

# DESIGN AND TECHNOLOGY

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Paper 0445/11  
Product Design

## Key messages

- Full solutions to the design problem, drawn in response to part (e), should show all construction details and dimensions rather than just manufacturing methods that might be used in the School workshop/studio.
- Candidates should avoid describing generic manufacturing methods in their response to part (g). This applies particularly where CAD and CAM methods form part of the answer. The response must relate to the description of the method used to manufacture an identified part of their final solution.

## General comments

Most candidates appeared to be prepared well to respond to the question of their choice and many showed that they could engage competently in the design problems set in the context of boats and boating.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded as and where required were able to evidence their design and thinking skills successfully. Candidates should avoid including information not required in response to a particular part of the design process.

Some candidates showed a high level of originality in their design work.

Candidates are asked to indicate the question number they are answering, in the rubric box at the foot of each A3 answer sheet.

Centres are reminded not to include question papers when sending completed A3 answer sheets to Cambridge.

## Comments on specific questions

### **Question 1**

This was the most popular question and the majority of candidates understood clearly the requirements of a rack that would hold single and double canoe paddles for storage and transportation.

- (a) Many candidates scored high marks on this starting point for the design process as they were able to identify four additional functional points required of the rack. Successful responses included: easy to access; lightweight; easy to store; paddles secure; waterproof; does not move when at water's edge. General responses such as 'durable' or 'safe' can be awarded marks only where the specific reason for the requirement is given.
- (b) Most candidates were able to show two methods of moving large items over flat surfaces. Appropriate responses included: wheels; castors; rollers; skids; tracks.
- (c) The majority of candidates presented three ideas and showed that they were able to be quite creative in their response to the design problem. Successful candidates enhanced their drawings with colour or other forms of highlighting and added annotations to provide information on the nature and detail of each design idea. Candidates are advised to use all the space allocated to the answer for this part of the question so that they can show all information clearly.

- (d) Successful candidates identified both positive and negative aspects so that they could discriminate between all three of their design ideas in relation to the context of the question. This was often more effective where some of the comments related to the functional points raised earlier in their response to part (a). High marks were scored where comments included valid judgements rather than just simple descriptions of each design idea.
- (e) The level of response to this part of the question has continued to show improvements over recent examinations. Successful candidates selected a drawing format appropriate to and large enough for the design being presented and then added constructional detail in the form of sketched and written annotations. Candidates are reminded of the need to add detailed dimensions for the award of maximum marks.
- (f) Many excellent responses selected specific materials appropriate to the design presented in the previous section. Reasons given for choice indicated that candidates had considered the structure of their design and were familiar with the strengths and weaknesses of a range of specific materials in this context.
- (g) Outlines that described an appropriate step by step manufacturing method for one part of the design solution, including the specific tools used, scored high marks. Responses to this part need to develop and include detail beyond general marking out and preparation methods that could be applied to any product. The use of simple drawings in addition to written text was generally successful.

## Question 2

This question, intended for those following the Graphic Products option, was answered by very few candidates. Candidates appeared familiar with the requirements of a flat pack model boat but imagination and flair that might be expected of those following a graphics option needed further development.

- (a) The majority of candidates identified four additional points about the function of the model boat and successful responses included: simple shape; not too much detail; easy for child to cut out; no need for glue; easy to join; colourful model.
- (b) Candidates, generally, had no difficulty showing two methods of waterproofing paper or card and these included: laminated with plastic; waterproof paint or colour; impregnation; clear varnish.
- (c) )
- (d) ) See **Question 1 (c) – (g)**
- (e) )
- (f) )
- (g) )

## Question 3

A small number of candidates answered this question. The requirements for the system to inform rowers when their time was up were such that candidates could make use of their knowledge and experience of systems and control in an interesting context.

- (a) Most candidates had little difficulty identifying four additional points about the function of the system and these included: easy to see from anywhere on the lake; displays number of boat; grabs attention; audio warning; weather resistant; safe power source.
- (b) Candidates responded well by showing two different display methods that would be visible from a distance. These included: analogue displays; digital displays; LEDs; flags, semaphore system; colours.
- (c) )
- (d) )

(e) ) See **Question 1 (c) – (g)**

(f) )

(g) )

# DESIGN AND TECHNOLOGY

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Paper 0445/12  
Product Design

## Key messages

- Full solutions to the design problem, drawn in response to part (e), should show all construction details and dimensions rather than just manufacturing methods that might be used in the School workshop/studio.
- Candidates should avoid describing generic manufacturing methods in their response to part (g). This applies particularly where CAD and CAM methods form part of the answer. The response must relate to the description of the method used to manufacture an identified part of their final solution.

## General comments

Most candidates appeared to be prepared well to respond to the question of their choice and many showed that they could engage competently in the design problems set in the context of newspapers and magazines.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded as and where required were able to evidence their design and thinking skills successfully. Candidates should avoid including information not required in response to a particular part of the design process.

