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## FOREWORD

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This booklet contains reports written by Examiners on the work of candidates in certain papers. **Its contents are primarily for the information of the subject teachers concerned.**

# DESIGN AND TECHNOLOGY

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## GCE Advanced Level and GCE Advanced Subsidiary Level

Paper 9705/01

Written

### General comments

The performance of candidates was mixed and ranged from poor to the very good. It was evident that in some cases candidates had only limited understanding of the subject matter they had chosen to answer. This was particularly true with production processes and manufacturing techniques where there was sometimes a distinct lack of appropriate technical knowledge and understanding.

Instructions on the front of the paper draw attention to the statement “discuss” within a question. While in some cases discussion was well presented with clear supporting arguments made, in some answers there was evidence to suggest that candidates had not taken sufficient notice of this instruction.

A few candidates failed to answer the required number of questions. A much higher number missed out parts of questions.

The questions on the examination paper require candidates to respond in a variety of different ways, for example, using one word answers, detailed explanations, tables, charts and annotated sketches. It is important that whichever method is used candidates try to make their answers as clear as possible and relate the length and depth of their responses to the number of marks available. A common error in written responses was for candidates to repeat the same point using slightly different words.

### Comments on specific questions

#### **Section A**

#### **Question 1**

- (a) Most candidates were able to identify two appropriate hazards associated with using a strip heater. These were generally related to the user being burnt or toxic fumes being produced if the plastic was over heated.
- (b) Appropriate ways of eliminating the hazards identified in (a) were suggested by the majority of candidates. The use of gloves and working in a well ventilated area were the preventative measures most commonly suggested.
- (c) This part of the question was answered with varying degrees of success. While most candidates suggested either a jig to help drill the holes or a former to aid the bending of the plastic the designs were not always appropriate. A common error was not showing how the plastic would be located on the jig or former in order to make sure that the holes or bends were made in the correct places.

#### **Question 2**

A good number of candidates were able to give a reasonable explanation in each part of this question.

- (a) Correct answers needed to explain that a temporary joint can be assembled and taken apart easily without causing damage to any of the parts. Appropriate examples of a temporary joint include screws, nuts and bolts.
- (b) An example of a moveable joint would be a hinge which while joining two pieces together enables at least one of them to freely move.

**Question 3**

Most candidates were able to display at least some understanding of the process of riveting the three pieces of aluminium together. A good number, however, explained the use of pop rivets rather than the required snap head rivets. Those that did this were still able to access most of the marks available for the question. The required depth of explanation was lacking in some responses with candidates stating part of the process rather than explaining how it would be done. For example “You would drill the holes” or “you would use the pop rivet gun”. Some candidates failed to include the required sectional view through the riveted joint in their answers.

**Question 4**

- (a) A number of candidates incorrectly related their answers to how the bowl would be shaped rather than on the process of annealing. Where the process was understood some good answers were seen. These answers described how the copper would be heated until cherry red and then quenched in water.
- (b) As with part (a) some answers related to the shaping of the bowl. Better answers explained that annealing softens the copper to relieve the internal stresses so that it can be shaped more easily.

**Question 5**

A good number did not answer this question and it was poorly answered by the vast majority of candidates who did. A large number of over complex mechanisms were seen many of which would have resulted in the windscreen wipers having a rotary movement rather than the required oscillating movement.

**Section B**

Many candidates are using too much continuous text in their answers to the questions in this section. In a few cases candidates did not produce any sketches at all.

**Question 6**

- (a) A number of candidates suggested totally inappropriate ways of making the wooden base. It was clearly stated in the question that it was ‘a turned wooden base’ but methods such as ‘cutting it out with a jig saw’ were sometimes suggested. Where a lathe was identified as the correct piece of equipment to use the required depth of explanation was frequently lacking. The use of appropriate tools, equipment and processes needs to be explained not simple stated. For example ‘You would use a lathe’ with little or no explanation about the stages involved. Perhaps because it was a more familiar process to candidates the drilling of the holes for the cables was much better explained than the making of the base.
- (b) Some very good answers were seen to this part of the question with the majority of candidates explaining how the acrylic shade could be made using either vacuum forming or blow moulding. Inappropriate methods of heating the plastic such as a strip heater or blow torch were suggested by a few candidates. Again some candidates failed to give sufficient explanation about how the tools, equipment and processes would be used. Most candidates made some reference to health and safety issues but sometimes the content was general rather than being specific to the tasks being undertaken. For example, statements such as ‘protective clothing should be worn’ were seen without explanation about what clothing or why it should be worn.

**Question 7**

- (a) Many good responses were seen to this part of the question. While most candidates were able to give an appropriate method of joining the base and the sides many answers were let down by poor sketching which often failed to give sufficient details about the joining method. Answers of this type are generally best answered using high quality annotated pictorial sketches. Some responses suggested joining methods, e.g. dovetail joints, which were not totally suitable for the given situation.

- (b) This part of the question was generally poorly answered with many candidates not being familiar with how to lay out a cutting list. Many candidates just drew and dimensioned the different pieces. A good number of inappropriate sizes were seen.
- (c) The majority of candidates were able to describe at least some of the stages involved in applying the painted finish to the MDF. Common errors were to apply only one coat of paint, not to mention drying time, the working environment or to suggest inappropriate ways of cleaning the equipment used.

### Question 8

This proved to be the least popular question in this section.

- (a) This part of the question was often answered at a very superficial level with only vague details about how a centre lathe would be used to make the container. Three stages of manufacture should have been described. Turning the outside diameter, making the step at the bottom and boring out the inside. At least one sketch should have been produced for each stage along with a clear description of how the process would be carried out. This description is often best presented as a series of bullet points rather than blocks of continuous text.
- (b) While some inappropriate methods were seen most candidates suggested the use of files and wet and dry paper. Fewer gave details about how a buffing or polishing wheel could be used in the final polishing stages.
- (c) Few answers gave full details about how the pin would be fixed to either the lid or the container and what would enable the lid to rotate. Some candidates gave good details about how a threaded pin could be used.

### Section C

#### Question 9

- (a) The majority of candidates were able to give at least one appropriate surface finish for the metal gate. The most common correct answers were galvanising and plastic coating.
- (b) While many candidates gained one mark by saying that the diagonal bar made the gate stronger fewer went on to gain the second mark by explaining how or why this additional strength would be achieved.
- (c) This was very well answered. The majority of candidates correctly identified the potential hazard associated with the pointed tops on gate C and went on to suggest that this could be overcome by rounding the top of each piece.
- (d)(i) Some candidates produced some good sketches which clearly explained what was meant by 'tongue and grooved'. A number of answers, however, thought that it meant the framework of the gate to which the boards were fixed.
- (ii) This was generally well answered but a number of responses were let down by poor quality sketches. Many answers only showed a single nail or screw going into each board which would not be sufficient to hold them securely in place.
- (e)(i) Most candidates were able to explain that it would be difficult to attach one of the hinges to gate A because it was made from metal and that each piece of metal only had a small surface area.
- (ii) While most candidates identified the tee hinge as being the most suitable to hang gate D many went on to just list the advantages rather than to discuss them. The better answers made reference to issues such as the hinge having a large surface area that would be in contact with the gate and that it had more screw holes.

**Question 10**

- (a) A fair number of correct responses were seen which made appropriate references about the rectangular shape being easier to manufacture, transport and store.
- (b) Many general answers were seen which stated 'it would make the card stronger' or 'make the outside look better'. Fewer candidates explained how laminating the card with polythene made the material waterproof and made a more hygienic internal surface.
- (c) While many candidates identified relevant issues generally advantages and disadvantages were listed rather than discussed.
- (d)(i) Many candidates were able to identify a suitable plastic for making bottles and state that blow moulding was the process most commonly used in their production.
- (ii) While a good number named aluminium as a metal from which cans could be made few were able to name an appropriate production process.
- (e) Most of the issues raised focused on the fact that all of the materials could be recycled and some answers went no further than to just state this. Again the main problem was that candidates did no more than list various issues. In order to gain high marks in this type of question candidates must explain and interpret these issues as appropriate and introduce evidence wherever possible to support their conclusions and/or arguments.

**Question 11**

- (a) Generally this part of the question was well answered but some responses were not specific enough for example 'outside', 'in the home' and 'in school'.
- (b) This part of the question was frequently poorly answered. Answers were often far too general with only vague references being made to the table's specific use and ergonomics. Answers were sometimes little more than a description of the table.
- (c)(i) The vast majority of candidates displayed a clear understanding of the term 'flat packed'.
- (ii) While most candidates were able to give issues relating to the advantages and disadvantages of buying flat pack furniture fewer made any real effort to discuss the issues they had identified.
- (d) Many candidates failed to relate their answers to 'large one piece table tops' and gave more general advantages and disadvantages of using solid wood and manufactured board. This could well have been a case where candidates needed to read the question more carefully.

