OCR
RECOGNISING ACHIEVEMENT

GCSE

# Applied Engineering (Double Award)
# Applied Manufacturing (Double Award)

General Certificate of Secondary Education **GCSE 1492**
General Certificate of Secondary Education **GCSE 1496**

## Report on the Units

## January 2007

**1492/1496/MS/R/07J**

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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## REPORT ON THE UNITS

## GCSE Engineering

### General Comments

Centres are to be congratulated on a general improvement in standards this session, with both good quality portfolio work and examination papers in evidence.

## 4868 - Application of Technology (Written Examination)

### General Comments

Changes to the paper: In previous sessions, this written examination paper was designed to cover the common content of Unit 3 of GCSE Manufacturing and GCSE Engineering, with questions aimed at allowing candidates to demonstrate their knowledge and understanding in both subjects. Following a QCA scrutiny, there are now separate papers for each subject with some common questions. This paper was the first such Engineering paper.

Centres have become increasingly adept at preparing candidates for the product analysis question, and most gain more than half of the available marks. It was felt that this question now requires recall rather than analysis and to maintain the ramp of difficulty, it was repositioned to Q2. It was clear that some Centres are encouraging candidates to note what is required, for example by annotating the main verbs in questions. This approach supported candidates' responses.

On the whole, candidates responded well to the changes in the paper. There were some part questions where performance was limited and these have been noted for future sessions.

### Comments on Individual Questions

**Q1)** The main change in the format of this question was that it specific products from Engineering sectors are given for parts (a) and (b)

- **(a)** Most candidates answered this part well gaining full marks.
- **(b)** Many candidates failed to gain marks because they stated different products from those given in part (a).
- **(c)** More able candidates gave at least one appropriate response, but many struggled, suggesting for example that sectors made researching products easier.

**Q2)** Most candidates were well-prepared for this question and there was a wide range of products. In some cases the marks awarded to candidates were limited by the technology used by the product selected. Some had attempted to memorise large amounts of complex information unsuccessfully. More able candidates used correct terminology with confidence and showed understanding. Weaker candidates were able to gain marks from simple statements.
As stated in the question. Marks were not awarded for points copied from the example given.

**Q 3)**

**(a-d)** Almost all candidates were able to suggest an appropriate product, though some then gave a technology or component rather than a material as requested. Marks were not awarded for generic materials eg 'plastic'.

**(e)** Many candidates gave effects on an employer rather than the workforce, possibly reflecting previous sessions' papers.

**Q 4)** The familiar product, a washing machine, enabled candidates to focus their response effectively. Responses varied between centres in each part, suggesting differences in specification coverage. There were some excellent thoughtful responses to the part (f) on difficulties with disposal, contrasting with centres where most candidates left blank spaces.

**(d)** Some candidates described automation in the operation of washing machines rather than their manufacture.

**Q 5)** The first question addressing engineering knowledge elicited a very encouraging response. Almost all candidates were able to gain marks reflecting their ability.

**(b)** Some candidates attempted to allocate sectors to components in this part. Some incorrect responses were based on the common rather than engineering use of terms, for example 'reservoir'.

**(c)** Linking ICT with component supply was a challenge for many candidates.

**Q 6)** Again an Engineering-based question answered well by almost all candidates. More able candidates gave well-thought out responses, using correct terminology particularly to parts a) to c). Other gained marks for simple descriptions, clearly based on their own experience.

**(d)** From a number of centres, candidates' knowledge of production planning was limited.

**Q 7)** This question addressed a key area of the specification. For full marks at this stage in the paper, clear explanations, drawing on an example were required. It is disturbing that many candidates showed little knowledge of modern and smart materials.
Most, however, were familiar with memory devices, gaining at least 2 of the 4 marks available in part (e).

**Q 8)** Responses to this question were inadequate in both structure and content.
Few showed understanding of what is meant by an embedded system, even fewer of Programmable Logic Controllers.

To help candidates structure their answers, the question repeats the advice given on the front cover of the paper.
Please note that the instruction 'discuss' means that you should:

- Identify three relevant issues/points raised by the question;
- Explain why you consider two of these issues to be relevant; and
- Use one specific example or piece of evidence to support your answer.

This is not yet reflected in the structure of candidate responses.

