lower cost', 'easier to print on' and 'better looking' the most popular answers, but again, such answers were rarely qualified, limiting the number of marks awarded.

Question 11

A very significant number of candidates were unable to correctly state specific examples of automation in part (a), instead stating generic processes for manufacturing fast food packaging.

Further, such responses were often not associated with the production stage of manufacturing. Correct responses included 'robots' or 'conveyor belts', however, these were rarely described for the second mark.

Parts (b) and (c) were answered better, although many candidates repeated responses from part (b) in part (c) and benefits were written in simple terms such as 'quicker production' or 'more accurate' for (b) and 'higher quality product' or 'receive product more quickly' for (c), without further explanation.

Question 12

Part (a)(i) was generally answered well. Part (a)(ii) elicited a mixed response, with a significant element explaining the overall effects of CAM for a company rather than the effects of CAM on the type and size of the workforce. Further, the second effect was often a repeat of the first, and many responses were too generic for a higher ramped question.

Unfortunately, part (b)(i) was left blank by a significant proportion of candidates, with correct answers focusing almost exclusively on an increase/decrease in global warming/emissions.

Part (b)(ii) was similar to part (a)(ii) in that the second effect was often a repeat of the first. Several responses for this question related to recycling or the effects of using control technology for a company or a workforce; all the aforementioned were incorrect, as the answer had to explain the effects of control technology on the global environment. The most popular correct answers were associated with the release of gases into the atmosphere or the use of fossil fuels. Some candidates gained one mark but not the second mark as a result of not expanding their answer.

Question 13

The majority of candidates sitting the examination paper this year attempted this final question. This is pleasing as it is good exam technique for candidates to attempt all questions, even if the response is an informed or 'educated' guess. For part (a) some good answers were seen; the most popular 'positive' responses were based around recycling, biodegradability and less landfill.

Candidates seemed to have a good knowledge of concerns about plastics (i.e. hydrocarbon based, give off toxic gas if burned, animals get tangled up in them) and used this to provide negative, but correct, answers. Some students gave further negative answers associated with the amount of packaging for consumer products. Most candidates found question (b) difficult; some noted that production may be simpler due to modern materials, resulting in lower product costs, but development costs was poorly understood, with many candidates choosing to ignore this part of the question. Some candidates did mention long-term savings and the highest ability candidates noted that newly developed materials could be used in other products to make further profits. Popular, but incorrect, responses focused on how costs have been reduced as a result of the benefits of modern processing technologies, with no mention of modern materials.

In both parts of the question few candidates were able to provide responses that generated full marks, and a significant proportion of candidates used bullet points to respond to both (a) and (b), which, for an 'explain' question, is unlikely to generate full marks.

Again, centres are reminded that the paper is ramped in difficulty and latter questions in each section are aimed at more able candidates.

Principal Examiner's Report Summer 2008
GCSE Engineering/Manufacturing
Unit 3: Application of Technology (5318)
Sector 02 – Food and Drink, Biological and Chemical

General Comments:

Section A and Section B of this paper produced a good range of responses.

Generic responses were often given to questions especially by lower ability candidates; terms such as 'quicker / faster/cheaper' were used limiting the marks awarded. Some candidates were not able to differentiate between the various types and forms of technology appropriately losing them marks through out of context and incorrect responses.

Some candidates had not adequately researched the product in Section B, losing them marks on the questions where detailed knowledge was required. Some candidates made generic responses to questions where a specific product related answer was required. Many candidates would benefit from being taught the research skills, assimilating product and processing data and information.

The more demanding questions at the ends of Section A and B proved a challenge for many candidates, numerous giving either low level or inappropriate responses, however significant numbers did not answer in the context of 'state', 'describe', 'explain'. Most candidates would have benefited from being taught appropriate examination skills and techniques.

Section A

Question 1

The majority of candidates correctly identified the products belonging to the Food and Drink sector in part (a) and Biological and Chemical sector in part (b).

Question 2

The majority of candidates correctly identified both pieces of equipment in table 1(a).

The majority of candidates gave appropriate explanations of the use of equipment in table 2(b). Some answers as to the uses of the mixer and refrigerator did not achieve full marks as they were too generic i.e. 'to mix ingredients', 'to store food' these lacked any extension or explanation.

Question 3

A straightforward and generally well answered question. Some candidates did confuse ICT terms with Control technology terms and vice versa.

Question 4

This question was attempted by the majority of candidates and the products used in previous papers were often used.

4(a)(i) Most candidates answered this question well with little difficulty.

4(a)(ii) Answered correctly by the majority but few omitted the obvious 'to eat'

4(b)(i) A number of responses were one word answers such as 'OVEN', 'MIXING' but were acceptable.
4(b)(ii) generic responses were often used e.g. mixing – quicker, easier.

4(c)(i) The question asked for one modern material, however a significant number of responses were based on currently used materials such as flour, sugar, yeast etc and although accepted it showed that these candidates had little knowledge of modern materials used in the product they chose.

4(c)(ii) There was a significant range of responses. Those candidates who were able to name a 'modern material' generally gave better and more detailed answers to the improvements to the key features of the product than those naming a 'currently used material'.

Question 5

Most candidates attempted this question.

5 (a)(i) The term 'database' was often repeated but without any explanation. Ordering and stock control related responses were common and often led to good answers i.e. reduced ordering times, faster delivery in (a)(ii).

5 (a)(ii) The explanations relating to the benefits were often generic e.g. faster quicker, cheaper and lacked any real application to manufacturing.

5 (b)(i) Generally well answered with 'email' being a popular choice, 'mobile phones' 'walkie - talkies' and 'phones' were also used. It was encouraging to also see EPOS occasionally. A few candidates identified digital cameras as examples of communication technology which were incorrect.

5 (b)(ii) Candidates often referred to their own experiences rather than to manufacturing applications.

5 (c) This question was attempted by most candidates, some confused retailer and manufacturer and gave inappropriate responses. Numerous candidates stated the general benefits of ICT, i.e. work can be saved, edited/changed more easily, without relating to the direct benefits to the retailer. Some candidates referred to making the packaging as an example of CAD and went on to claim that the benefits were that you could print it out – easier and quicker. A number of candidates also mistakenly identified aspects of production and identified lower costs or better quality as a benefit.

Question 6

Most candidates attempted this question. Generally answered well but there were a few candidates who gave 'computer' as an example of control technology without any explanation. However, most candidates were able to name an example of at least one systems and control technology, the method it has replaced and explain a benefit.