**Papers 9705/02 and 9705/04**  
**Coursework Projects 1 and 2**

**General comments**

Candidates should be congratulated on the imagination shown in the production of a wide range of projects. Some work was of an extremely high standard and in line with expectations for Design and Technology at this level of examination. Notable products included: sports equipment storage, electric toothbrush, bedroom work station, car reversing aid, car washing equipment, paint brush cleaner, solar water heater, loud speaker enclosure, shoe design, portable picnic table, car dashboard, spray painting booth, promotional material for various initiatives and organisations in addition to the normal range of domestic furniture and other devices.

The work was generally presented well and design folders were easy to follow. This is helpful to the Moderator as the basis on which the assessment has been made can be seen easily. It is very important that clear and detailed photographs of the models produced by candidates for 9705/02 Project 1 are included in the folders. If this is not done then moderation of this section of the assessment scheme cannot be carried out.

Although the design process can be evidenced in a variety of ways it would assist candidates if folders were structured to reflect the order of the assessment criteria. Where this had been done it was clear to see how marks had been awarded and, generally speaking, the work was of a higher standard as candidates had covered all aspects of the assessment scheme.

There were a few cases where candidates had spent an inappropriate amount of time on certain aspects of their design folders often to the detriment of other sections. The weighting of marks for each section should give some indication of the amount of time to be devoted to that part of the design process for assessment purposes.

Centres are reminded of the need to include the Summary Coursework Assessment Form 9705/2/4/CW/S together with the Moderator copy of the computer printed mark sheet MS1 with the sample of work sent for moderation.

### **Comments on individual assessment criteria**

#### ***9705/02 Project 1***

##### **Identification of a need or opportunity leading to a design brief**

Most candidates gave consideration to the situation in their design brief but a detailed description of the user was not always included. Only when both are included can a clear picture of the design need be identified.

##### **Analysis of and research into the design brief which results in a specification**

Most candidates were able to identify a wide range of existing products but they did not always relate these to the intended situation and user specified in their design brief. This section should not include irrelevant information such as the history of products or information on components, materials and constructions before ideas have been generated and appraised. This stage of the design process should be considered as part of Product Development in Project 2 (9705/04).

Many candidates fell into the trap of simply giving illustrations or descriptions of existing products, often with vast amounts of copied technical detail. For the award of high marks, detail of existing products must be analysed and evaluated in the context of the situation and user stated in the design brief. Detail gathered and observations made should then be carried forward and referred to in the generation of ideas.

The Moderator does not expect to see large amounts of 'cut and paste' at this level of examination and where this technique is used no marks can be awarded unless it is accompanied by the candidate's own detailed observation and comment.

Successful candidates identified and collected data by 'working through' the purpose of the intended product and visualising its use in the design situation.

This section of the folder must culminate in a detailed specification that has evolved from the detailed analysis and research. The specification is most effective when consisting of a list of specific points that can be easily identified and referenced during the generation and appraisal of ideas.

##### **Generation and appraisal of design ideas**

Most candidates produced a reasonable range of design ideas. In many cases the quality of drawing was very high and, as such, information was successfully conveyed. There were examples of high quality work indicating that candidates were able to think in an imaginative and innovative way leading to genuine creativity.

This section of the folder gives candidates the opportunity to explore and record a wide range of ideas however practical or appropriate they may appear at this stage. Unfortunately some candidates approached this in a somewhat formal and stifled way simply concentrating on one or two concepts with these often coming, at the lowest level of performance, from existing ideas.

Candidates should be encouraged to include all evidence of design thinking whatever quality the drawings may be at this stage. As candidates consider their design ideas they need to show through clear annotation of drawings that they have the specification in mind throughout this stage of the design process. The assessment criterion in the syllabus gives a clear indication of what is expected here.

## **Modelling of ideas**

By this stage candidates should have some idea of the design of their intended product outcome. The modelling stage allows candidates the opportunity to explore ideas further either with regard to the appearance of the design or in terms of particular constructional or operating aspects of the design.

Successful candidates considered the most appropriate way of modelling their design ideas in terms of suitable materials and construction methods to be used. The model need not necessarily be of a complete product but may concentrate on one or two particular design aspects still to be finalised. Where products include particular mechanisms or structures it would benefit candidates if they included evidence of modelling of these.