Some candidates showed a high level of originality in their design work.

Candidates are asked to indicate the question number they are answering, in the rubric box at the foot of each A3 answer sheet.

Centres are reminded not to include question papers when sending completed A3 answer sheets to Cambridge.

## Comments on specific questions

### **Question 1**

This was the most popular question and the majority of candidates understood clearly the requirements of a unit that would store newspapers and magazines in a hotel lounge area.

- (a) Many candidates scored high marks on this starting point for the design process as they were able to identify four additional functional points required of the unit. Successful responses included: easy to access; appropriate height/size/shape; newspapers and magazines stored in different ways; display magazines; match lounge environment; moveable. General responses such as 'durable' or 'safe' can be awarded marks only where the specific reason for the requirement is given.
- (b) Most candidates were able to show two methods of rotating such a unit for access. Appropriate responses included: wheels; castors; rollers; ball races; central vertical or horizontal spindle; sliding mechanisms.
- (c) The majority of candidates presented three ideas and showed that they were able to be quite creative in their response to the design problem. Successful candidates enhanced their drawings with colour or other forms of highlighting and added annotations to provide information on the nature and detail of each design idea. Candidates are advised to use all the space allocated to the answer for this part of the question so that they can show all information clearly.

- (d) Successful candidates identified both positive and negative aspects so that they could discriminate between all three of their design ideas in relation to the context of the question. This was often more effective where some of the comments related to the functional points raised earlier in their response to part (a). High marks were scored where comments included valid judgements rather than just simple descriptions of each design idea.
- (e) The level of response to this part of the question has continued to show improvements over recent examinations. Successful candidates selected a drawing format appropriate to and large enough for the design being presented and then added constructional detail in the form of sketched and written annotations. Candidates are reminded of the need to add detailed dimensions for the award of maximum marks.
- (f) Many excellent responses selected specific materials appropriate to the design presented in the previous section. Reasons given for choice indicated that candidates had considered the structure of their design and were familiar with the strengths and weaknesses of a range of specific materials in this context.
- (g) Outlines that described an appropriate step by step manufacturing method for one part of the design solution, including the specific tools used, scored high marks. Responses to this part need to develop and include detail beyond general marking out and preparation methods that could be applied to any product. The use of simple drawings in addition to written text was generally successful.

## Question 2

This question, intended for those following the Graphic Products option, was answered by a significant number of candidates. Candidates appeared familiar with the requirements of a display unit for a new magazine but imagination and flair that might be expected of those following a graphics option needed further development.

- (a) The majority of candidates identified four additional points about the function of the display unit and successful responses included: easy viewing of magazine; easy access to stored magazines; attracts attention; colourful; lightweight for storage; simple construction for taking apart; stable.
- (b) Candidates, generally, had no difficulty showing two different methods of holding open a magazine on a particular page and these included: different sliding/turning clip systems; held under transparent sheet; vertical/horizontal bars and bands.
- (c) )
- (d) ) See **Question 1(c)–(g)**
- (e) )
- (f) )
- (g) )

## Question 3

A fairly small number of candidates answered this question. The requirements of a device for compressing old newspapers into a brick shape were such that candidates could make use of their knowledge and experience of systems and control in an interesting context.

- (a) Most candidates had little difficulty identifying four additional points about the function of the device and these included: water resistant; water capture; mechanical advantage issues; correct height for use; floor/wall mounted; protect user; transportable.
- (b) Candidates responded well by showing two different methods of gaining mechanical advantage. These included: different types of lever; pneumatics; hydraulics; gear systems; rack and pinion.

(c) )

(d) )

(e) ) See **Question 1(c)–(g)**

(f) )

(g) )

# DESIGN AND TECHNOLOGY

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Paper 0445/13  
Product Design

## Key messages

- Full solutions to the design problem, drawn in response to part (e), should show all construction details and dimensions rather than just manufacturing methods that might be used in the School workshop/studio.
- Candidates should avoid describing generic manufacturing methods in their response to part (g). This applies particularly where CAD and CAM methods form part of the answer. The response must relate to the description of the method used to manufacture an identified part of their final solution.

## General comments

Most candidates appeared to be prepared well to respond to the question of their choice and many showed that they could engage competently in the design problems set in the context of trees and logs.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded as and where required were able to evidence their design and thinking skills successfully. Candidates should avoid including information not required in response to a particular part of the design process.

Some candidates showed a high level of originality in their design work.

Candidates are asked to indicate the question number they are answering, in the rubric box at the foot of each A3 answer sheet.

Centres are reminded not to include question papers when sending completed A3 answer sheets to Cambridge.

## Comments on specific questions

### **Question 1**

This was the most popular question by far and the majority of candidates understood clearly the requirements of a unit that would transport logs into a house.