Communications technology was often referred to and not systems and control technology as stated in this question. Databases and spread sheets were sometimes mentioned without any explanation.

Robots were a popular choice and the related answers were appropriate i.e. replaced manual handling with able to work longer and making fewer mistakes stated as being the benefits.

Question 7

This question was reasonably well answered. A small number of candidates read the question as CAD and answered accordingly.

The question required an ability to provide specific responses, by drawing upon specialist knowledge and not generic answers, such as those e.g. in part (a) lower costs, less wages stated without specific applications to manufacturing e.g. lower costs because less staff are needed as the machines can manufacture products automatically once set up.

In Part (b) there was some confusion differentiating between consumers and retailers some candidates took consumer to mean retailer. The most popular responses for those who recognised the consumer were 'products made to a good standard so less are taken back to the shop' or 'products cost less as the manufacturer can make them more efficiently', more consistent quality, however few candidates could think beyond the ideas of 'consistent' or 'reliable.

Candidates who provided answers that related to the benefits of CAM for the manufacturer and the consumer scored well.

Section B

Based upon the 'mass produced chocolate chip muffins'

Question 8

8(a) Generally this question was well answered, but it was evident that those who had not adequately researched the product were not able to provide comprehensive or correct responses, therefore not gaining the full marks.

A significant number of candidates responded to this with reference to the appearance of the product, the colour of the product and taste as functions which were not correct.

8(b) A well answered question by most candidates although some did not expand their answers, responding with only single word responses e.g. taste, colour, and appearance.

Question 9

9(a)(i) & (a)(ii) Correctly answered by the majority of candidates.

9(b)(i) A very significant percentage of candidates could not adequately describe the processing – production stage, providing only generic responses such as 'making it', 'this is where the product gets processed', these were not acceptable, 'making of parts and components to a specified standard' was acceptable, but required some detailed explanation especially as to the manufacture of the chocolate chip muffin should have been researched.

References to quality checks, following a specification, correct procedures, references to specific parts of the process e.g. mixing, baking etc were given credit.

9(b)(ii) A significant percentage of candidates could not adequately describe the packaging and dispatch stages, providing only generic responses e.g. 'packing the product', 'dispatching the product' etc. The protection, presentation and transportation seemed to be most common acceptable generic answer given, but required some detailed explanation especially as the packaging and dispatch of the chocolate chip muffin should have been researched.

Those expanding their answers were given credit e.g. applying labels; correct packaging materials, correct storage conditions, checking codes, stock control, assembling orders, sending to customers etc.

Question 10

10(a)(i) Most candidates achieved one mark on this question, few candidates used the generic term of 'additives', which was not acceptable, therefore did not gain any marks. Some candidates referred to packaging materials which were accepted where appropriate.

10(a)(ii) Most candidates provided appropriate follow through when a correct response was made in (a)(i), although generic responses were sometimes used e.g. cheaper etc.

10(b) A significant number of candidates did not attempt this question, but from those who did, the vast majority correctly identified the functions of humectants.

Answers to this part of the question clearly exposed those candidates who had not researched the product adequately and those who had.

10(c) Attempted and answered well by the majority of candidates many gaining two marks. Although the question primarily sorts responses relating to 'health and safety' issues, credit was given to those responding to 'food safety' issues. A wide range of appropriate answers were given, showing that candidates had a good understanding of both aspects.

10(d) Some candidates did not attempt this part of the question and some provided long answers that generated few marks because they missed the important points. Generic responses were frequently used e.g. quick, easy and cheap. Those gaining good marks had a good understanding of modern materials, what they do and their effects and the relationship to increasing sales.

Question 11

11(a) A very significant number of candidates were unable to correctly state specific examples of automation, instead stating generic processes for manufacturing chocolate chip muffins. Examples such as weighing machines, conveyor belts, electric mixers, depositors were sometimes given as examples of automation and where relevant marks were credited.

Some candidates simply gave CAD or CAM etc as examples of automation.

11(b) This part of the question was generally well answered. Generic benefits were often given such as safer, efficient, quicker, but often without adequate explanation.

11(c) This part of the question was answered similar to (b)(i) but with many of the responses repeated e.g. the benefits to the manufacturer and consumer being largely the same. This suggested that a significant number of candidates either did not read the question properly or were unable to differentiate between them.

This is an example of a good differentiating question with the more able candidates providing full and coherent answers

Question 12

12(a)(i) This was a generally well answered, the majority stating a smaller workforce as the main change. A number of candidates explained the overall effects of CAM for a company rather than the effects of CAM on the type and size of the workforce.

12 (a)(ii) This question was answered well by the better candidates although it is clear that some candidates equate the declining workforce as a loss of social life. Some candidates repeated the answers given in (a)(i) with a slight change e.g. smaller workforce followed by fewer workers. Better candidates included training, more skills etc. in their answers. The same effect was often largely repeated in both parts of the question.

12(b)(i) Again was well answered by the better candidates.

12(b)(ii) There were some very good answers with candidates showing clear informed opinions about the environment and associated issues. The vast majority of candidates mentioned landfill, less waste, pollution, release of gases into the atmosphere, the use of fossil fuels, global warming etc. The same effect was frequently repeated in both parts of the question.

Many responses were too generic for a higher ramped question.

Question 13

13(a) The majority of candidates sitting the examination paper this year attempted this part of the question. However the full four marks were difficult for most candidates. This question required an explanation that most candidates were unable to provide in sufficient detail. Some long answers missed the important points where some shorter answers could only generate 1, 2 or 3 marks.

13(b) This part of the question was answered very poorly by the majority of candidates or not answered at all. Many who attempted gave both lengthy and wordy answers which involved a great deal of repetition and often candidates got 'tangled up' and 'lost the thread' of what they were attempting to say. Most of the candidates struggled with development costs, but faired better with production costs. Popular, but incorrect, responses focused on how costs have been reduced as a result of the benefits of modern processing technologies, with little or no mention of modern materials. Better candidates related to modern materials and factors such as longer shelf life and more efficient processing reducing waste products. Four marks were difficult to pick up for most candidates. This question again required explanations that few candidates were able to provide in sufficient detail.

Centres are reminded that the paper is ramped in difficulty and latter questions in each section are aimed at more able candidates

Principal Examiner's Report Summer 2008
GCSE Engineering/Manufacturing
Unit 3: Application of Technology (5318)
Sector 03 – Textiles and Clothing

General Comments:

Overall, the two sections within this paper produced a good range of responses.