## Principal Moderator's Report

Portfolio units 4866 and 4867

### General Comments

Good practice was shown by centres who used A3 or A4 presentation folders and placed candidates' sheets in individual plastic wallets.

The use of dividers and other methods of separating the five strands of work in the candidates' portfolios was much appreciated as this helped to focus the moderator and made the process of approving centres' marks much more straightforward.

It was particularly helpful where Centres had completed the URS for to identify and locate evidence.

Centres should consider carefully which project will be attempted in Unit 4867, as it is a requirement that the making of the engineered product should use at least one process from each of the following categories: material removal, joining and assemble, treatment processes and surface finishing.

Throughout the portfolio work, candidates show a tendency to focus on the generic, rather than the specific area or product required.

### Comments on Individual Units

#### 4866 - Design and Graphical Communication

Strand a The majority of candidates produced an initial specification from a given design brief. However there still appears to be confusion between a customer or client and the end-user. This prevents candidates from gaining marks in strands (a2) and (a3) as evidence of customer feedback is required. Top performing candidates in (a3) explained and evaluated how customer feedback and associated information was used.

Strand b Candidates generally presented a range of rendered ideas that were suitable solutions to their design brief. Evidence of different drawing techniques was show in the portfolios. However, much candidate time was spent labelling or describing ideas rather than justifying the drawing techniques used to develop a final idea. Best practice showed candidates presenting and evaluating their selected idea with reference to their specification and explaining why the drawing techniques used were appropriate.

Strand c The majority of candidates identified Health and Safety issues, however there was a varied response as to how these issues were explained. Some candidates simply listed key words, others discussed them in general terms. Evidence of good practice examined generic Health and safety issues then developed these to relate to the product being presented.

In far too many instances, candidates showed knowledge of Quality Control but failed to explain how or why procedures would be carried out at each stage of production of their product. Good practice was evident when the candidate reflected on the product being designed and broke down the production process into stages, allowing quality control procedures to be identified and explained.

On the rare occasions that the use of Total Quality Management featured in portfolios, it tended to be dealt with in generic terms rather than being specific to the selected design idea.

Strand d It should be noted that this section is a development of strand b with the selected idea being presented to the customer in a variety of ways. The emphasis must be the presentation of the final product to the customer (ie as a specific 'sales pitch' for the product). Many candidates had spent unproductive time presenting all the work in their portfolio as a PowerPoint slide show, gaining no credit.

(d1) was well answered with sketches and diagrams used to present the design solution, however, in many cases, due to lack of an appropriate customer/client, it was difficult to explain these ideas (d2) and obtain appropriate feedback so that the final solution could be justified.

Strand e In general candidates showed goof understanding of how their product would be made and therefore scored well in (e1).

Production plans were evident for (e2) with stages of making and quality assurance procedures identified, however, some of the information presented was limited. Best practice not only identified issues but explained how and why production methods and quality assurance procedures would be carried out.

A limited number of candidates discussed real world Engineering specifically in relation to their product. On many occasions real world engineering was ignored, or explained in general terms.

**4867 - Engineered Products**

Strand a It is expected that in (a1) a description is given of a simple Engineering process. A number of candidates failed to do this and their evidence commenced with a production plan developed from a given design brief. Marks awarded by these centres were adjusted accordingly, with a deduction of those credited for absent work. Production plans were presented and tended to be comprehensive, detailing the required Engineering processes and Quality Control issues. Good practice was seen in centres where candidates then evaluated their production plans analysing identified Engineering processes and Quality Control procedures.

Strand b Candidates addressing (b1) showed a good understanding of why production plans are important as well as the necessity to meet the product specification. In general, production plans produced as part of strand (a) were adapted to include a time schedule. Several candidates presented a second plan in the form of a Gantt chart which indicated a further time schedule. Best practice saw candidates evaluating their production plan and schedule.

Strand c As in Unit 4866, Health and Safety issues tended to be identified in general terms. It is expected in addressing (c1) that candidates state why Health and Safety is important. Work presented gave the impression that candidates were conscious of Health and Safety issues, as reference was made to personal protective equipment and risk assessments were carried out. However this work needs to be developed with candidates reflecting on the reason why this is important related to the specific product being produced.