Construction kits can be put to good use when modelling some design features as they can be reused once photographic evidence has been taken. As mentioned earlier it is a requirement of the assessment scheme that photographic evidence of modelling is included in all design folders.

## **9705/04 Project 2**

### **Product development**

This is the opportunity for candidates to take the chosen idea from Project 1 and to consider all aspects of form, materials, finish, construction and production methods in detail. All information should be linked directly to the chosen idea and, where this is technological in nature, should include details of components to be used.

Candidates who benefited most from this development stage took account of the outcomes of modelling and became involved in meaningful trialling and testing of materials and constructions. They also considered how particular shapes and forms could be achieved.

Having developed their ideas through consideration of alternatives, candidates must give the reasons for decisions made if they are to be awarded high marks in this section. Unfortunately, this was the weakest section in many projects leading to uncertainty as to how the product had developed from the final idea to the artefact produced.

The final part of the development should give all details of the intended design solution.

### **Product planning**

Successful candidates planned the production of their artefact before any work commenced. This included an indication of the overall sequence of operations linked to some form of time plan. There is no need for candidates to give detail or show illustrations of basic tasks but it is expected that the order of events will link to sound practical techniques.

Working drawings should provide all the detail required for the artefact to be made by an experienced person. A list of materials and components to be used should also be included.

Unfortunately some candidates produced this section after the product had been completed or simply included photographic evidence of the work in progress. In this way it simply formed a record or diary of what had already happened and showed no evidence of forward thinking. Marks cannot be awarded for this approach.

### **Product realisation**

The quality of the final product and the way in which candidates have independently undertaken its production account for half of the total marks awarded to Project 2. Candidates are expected to take on tasks appropriate to this level of examination and to produce work of a high practical quality and standard of finish.

There was evidence that many candidates had become very involved in the realisation of their developed designs and these products were of a very high quality indeed. It was clear that the artefacts matched the requirements of the specification and could be put to good use.

These candidates had been able to use their own initiative in the making stages and had worked on their own to overcome problems as they arose. Other less successful candidates had clearly required more help and guidance from their teachers.

Centres are reminded of the need to include photographic evidence showing overall views of the product together with close up detail showing the quality of work produced. Without this evidence the Moderator is unable to substantiate the marks awarded.

### **Testing and evaluation**

In many ways this is the section of the design process where many candidates do not seem to achieve their full potential. Very often the evaluation was simply a few unconnected observations, made by the candidates themselves, about problems associated with the making of the artefact or in the production of the design folder. Evaluations of this nature can be awarded few marks.

Meaningful evaluations included evidence of practical testing which led to the identification of opportunities for modifications and improvement. Critical testing of the required nature can really only be successful where the potential user of the product has been involved. It is expected that this will be supported by a meaningful record of testing activity and/or photographic evidence, where this is possible.

Successful candidates referred to the original specification points and commented on the level to which these had been satisfied. A list of the specification points with ticks or crosses is not sufficient at this level of examination.

Good folders contained evidence indicating that designs had been carefully developed and thought through with subsequent acceptance and approval by the intended user(s).

<p><b>Paper 9705/03</b> <b>Written Paper</b></p>
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### **General comments**

The overall standard of responses was very similar to July 2003. A number of candidates produced very detailed responses to **Section A** and followed the guidance given in previous years reports to ensure that all elements of the assessment criteria for **Section B** were fully completed.

Performance on **Section B** continues to improve with candidates producing comprehensive and well-presented design thinking. Time allocation and organisation is still a problem for some candidates. A number of candidates devote considerably more time to **Section B** and consequently do not achieve high marks in **Section A**. Some candidates spent far too long on **Section A**, particularly in *Part (c)*, and did not leave enough time to fully complete **Section B**.

There has been significant improvement in the use of sketching and annotation in **Section A** and in the presentation of work in **Section B**.

*Part A* was most popular with candidates with **Question 2** answered by most followed by **Question 3** and **Question 1**.

Most candidates answered **Question 5** in *Part B* followed by **Question 4** then **Question 6**.

A few candidates attempted *Part C*, all answering **Questions 8** and **9**.



## **Comments on specific questions**

### **Section A**

#### *Part A – Product Design*

##### **Question 1**

Generally not well answered. Candidates were required to describe how different tools could be used to cut wood and metal. Most candidates selected sawing and drilling and in many cases did not describe the tools in any detail and made little or no reference to cutting actions and any differences in the tools required to cut different materials.

Candidates who selected turning tended to include far more specific detail relating to cutting actions.

##### **Question 2**

A very popular question with a number of outstanding responses.

- (a) Acrylic and aluminium were the most popular materials. Most candidates gave appropriate reasons for selection.
- (b) The description of the manufacture of the prototype CD rack was very good. Most candidates made excellent use of annotated sketches to clearly describe the processes of manufacturing the slots and using forms to produce the bends.
- (c) It is pleasing to see the improvement of candidate's performance relating to the knowledge and understanding of quantity production. Candidates demonstrated appropriate knowledge of the use of jigs, templates and moulds.

##### **Question 3**

A wide range of responses. The best answers clearly described the preparation of surfaces and the correct application methods. Some only referred to one material.

In part (b) many candidates were able to explain the appropriateness of two different finishes and gave clear details of functional and environmental requirements.

#### *Part B - Practical Technology*

##### **Question 4**

Most candidates compared and described two methods of joining by heat. Brazing, welding and soft soldering were the most popular responses.

Answers were generally fully detailed and indicated a sound knowledge and understanding of the processes involved. The use of annotated sketches was most impressive.

##### **Question 5**

The most popular question in this section. Many candidates were able to fully access all parts of the question and achieved very high marks.

##### **Question 6**

Relatively few candidates attempted this question. All were able to identify the strut and tie and describe how triangulation is used to make structures rigid.

Some candidates produced a frame diagram to calculate the direction and magnitude of the resultant force on the hook.

In part (d), most candidates identified an example and described buckling, twisting and fatigue. Plastic buckling refers to the deformation or change in shape along a fault line of a structural component under sustained load without fracture. The supporting columns of bridges or similar structures are common examples of where plastic hinging occurs.

*Part C – Graphic Products*

**Question 7**

No one attempted this question.

**Question 8**

Very well answered. Most candidates produced accurate perspective drawings including all details.

**Question 9**

Most candidates offered several relevant issues for discussion and demonstrated a good understanding of the impact of computers on designing and making. Most included relevant supporting evidence and examples to support conclusions.

**Section B**

There was a wide range of responses to this section. Many were very well presented and covered the full assessment criteria. A significant number of candidates do not fully complete all aspects.

*Analysis*

Candidates are expected to extend the analysis to show thinking around the problem. Many candidates repeat the statements given in the question.

The best responses indicated at least five detailed points of analysis relating to the given problem.

Some candidates used scatter charts and went on to qualify issues raised. In a number of cases candidates used generic single words e.g. 'materials' without further qualification.

*Specification*

Many candidates do not develop beyond what is given in the question.

Each question provides initial specification points or data. Candidates are expected to produce a list of five other points.

*Exploration*

There was a significant improvement in this area. Most candidates produced a range of well-presented ideas with clear annotation and gave sound reasons for the selection of features to be developed. Some candidates do not evaluate ideas.

*Development*

A number of candidates do not give appropriate reasons for the development of proposals into a single design solution. Most candidates gave clear details of specific materials and construction methods.

*Proposed solution*

Most candidates produced either orthographic or dimensioned pictorial views of their proposed solution. Some candidates do not leave enough time to produce an appropriate drawing showing the complete solution. Dimensioning is now evident in most cases.

### *Evaluation*

A number of candidates did not leave enough time to complete the evaluation. The best evaluations gave a clear indication of the features that would meet points raised in the specification and identified possible weaknesses in the design with suggested modifications.

A more detailed breakdown of the assessment criteria for **Section B** is given in the Mark Scheme.

#### **Question 10**

A popular question, generally well answered. Candidates made very good use of the supporting data to produce effective design ideas. Some responses lacked any technical detail in terms of construction and functional requirements.

#### **Question 11**

There was a range of mechanical and technical systems proposed. A significant number of candidates did not include circuit diagrams in their proposed electronic solutions. Some candidates who had a very good understanding of the circuitry involved did not produce drawings of the practical housings and fixings for their solutions. Specific material detail was often lacking.

#### **Question 12**

Most candidates appreciated the need to design a 'flat pack' system that could be folded flat for posting and assembled into a 3-D product by the client. Constructional detail was varied. The best responses included full details of interlocking or folding systems and appropriate gluing tabs and attachments.