Lower ability candidates often gave generic responses to questions, such as 'quick/fast/cheap' which gained limited marks. Some candidates based their responses on an incorrect context and therefore did not gain marks. The more demanding questions at the ends of Section A and B were difficult for many candidates and consequently many gave inappropriate responses.

It was extremely pleasing, however, to see that the majority of candidates attempted all questions and empty spaces were kept to a minimum throughout the paper.

Most candidates would benefit from being taught examination skills and techniques as often they did not read the questions properly and questions were not answered using the 'state, describe, explain' method.

Section A

Question 1

The majority of candidates correctly identified the products belonging to the Textiles sector in part (a) and Clothing sector in part (b). Less able candidates were caught out by 'carbon fibre' in part (a).

Question 2

The majority of candidates correctly identified both components. A significant amount responded in their explanation of 'elastic' in a non- Textiles context.

Question 3

A straightforward and generally well answered question. However, a significant element confused ICT terms with Control terms and vice versa.

Question 4

This question was attempted by the majority of candidates and often the products named were from previous papers.

4(a)(i) Some candidates still named a material and not a product.

4(a)(ii) Answered correctly by the majority.

4(b)(i) A number of simple responses such as 'Sewing the product' or 'Cutting Fabric' but were accepted as being part of the process. Many responded with an incorrect answer of 'sewing machine'. If the response related to a product being sewn, that however was accepted.

4(b)(ii) generic responses were often used e.g. Quicker, easier

4(c)(i) Very good responses here, often linking to materials named in past papers.

4(c)(ii) Generally well answered by candidates.

Question 5

Most candidates attempted this question.

5(a)(i) The term 'database' was often repeated without explanation.
A high proportion of candidates gave incorrect answers that related to 'spreadsheets', 'CAD' or 'computers'.

5(a)(ii) The explanations were often generic e.g. faster, quicker, cheaper.

5(b)(i) Generally well answered, the most popular response being 'E-mail' along with 'mobile phones' and 'phones'.

5(b)(ii) Candidates often cannot able to access the second mark, by not clearly explaining the benefit and its application.

5(c) The majority of the candidates gave low responses, where the benefit to the retailer was 'quicker', 'easier', 'reduced time', 'can see stock levels'.

Question 6

Most candidates were able to name an example of at least one systems and control technology, the method it has replaced and explain a benefit.

A significant proportion of candidates gave answers associated with communications technology; otherwise this section was reasonably well answered, with 'robots' the most popular answer.

The benefit was generally written in simple terms, such as 'quicker production' or 'more accurate', or 'fewer mistakes'.

Question 7

This question was reasonably well answered. In part (a) the question required an ability to provide specific responses, by drawing upon specialist knowledge and not giving generic responses such as 'lower costs', 'less wages'.

Part (b) was not answered as well, as lots of responses confused the consumer with retailer.

Candidates who provided answers that related to the benefits of CAM for the manufacturer and the consumer scored well.

Section B

Based upon the 'mass produced trainers'

Question 8

A well answered question for both parts. Candidates were able to effectively explain, using notes and sketches, the function of both the collar/lining and the boxed toe bumper. The vast majority of candidates had clearly undertaken research based upon the pre-release material; those that could not access full marks were those who did not provide a sketch.

Question 9

9(a)(i) and (ii) A number of candidates were unable to correctly identify the missing stages in the list.

9(b)(i) A very significant percentage of candidates could not adequately describe the Production stage, providing only generic responses such as 'making it'; some candidates were able to note specific processes.

9(b)(ii) A significant amount of candidates could not describe the Assembly and Finishing stage, providing generic responses such as ' put together' or 'adding all the bits'.

Question 10

10(a)(i) was well answered. This year, there were fewer candidates giving generic responses, with a high proportion naming a specific material. There was evidence that detailed research had taken place.

10(a)(ii) Good responses for 'improvement' were given with the explanation of 'how' being mainly generic e.g. 'Better'.

10(b) was also generally well answered; those that had studied the pre-release material were able to offer detailed responses in relation to 'comfort feature', 'support' and 'balance'. Some candidates only gained 1 mark as there was no explanation or second reason, only naming the feature.

10(c) Attempted and answered well by the majority of candidates.

Question 11

11(a) A very significant number of candidates were unable to correctly state specific examples of automation, instead stating generic processes for manufacturing hiking boots. Correct responses included 'automated sewing machines' or 'cutting equipment'.

11(b) Candidates generally answered well in this part of the question. Generic benefits were often given such as safer, quicker but without adequate explanation.

11(c) Candidates generally answered well, as in part (b) but many giving repeated benefits of the manufacturer and consumer.

Question 12

12(a)(i) Was generally answered well, with many giving the response as 'smaller workforce' as the change.

12(a)(ii) Was well answered by the more able candidates. Some candidates repeated the answers given in (a)(i).

12(b)(i) was often left blank by a significant proportion of candidates, with those who did answer often miss-reading the question therefore relating their answer to the workforce.

12(b)(ii) was similar to part (a)(ii) in that the second effect was often a repeat of the first. Several responses for this question related to recycling with the most popular answers being associated with the release of gases into the atmosphere or the use of fossil fuels. Some candidates gained one mark but not the second mark as a result of not expanding their answer.

Question 13

13(a) The majority of candidates sitting the examination paper this year attempted this final question. However the full four marks were difficult to pick up for most candidates. Many candidates accessed one or two marks with reference to re-cycling or waste but they could not expand further to gain the full marks.

13(b) Not many candidates gained more than two marks and in general this part of the question was answered badly. Many candidates left this part of the question blank; those who did attempt the question could not provide answers of sufficient detail.

Centres are reminded that the paper is ramped in difficulty and latter questions in each section are aimed at more able candidates

Principal Examiner's Report Summer 2008
GCSE Engineering/Manufacturing
Unit 3: Application of Technology (5318)
Sector 04 – Engineering Fabrication

General Comments:

Overall, the two sections within this paper produced a good range of responses.

Lower ability candidates often gave generic responses to questions, such as 'quick/fast/cheap/accurate' that gained limited marks. Some candidates based their responses on an incorrect context or misread the question and therefore did not gain marks. The more demanding questions at the ends of Section A and B were difficult for many candidates and consequently many gave inappropriate responses.