- (a) Many candidates scored high marks on this starting point for the design process as they were able to identify four additional functional points required of the unit. Successful responses included: easy to access logs; lightweight for easy transport; easy to store; used to store logs in house; rustic appearance, easy to clean out. General responses such as 'durable' or 'safe' can be awarded marks only where the specific reason for the requirement is given.
- (b) Most candidates were able to show two ways by which logs could be stacked. Appropriate responses included: on ends; on sides; bonded; round section or split; different stacking supports.
- (c) The majority of candidates presented three ideas and showed that they were able to be quite creative in their response to the design problem. Successful candidates enhanced their drawings with colour or other forms of highlighting and added annotations to provide information on the nature and detail of each design idea. Candidates are advised to use all the space allocated to the answer for this part of the question so that they can show all information clearly.

- (d) Successful candidates identified both positive and negative aspects so that they could discriminate between all three of their design ideas in relation to the context of the question. This was often more effective where some of the comments related to the functional points raised earlier in their response to part (a). High marks were scored where comments included valid judgements rather than just simple descriptions of each design idea.
- (e) The level of response to this part of the question has continued to show improvements over recent examinations. Successful candidates selected a drawing format appropriate to and large enough for the design being presented and then added constructional detail in the form of sketched and written annotations. Candidates are reminded of the need to add detailed dimensions for the award of maximum marks.
- (f) Many excellent responses selected specific materials appropriate to the design presented in the previous section. Reasons given for choice indicated that candidates had considered the structure of their design and were familiar with the strengths and weaknesses of a range of specific materials in this context.
- (g) Outlines that described an appropriate step by step manufacturing method for one part of the design solution, including the specific tools used, scored high marks. Responses to this part need to develop and include detail beyond general marking out and preparation methods that could be applied to any product. The use of simple drawings in addition to written text was generally successful.

## Question 2

This question, intended for those following the Graphic Products option, was answered by a significant number of candidates. Candidates appeared familiar with the requirements of a display for promoting wood as a fuel but imagination and flair that might be expected of those following a graphics option needed further development.

- (a) The majority of candidates identified four additional points about the function of the display and successful responses included: not too much information; clear to read; easy to move; lightweight; stable in use; attracts attention; portable power source for moving feature.
- (b) Candidates, generally, had no difficulty showing two different methods of achieving movement on the display and these included a range of features using: rotation; reciprocation; oscillation; linear movement; hinges or methods of moving the display itself.
- (c) )
- (d) ) See **Question 1 (c) – (g)**
- (e) )
- (f) )
- (g) )

## Question 3

A fairly small number of candidates answered this question. The requirements of a device for holding tree branches for cutting were such that candidates could make use of their knowledge and experience of systems and control in an interesting context.

- (a) Most candidates had little difficulty identifying four additional points about the function of the holding device and these included: easy to use; weather resistant; takes different diameter/shaped logs; quick release action; stable in use; suitable cutting height.
- (b) Candidates responded well by showing two different methods of gripping logs. These included: vices; over centre cam; chain; rope, levers.
- (c) )



(d) )

(e) ) See **Question 1 (c) – (g)**

(f) )

(g) )

# DESIGN AND TECHNOLOGY

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Paper 0445/21  
Graphic Products

## Key message

- The focus of this assessment is Graphic Products. Future candidates would benefit from practical activities based on the questions contained in this paper.

## 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**. A smaller number of candidates chose to answer **Question B4**. A small number of candidates did not follow the rubric instruction and omitted part of **Question A3** or answered all the questions.

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. Candidates must be able to add thick and thin lines to pictorial drawings to make them appear three-dimensional. Practical experiences of using vacuum forming to produce blister packaging are also areas that need to be improved.

## Comments on specific questions

### **Question A1**

#### *Model Aeroplane parts*

Candidates were given detail drawings of the three parts of a model aeroplane. The question required candidates to complete the isometric drawing by completing the fuselage and by adding the main and tail wing. Successful candidates 'crated' the wings to get the true outline of the front edges in isometric projection. Centrally placing the wings appeared to be an issue for some candidates.

### **Question A2**

*An enlarged side view of the aeroplane fuselage was given to candidates*

- (a) Candidates were required to complete the lettering of 'CIE AIRLINES' by adding the letter 'R' and letter 'N'. Marks were awarded for lettering that was in the same style, height and proportion.
- (b) To complete the side view, a right angled triangular window was to be drawn having sides of 30 mm and 16 mm.

### **Question A3**

#### *Model Aeroplane blister packaging*

- (a) This required candidates to complete the scale 2:1 sectional drawing of the backing card and blister that was to be used to package the parts for a model aeroplane. Most candidates completed the backing card. The blister was generally drawn to the correct pocket depth, but the pocket was not always in the correct position or on the correct side.
- (b) The two most common plastic materials for vacuum forming are Polystyrene and HIPS.

- (c) Candidates who had first hand experience of Vacuum Forming immediately recognised that the decision box required a YES at the bottom corner and a NO to the right (or to the left). A feedback loop is always leading from the decision box 'NO' to the previous activity (Heat Plastic). The missing activity before 'Unclamp Plastic' is 'Wait for plastic to cool'. A practical experience of vacuum forming would have provided the candidate with sufficient knowledge to describe the steps in the process.