Good practice showed and explained Quality Control tests being carried out as well as Health and Safety rules being followed. This work can be presented as an annotated log supported with photographic evidence.

Strand d There was a mixed response to this strand. Some candidates did not attempt it at all while others explained how ICT could be used in general terms, referring to experiences they may have seen on industrial visits, videos or through theory topics covered. These candidates tended to ignore their own product and did not relate ICT specifically to its production.

Best practice was shown by candidates who explained and evaluated how they had used ICT to product their product, or why they chose not to.

Strand e A good understanding was shown by candidates regarding how the product would be produced. However in some cases candidates did not fully answer strand (e1) as they merely listed the stages they would go through, rather than describing the process, identifying appropriate tools and equipment. Best practice was shown by candidates who explained in (e2) why tools and equipment were appropriate to the task.

Very few candidates explained changes that were made to the production plan (or why their planning was accurate and no changes were necessary). Candidates who scored highly in this section described how production processes would be changed to produce their product in 'real world' Engineering.

## GCSE Manufacturing

### General Comments

Centres are to be congratulated on a general improvement in standards this session, with more good quality portfolio work and examination papers in evidence.

## 4880 - Application of Technology (Written Examination)

### General Comments

Changes to the paper:

In previous sessions, this written examination paper covered the common content of Unit 3 of GCSE Manufacturing and GCSE Engineering, with questions aimed at allowing candidates to demonstrate their knowledge and understanding in both subjects. Following a QCA scrutiny, there are now separate papers for each subject. This paper was the first such paper with questions specifically aimed at allowing candidates to demonstrate the Manufacturing knowledge and understanding developed during the course, along with common questions in a format familiar from previous sessions.

Centres have become increasingly adept at preparing candidates for the product analysis question, and most gain more than half of the available marks. It was felt that this question now requires recall rather than analysis and to maintain the ramp of difficulty, it was repositioned to Q2. It was clear that some Centres are encouraging candidates to note what is required, for example by annotating the main verbs in questions. This approach supported candidates' responses.

Candidates responded well to the changes in the paper. There were some part questions where performance was limited and these have been noted for future sessions.

### Comments on Individual Questions

**Q1)** The main change in the format of this question was that it specific products from Manufacturing sectors are given for parts (a) and (b)

- **(a)** Most candidates answered this part well gaining full marks.
- **(b)** Many candidates failed to gain marks because they stated different products from those given in part (a).
- **(c)** More able candidates gave at least one appropriate response, often related to training or careers, but many struggled, suggesting for example that sectors made researching products easier.

**Q2)** Most candidates were well-prepared for this question and there was a wide range of products. Some good examples clearly came from companies studied by the candidates In some cases the marks awarded to candidates were limited by simplicity of the product selected. Some had attempted to memorise large amounts of complex information unsuccessfully.

**Q 3)**

**(a-d)** Almost all candidates were able to suggest an appropriate product, though some then gave a technology or component rather than a material as requested. Marks were not awarded for generic materials eg 'plastic'.

**(e)** Many candidates gave effects on an employer rather than the workforce, possibly reflecting previous sessions' papers.

**Q 4)** The familiar product, a washing machine, enabled candidates to focus their response effectively. Responses varied between centres in each part, suggesting differences in specification coverage. There were some excellent thoughtful responses to part (f) on difficulties with disposal, contrasting with centres where most candidates left blank spaces.

**(d)** Some candidates described automation in the operation of washing machines rather than their manufacture.

**Q 5)** The first question addressing Manufacturing knowledge elicited a very encouraging response. Almost all candidates were able to gain marks reflecting their ability, from single word responses to well-reasoned explanations with an appropriate example.

**Q 6)** Responses to this question were more limited. Candidates studying Manufacturing should know about the stages of production given in the specification. Factors to be considered were required, rather than activities carried out (as in a previous paper). Some candidates gained credit for describing their own making experience, though marks were more accessible through considering industrial production.

**Q 7)** This question addressed a key area of the specification. For full marks at this stage in the paper, clear explanations, drawing on an example were required. It is disturbing that many candidates showed little knowledge of modern and smart materials. Most, however, were familiar with memory devices, gaining at least 2 of the 4 marks available in part (e).