It was very pleasing, however, to see that the majority of candidates attempted most questions and empty spaces were kept to a minimum. However many candidates failed to answer Q11 – Automation.

Most candidates would benefit from being taught examination skills and techniques as often they did not read the questions properly and questions were not answered using the 'state, describe, explain' method.

Section A

Question 1

The majority of candidates correctly identified the products belonging to the Engineering Fabrication sector in part (a) and part (b).

Question 2

The majority of candidates correctly identified one of the components – the gear. Typical responses were 'gear' or 'cog'. Not as many candidates identified the 'bearing' as the other component, which is surprising, as this has been used in past papers. Many candidates gave an answer of 'washer'.

Many candidates could not describe the use of the 'Split Pin'. Candidates gave responses such as 'joining materials together of keeping materials apart. Some candidates however did give good responses that talked about holding components in place and the actual operation of the split pin i.e. placing through a pre drilled hole and bending the legs to prevent removal.

The 'Compression Spring' also caused some problems. Candidates gave responses such as 'used in car suspension' and 'to keep material apart'. These responses gained some marks, however the better responses came when answers such as 'used to absorb shock and vibration' were given and then an example of its use.

Question 3

A straightforward and generally well answered question. However, a significant element confused ICT terms with Control terms and vice versa.

The term 'Assembly robot' was identified as belonging to the ICT Key area by a significant proportion of candidates, which is incorrect.

A number of candidates linked the Term 'PLC' with 'ICT' again which is also incorrect.

Question 4

Good responses to (a) included products used in the pre-release materials for past papers or specimen assessment materials, but some candidates insisted on using a part belonging to the excluded product, wheelbarrow, as the subject for the question.

In part (b), candidates generally provided answers based upon processes used within the production stage for the given product or an explicit manufacturing stage. Both resulted in a detailed answer for (b)(ii). A broad range of answers in the mark scheme meant that generally good marks were awarded for part (b).

Part (c) was well answered by the majority of candidates, with 'aluminium' or 'steel' the most popular answers for (i) and strength/durability or lightweight type answers the most popular for (ii).

Question 5

For part (a), many responses were related to stock control/levels or accessing the contact details of a supplier, and hence the explanation in (b) was generally appropriate, i.e. 'reduced ordering times'.

For part (b), 'mobile phone' or 'e-mail' were the most popular responses, however, a significant proportion stated computer software such as spreadsheets, which is incorrect. Many responses to the associated benefits were simple terms such as 'quicker' or 'easier', but a good proportion of these answers were qualified, i.e. 'easier as you can roam around whilst talking', and this explanation allowed access to second mark.

For part (c), many candidates noted the general benefits of ICT, i.e. work can be saved, edited/changed more easily, without relating the benefit to the retailer, and hence responses that were awarded good marks included 'can see 3D virtual models of a brand new product before deciding whether or not to sell it' and 'shorter ordering times as ordering is done Just In Time'.

Many candidates gave inappropriate answers relating to CAD and the ability to send drawings and produce drawings using ICT. This was not related to the distributor.

Question 6

Most candidates were able to name an example of at least one systems and control technology, the method it has replaced and explain a benefit.
A significant proportion of candidates gave answers associated with communications technology for (a); otherwise this section was reasonably well answered, with 'robots' the most popular answer.

Part (b) was quite well answered with a lot of candidates using the term 'manual', i.e. 'manual placing', for which credit was awarded. For Part (c), the benefit was generally written in simple terms, such as 'quicker production' or 'more accurate', although it is pleasing to note that some candidates did mention JIT techniques in context.

Again many candidates gave the answer of CAD, spreadsheets or databases which was inappropriate. However these candidates were awarded marks for Follow Through if benefits were explained.

Question 7

Centres are reminded that the paper is ramped in difficulty and the latter questions in each section are aimed at the more able candidates. The question required an ability to provide specific responses, by drawing upon specialist knowledge. Candidates who provided answers that related to the benefits of CAM for the manufacturer and the consumer scored well. Many candidates provided highly generic responses.

For Part (a) responses such as 'lower costs because less staff are needed as the machines can manufacture automatically once set up' were awarded full marks; a small proportion of candidates read the question as CAD and answered accordingly, which was incorrect.

Part (b) was not answered as well, as lots of responses focused on the manufacturer again, as in part (a); the most popular responses for those who recognised the consumer angle were 'products made to a good standard so less are taken back to the shop' or 'products cost less as the manufacturer can make them more efficiently'; again, a small proportion of candidates read the question as CAD and answered accordingly, which was incorrect.

Section B

Based upon the 'mass produced metal wheelbarrow'

Question 8

A well answered question for both parts. Most candidates were able to effectively explain, using notes and sketches, the function of both the wheel and the hand grips. The vast majority of candidates had clearly undertaken research based upon the pre-release material; those that provided incorrect responses described the materials used to make the product rather than the function. There were unusual numbers of candidates who did not give notes and sketches this year and therefore were unable to gain full marks.

Question 9

A number of candidates were unable to correctly identify the missing stages in the list. Some tried to give 'Quality Control' as a stage. The correct sequence of stages is clearly outlined in the specification and centres should refer to it. Typically, such candidates were unable to correctly identify the stage where the metal wheelbarrow would be advertised.

A very significant percentage of candidates could not adequately describe the production stage in part (b)(i), providing only generic responses such as 'this is where the wheelbarrow parts are made'; some candidates were able to note specific processes, such as machining, pressing forming, moulding, and others gave responses such as 'inspecting its okay' or 'checking quality', which were awarded credit, but only the highest ability candidates qualified the answer 'following a sequence'.

Part (b)(ii) was generally well answered, with many candidates gaining at least 2 marks, through responses associated with 'putting all the parts together and applying a suitable finish to the pan'. Some candidates even gave examples of assembling the various parts of the wheelbarrow.

Question 10

Part (a)(i) was well answered. However, some candidates gave generic responses such as 'plastic' when a specific material was required. A number of candidates gave specific materials such as 'Tubular Steel' or 'Galvanised Steel' which in general was a better response than simply 'Mild Steel'.

This allowed candidates to produce responses for (a)(ii) such as 'strong and lightweight' and 'strong and corrosion resistant'. However, some candidates did not read the question and gave improvements relating to the wheelbarrow pan rather than the frame.

Part (b) was also generally well answered; those that had studied the pre-release material were able to offer detailed responses in relation to why injection moulding is a suitable process for the production of the hand grips. The most popular answers were 'because complex shapes can be produced quickly and they will be identical every time' or 'it is suitable for mass production and there is very little waste'. Some candidates simply explained the injection moulding process and failed to give any reason for the suitability of the process.

Part (c) was very well answered with popular responses such as tube bending, press forming, galvanising, cutting and welding. Part (d) was well answered with popular responses including references to increase strength, reduced weight, improved aesthetics and increased product range. Answers such as 'lower cost' and 'better looking' were rarely qualified, limiting the number of marks awarded.

Question 11

A very significant number of candidates were unable to correctly state specific examples of automation in part (a), instead stating generic processes for manufacturing the wheelbarrow. Correct responses included 'robots' or 'conveyor belts', however, these were rarely described for the second mark.

Parts (b) and (c) were answered better, although many candidates repeated responses from part (b) in part (c) and benefits were written in simple terms such as 'quicker production' or 'more accurate' for (b) and 'higher quality product' or 'receive product more quickly' for (c), without further explanation.

Question 12

Part (a)(i) was generally answered well. Part (a)(ii) elicited a mixed response, with a number of candidates explaining the overall effects of CAM for a company rather than the effects of CAM on the type and size of the workforce.

Further, the second effect was often a repeat of the first, and many responses were too generic for a higher ramped question. Unfortunately, part (b)(i) was left blank by a significant proportion of candidates, with correct answers focusing almost exclusively on an increase/decrease in global warming/emissions.

Part (b)(ii) was similar to part (a)(ii) in that the second effect was often a repeat of the first. Several responses for this question related to recycling or the effects of using control technology for a company or a workforce; all the aforementioned were incorrect, as the answer had to explain the effects of control technology on the global environment.

The most popular correct answers were associated with the release of gases into the atmosphere or the use of fossil fuels. Some candidates gained one mark but not the second mark as a result of not expanding their answer.

Question 13

The majority of candidates sitting the examination paper this year attempted this final question. This is pleasing as it is good exam technique for candidates to attempt all questions, even if the response is an informed or 'educated' guess.

For part (a) some good answers were seen; the most popular 'positive' responses were based around recycling, biodegradability and less landfill and material re use. Candidates seemed to have a good knowledge of concerns about plastics i.e. hydrocarbon based, give off toxic gas if burned; animals get tangled up in them and used this to provide negative, but correct, answers. Some students gave further negative answers associated with the amount of packaging for consumer products.

Most candidates found question (b) difficult; some noted that production may be simpler due to modern materials, resulting in lower product costs, but development costs was poorly understood, with many candidates choosing to ignore this part of the question. Some candidates did mention long-term savings and the highest ability candidates noted that newly developed materials could be used in other products to make further profits. Popular, but incorrect, responses focused on how costs have been reduced as a result of the benefits of modern processing technologies, with no mention of modern materials.

In both parts few candidates were able to provide responses that generated full marks. Again, centres are reminded that the paper is ramped in difficulty and latter questions in each section are aimed at more able candidates.

Principal Examiner's Report Summer 2008
GCSE Engineering/Manufacturing
Unit 3: Application of Technology (5318)
Sector 05 – Electrical and Electronics, Process Control, Computers, Telecommunications

General Comments:

Overall, the two sections within this paper produced a good range of responses.

Lower ability candidates often gave generic responses to questions, such as 'quick/fast/cheap' which gained limited marks. Some candidates based their responses on an incorrect context and therefore did not gain marks. The more demanding questions at the end B were difficult for many candidates and consequently many gave inappropriate responses.

It was extremely pleasing, however, to see that the majority of candidates attempted all questions and empty spaces were kept to a minimum throughout the paper.

Most candidates would benefit from being taught examination skills and techniques as often they did not read the questions properly and questions were not answered using the 'state, describe, explain' method.

Section A

Question 1

The majority of candidates correctly identified the products belonging to the electrical and electronics sector in part (a) and process control sector in part (b).

Question 2

The majority of candidates correctly identified the speaker; however, the LDR gave some candidates problems giving responses such as transistor or thyristor. Part (b) was again well answered by the majority of candidates but few gained full marks by not giving a fuller answer and relying on just a brief statement.

Question 3

A straightforward and generally well answered question with a good representation of full marks being allotted.

Question 4

Good responses to (a) included products used in the pre-release materials for past papers or specimen assessment materials. In part (b), candidates generally provided answers based upon processes used within the production stage for the given product. An explicit manufacturing stage was seen less than the aforementioned, but often resulted in a more detailed answer for (b)(ii). A broad range of answers in the mark scheme meant that generally good marks were awarded for part (b). Part (c) was well answered by the majority of candidates, with ABS the most popular answer for (i) and strength/durability or improves appearance/colour type answers the most popular for (ii).

Question 5

For part (a), many responses were related to stock control/levels or accessing the contact details of a supplier, and hence the explanation in (b) was generally appropriate, i.e. 'reduced ordering times'.

For part (b), 'mobile phone' or 'e-mail' were the most popular responses, however, a significant proportion stated computer software such as spreadsheets, which is incorrect. Many responses to the associated benefits were simple terms such as 'quicker' or 'easier', but a good proportion of these answers were qualified, i.e. 'easier as you can send information in a faster time than ordinary mail', and this explanation allowed access to second mark.

For part (c), many candidates noted the general benefits of ICT, i.e. work can be saved, edited/changed more easily, without relating the benefit to the retailer, and hence responses that were awarded good marks included 'shorter ordering times as ordering is done Just In Time' .

Question 6

Most candidates were able to name an example of at least one systems and control technology, the method it has replaced and explain a benefit.

A significant proportion of candidates gave incorrect answers such as CAD, CNC or database for (a); otherwise this section was reasonably well answered, with 'robots' and PLC's being the most popular answers.

Part (b) was quite well answered with a lot of candidates using the term 'manual' or 'human', i.e. 'manual/human placing', for which credit was awarded. For Part (c), the benefit was generally written in simple terms, such as 'quicker production' or 'more accurate', although it is pleasing to note that some candidates did mention JIT techniques in context.

Question 7

The majority of candidates attempted this question which was pleasing as in previous years it has been poorly attempted. The question required an ability to provide specific responses, by drawing upon specialist knowledge.

Candidates who provided answers that related to the benefits of CAM for the manufacturer and the consumer scored well. Many candidates provided highly generic responses.

