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# DESIGN AND TECHNOLOGY

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Paper 0445/01

Common Core

## General comments

All questions were accessible to candidates and scripts covering a wide range of marks were submitted. There was no evidence to suggest that candidates were unable to complete the Paper in the time available. Indeed some candidates should be congratulated on the quality of work submitted, particularly for **Part B** questions.

Most candidates labelled each part of their response to the chosen **Part B** question and this should be encouraged, as the Examiner is able to follow each individual design process in the marking of this question. The Instructions to candidates on the cover of the Question Paper ask candidates to fasten the separate drawing paper, used for **Part B**, to the Question Paper at the end of the examination. The Examiner asks that this be done in such a way that it is easy to access all parts of candidates' responses for marking purposes. A treasury tag or a lightly tied piece of string holding the drawing paper at the back of the Question Paper is most suitable. Metal staples should not be used as they are difficult to remove before marking can take place.

## Comments on specific questions

### **Part A**

#### **Question 1**

Surprisingly few candidates were able to complete the required orthographic view. Some did not draw their answer in the outline provided. Marks were awarded for lines representing the two cut outs and for the use of hidden detail convention.

#### **Question 2**

A reasonable number of candidates knew that this was a class 2 lever and most of these were able to identify point **B** as the fulcrum.

#### **Question 3**

Most candidates were able to identify a potential hazard in the use of the vacuum forming process. This was linked to problems of overheating of the plastic, touching hot parts of the equipment/plastic or giving off fumes. Safety precautions being looked for were generally linked to protective clothing or other equipment. The Examiner was happy to award full marks if the hazard was realistic and the precaution sensibly linked to it.

#### **Question 4**

Most candidates were able to give examples of a hardwood and a softwood. A reassuring proportion was also able to suggest specific timbers for the products stated. In all cases both local and international timbers were accepted.

#### **Question 5**

- (a) This question created few problems for candidates, most suggesting essential information as the overall size and number of CDs to be held.
- (b) Candidates were fully aware of the advantages of self-assembly furniture to both the user and the manufacturer.

### **Question 6**

Many candidates were aware that the use of anthropometric data assisted with the comfort of the chair but, for the award of the full 4 marks, the Examiner expected candidates to refer to at least two specific parts of the chair e.g. seat height, seat size, height of back, etc.

### **Question 7**

Candidates answered this drawing question very successfully and showed sound understanding of this type of representation of information. For the award of all 5 marks candidates were expected to draw the half aircraft divided vertically through the tail fin.

### **Question 8**

The majority of candidates responded extremely well to this design question with sensible and realistic modifications suggested. Most suggested additional shaping of the handle and the use of a textured finish such as rubber.

### **Question 9**

The rack and pinion mechanism was familiar to many candidates and most knew that it converted rotary motion into linear motion.

### **Question 10**

- (a) Most candidates were able to suggest at least one suitable corner joint such as dovetail, finger, dowel, lap, etc but if butt was suggested the Examiner awarded marks only if this was qualified with nailed or pinned.
- (b) However, fewer candidates were able to show a rebate or groove, the methods by which a base could be attached to the box so that the edge would not be seen from the outside.

### **Part B**

Communication skills were often of a high standard and candidates should be congratulated on this aspect of their work. Good use was made of colour to enhance drawings and this should be encouraged.

Candidates are reminded that they do not have to produce large numbers of drawings and notes to achieve high marks. The Examiner is looking for evidence of depth of understanding and design thinking in all sections of the chosen question.

### **Question 11**

This was a reasonably popular question and candidates seemed familiar with storage methods for items of this type.

- (a) Candidates sometimes found difficulty identifying points about the function of the unit beyond those set out in the question.
- (c) Some candidates sketched a vast number of ideas but these were often variations on a single theme rather than different approaches. Candidates should be encouraged to annotate their drawings and give some consideration to the detail of possible constructions and materials rather than simply showing aesthetic aspects of their designs. Although there is no intention to specify the required number of design ideas, candidates should be able to gain high marks from perhaps three or four well communicated ideas if they are very different in kind and include good annotation and detail.
- (c) Evaluations were often quite lengthy and wordy tending to be repetitive and somewhat subjective in nature. Candidates are encouraged to refer to the function and requirements of the design brief and to list evaluations point by point.

- (d) The quality of responses to this part varied enormously and many drawings were just repeats of ideas from the previous parts of the question. Candidates are expected to show detail of all parts of the construction and to include dimensions, if high marks are to be gained. Drawings do not have to be formal orthographic presentations but the information should be such that the design could be made by an appropriately experienced person.
- (e) Generic terms such as wood, metal and plastic are not acceptable and candidates should identify specific materials relating to the chosen and developed design idea. Again reasons should be specific to the design and not general such as: strong, durable, cheap etc.
- (f) Candidates tended to lack meaningful detail for the chosen process and often spent too much time on simple tasks such as marking out and preparing materials to size.
- (g) Some innovative improvements were suggested but in many cases this simply included the addition of a rule and knife or pair of scissors.

### Question 12

This was quite a popular question and candidates explored a range of different types of jewellery. The themes for the jewellery covered all those suggested in the question. There was a tendency for candidates to be somewhat superficial in consideration of methods used to manufacture suggested items and responses often focused solely on the appearance of the jewellery.

- (a) Candidates often struggled to list four points about the appearance of the design but acceptable responses included: attractive, smart, trendy, colourful, fashionable, etc.
- (b) Other factors to be taken into account included: cost, manufacturing methods, materials, tools needed, age and gender of wearer, etc.
- (c)(d)  
(e)(f) See **Question 11 (b) – (e)**.
- (g) The manufacture of jewellery tends to include a narrow range of, often, simple processes and, as such, candidates need to cover all aspects of production including the use and fitting of ready-made findings.

### Question 13

This was probably the most popular question in **Part B** particularly for those candidates who had followed the Communication option. Unfortunately, many displays were very 'flat' in appearance and lacked the imagination being looked for. The question stated that stiff card was to be used in the design but far too many candidates failed to include details of how the card would be formed and/or joined to form a display structure.

- (a) Again, candidates often struggled to list points about the appearance of the display beyond those stated in the question. Acceptable responses included: bright appearance, interesting, exciting, reflects image, gives information, etc.
- (b)(c)  
(d) See **Question 11 (b) – (d)**.
- (e) Candidates seemed familiar with the benefits of using computer aided techniques in the design of such products. Reasons included: changes made easily, sending design electronically, easy storage, application of colour, modelling, etc.
- (f) A fair range of informative instruction sheets was seen although candidates sometimes fell into the trap of using too many words at the expense of simple drawings.
- (g) Many candidates seemed short of ideas for developing a floor standing display unit and too often simply suggested increasing the size of that already suggested. This was fine where consideration was also given to stronger materials and/or improved structures.

## Question 14

This was probably the least popular question although in many ways it was the opportunity for candidates to be most creative. Although most candidates included a wide range of types of movement created by the wind, some went on to incorporate moving water in their designs. Interesting mechanisms were also incorporated in some designs.

- (a) Candidates listed functional points such as: interesting, noise, visual impact, style, match surroundings, environmental, etc.
- (b) Candidates were familiar with points to consider when designing for exterior use such as: non-corroding materials and finishes, strength against the elements, appearance, etc.
- (c)(d)  
(e)(f) See **Question 11 (b) – (e)**.
- (g) Many candidates gave superficial consideration to this part of the question and, as such, lost the opportunity to gain most of the eight marks available. Candidates who have followed a Design and Technology course should be able to relate this type of part question to their experiences in the workshop.

<p><b>Paper 0445/02</b> <b>Communication</b></p>
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### General comments

The standard of work was largely as in November 2001 and candidates are to be congratulated on this.

It would appear however, that some candidates had not been fully prepared for all elements of the syllabus.

### Comments on specific questions

#### **Question 1**

##### *Clamp*

Response to this question was as expected, with those candidates with experience of Engineering Drawing answering it well.

- (a) Two marks were given for line quality and to gain both these marks, both views had to be largely completed.

Five marks were given for the accurate completion of Part B in View FV. A large number of candidates omitted to draw the rivet and many incorrectly positioned Part B on the given horizontal centre line of the ten millimetre radius of the lug.

To gain the nine marks given for Part C, the threaded end had to touch the surface of Part A, be the correct size and show a conventional representation for the screw thread. In addition, the head had to be of a suitable size and show a satisfactory means of gripping it easily. Most candidates showed either a form of knurling or a toggle bar.

Three marks were given for hidden detail throughout view FV.

- (b) A number of candidates did not attempt the plan, but drew the end view of the clamp instead and subsequently wasted time and lost marks.

Seven marks were given for Part A in the plan three marks for Part B and four marks for Part C. It should be noted that details projected accurately from an incorrectly drawn view FV were given credit.

## Question 2

### *Symbols for an advertisement*

Most candidates attempted this question.

- (a) To gain all nine marks, candidates had to investigate two *different* ideas for each symbol. Generally, this part of the question was answered well with a very satisfactory standard of freehand sketching.
- (b) Seven marks each were given for drawing the three chosen designs for the symbols of which three marks were for quality of presentation and four marks for a design that represented the service offered. Many otherwise good ideas were often spoilt by too much detail. For example, the outline of a single flower, plant or tree would have been perfectly adequate for the Garden Centre. It was important, however, that the symbols for the Garden Centre and Tools for Sale and Hire would be sufficiently different. Many candidates lost marks for showing garden tools for the Garden Centre and more tools for Tools for Sale and Hire.

As expected, the Carry to the Car Service was answered the least well, with a number of candidates drawing a symbol for Car Servicing. It should be noted that candidates making this mistake were given some credit for the quality of presentation.

## Question 3

### *Glassware package*

It was intended that this question, comprising a number of geometrical constructions, would provide candidates with the opportunity to demonstrate their individual knowledge and abilities.

- (a) One mark was given for line quality and two marks for drawing the base line accurately and correctly positioned. Most candidates gained these marks.

To gain the three marks given for each arc, there had to be evidence of a correct construction. Accurately drawn arcs without construction could gain a maximum of one mark each.

- (b) One mark each was given for accuracy of the six sides of the package, three marks for a viable development that would assemble correctly and one mark for line quality. An economical development was penalised by one mark. Most candidates gained high marks for this part of the question.

Three marks were given for suitable gluing and other flaps. Marks were lost for an inadequate number of flaps and more particularly for flaps that were too small to be effective.

The remaining four marks were given for an accurate and correctly positioned octagon. The most common error was to draw an octagon that was not sixty millimetres across the flats.

## Question 4

### *Kitchen-roll holder*

Generally, this question was answered badly. It would appear that many candidates were of the opinion that to draw freehand did not require them to draw with care and accuracy.

- (a) It was expected that modification to the kitchen-roll holder would consist largely of shaping the given outline by removing corners, sharp edges and generally softening the overall appearance. Many solutions included exaggerated shaping and/or the addition of unnecessary additional features. Two marks were given for sketching quality and two marks for suitable investigation.
- (b)(i) Three marks were given for drawing quality, one mark for the use of the correct approximate scale and two marks for a suitable pictorial view that showed the kitchen-roll holder to its best advantage.

Drawings were often very badly drawn, the holder was not presented to its best advantage and the view presented was not pictorial.

Eleven marks were given for accuracy. Many solutions showed a total disregard for sizes, construction and detail of the kitchen-roll holder. In addition, many answers did not show the parts exploded correctly.

- (ii) Few candidates gained the four marks given for shading and colouring the kitchen-roll holder to show that it was made from wood. This is an area of the syllabus requiring considerable improvement.

**Paper 0445/03**

**Realisation**

### **General comments**

This year's results are very similar to last years, with many candidates still attempting to stay inside one small area of knowledge such as woodwork. To raise standards Centres must try to extend the range of materials and experiences for candidates.

This is a Design and Technology examination and candidates are somewhat handicapped when a Question Paper that is based on a range of differing materials faces them.

### **Comments on specific questions**

#### **Question 1**

This was an unpopular question for most candidates who avoided it as part of their choice, due in part to it being based around metalwork and its processes.

- (a) Those candidates that attempted the question only gave strength as a reason for using mild steel tube. Very few gave another reason such as lightweight, easy to shape/join, hardwearing, etc.
- (b) The question had been broken down in an attempt to help candidates explain the stages in making the frames, however few gave any in-depth information on the processes.
  - (i) Many answers just stated that the mild steel tube was cleaned with a rag, without any regard to degreasing, emery cloth, etc.
  - (ii) Few understood that the tube joint had to be placed on a brazing hearth, supported, fluxed, etc to be ready for brazing processes.
  - (iii) A number of candidates got mixed up with the soldering process and tried to use a soldering iron for what had to be a brazed joint.
- (c)(i) Very few candidates were able to show a valid development of the metal sheet prior to bending. Many just gave a rectangular shape without any cut-outs or fold lines.
  - (ii) Most used a bending machine for folding the metal, but gave few details. Some better candidates did use a folding bar or bench edge and mallet.
  - (iii) Most answered welding but gave little detail how this could be done! A few riveted, and some soldered the corner joint.
- (d) On the whole this was quite well attempted with a range of valid solutions for adjusting the foot support to different angles. Some used holes and pins others rods and slots, while some used hinges and plates.

## Question 2

This was quite a popular question for those candidates who had a good grasp of plastics.

- (a) No major problems with this part of the question with most able to give a suitable plastic and two valid reasons. Acrylic was the main choice with 'easy to form the shape' and 'colour' as the two main reasons.
- (b) The responses to these processes depended very much on Centres. Some Centres confused vacuum forming with compression moulding.

Vacuum forming in the main was well done with only minor details missing from the process.

The injection moulding process however was not as well covered; a number failed to mention the heating of the granules, how the screw action worked, etc.

Some of the sketching for these two elements was of a much better standard than in past years.

- (c) Most candidates attempted to answer the problem of not draft or round corners on formers, giving the reason that the plastic would break or be difficult to remove once the plastic has cooled. Few attempted to answer (ii) 'a mould that is cold', those that did scored quite well with answers such as poor final shape, incomplete shape, etc.

## Question 3

This was quite popular with candidates, many tried to turn it into a woodwork question.

- (a) Most candidates were able to give the advantages and disadvantages for plywood but had problems with nylon and brass. Many just repeated the same reasons for all.

Candidates stated that plywood tended to be lightweight and that it could splinter; nylon was again given as lightweight but it would melt and brass for many was going to rust.

- (b)(i) Marking out the outline shape was not well done, with large numbers saying 'draw out the shape with a pencil'. No mention of correct marking out tools for angles, curves, etc.
- (ii) Marking out the slots and centres of the holes was again very poorly done. If tools did get mentioned they proved to be unsuitable for the material.
- (iii) This was much better attempted by candidates who did understand the process of drilling, with the material being supported and clamped to a drilling table.
- (iv) Most understood the need for drilling starting holes to produce the slots, but many then used the wrong type of saw to remove the waste. A hacksaw is not a woodwork tool or a file.
- (v) Once again most held the work in a bench vice while working the material, but then used the wrong tool to attempt the process.
- (vi) In the main this was quite well answered with most candidates able to suggest a suitable finishing process.

## Question 4

This was the most popular question on the Paper, perhaps due to it being a woodwork question.

- (a) All seemed able to give two properties that would make a wood suitable for the toy.

A wide range of answers from, durable, lightweight, easily coloured, non-toxic, etc.

- (b) This part was again quite well answered with a wide range of possible joints offered. They ranged from (i) finger, dowel, dovetail, rebate, screwed, to the very poor nailed joint; (ii) stopped housing, through housing, mortise and tenon, screwed, and again the poor nailed effort. Sketching in some cases was of a very high standard.

- (c) In the main the process of making the chosen joint was quite well explained; however, once again some stages got missed out or no tool was named, and others used the wrong tools. Also materials must be held in some way while they are worked.
- (d)(i) Most candidates suggested clamping the work together for drilling the holes but failed to mention that they must align to be accurate and supported.
- (ii) Not many answers to 'safety checks', just clamp.
- (iii) Most gave drill positioning but failed to mention speed or action.
- (e) This was well done by all, with many giving the correct mechanical explanation of the crank handle turning the cam, which in turn moved the follower, giving the rise and fall action.

## **Conclusion**

Once again a good year's efforts from some Centres that continue to explore and expand the subject area. However, a number of Centres continue to remain in a narrow one-material state which restricts their candidates' choice of question at these examinations. Examiners have mentioned this point a number of times before in reports in the hope that Centres would aid their candidates in future years. It was very noticeable this year how many candidates attempted the metalwork question, or showed any understanding of metals in the multi material **Question 3**. If Centres hope to improve results, candidates need to experience a wider range of materials and the processes involved in working them.

<p><b>Paper 0445/04</b></p> <p><b>Technology</b></p>
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## **General comments**

Good responses were generally characterised by good all round subject knowledge, evidence of practical application of subject knowledge in the classroom and good use of a variety of communications techniques including graphical skills. Those candidates who scored highly were able to draw upon their own experiences and of a wider understanding of technology in everyday life.

## **Comments on specific questions**

### **Question 1**

This question was generally well answered but there was some confusion between energy conversion and motion conversion. Few candidates could explain the need for or uses of modelling during the design stage.

Part (c)(i) was very poorly answered and most candidates did not know what a strain gauge was. Similarly no candidate could offer an alternative accurate method of measuring deflection.

There was much confusion over the term cross-section when applied to structural members.

### **Question 2**

Though a popular choice this question saw few candidates scoring highly. Few could sketch a universal joint and fewer still appeared to understand the concept or effects of shear force on the coupling pin.

Part (b) was the weakest element with most candidates showing a total misunderstanding of the stress/strain graph and its key points. Candidates could not identify typical behaviour of materials and few could calculate the strain on the pin. The term stress was better understood and explained.

Part (c) was better attempted and more candidates were able to score well here.

### Question 3

Fewer candidates attempted this question but those that did were able to access a good proportion of the marks available. Responses concerning the needs and applications of bearings were generally well attempted though the answers on lubrication were not as good as other question elements.

Part (c)(i) was very poorly answered with little evidence of candidates' wider knowledge of the uses of cams. Generally sketching skills were poor in this element.

### Question 4

A popular choice with some Centres clearly excelling in electronics technology. Few candidates however could fully complete the 555 timer circuit plan for a standard flashing light circuit design.

Candidates knowledge of switches and electromagnetic devices and their applications was good on the whole. Few candidates however could calculate the power rating for the given circuit. Most candidates were able to complete the circuit block diagram.

Part (e) was poorly answered with very few candidates understanding the use of a capacitor to delay the switching off of the LED to aid the users of the battery tester in taking a reading.

<p><b>Paper 0445/05</b> <b>Coursework</b></p>
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### General comments

Candidates produced a wide range of coursework projects and in most cases these were intended to solve a real or personal problem raised by the candidate concerned. In addition to the expected range of toys and household items or furniture, interesting project outcomes included: airline livery, sand toboggan, working model helicopter, child's scooter, air circulation system, holder for hot plates and lifting equipment.

There were few cases where candidates seemed to be stifled by poor problem selection but in cases where familiar problems were chosen, outcomes often showed little evidence of imaginative interpretation and/or creativeness of outcomes. It is important that Centres guide candidates in this respect so that they can take full advantage of the potential range of opportunities presented by the initial problem.

The sample of work presented for moderation was suitable in most cases and Centres had generally applied the assessment criteria appropriately although, in some cases, not at the correct level. Centres new to this syllabus are advised to refer to the exemplar coursework material contained in the Distance Training Pack, obtainable from CIE, if they have not already done so.

Centres are reminded of the need to include the full range of candidates' marks, including the highest and lowest marks, in the moderation sample sent to CIE. All folders must include clear photographic evidence of artefacts showing detail to support the award of marks in addition to an overall view of the made item.

### Comments on specific assessment headings

#### **Analysis of problem and design brief**

Candidates stated clearly the problem to be addressed and this was followed by a concise design brief in the majority of cases. However, the degree to which candidates researched the design problem varied enormously. Candidates should be encouraged to complete adequate and relevant research in order to create a suitable knowledge base prior to the formulation of the specification.

Far too often this research consisted simply of information on materials, components and constructions taken directly from textbooks. Information of this type is totally irrelevant at this stage of a design process and should be considered at the development stage when ideas have been explored.

## **Specification**

The majority of candidates included specification points but very often these were generic in nature and could be applied to any product. This section of the folder should state clear and specific requirements for the design outcome and, for the award of maximum marks, points should be qualified wherever possible. The Specification is best presented by a list of separate requirements so that subsequent reference is straightforward.

## **Exploration of ideas**

This section is the most successful in discriminating between candidates of different abilities. This is where candidates can show their ability 'to think with a pencil' and include evidence of genuine design creativity. Successful candidates included a wide range of different ideas presented by clearly annotated sketches. Too often candidates presented a few formal drawings that showed little design flair and tended to follow a single concept.

These ideas can be presented most successfully through simple pencil sketches and candidates should be encouraged to include everything that comes to mind however practical it may appear at the time. These ideas do not have to be of complete products but can be mini developments of parts of ideas as thoughts come to mind. Annotations should include comment as to how an idea might link to the specification.

Candidates at some Centres made good use of ICT skills in their design folders and this is encouraging to see. However, the Moderator is not convinced that this is the most appropriate method for exploring and recording design ideas in this section of the folder.

## **Development of proposed solution**

This is the section of the folder where candidates should take their chosen idea or selection of ideas and make further detailed decisions on form, materials and construction methods to be used in the final product. Many candidates found this difficult to do and in far too many cases the final idea was simply a repeat of one of the ideas recorded in the previous section.

Final drawings of the design solution were generally well presented and gave sufficient information for the manufacture of the product.

## **Planning for production**

This section must show clear evidence that the production of the artefact has been planned in advance. It should not be a record of what has already happened, as was the case with the work of many candidates.

Details of materials and components to be used should be included together with the main stages of the production set out in logical progression. A suggested time plan should assist candidates and should include comment when this has not been adhered to. Candidates are not required to include detailed descriptions of basic procedures such as the preparation and simple marking out of materials, but they should be encouraged to show evidence of the planning of unusual techniques and those new to them.

## **Quality of production**

Candidates should be congratulated on the wide range of technologies and materials being used and this included sensible use of textiles in the manufacture of some products.

Photographic evidence indicated that some candidates were able to work to a very high standard of construction and finish to the extent that products could be put to good use.

## **Evaluation**

Candidates should be encouraged to include photographic evidence of product testing in the intended environment or by the intended user. They can then go on to link the outcome to the original specification and make objective and qualified judgements on the success of the product. This section should also include suggestions for further modifications or possible improvements to the product.

Too often candidates referred only to issues linked to the making of the artefact with the addition of their own subjective appraisal of the outcome. Evaluations of this type cannot be awarded marks beyond the low level of achievement.