**Q 8)** Most candidates attempted this question, though few gained even half of the available marks, often drawing on the mention of an embedded system in question 4. The wide use of Programmable logic controllers in Manufacturing is not reflected in candidates' knowledge of this area. In some cases candidates did not distinguish between these examples of control technology.

## Principal Moderator's Report

Portfolio units 4878 and 4879

### General Comments

Good practice was shown by centres using A3 or A4 presentation folders with candidates' sheets in individual plastic wallets.

The use of dividers and other methods of separating the five strands of work in the candidates' portfolios was much appreciated as this helped to focus the moderator and made the process of approving centres' marks much more straightforward.

It was particularly helpful where Centres had completed the URS for to identify and locate evidence.

In unit 4879, candidates must show evidence that they have produced a batch of items made up of at least three components or ingredients which should be manufactured by a team with tasks allocated to individuals. In many portfolios it was difficult to establish what had been produced and by whom. Good practice included photographic evidence to show the batch of items produced.

### Comments on Individual Units

#### Unit 4878 - Designing Products to Manufacture

Strand a The majority of candidates managed to produce an initial specification from a given design brief. The issue of the difference between the customer or client and the end user raises concern. The intention of this unit is that the candidate should be working as a designer following a design brief issued by a client. It was obvious that several candidates did not have such information as a starting point.

Once the initial specification is presented, candidates should then gather a range of associated information. This aspect of the portfolio requires careful management as far too many candidates were not sufficiently selective in gathering relevant information.

In strand (a2), a revised specification was generally presented but this area tended to lack the involvement of the client and often decisions were made with reference to surveys carried out with potential end users. Few candidates developed their work into strand (a3) by justifying their final design specification.

Good practice was exemplified by candidates discussing their research findings with the customer/client then presenting and evaluating a revised specification.

Strand b The vast majority of candidates presented a range of ideas in strand (b1). An explanation of the ideas in many cases could only be described as labelling: better candidates not only described their designs but also related them to their design specification.

On occasion it was difficult to distinguish which idea the candidate had selected as no development was evident from the initial design stage. Good practice showed a final developed idea that was evaluated with design decisions justified.

Strand c Candidates recognised the need to identify Health and Safety issues but as in past sessions these often related to general workshop issues rather than specifically to the product being designed.

Quality control issues were identified by many candidates who then failed to develop this aspect without giving sufficient detail as to how checks would be carried out or why they are necessary.

Very few candidates considered Total Quality Management and, when they did, gave a general description rather than relating how the designed product would be checked using a variety of procedures.

Strand d This strand is distinct from strand (b), and work presented here should be a development of the final idea selected in the earlier section. Candidates are encouraged to present ideas to the client/customer. Presentation software is useful here, but it is important that candidates are directed towards 'selling' their product, rather than producing a slide show of the contents of their portfolio.

Good practice used a variety of methods to present ideas in strand (d1), including coloured sketches, 3D and working drawings. The use of CAD was also evident. In strands (d2) and (d3), candidates benefited from involving their client, as this allowed ideas to be explained and justified as well as giving the opportunity to gain valuable feedback.

Strand e Many candidates managed to identify manufacturing processes that would be used to produce their designed product. This, however, did not fully address strand (e1), since a description of how the product would be manufactured in quantity is required. Some candidates' marks were adjusted for this reason.

Real world manufacturing was identified by better candidates. This however must be relevant to the selected product rather than a general summary of production.

## 4879 - Manufactured Products

Strand a Candidates should begin this unit by describing a simple manufacturing process; several failed to do so commencing with a production plan derived from a given design brief. Marks had to be adjusted where centres had given credit for this missing work. Production plans presented tended to be quite comprehensive, detailing the required manufacturing processes and Quality Control issues. Best practice saw candidates evaluating their production plan making reference to manufacturing processes and Quality Control procedures.

Strand b Several candidates did not attempt strand (b1), but those who did tended to score well.

Production plans produced in strand (a) usually included time schedules and identified roles of individual team members. Several candidates presented a second plan in the form of a Gantt chart.

Best practice was seen from candidates who evaluated their production plan indicating how it could be improved and raising points which would allow this to happen. These candidates also reflected on the production schedule, stating how well it had worked, or justified possible changes.

Strand c Most candidates include Health and Safety and Quality Control in their portfolios, but often only in general terms. Strand (c1) requires candidates to describe health and Safety issues, but this is often missing. Evidence of Health and Safety and Quality Control procedures are normally covered in production plans. Good practice not only identifies such procedures, but explains how they would be carried out. Photographs can be used to help highlight key points and evidence procedures being undertaken.

Strand (c3), when attempted, tended to be covered in general terms, particularly Total Quality Management. A definition is often given but not then developed to consider the implications on the job to be produced, stating how systems could be put into place to support Quality Assurance.

Strand d Candidates do address the features of good teamwork, which should be explained rather than presented as a list. Team roles are included in many folders, with good practice being shown by candidates reflecting on why particular roles were allocated.

Strand (d3) continues to be poorly attempted, with some candidates totally ignoring the section especially when they have to consider the impact of buying in components.

Strand e Candidates present information as to how they have produced their product, using a variety of formats including logs, tables and written summaries. Good practice included the use of annotated photographic evidence to show candidate activity.

Tools and equipment were mentioned, but several candidates failed to develop this point explaining why items were appropriate. Many candidates failed to record

changes made during the production of the items. It would be preferable to show evidence in this strand of the batch of items produced by the team.

Real world Manufacturing featured in some candidates' portfolios, but this aspect needs to be developed. Again, coverage was often covered in general terms rather than specific to the batch of items produced.

**General Certificate of Secondary Education**
**Engineering (Double Award) 1492**
**January 2007 Assessment Series**

## Unit Threshold Marks

| Unit | | Maximum Mark | A* | A | B | C | D | E | F | G | U |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **4866** | Raw | 50 | 46 | 40 | 34 | 29 | 23 | 18 | 13 | 8 | 0 |
| | UMS | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 0 |
| **4867** | Raw | 50 | 45 | 40 | 35 | 30 | 24 | 18 | 13 | 8 | 0 |
| | UMS | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 0 |
| **4868** | Raw | 100 | 69 | 61 | 53 | 45 | 39 | 34 | 29 | 24 | 0 |
| | UMS | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 0 |

## Entry Information

| Unit | Total Entry |
|---|---|
| **4866** | 126 |
| **4867** | 76 |
| **4868** | 665 |

## Specification Aggregation Results

| GRADE | A*A* | AA | BB | CC | DD | EE | FF | GG | UU |
|---|---|---|---|---|---|---|---|---|---|
| **UMS** | 270 | 240 | 210 | 180 | 150 | 120 | 90 | 60 | 0 |
| **Cum %** | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 100 |

3 candidates were entered for aggregation this series

For a description of how UMS marks are calculated see;
http://www.ocr.org.uk/exam_system/understand_ums.html

Statistics are correct at the time of publication

**General Certificate of Secondary Education**
**Manufacturing (Double Award) 1496**
**January 2007 Assessment Series**

## Unit Threshold Marks

| Unit | | Maximum Mark | A* | A | B | C | D | E | F | G | U |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **4878** | Raw | 50 | 45 | 40 | 35 | 30 | 24 | 19 | 14 | 9 | 0 |
| | UMS | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 0 |
| **4879** | Raw | 50 | 45 | 40 | 35 | 30 | 24 | 19 | 14 | 9 | 0 |
| | UMS | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 0 |
| **4880** | Raw | 100 | 69 | 60 | 51 | 43 | 37 | 32 | 27 | 22 | 0 |
| | UMS | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 0 |

## Entry Information

| Unit | Total Entry |
|---|---|
| **4878** | 108 |
| **4879** | 35 |
| **4880** | 440 |

## Specification Aggregation Results

| GRADE | A*A* | AA | BB | CC | DD | EE | FF | GG | UU |
|---|---|---|---|---|---|---|---|---|---|
| **UMS** | 270 | 240 | 210 | 180 | 150 | 120 | 90 | 60 | 0 |
| **Cum %** | 0 | 0 | 50 | 50 | 50 | 100 | 100 | 100 | 100 |

2 candidates were entered for aggregation this series

For a description of how UMS marks are calculated see;
http://www.ocr.org.uk/exam_system/understand_ums.html

Statistics are correct at the time of publication

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