For Part (a) responses such as 'lower costs because less staff are needed as the machines can manufacture automatically once set up' were awarded full marks; a small proportion of candidates read the question as CAD and answered accordingly, which was incorrect.

Part (b) was answered well with most candidates achieving at least one mark.

Section B

Based upon the 'mass produced soldering iron workstation'

Question 8

A well answered question for both parts. Candidates were able to effectively explain, using notes and sketches, the function of both the soldering iron bit and the stand. The vast majority of candidates had clearly undertaken research based upon the pre-release material. Again, as in previous years, some candidates failed to provide a sketch which meant full marks for the question could not be awarded.

Question 9

A number of candidates were unable to correctly identify the missing stages in the list. The correct sequence of stages is clearly outlined in the specification and centres should refer to it.

A very significant percentage of candidates could not adequately describe the production stage in part (b) (i), providing only generic responses such as 'making it'; some candidates were able to note specific processes, such as cutting/folding/vacuum forming, and others gave responses such as 'inspecting its okay' or 'checking quality', which were awarded credit.

Part (b) (ii) was generally well answered, with many candidates gaining at least 2 marks, through responses associated with packaging in quantity and transportation. Few candidates gained full marks as responses such as invoicing and bar coding were rarely seen and answers were rarely developed.

Question 10

Part (a)(i) was well answered. However, some candidates gave generic responses such as 'plastic' when a specific material was required. Popular responses for (a)(ii) included 'more lightweight', 'easy to shape/form', and 'larger range of colours'.

Part (b) was also generally well answered; those that had studied the pre-release material were able to offer detailed responses in relation to thermostatic control and how it is used. Some candidates only gained 1 mark as there was no explanation or second reason given. The second part of part (b) was answered well with answers relating in the main to the 'stand' and the 'fuse in plug' but, some candidates referred to H&S/PPE such as 'goggles' or 'gloves' which are not safety features of the soldering iron workstation.

Part (c) was also generally well answered, with 'lower cost', 'more colours' and 'better looking' the most popular answers, but again, such answers were rarely qualified, limiting the number of marks awarded.

Question 11

A very significant number of candidates were unable to correctly state specific examples of automation in part (a), instead stating generic processes for manufacturing. Correct responses included 'robots' or 'conveyor belts', however, these were rarely described for the second mark. CAM and CNC were sometimes stated incorrectly.

Parts (b) and (c) were answered better, although many candidates repeated responses from part (b) in part (c) and benefits were written in simple terms such as 'quicker production' or 'more accurate' for (b) and 'higher quality product' or 'receive product more quickly' for (c), without further explanation.

Question 12

Part (a)(i) was generally answered well. Part (a)(ii) elicited a mixed response, with a significant element explaining the overall effects of CAM for a company rather than the effects of CAM on the type and size of the workforce. Further, the second effect was often a repeat of the first, and many responses were too generic for a higher ramped question.

Part (b)(ii) was similar to part (a)(ii) in that the second effect was often a repeat of the first. The most popular correct answers were associated with the release of gases into the atmosphere or the use of fossil fuels. Some candidates gained one mark but not the second mark as a result of not expanding their answer.

Question 13

The majority of candidates sitting the examination paper this year attempted this final question. This is pleasing as it is good exam technique for candidates to attempt all questions, even if the response is an informed or 'educated' guess.

For part (a) some good answers were seen; the most popular 'positive' responses were based around recycling, biodegradability and less landfill. Most candidates found question (b) difficult; some noted that production may be simpler due to modern materials, resulting in lower product costs, but development costs was poorly understood, with many candidates choosing to ignore this part of the question.

Some candidates did mention long-term savings and the highest ability candidates noted that newly developed materials could be used in other products to make further profits. In both parts few candidates were able to provide responses that generated full marks.

Again, centres are reminded that the paper is ramped in difficulty and latter questions in each section are aimed at more able candidates.

Principal Examiner's Report Summer 2008
GCSE Engineering/Manufacturing
Unit 3: Application of Technology (5318)
Sector 06 – Mechanical, Automotive

General Comments:

Overall this paper produced a good range of responses across the whole paper and the two sections within it.

There was evidence that candidates were not able to identify and explain the use of the split pin in question 2. The more demanding questions at the end of Section B were difficult for most candidates and many gave inappropriate responses. Some candidates gave general responses or based their responses on incorrect contexts and did not gain marks.

It was extremely pleasing, however, to evidence that the majority of candidates attempted all questions and empty spaces were kept to a minimum throughout the paper. Lower ability candidates often gave generic responses to questions, such as 'quick, fast, and cheap' which gained those limited marks.

Most candidates would benefit from being taught exam skills as often they did not read the questions properly.

Section A

Question 1

A good range of responses, well answered by many but distracters caught poorer candidates out in a few cases. The vast majority of candidates selected appropriate products belonging to the mechanical sector for part a) and for the automotive sector for part (b).

A significant amount however did think that a computer monitor belonged to the mechanical sector and safety overalls or especially mobile phones belonged to the automotive sector. In this latter case obviously the hydraulic pump and steering wheel were the correct answers.

Question 2

Part (a) seemed to be answered better than part (b). A large range of answers were however accepted for the gear. Often candidates did not know about the use of the split pin. Some answers like 'to split the metal' or 'to remove riveters' demonstrated some of the desperation these candidates had when trying to answer this part.

Question 3

Generally this question was answered very well. Whilst the materials links were generally good sometimes there was confusion between ICT and control technology.

Control technology is an embedded part of this unit and should be emphasised throughout the delivery.

Question 4

A wide range of appropriate products were evidenced some from last year's pneumatic cylinder or a foot pump or the trolley jack from previous years. Some answers were very similar to the pre-release product such as 'pop riveter'. Explanations were generally sufficient to be awarded a range of marks.

Centres are reminded that products from this sector are wide and varied so candidates should always be able to gain some marks from these types of questions.

Often candidates were unable to give a stage in part (b) where control technology would be used. The most obvious answer here would be within production. Whilst many were very able to state a stage where control technology would be used for part (b) and state a suitable material for part (c) often they failed to maximise their marks when explaining the advantage or describing how the material improves the features respectively.

Candidates should, in this question concentrate on the product stated in part (a) and not the pre-release product.

Question 5

For part (a), many responses were related to stock control/levels or accessing the contact details of a supplier or customers, and hence the explanation in (b) was generally appropriate, i.e. 'reduced ordering times'. Some answers were however close to the use of a spreadsheet. For part (b), 'mobile phone' or 'e-mail' were the most popular responses.

Many responses to the associated benefits were simple terms such as 'quicker' or 'easier', but a good proportion of these answers were qualified, i.e. 'easier as you can roam around whilst talking', and this explanation allowed access to second mark.

For part (c), many candidates noted the general benefits of ICT, i.e. work can be saved, edited/changed more easily, without relating the benefit to the distributor, and hence responses that were awarded most marks included 'the distributor will have less returns as it helps produce more consistent products' and 'shorter ordering times as systems monitor stock levels and react quickly'. Part (c) was mainly answered correctly by only the higher achievers. Very few gave the benefit and how it was achieved.

Question 6

Although often good responses were seen many candidates were unable to give two varied answers between example 1 and 2. Hence the benefits given were also limited. Most candidates were able to name an example of at least one systems and control technology, the method it has replaced and explain a benefit.

A significant proportion of candidates gave answers associated with communications technology for (a); otherwise this section was reasonably well answered, with 'robots' or other forms of automation being the most popular answer.

Part (b) was quite well answered with a lot of candidates using the term 'manual', i.e. 'manual placing', for which credit was awarded.

For Part (c), the benefit was generally written in simple terms, such as 'quicker production', some related to improvements in quality.

Question 7

Some candidates failed to attempt this question. This is the hardest question in section A of the paper.

Some good responses were given by the higher achievers. Often others did not put their answers in the context of the consumer for part (b). Specialist knowledge is required for this question about the application of CAM. Many candidates provided very generic responses.

For Part (a) responses such as 'improved quality because the machines can manufacture automatically and more accurately' were awarded full marks; a small proportion of candidates read the question as CAD and answered accordingly, which was incorrect.

Part (b) was not answered as well, as lots of responses focused on the manufacturer again, as in part (a); the most popular responses for those who recognised the consumer angle were for example 'products cost less as the manufacturer can make them more efficiently'; again, a small proportion of candidates read the question as CAD and answered accordingly, which again was incorrect.

Section B

Based upon the 'mass produced lazy tong riviters'

Question 8

A simple question well answered with many candidates able to gain all marks by using notes and sketches to explain the functions of the handle grip and lattice. Marks were awarded for what the candidates communicated and not how they communicated, although those who either only gave notes or only gave sketches were unable to gain maximum marks. Those that provided incorrect responses described the features of the handle grip or the lattice and what it was made from rather than the function.

Question 9

Whist the responses to this question were better than in previous years some candidates still struggle to recall the stages of manufacture as outlined in the unit specification.

Candidates should be encouraged to use the correct technical terms to describe these stages although many variations such as 'supply of parts' were rewarded for part (a)(i).

It was disappointing to see many responses for part (b)(i) not score maximum marks as production is almost the key stage within manufacturing, particularly when it is considered in the context of engineering.

Question 10

Part (a) of this question provided an opportunity for many candidates to gain three marks, the responses expected needed to be specific materials. It was hard to understand how candidates who had carried out the pre-release work would think that titanium was a suitable material for the handle grip.

Part (b) caused problems for many. It is apparent that many centres had not covered heat treatment in their delivery. Many candidates guessed and thought the main reason for hardening was to improve the strength characteristics, whilst this could be an outcome from hardening it was not the reason in the case of the lazy tong riveter.

It was also surprising how many candidates were unable to give two other processes used in the manufacture of the lazy tong riveters when there was so many to pick from.

The most able candidates were able to gain full marks for part (c) when they responded with a full explanation associated with increasing sales.

Question 11

Many candidates struggled to clearly give a varied response throughout this question. Often correct responses included 'robots' or 'conveyor belts', however, these were rarely described for the second mark.

Parts (b) and (c) were answered better, although many candidates repeated responses from part (b) in part (c) and benefits were written in simple terms such as 'quicker production' or 'more accurate' for (b) and 'higher quality product' or 'receive product more quickly' for (c), without further explanation. The benefits to the manufacturer and consumer given were often the same.

This suggested that a significant number of candidates either did not read the question properly or were unable to differentiate between them.

Question 12

Most responses by weaker candidates for all parts were very simple statements and only attracted minimum marks. The differentiation aspects of this question allowed those who knew about the impact on the type and size of the workforce and the global environment to be rewarded. A significant amount of candidates explained the overall effects of CAM for a company rather than the effects of CAM on the type and size of the workforce.

Some candidates were confused when answering part (b) as their answer was about the global economy, which was a question in a previous paper, and not the global environment.

The more popular correct answers were associated with the release of gases into the atmosphere or the use of fossil fuels. Some candidates gained one mark but not the second mark as a result of not expanding their answer.

Question 13

Generally responses were poor but as a progressive question it differentiated ability levels. Most candidates found this question challenging and as such very few were able to access all of the marks.

For part (a) some good answers were seen; the most popular 'positive' responses were based around recycling, biodegradability and less landfill. Candidates seemed to have a good knowledge of recycling and concerns about plastics (i.e. hydrocarbon based, give off toxic gas if burned) and used this to provide negative, but correct, answers.

Many wrote a lot for part (b) but failed to target their response to the development costs which was poorly understood, and many candidates choose to ignore this part of the question. They did fair better when discussing how the use of modern materials and components had impacted on production costs.

A pleasing aspect did exist again in this paper that some lower achievers were able to gain 'odd' marks for this question. Again, however, centres are reminded that the paper is ramped in difficulty and latter questions in each section are aimed at more able candidates.

Statistics

Coursework internally assessed

Unit 1: 5316 – Designing products for Engineering

Grade	Max Mark	A*	A	B	C	D	E	F	G
Raw boundary mark	42	40	34	28	23	19	15	11	7
Uniform boundary mark	100	90	80	70	60	50	40	30	20

Unit 2: 5317 – Engineering products

Grade	Max Mark	A*	A	B	C	D	E	F	G
Raw boundary mark	42	39	34	29	24	19	15	11	7
Uniform boundary mark	100	90	80	70	60	50	40	30	20

Statistics

Unit 3 – 5318 External examination with pre-release

5318/01 – Printing and Publishing, Paper and Board

Grade	Max Mark	A*	A	B	C	D	E	F	G
Raw boundary mark	100	87	78	69	61	53	46	39	32
Uniform boundary mark	100	90	80	70	60	50	40	30	20

5318/02 – Food & Drink, Biological & Chemical

Grade	Max Mark	A*	A	B	C	D	E	F	G
Raw boundary mark	100	93	84	75	66	57	49	41	33
Uniform boundary mark	100	90	80	70	60	50	40	30	20

5318/03 – Textiles and Clothing

Grade	Max Mark	A*	A	B	C	D	E	F	G
Raw boundary mark	100	80	71	62	53	49	45	41	37
Uniform boundary mark	100	90	80	70	60	50	40	30	20

5318/04 – Engineering Fabrication

Grade	Max Mark	A*	A	B	C	D	E	F	G
Raw boundary mark	100	87	78	69	61	54	47	40	33
Uniform boundary mark	100	90	80	70	60	50	40	30	20

Statistics

5318/05 – Electrical and Electronic, Process Control, Computers, Telecommunications

Grade	Max Mark	A*	A	B	C	D	E	F	G
Raw boundary mark	100	90	81	72	64	56	48	41	34
Uniform boundary mark	100	90	80	70	60	50	40	30	20

5318/06 – Mechanical, Automotive

Grade	Max Mark	A*	A	B	C	D	E	F	G
Raw boundary mark	100	83	75	67	59	52	45	39	33
Uniform boundary mark	100	90	80	70	60	50	40	30	20

APPENDIX 1

Support Paper for Teachers of GCSE Engineering/Manufacturing
Use of Pre-release for the External Examination Unit 5318

The examination for Unit 3 is offered as six different sector pathways. Centres are free to select which sector paper they wish to enter their candidates for. The deadline for entries to be received by Edexcel is 21st March of each year. The pre-release material is posted on the website by the end of September for the examination in June the following year. Where centres have estimated entries for the Engineering or Manufacturing qualification, a complete copy of the pre-release material can be downloaded from the Edexcel website. This pre-release will be in the form of a booklet and will cover all six sectors.

Teachers at new centres should ensure that their Examinations Officer has informed the ECC (Entries Department) at Edexcel of their intention to enter candidates.
The pre-release consists of guidance for the candidates and notes to the centre. Staff at the centre should therefore open this material as soon as it arrives in the centre and read the information for all six sectors before deciding which sector is most suitable for them to support the needs of their candidates.
Generally speaking, Engineering is split into three sectors, Engineering Fabrication, Mechanical/Automotive, and Electrical and Electronic/Computer/Process Control/Telecommunications. Manufacturing is split into three sectors, Food and Drink/Biological and Chemical, Printing and Publishing/Paper and Board, and Textiles and Clothing.

Regardless of the route the centre is planning for the other two units in the qualification, the sector for this unit can be chosen to suit the best support a centre can offer rather than being defined by any preconceived ideas.

The product selected by Edexcel for each of the sectors is a product that is in general use, easy to recognise and easy to obtain. Most of these products would be of a reasonable price to purchase, such as the Cordless Electric Drill, or are already available or owned by centres or candidates, such as the Mountain Bike.
Whilst the internet is a valuable source of information researching for this product, centres should not rely totally on this and may need to be diligent in their own research before deciding which sector is best for their candidates. For some sector products there may be a wealth of materials on the internet, such as food industry information. However, searching for manufacturers of traditional engineering type products may prove more difficult. Often adding the word “manufacturer” when carrying out searches using ‘advanced search tools’ on search engines supplies better results than not entering or using this word alongside the product name.
After defining the sector specific paper, centres need to develop a support strategy for their students.

They need to consider the local support that can be gained from either industry, colleges or even universities, together with the information known to be available from the teacher's initial search and investigation to decide which sector paper to use.

In an area where manufacturer support for the exact product may be difficult to come by, such as the Trolley Jack in the 2005 pre-release, the centre needs to source local engineering support that uses similar processes and techniques to that found in almost any engineering manufacture. A typical way to support the candidates, in this case, would be to visit the local company before the planned visit, establish what the company can show/offer, and then match or simulate this to the manufacturing process in e.g., the Trolley Jack.

Different groups of candidates could be asked to get information on a particular aspect on application of technology from the company visit and briefed to give feedback to the rest of the group on return back to the centre. The teacher's role would be to draw out the similarities between the technology seen and that of the Trolley Jack. Back at the centre the product, in this case, the Trolley Jack, should be made available and dismantled. Again the teacher should be able to relate what is required for the manufacture and application of technology from that seen on any visits to local companies.

The delivery of the vocational curriculum requires that centres support candidates in the context of their course by applying work-related learning techniques to their area of study. Engineering and Manufacturing has the support of SEMTA and local SET Points, as well as all other local support mechanisms such as the Education Business Links Organisations (EBLO) and Work Related Learning Officers, either in schools or LEA. Food manufacturing, for example, has the support of appropriate trade associations and professional bodies such as, for the mass-produced sliced and wrapped loaves of bread in the 2004 pre-release, the Federation of Bakers, and similar baking industry associations may be useful sources. Often Vocational Learning Support Networks 14–16 are available and supported by the Learning & Skills Development Agency (LSDA).

Once the centre has facilitated the research required by the pre-release material and instructions, the teachers should encourage the candidates to consider the usefulness of any materials gained. Often materials will be found on websites; centres need to ensure that the candidates print/copy only pages that are relevant to that required and defined by the pre-release. They should not print masses of web pages. If studied closely the pre-release highlights the areas of knowledge required for the examination and can become the focus for collecting information. Just like an internally assessed unit, the candidates should be encouraged to produce a portfolio of their research. This can then be taken into the examination and used by the candidates when answering the questions in the paper. The research notes and sketches therefore need to be well organised, or they may be more of a hindrance than help. After studying the application of technology associated with the manufacture of the Trolley Jack candidates in 2005 were asked, for instance, to answer questions about coatings used. Therefore this was listed in the pre-release instructions as an important aspect to research for Section B of that paper.

The experience of reviewing responses in previous examinations indicates that centres may be allowing candidates to take into the examination more than their own research notes and sketches, such as practice or previous examination papers, or materials from the Candidate Kit supplied by Edexcel as support materials.

This can damage candidate opportunities when they give a very detailed answer, obviously taken from the practice papers or Candidate Kit, but fail to put their answer into the context of the question being asked. Centres should think about their responsibility in this matter, as candidates may be disadvantaged and not be awarded marks to match their potential. In short, staff in centres should prepare themselves to prepare the candidates to achieve their full potential in the examination without employing strategies that will disadvantage them.

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