#### Question B4

##### *Bottle carrier*

This question was derived from a real 'Graphic Product' frequently used by supermarkets.

A classroom exercise to make the bottle carrier in cardboard would be most beneficial to future candidates' understanding of this commonly used application.

This question was attempted by a smaller number of the candidates. Overall, candidates gained a wide range of marks for their answers.

- (a) Candidates were required to complete the half scale orthographic views of the bottle carrier given the dimensioned pictorial view. The starting lines for each view and the given symbol showed that the views were in third angle projection.

The Plan required the outline to be completed and dividers to be drawn to give six equal pockets.

The Front view required the bottom holder to be drawn  $90 \times 40$  and the top of the handle to be 40 above the top edge of the bottom holder, drawn 55 long and centrally placed. Two semi-circles R6, 35 apart and 30 from the top edge of the bottom holder, joined by horizontal lines completed the finger slot.

- (b) This part of the question required an ellipse to be drawn to form a base completing the pictorial view of the bottle. Many methods of construction were seen that were valid and accounted for full marks.

- (c) (i) CAD is an abbreviation of Computer Aided Design.

- (ii) The advantages of bitmap compared to jpeg images are that they are higher resolution, better quality, clearer images and can have a larger colour range. The disadvantages are that it requires a larger file size, takes up more storage space, takes longer to upload and is prone to 'pixelate' when enlarged.

#### Question B5

##### *Child's playhouse*

This question was derived from an actual 'Product' used by playgroups for pre-school children.

A classroom exercise to make the product in cardboard would be most beneficial to future candidates' understanding of the relevant folding and joining of materials that are in common use for constructing this type of Graphic Product.

This question was attempted by a large number of the candidates. Overall, candidates gained a wide range of marks for their answers.

- (a) Candidates were required to add thick and thin line technique to the pictorial drawing. The golden rule for this technique is that a thick line is applied to all edges where only one side can be seen that produces the edge. All other edges where two sides can be seen are left as thin lines.

- (b) Candidates were required to complete the development (net) of the chimney to a scale of 1:5. A starting side was given that corresponded to the long front side. Two sides 36 wide needed to be added either side of the long front side and one 40 wide side 30 high to the far right. Sloping sides on each 36 wide side brought the join edge to a height of 30. A joining glue flap needed to be

added to one of the shorter edges. All fold lines were to be to convention as shown here.



- (c) Candidates were required to complete the single point perspective of the given playhouse. All horizontal edges needed to be projected to VP1 including the inside of the house, the window and the chimney stack. The vertical edges of the house and the vertical edges of the window were to be estimated.



# DESIGN AND TECHNOLOGY

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<p><b>Paper 0445/22</b> <b>Graphic Products</b></p>
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## Key message

- The focus of this assessment is Graphic Products. Future candidates would benefit from practical activities based on the questions contained in this paper.

## 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**. A smaller number of candidates chose to answer **Question B5**. A small number of candidates did not follow the rubric instruction and answered all the questions.

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. Candidates must be able to apply rendering techniques to illustrate different materials. The joining of arcs and circles that touch is an important drafting skill. The practical experience of using card and cardboard as modelling materials are also areas that needs to be improved.

## Comments on specific questions

### **Question A1**

#### *Pizza Box*

- (a) Candidates were required to complete the outline of a Pizza Box to a half size scale. Most candidates completed the half Octagon using a variety of constructions.
- (b) The flag required candidates to be able to draw arcs that touch. It was necessary to determine the centre of these arcs from fixed points of contact. Two vertical parallel lines to give three equal parts to the flag required lines to be drawn either side of the centre line.
- (c) Candidates were required to complete the lettering 'FRESH PIZZA' by adding the letters 'R' and 'A'. Marks were awarded for – Font, Style, Spacing and Proportion.

### **Question A2**

#### *Isometric view of closed Pizza Box*

Two fully dimensioned orthographic views of the Pizza Box were shown and a start corner drawn for candidates in isometric. Candidates were required to complete the isometric view to the scale of 1:2. Most candidates 'crated' the box. This enabled the front right hand corner (45°) to be drawn correctly.

### **Question A3**

*Some candidates did not attempt this compulsory question.*

Corrugated cardboard is extensively used in the packing industry. This question required the candidates to understand its properties and to explain its suitability for this application

Correct responses included:

- High strength to weight ratio. Strong enough to hold the Pizza in transport without being too heavy.
- Good insulation properties. Multi-layer construction traps air and stops heat escaping from the Pizza, therefore it stays hotter for longer/heat is not transmitted to a person's hand.

#### Question B4

- (a) Two third angle orthographic views of a chair used in the pizza restaurant were shown.

Candidates were required to complete the planometric view of the chair from the given front leg base 'A'. Many candidates used isometric or oblique projection. However, marks were awarded for the correct size and position of the component parts.

- (b) A table of Pizza Sales over one day was given. A column chart had been started with sales of the Margherita flavour correctly plotted.

Candidates were required to add the other three flavour sales to the column chart. Candidates were awarded marks for the correct quantity and a vertical order similar to the Margherita column. A suitable Y axis scale was needed and a clear labelling of the X axis. The title of the chart needed to contain the words 'daily' or sales over 'one day'

#### Question B5

##### *Holder for condiments*

This question was attempted by a large number of candidates. Overall, candidates gained a wide range of marks for their answers.

This question was derived from a real 'Product'. Candidates would benefit from making models from Perspex, Foam Board, Styrofoam and Hardboard.

A dimensioned isometric view of a fabricated condiments holder made from 5 mm Acrylic was shown.

- (a) Candidates were required to complete the number of parts needed for each component required by the fabrication. The Partitions could be projected from the ENDS but drawn 5 mm less at the bottom edge as the Partitions sat on the Base. The Front/Back could be drawn full size from the isometric view. The side slots and cut-outs needed to be the correct size and in the correct position. Having completed the Front/Back the Base could be projected down to the right width with projecting side tabs but with 5 mm less at each end to allow for fitting the Ends.
- (b) This part of the question required candidates to have knowledge and use of a CAM machine such as a Laser Cutter, Milling Machine or a CAMM1.
- (c) This part question required candidates to render the wood to have grain on the top and side surface with growth rings and medullary rays evident on the end.
- (d) Candidates were required to complete the single point perspective of the given menu holder block. All horizontal edges needed to be projected to VP1 including the inside of the groove. The vertical edge of the end was to be estimated. The far end of the groove required a vertical line also.

# DESIGN AND TECHNOLOGY

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<p><b>Paper 0445/23</b> <b>Graphic Products</b></p>
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## Key message

- The focus of this assessment is Graphic Products. Future candidates would benefit from practical activities based on the questions contained in this paper.

## 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**. A smaller number of candidates chose to answer **Question B5**. A small number of candidates did not follow the rubric instruction and answered all the questions.

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. Candidates need to have knowledge of commercial printing and cutting methods. Also, the drawing of irregular shapes in isometric projection. In addition, candidates must be able to effectively use the correct convention for fold lines.

## Comments on specific questions

### **Question A1**

#### *Logo design*

Candidates were required to complete the design for a logo by drawing:

- (a) The logo outline including the 160 × 50 rectangle and the R80 semi-circle centrally placed on the top of the rectangle.
- (b) The remaining letters of 'COOL' to the correct size, style and spacing including the accurate construction of the arcs.
- (c) The three-pointed shape containing equilateral triangles.

### **Question A2**

- (a) The drawing of the logo was to be completed by drawing the perimeter of a rectangular label 200 × 170 that contained the logo centrally. Candidates who positioned this rectangle with 20 mm space on each side of the Logo scored full marks.
- (b)(i) The most suitable printing method for a batch of 10,000 is Digital Printing.
- (ii) The benefits of using self-adhesive vinyl for the labels are that it allows a sharper image with no ink bleed, it is more resistant to water and no additional adhesive is required to apply the label.

### **Question A3**

Some candidates did not attempt all parts of this compulsory question.

- (a) The question asked candidates to complete the unfinished plan and side view of point of sale display for shower gel. A pictorial view gave all the dimensions and information required. The orthographic view had been started to a scale of 1:2

Most candidates completed the plan with a rectangular base  $110 \times 50$  in front of a backboard  $110 \times 5$ . A semi-circle of R25 was then to be drawn with the centre point being 15 from the front edge of the back and centrally placed. The plinth could then be completed by drawing tangents from the semi-circle to the front edge of the back. The indent could then be drawn in the middle of the plinth. Two lines showing the cut out on the back needed to be drawn centrally and 30 apart.

The side view could be completed by projecting lines from the front view and from the plan. The indent needed to be shown in hidden detail.

#### Question B4

##### Packaging for shower gel bottle

This question was derived from an actual package for a bottle sold in a shop.

This question was attempted by many candidates. Overall, candidates gained a wide range of marks for their answers.

- (a) An incomplete one-piece development and a pictorial view of a cardboard package for a shower gel bottle were given. From the position of the given front and the accompanying fold lines, the Candidate should have recognised that the left-hand side needed to be added to the left of the given front and the remaining side and back added to the right. The lid along with its fold-in flap needed to be joined to the top of the back. The two sides needed to have the fold in flaps added to the top with slopes on the inner edges. The window in the front needed completing to the  $80 \times 30$  dimensions with R10 corners.
- (b) Three small glue tabs were needed to secure the base (positioned on the base or the bottom edges of the two sides and back). One long glue tab to secure the side to the back could be placed on either the back or the left-hand side.
- (c) To permanently join the card development (net) together, any of the following adhesives could be used: PVA, Contact adhesive, hot melt glue, double sided tape. Commercial names of adhesive derived from the list were accepted.
- (d) The advantages of using a Die Cutter are that many layers can be cut at once enabling large quantities to be cut in a short time. Cuts and creases can be made at the same time. All cuts are the same size. The disadvantages of using a Die Cutter are that the initial set-up costs are high, the use is only economic when used for large quantities, and once the die has been made, it is difficult/expensive to alter the design.
- (e) Suitable materials for the window were Acetate and HIPS.
- (f) A suitable size for the transparent window would be:  
Length: any size between 84 – 100 Width: any size between 34 – 50
- (g) Any suitable locking method that would hold the lid in place was accepted. Candidates needed to show good communication with a sketch accompanied by notes.

#### Question B5

##### Shower gel bottle

This question was attempted by a smaller number of candidates. Overall, candidates gained a wide range of marks for their answers.

- (a) This question required candidates to complete an isometric view of a shower gel bottle. The elliptical screw cap had been given. Starting with the  $30 \times 30$  top shoulder, the centre line could be determined. Descending the centre line, crating of individual parts could be drawn starting with the



35 × 50 × 20 deep crate below the top 30 × 30 surface. Descending in this way, the rectangular shape could be drawn in isometric.

- (b) The circular screw cap appears as an ellipse in isometric. Many methods of drawing an ellipse were seen and accepted. Where a 'trammel' was used, candidates needed to draw this on the exam paper or attach it to the exam paper to gain marks for construction.
- (c) Several methods of rendering exist. The most common showed vertical shading to the curved face that diminished towards the front face. The circular top was rendered with concentric arcs that increased in diameter from the centre outwards.
- (d) The Anthropometric data commonly used for this Design application would be the size of the user's hand and the grip strength along with turning force that could be applied.
- (e) The symbols printed on the shower gel bottle would show:
- Expiry date of the product
  - The product has not been tested on animals

# DESIGN AND TECHNOLOGY

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Paper 0445/31  
Resistant Materials

## Key messages

- Candidates need to read the questions carefully before attempting to answer. Candidates should try to focus on the key elements of each question. The mark allocation given to each question and the space provided to answer the question provides candidates with a clear indication of what is required.
- Candidates need to improve their communication skills. They must try to provide clearly drawn sketches when attempting questions that begin with the statement: *Use sketches and notes to...* In addition, notes should enhance and make clearer what they have drawn.
- In order to achieve good marks for **Section A**, candidates need to develop a wide knowledge and understanding of materials, tools and processes used when working with wood, metal and plastic.

## General comments

### **Section A**

Many candidates needed to further develop the all-round knowledge and understanding required to answer all questions in this section.

### **Section B**

This section always has a number of questions with large mark allocations requiring a combination of clear and accurate sketches supported by detailed written notes. The comments made in the first 2 bullet points above are particularly relevant.

## Comments on specific questions

### **Section A**

#### **Question 1**

This question tested the candidates' knowledge of standard sections made from metal.

A small number of candidates could name the two metal sections. Most answers referred to the shapes rather than to the technical terms: round bar or rod and hexagonal bar or rod.

#### **Question 2**

- (a) A very small number of candidates could name the Surform tools.
- (b) Most candidates stated that the sharp teeth or the coarse cut would remove the waste wood quickly.

#### **Question 3**

Candidates needed to develop their knowledge for this question as very few could name the three different holes used when joining with screws. Many candidates recognised a countersunk hole and some the pilot hole. Very few named the clearance hole.

#### Question 4

A very small number of candidates could name **all four** materials from the descriptions provided. Many named acrylic and plywood correctly. Beech and brass were less common correct answers.

#### Question 5

There was a wide variety of answers to this question. Many candidates did show the spur and thumbscrew, not always in the correct position.

#### Question 6

- (a) Candidates needed to develop their knowledge for this question as only a small number could name the press forming/moulding process.
- (b) Most candidates understood that the purpose of the pegs was to align or locate the formers.

#### Question 7

Very few candidates described a benefit of using the wooden toy while there were many who described how the plastic toy would be more comfortable and lighter in weight. Many candidates did not read the question carefully and described the benefits of the manufacturing processes rather than the benefits to the children in use.

#### Question 8

Candidates needed to develop their knowledge for this question as many of them could not show how the corner of the frame construction could be strengthened by use of the hardboard plate and the corrugated fastener. Many candidates showed the hardboard plate incorrectly inside the frame rather than on top of the corner. Few candidates understood the purpose of the corrugated fastener.

#### Question 9

Many candidates provided a correct reading of the micrometer. Marks were awarded for partially correct answers: 7.00, 0.50 and 0.24.

#### Question 10

- (a) The item of equipment shown was a polishing or buffing wheel used to polish or finish metals and plastics. Many incorrect answers referred to the removal of wood and metal.
- (b) Most candidates gained at least one mark for giving a sensible safety precaution. The best answers referred to the wearing of a face mask, fastening loose clothing, keeping fingers out of the way and holding material firmly against the underside of the polishing mop.

#### Section B

#### Question 11

Attempted by almost a quarter of all candidates.

- (a) Only a very small minority of candidates gave correct sizes for **all four** missing dimensions. Most candidates gave the correct width of the top.

The question did state, '*not all dimensions are given*'. This was specifically aimed at the 'overhang' on the top of the unit and the 'set back' of the shelves. Candidates were expected to use their own judgement. With the exception of the top of the unit, each of the dimensions included a tolerance.

- (b) Candidates needed to develop their knowledge for this question as very few were able to provide two benefits of using veneered chipboard for *the* top. The best answers referred to its stability, availability and chipboard being cheaper (not cheap) than solid wood. Popular misconceptions included that chipboard was easier to use and that it was lighter in weight than solid wood.

- (c) Most candidates achieved at least one or two marks for showing some type of wheel or castor that would allow the unit to be moved about easily. There were some excellent sketches showing how the wheel or castor could be attached to the unit.
- (d) Candidates needed to develop their knowledge for this question as very few achieved maximum marks for this question. For maximum marks a clear sketch of a recognised K–D fitting was required. At least two K–D fittings were needed at each end and the method of fixing the shelf to the end by means of screws was required.
- (e) Most candidates did not understand that the edges of chipboard are unsightly and need to be covered. The covering is known as a ‘lipping’. Some candidates did show a thin piece of solid wood pinned and glued to the edge to achieve maximum marks.
- (f) There were some potentially good modifications suggested by candidates. Many candidates achieved at least three marks for showing how the additional items could be stored. Many candidates simply showed a separate storage unit without showing how it would be included in the original design. For maximum marks candidates needed to provide details of materials, constructions and fittings used.
- (g) Most candidates showed some sort of ‘back’ that could be added to the storage unit to prevent paper falling off the shelves. The best answers, achieving maximum marks, provided details of the size of the ‘back’ piece and how it would be fitted to the storage unit.

### Question 12

The most popular question attempted by almost two-thirds of all candidates.

- (a) The majority of candidates were able to give at least one good item of research to be considered when designing the headphone stand. The most common answers referred to the size of existing stands, their weight, the location of the stand and consumer preferences. Some candidates presented their answers in the form of a design specification for which no credit was given.
- (b) The majority of candidates were able to give at least one reason for making a model of the stand before making it from acrylic. The most common answers referred to checking the sizes, the overall appearance, the possibility of using the model as a development (net) and that checking a model for faults would prevent wastage of expensive acrylic.
- (c) (i) Most candidates achieved marks for showing the acrylic softened by means of a strip heater or line bender and the use of some type of former around which the shape could be made. Some candidates described use of a hot air gun that was acceptable but those who attempted to soften the acrylic by exposing it to a naked flame was not practical. Many candidates did not achieve maximum marks because they did not describe how the acrylic would be held while it cooled. The best methods involved some form of clamping device rather than holding it by hand.  
  
(ii) There were some excellent, concise, text book explanations of acrylic as a ‘smart’ material. Some candidates did not focus on the word ‘smart’ in the question and instead gave a list of properties of acrylic.
- (d) (i) Candidates needed to develop their knowledge for this question. To achieve two marks candidates need to describe how the acrylic cement would be applied to both parts of the stand and then clamped in position. Many candidates described the first part but were unable to describe how the joint would be held together.  
  
(ii) Most candidates gave two good safety precautions; the most common being to wear safety glasses, a mask to prevent inhalation of fumes, the wearing of gloves to avoid contact with the skin and to provide adequate ventilation.
- (e) (i) Most candidates sketched and named a suitable joint that could be used to join the support to the hardwood base. The most common answers showed a dowel joint or a mortise and tenon joint.

Candidates needed to develop their knowledge for this question as a butt joint was not considered appropriate. Sometimes candidates were unable to achieve maximum marks because they drew an appropriate joint but provided the wrong name.

- (ii) Very few candidates recognised the paper shape as a template.
- (iii) Most candidates named two appropriate saws that could be used to cut out the curved shape. The most common saws were the coping, scroll, band and jig saws.
- (f) This question required candidates to design a means of storing the headphone cable neatly. There were some good, innovative designs including the use of fabricated 'hooks', pegs of dowel or acrylic around which the cable could be wound and the use of a small box into which the cable would fit.

There were many potentially excellent ideas that did not achieve full marks because the sketches and notes did not always provide details of the materials, sizes and constructions for which two marks were available.

### Question 13

The least answered question.

- (a) Some candidates gave reasons for applying a finish to the shelf unit. The key point of this question was why the shelf unit would be finished **before** it was assembled. Careful reading of the question is essential.
- (b) The most common benefit for using stainless steel was that it did not corrode. Answers such as 'strong' are not in sufficient detail to be credited.
- (c) (i) and (c)(ii) Candidates needed to develop their knowledge for this question. This question required an understanding of solid woods. Solid wood contains moisture and therefore under certain conditions they will dry out and shrink, causing them to split. A very small number of candidates demonstrated understanding of this and most concentrated on the causes of splitting being the result of inadequate constructional detail. Any form of screwing must allow for movement in solid wood to avoid splitting.
- (d) (i) Candidates needed to develop their knowledge for this question. Many candidates had limited understanding of sawing jigs. Candidates must be aware of this area of the syllabus for batch production purposes.
  - (ii) The most common correct joints were the mortise and tenon and dowel joints. Those candidates who showed a butt joint needed to show how it would be secured by means of pins and glue.
  - (iii) Most candidates who attempted this question achieved one or two marks for naming appropriate tools used to make the joint. Some candidates named equipment such as 'glue' which could not be considered a tool.
- (e) Most candidates suggested a good functional improvement; the most common being the addition of sides to prevent items from falling off the shelf or to add an additional rail to add strength.
- (f) Candidates could argue that Design **A** or Design **B** was the cheaper to mass-produce. Those who chose **A** argued that it involved more processes and therefore greater costs. Those who chose **B** argued that stainless steel was more expensive than hardwood.
- (g) (i) Most candidates described a benefit of self-assembly products as being personal satisfaction and ease of collection and delivery.
  - (ii) Most candidates correctly stated that because manufacturers were not required to assemble products they would be able to make more products at a lower cost.

# DESIGN AND TECHNOLOGY

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Paper 0445/32  
Resistant Materials

## Key messages

- Candidates need to read the questions carefully before attempting to answer. Candidates should try to focus on the key elements of each question. The marks allocation given to each question and the space provided to answer the question provides candidates with a clear indication of what is required.
- Candidates need to improve their communication skills. They must try to provide clearly drawn sketches when attempting questions that begin with the statement: *Use sketches and notes to...* In addition, notes should enhance and make clearer what they have drawn.
- In order to achieve good marks for **Section A**, candidates need to develop a wide knowledge and understanding of materials, tools and processes used when working with wood, metal and plastic.

## General comments

### **Section A**

Many candidates needed to further develop the all-round knowledge and understanding required to answer all questions in this section. Specifically, **Questions 3, 6 and 8** required knowledge of metalworking processes that many candidates needed to improve their understanding of.

### **Section B**

This section always has a number of questions with large mark allocations requiring a combination of clear and accurate sketches supported by detailed written notes. The comments made in the first 2 bullet points above are particularly relevant.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a) Many candidates named a marking gauge correctly. There were many answers naming a marking knife or try square that were incorrect.
- (b) Most candidates named a smoothing or jack plane correctly. A block plane was also a correct answer. Jointer and try planes were considered to be too long to be suitable for planing wood 300 mm long.

#### **Question 2**

Although there were many candidates who named the process correctly as extrusion, the majority of candidates gave injection moulding as a common incorrect answer.

#### **Question 3**

Many candidates needed to further develop their knowledge for this question as they could not name both tools and provide a specific use for them. Most candidates did achieve at least one or two marks for this question. The dividers were often referred to as compasses. There were many instances where the tools were associated with processes carried out on wood rather than metal.

#### Question 4

There were some excellent sketches showing a biscuit joint. However, many candidates produced sketches of a housing joint.

#### Question 5

Many candidates needed to further develop their knowledge for this question as few could correctly name three different thermosetting plastics for the products shown in the question. Many answers were not thermosetting plastics and some not plastic at all. The most common correct answer was epoxy resin for the two-part adhesive.

#### Question 6

**(a) and 6(b)** Many candidates could not describe a specific use for the three and four jaw chucks. As with **Question 3**, practical experience and knowledge of metalworking processes and techniques needs to be further developed.

#### Question 7

- (a)** Candidates needed to further develop their knowledge for this question. The majority of candidates could not name carbon fibre reinforced polymer/plastic or CFRP as the composite material for the shin pads. Candidates gained a mark for stating 'carbon fibre'. GRP was a common incorrectly named composite while some materials named were not composites but metals or woods.
- (b)** Many candidates were unable to describe properties that made CFRP suitable for the shin pads. The most common correct properties referred to them being lightweight, rigid, good tensile strength. (not 'strong') and corrosion resistant.

#### Question 8

**(a) and 8(b)** Candidates needed to improve on their knowledge for this question. Many candidates could not name the **two types** of soldering for the electronic components and the nickel silver jewellery; 'soft' and 'hard' or 'silver' respectively.

#### Question 9

There were a minority of clear and accurate sketches of the KD fitting joining the leg and rail of a table. This type of fitting is commonly used in self-assembly furniture and candidates should have a good understanding of them in terms of their appearance and applications.

#### Question 10

**(a) and 10(b)** Many candidates recognised the blow moulding process and how a flat bottom could be produced on the plastic bowl.

#### