

DESIGN AND TECHNOLOGY

Paper 0445/01

Design

General comments

The choice of questions on this paper is intended to reflect the specific syllabus optional subject content for which a candidate might have been entered. However, candidates are free to select any one of the three questions and **Question 1**, designed to have a Resistant Material focus, was by far the most popular. **Question 2** was the next most popular, with the smallest number of candidates answering **Question 3**.

The Examiner is pleased to report that the majority of Centres now appear to be preparing their candidates to respond to the question of their choice in the correct places on the pre-printed A3 answer sheets as intended. Where candidates' answers adhere to the size of the spaces provided on these sheets then they give sufficient time to the requirements and expectations of each part of the question.

Centres are reminded that candidates must not respond with general functional requirements, when responding to part (a) of their chosen question, as these will not be marked positively. For example: 'should be safe' is not acceptable but this could be qualified as: 'be shaped so that a child could not harm themselves' would be marked as correct. Similarly, 'should be simple' and 'not expensive' require qualification.

Comments on specific questions

Question 1

Candidates appeared to understand fully the requirements of this question and the design need was clearly one with which they were familiar in their normal day-to-day experiences. Suggested outcomes covered the full range of materials although some type of wood tended to be the material of choice.

- (a) Candidates responded well to this introductory part of the question and functional points additional to those set out in the question included: toys easily accessible; stores a range of toys; stable in use; can be moved around (lightweight); hygienic (easy to clean); does not take up too much space; matches the design of room; attract the child's attention; easy to return toy to unit; qualified safety aspects etc.
- (b) A few candidates struggled to draw two different joints that would be suitable for box constructions and those used in frames were not accepted. Appropriate joints included: dovetail; finger; butt (nailed and screwed); lap; hinged; riveted; welded etc.
- (c) Responses to this part of the design questions have improved considerably over recent examinations and the majority of candidates were able to draw three or four different ideas. Candidates are expected to produce clear drawings using appropriate techniques so that all design detail is clear to the viewer. Marks are awarded for the quality of communication techniques so drawings should be enhanced through the use of shading or colour and appropriate annotation added. Marks are also awarded for the suitability of designs and the detail included.

Centres are reminded that it is possible for candidates to be awarded full marks if they present just three **different** ideas so long as the other requirements of the mark scheme are met. Marks are awarded pro-rata if fewer than three ideas are shown. Candidates are advised to use all of the space provided for this part of the question.

- (d) The majority of candidates evaluated effectively each of their design ideas in the table provided. Candidates identified the chosen idea with reasons for choice given. It is important that candidates placed their reasons for choice in the evaluations in the space provided and not alongside their design ideas in part (c). Unfortunately, as Examiners rewarded these incorrectly positioned responses in the normal way, there is a danger that they could be missed, so this practice should be discouraged.

As has been mentioned in previous examinations, some candidates had obviously been encouraged to produce a table so that each design idea could be compared to specification points. Unfortunately, the result was often a set of boxes with ticks or crosses and no reasons or qualifications given. Candidates are required to comment on good and bad points about their design ideas, so this type of approach can be awarded a maximum of only 3 marks for the evaluation of design ideas.

- (e) Centres have obviously taken heed of the Examiner's comments from previous examinations and responses to this part of the question have improved. There was evidence of good quality drawing and constructional detail was provided either as part of the main presentation or through annotation or other surrounding smaller drawings. As has been mentioned before, candidates can choose their own presentation style so long as all constructional detail is clear to the viewer and significant dimensions are included.
- (f) It is intended that candidates' responses to this part of the question follow on from the rest of the design process so, as such, materials suggested should be appropriate and match the design requirements already given. There were occasions when candidates mentioned materials that could not be used for the proposed design, so, clearly, marks could not be awarded for these answers. Once again, Centres must be reminded that only **specific** materials will be awarded marks and 'wood', 'metal' and 'plastic' are not acceptable.
- (g) The Examiner was looking for a simple step-by-step approach to this final part of the question indicating that the candidate was familiar with constructional processes to be used for the proposed design. Unfortunately, processes and techniques presented were often too general in nature and description, and not specific to the product to be made. Marks were awarded for the appropriateness of the process suggested and the tools/equipment used.

Question 2

There was a mixed response to this Graphic Products question and some candidates missed the point that the shop display needed to be portable, as stated. As such, materials and constructions were not always those that might be linked to this area of the syllabus content. Centres are advised to give careful guidance to their candidates so that they make an appropriate choice of question.

- (a) Most candidates were able to suggest additional functional requirements for the display unit such as: stable when set up; attracts attention of public; easy to transport; not made of plastic (to enhance the point being made); colourful etc.
- (b) Most candidates were able to show two methods of joining portable displays and these included: 'velcro'; tabs/slots; clips; elastic; hinges; hooks; screws/wing nuts etc.
- (c))
- (d))
- (e)) See **Question 1(c) – (g)**
- (f))
- (g))

Question 3

This question was intended to encourage candidates to investigate devices that could be used to catch insects or small animals. Unfortunately, few candidates responded to the challenge as intended and the solutions were not very imaginative. Part **(b)** of the question was intended to get candidates looking in the appropriate direction.

- (a) Additional points about the function of the catching device included: light in weight; easy to clean; easy to empty; insects/animals cannot escape; cannot damage insect/animals; provides ventilation; etc.
- (b) The identification and drawing of two remote control systems presented a few problems for candidates but appropriate suggestions included: radio control; infra red; trip release; Bowden cables; linkages; string etc.
- (c))
- (d))
- (e)) See **Question 1 (c) – (g)**
- (f))
- (g))

DESIGN AND TECHNOLOGY

Paper 0445/02
Graphic Products

General Comments

Candidates were required to complete all questions in **section A** (**A1**, **A2** and **A3**) and then go on to answer *either* **B4** or **B5** from **section B**. This instruction was not followed by all candidates. **Question B4** and **B5** were equally popular option questions for candidates. Some Centres are not following the rubric requesting that sheets are **not** to be punched and tied together with string.

The standard of work was comparable to that of the previous year.

There are areas of the syllabus however, in which further improvements are needed. These include in particular the application of 'thick and thin' lines to enhance a pictorial view. Candidates must be able to understand information given in one graphical format and be able to draw the same item correctly in another graphical format.

Students need to have a greater focus on 'Graphic Products' rather than traditional 'Communication'. Future candidates would benefit from practical activities based on the questions in this paper.

Comments on specific questions

Question A1

Hexagon Car Park to Party Hall map

Most candidates completed the remaining pathway and the 130 x 70 outline of the signboard correctly.

The construction of the hexagon given the length of side produced many inaccurate drawings, including some where the hexagon was not correctly sized or orientated.

The equilateral triangle was completed correctly by most candidates with a few candidates drawing an isosceles triangle with two sides 50 long.

Question A2

Lettering 'PARTY HALL'

Many candidates completed the letters T and Y correctly. The letter R was not always produced in the same style as the given letters and proved to be more problematic. One mark was awarded each for spacing and height alignment. Many candidates scored between 3 and 6 marks

Question A3

Isometric Fence Post

Unfortunately, not all candidates attempted this compulsory question losing the 10 marks available. A small number of candidates misread the question and drew the post again in two Orthographic views.

Many candidates drew the post in the correct orientation with the post upright. Where candidates drew a different orientation, this did not affect the marks awarded.

Most candidates drew the post to the correct size to scale. Whilst many included the slot, this was not always to the correct size, or correctly positioned. The Radius 150 proved to be difficult for a large number

of candidates to draw in Isometric. Some candidates achieved the correct profile but did not show evidence of repeating the curve at a given distance for the thickness.

Very few candidates applied 'thick and thin' line correctly to the drawn post. A very small number of candidates applied 'thick and thin' lines to the slot correctly.

Question B4

Robot model

This question was derived from an actual 'Graphic Product' used as a 'promotional gift'.

A classroom exercise to cut-out and make the Robot from polystyrene, card tube and foamboard, would be most beneficial to future candidates' understanding of this Graphic Product.

- (a) (i) Many candidates drew the body and hips correctly. Many candidates did not add the arms and legs by working out the given hole centres on the body and then drawing on the R9 and the centre spacing from the given $\text{Ø}18$ of the arm and leg. As a consequence, many arms and legs were too long. Most candidates added two feet 18SQ. Washers and feet were not evident in very many responses.
- (ii) Many candidates included a $\text{Ø}30$ circle but very few showed wall thickness indicating a tube. Most candidates included a 20 x 50 body but few added arms and feet. Washers and feet were not evident in very many responses.
- (iii) Very few candidates attempted an elliptical base. Of those who drew the ellipse in the plan view, only a few projected it up to show a 5 mm thick base to the front elevation
- (b) A wide variety of possible solutions for the attachment of the tubular head to the body of the robot were seen. Exploded sketches were awarded up to three marks according to quality of solution. A further two marks were awarded for clear notes (even if the solution drawn would not work).

Question B5

Packaging for a cosmetic product

This question was attempted by approximately half of the candidates. The working and order of the instruction in the question should lead the candidate to the correct response. Overall, candidates gained a wide range of marks for their answers.

This question was also derived from a real 'Graphic Product'. A cut-out and make activity using this question would benefit many candidates in the future.

- (a) Many candidates managed to draw an octagon to the correct size and correct orientation for a plan view. Whilst many candidates drew an octagonal prism in projection to the plan and to the correct height, many did not get the orientation correct when drawing in the window on three of the sides.
- (b) If part (a) above was drawn correctly first, then the development was a straightforward 'roll out' of the sides in line with the EV projection. Many candidates did not appreciate this, and some drew only six sides in the development. Many candidates failed to start the window with 3 full faces to the left and 2 full faces to the right. Some candidates gave the correct profile for the top of the window but with slopes also on two faces of the base of the window. Most candidates drew an octagonal lid with three flaps.
- (c) Of those candidates who attempted this part of the question, many produced workable solutions to the problem of supporting the product by the use of a slightly smaller octagonal card with 60 long fold down flaps on at least 4 sides.

DESIGN AND TECHNOLOGY

Paper 0445/03
Resistant Materials

General comments

Section A

This section tests a very wide area of knowledge concerned with materials, tools and processes used when working with resistant materials. Most candidates achieved fewer marks for this section than **section B** because they were unable to demonstrate the width of knowledge and understanding required associated with wood, metal and plastics. In particular, answers to metalworking questions were very poor.

Section B

Question 11 required a knowledge and understanding of metalworking techniques, **Question 12** plastics and **Question 13** a combination of wood and metal. Overall, there were fairly equal numbers of candidates attempting each of the questions.

There were many excellent answers to parts of questions describing processes used for specific purposes. These were typified by good, large, clear sketches and accurate technical, detailed notes. Sometimes, however, it was variable quality of communication by way of sketches or written notes that meant candidates failed to achieve the maximum marks available for some questions.

Comments on specific questions

Section A

Question 1

- (a) The majority of candidates failed to show two or three sash cramps evenly spaced applying pressure across the frame. Many candidates drew nothing at all.
- (b) Many candidates named a sash cramp correctly but many thought that a G cramp would be appropriate.

Question 2

Many candidates named a hammer and scrap wood correctly when labelling tools and equipment **A** and **B**. However, only a minority of candidates were able to name folding bars for **C**.

Question 3

Many candidates drew the grain of each ply at 90° to the previous ply but many simply drew end grain on the plies.

Question 4

This question was poorly answered. Drawfiling is a technique candidates should be familiar with from their practical activities.

Question 5

Most candidates were unable to describe how to plane end grain without splitting it. Placing scrap wood at the end of the wood allows the plane to be taken across without splitting. Another technique is to plane the centre of the end grain, stop, then plane inwards from the opposite edge.

Question 6

- (a) Many candidates could not name the odd leg calipers shown. Many candidates confused their use with those of dividers or compasses.
- (b) To set odd leg calipers the 'foot' of the caliper is set against the end of the steel rule. Very few candidates showed this technique.

Question 7

Many candidates provided a sketch of a finger or comb joint that was clear and accurate enough to achieve maximum marks.

Question 8

Many candidates were able to name a suitable finish for a table top, the most common answer being 'varnish'. However, only a minority of candidates recognised that a wooden chopping board would require a 'tasteless' finish such as olive oil or its equivalent or that no finish would be applied.

Question 9

The three plastic products would be manufactured using the following methods: blow moulding, glass-reinforced plastic moulding [GRP] and injection moulding respectively. As these are fundamental to plastics products, it was disappointing that few candidates could provide three correct answers.

Question 10

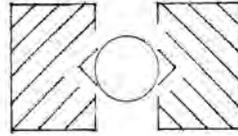
The vast majority of candidates were unable to name the three parts of the centre lathe: tool post, bed and lead screw. Even without practical experience of centre lathe work candidates should be able to name these parts and describe their function.

Section B

Question 11

- (a) Most candidates stated correctly that aluminium was lightweight and that it would not corrode outdoors. Answers referring to the quality of sound produced by the metal were not rewarded.
- (b)(i) Many candidates named two tools that could be used to mark out the development [net].
 - (ii) Most candidates recognised that a template allows marking out to be done accurately and quickly. There were some excellent answers related to marking out shapes in quantity.
 - (iii) Candidates achieved two marks for naming and drawing tin snips being used to cut out the shape. [Hacksaws would be inappropriate.] Some details showing how the metal would be secured, flat onto a bench were awarded the third mark.
- (c) Very few candidates designed a practical jig. The best designs showed:
 - 1 some form of 'cradle' or 'bed' on which a length of metal tube could be held;
 - 2 three different locations or saw cuts which would guide a hacksaw into position without the need to measure each length.

- (d)(i) Very few candidates were able to complete the sectional view shown below.



Candidates did achieve one mark for showing the rod in position and a second mark for the 45° recesses.

- (ii) Most candidates recognised that a Centre punch would help guide the drill making a more accurate hole. Answers referring to the Centre punched mark showing where the centre would be drilled received no marks.
- (e)(i) Most candidates were unable to name a suitable finish, the best being clear lacquer or anodising.
- (ii) Simple preparation techniques were missing from many answers. The best answers referred to the use of various grades of wet and dry paper.
- (f) Many candidates achieved some marks for this question. Often candidates showed potentially practical ideas and achieved up to two marks for this. For the further two marks they needed to provide accurate technical details such as the materials used to make the bracket or support, important sizes and any methods of construction. Many candidates failed to achieve the last two marks.

Question 12

- (a) Most candidates provided two sensible items of research including the size of the DVD and the quantity to be stored. There were other excellent answers relating to the need to ask the user group and to consider existing DVD racks on the market.
- (b)(i) Most candidates gave three processes: cutting, filing to shape and finishing being the most common. The tools and equipment named to carry out the processes were not always correct. However, many candidates did achieve at least four or five marks for this question.
- (ii) Most candidates were able to state a problem when working with acrylic: the most common being the tendency to crack or snap when worked in a vice and the ease with which it becomes scratched. These problems were generally accompanied by sensible actions that would overcome them.
- (c)(i) The key words were 'finish the edges'. Some candidates referred incorrectly to use of the sanding disc while the best answers named files, wet and dry paper and use of a polishing wheel and /or polish.
- (ii) The majority of candidates recognised that it would be much easier to finish the edges of the acrylic before it was bent to shape.
- (d) This question tested the candidates' practical knowledge and understanding of bending acrylic. There were many excellent answers that showed:
- 1 the acrylic being heated on a strip heater or line bender;
 - 2 the use of a former to hold the acrylic in position while it cooled;
 - 3 accurate technical notes to support the sketches.
- (e) Many candidates achieved some marks for this question. Often candidates showed potentially practical ideas and achieved up to three marks for this. For the further two marks they needed to provide accurate technical details such as the materials, constructions and any fittings used to make the modification. It was this part of the question that was not answered very well. The best answers showed the sides of the rack extended and bent to provide a flat strip that could then be screwed to a wall.

Question 13

- (a) (i)** There were a vast number of hardwoods available and the majority of candidates achieved credit for this part. There were some incorrectly named woods such as pine.
- (ii)** Most candidates stated a sensible property of hardwood but terms such as 'strong' do not receive credit since they are too vague.
- (b)** Most candidates named and sketched two suitable constructions; the most common being housing joints, mortise and tenons and dowel joints. Poor quality of sketching and the accuracy of the joint often meant that candidates did not always receive maximum marks. Butt joints gained some credit only if they were shown reinforced with nails and glue.
- (c)** There were some excellent answers showing designs for an adjustable handle. Candidates are reminded to read the bullet points carefully as these are provided to give them guidance as to what their design must include. These are specification points to focus on. The best designs showed:
- 1 some form of bracket attached to the side of the truck with screws;
 - 2 the use of removable pins to allow the handle to be positioned at three different heights;
 - 3 accurate technical details to support the design ideas.
- (d)** Most candidates concentrated on the need to secure the wheel on the axle, usually by means of nuts and bolts. Most answers did not consider the safety of the child in the method of attachment.
- (e)** This question provided candidates with the opportunity to demonstrate their practical knowledge of woodturning using a woodturning lathe or a centre lathe. While the woodturning lathe was the more popular option, most candidates failed to demonstrate more than superficial knowledge of the processes involved. Marks were available to show how the wood would be prepared, set up on the lathe and then a brief description of the method by which the wheel would be turned. Many candidates achieved some marks but the vast majority of candidates did not have a basic knowledge in this area of the syllabus.

DESIGN AND TECHNOLOGY

Paper 0445/04
Systems and Control

General comments

Good responses were characterised by the use of appropriate technological terminology and were supported by examples drawn from candidates' hands on experience of processes, components and project work. The use of annotated sketches was indicative of good responses. There was evidence too of good preparation of candidates for this paper in the way in which questions were selected and approached. One area of very good practice was in 'Mechanisms' where there was clear evidence of good teaching, preparation and practical application of knowledge. Though only a small number of candidates attempted the Electronics question many responses were characterised by good levels of knowledge and understanding. Candidates' knowledge and understanding of structures was less satisfactory in the compulsory questions, with no candidates attempting the structures optional question.

Comments on specific questions

Section A

Question 1

- (a) Most candidates correctly identified frameworks and shell structures.
- (b)(i) Few candidates were able to explain the benefits of laminated structures in terms of good strength to weight ratio or the combining of structural properties of the conjoined materials.
 - (ii) Some candidates were able to cite Plywood as an example but few correct responses were made across the candidature.

Question 2

Most candidates were able to draw and label a lever.

Question 3

Most candidates identified the reed switch, fewer were able to give an appropriate application for a tilt switch. Some candidates were able to sketch a membrane panel switch.

Question 4

- (a) Most candidates correctly sketched the LDR symbol.
- (b) Most candidates correctly identified an appropriate application for the LDR.

Question 5

- (a) Some candidates were able to determine the driven gear speed.
- (b) Some candidates were able to explain the use of an idler gear.

Question 6

Many candidates were able to name the OR gate.

Question 7

Some candidates were able to identify the cantilever.

Question 8

Some candidates were able to identify the first order lever.

Question 9

Most candidates correctly named an appropriate application for pulleys to control speed.

Question 10

Most candidates correctly identified friction or wear and tear as reasons for using bearings in a mechanical system.

Section B

Question 11

- (a) Most candidates correctly stated an appropriate example of the use of logic in everyday life.
- (b)(i) Some candidates were able to explain the operation of an AND logic system in terms of a switch and light bulb circuit. But some candidates drew the logic symbol circuit and therefore did not gain full marks in this element.
 - (ii) Most candidates were able to draw the circuit symbol for a NAND gate.
 - (iii) Many candidates were able to complete the truth table for the NAND gate.
- (c)(i) Most candidates correctly drew an LED and were able to show how it would be connected according to polarity. A few candidates drew the circuit symbol for an LED which precluded them from accessing the marks for this element.
 - (ii) Most candidates were able to explain how the LED needed to have a current limiting resistor to protect it from overloading.
 - (iii) Some candidates were able to calculate the value of the current flowing through the LED.
 - (iv) Only a few candidates were able to give two advantages of the use of LEDs over light bulbs but many were able to access one mark from the two marks available.
- (d) Most candidates were able to identify the nominal value of the resistor.

Question 12

- (a) Many candidates correctly identified oscillating and reciprocating motions for the system shown.
- (b) A few candidates correctly sketched an appropriate linkage system to perform the required function.
- (c)(i) Few candidates sketched an appropriate linkage system to perform the required function.
 - (ii) Few candidates correctly sketched an appropriate method for limiting the distance of travel for the head of the toy.
 - (iii) Few candidates correctly sketched an appropriate method for modelling the mechanism for the toy by using either card and paper fasteners, construction kits or CAD modelling.
 - (iv) Most candidates were able to explain the benefits of modelling a mechanism before constructing it in resistant materials.

- (d)(i) Most candidates were able to give an appropriate example of a worm and wormwheel system.
- (ii) Few candidates correctly explained how this system can enable precise control, great speed reductions and change the axis of rotation.
- (iii) Few candidates correctly calculated the gear ratio for the system.
- (iv) Few candidates correctly calculated the output speed for the gearing system.

Question 13

No candidates attempted this question.

DESIGN AND TECHNOLOGY

Paper 0445/05

School Based Assessment

General comments

A good range of work was submitted for moderation with projects scoring from maximum marks down to below 20 marks. The work covered all of the material areas, although Resistant Materials work was the most common and Systems & Control the least popular.

The overall standard of work was comparable with previous examination sessions. It was clear that there are many talented designers who have been well supported by their teachers.

The coursework samples were generally well presented for moderation and many centres had their marks confirmed by the moderation process. Centres are, however, reminded of the following key points:

1. Centres must include both the Coursework Assessment Summary Form (0445/05/CW/09) and the Moderator copy of form MS1 with the sample of work. Without these two documents moderation cannot proceed.
2. The individual assessment objective scores must be recorded on the Coursework Assessment Summary Form and the totals checked. Many errors were found in the addition of marks.
3. If more than one teacher is involved in the delivery of the subject all work must be internally moderated to establish a reliable rank order (arranging the candidates from best to worst).
4. Marks must not be awarded if there is no evidence in the folder. For example, a small number of centres gave marks for the Evaluation and testing when there was no paperwork to support the judgment.
5. The vast majority of projects were A3 in size. It is acceptable to use A4 size paper but a mixture of A3 and A4 sheets is discouraged. Regardless of the size of paper used the work should be arranged in order and firmly fastened together.
6. Photographic evidence should record both progress in making and the final outcome. A small number of Centres awarded marks for the making but did not include any photographs in the folders.

Comments on specific questions

Identification of a need

Almost all candidates successfully completed this assessment objective. Centre assessment of this objective was reasonably accurate. It is, however, important that maximum marks are not given unless both the need and the user are fully considered. Superficial mention of a user, for example 'my uncle', does not justify awarding maximum marks in this assessment objective.

Research into the design brief resulting in a specification

Candidates produced a wide range of responses to this assessment objective. Some very good work was seen that demonstrated an excellent understanding of the requirements. A number of Centres included large amounts of photocopied material, with little evidence of any consideration of how this might impact upon the design of a solution. This is to be discouraged.

The specification should be a clear and concise list of points that define the final design requirements. It should not contain vague statements.

Generation of ideas

The majority of candidates produced a range of ideas, with appropriate evaluation and selection of one. Pencil and crayon sketches were common, although a number of Centres used more formal drawing and simple CAD drawings. Some of the graphical skills seen in this objective were outstanding.

Candidates should be discouraged from focussing on a single concept and producing ideas that are very similar to an existing product. A range of imaginative ideas is required for the top marks.

Development of proposed solution

This was the weakest section in many folders. High marks should not be awarded unless a candidate has carried out testing and trialling in order to make reasoned decisions about form, materials and production methods. In many cases decisions had clearly been made but the process was not evident. For example, the sizes of the product were determined but there was no indication of how these decisions were reached. It was also common to see candidates simply listing alternative methods of construction.

The production and evaluation of simple models and mock-ups may assist candidates in demonstrating capability in this objective. Digital photographs of the models and mock-ups should be included in the folder.

Planning for production

This was a real strength in many folders. Typically, candidates produced orthographic or exploded drawings, a materials list and some form of flow chart to identify the stages in making. In some cases there were slight discrepancies between the drawing and the materials list and candidates are advised to cross check these before the realisation begins.

Product realisation

A wide range of products were seen that were mainly made from wood and plastics. The use of metal or electronic components was less common. There was clear evidence that a wide range of tools and equipment were appropriately used to shape, join and finish the materials.

It is essential that good quality photographic evidence records both progress in making and the final outcome.

Testing and evaluation

In some respects the responses to this assessment objective were better than in previous years. This was pleasing to see but much of the testing was still largely superficial in that it did not take account of the views of the users or show the product in the environment for which it was designed. Many evaluation comments were subjective ("I think...") rather than objective ("My questionnaire showed...").

Effective testing should quite naturally lead to proposals for further development.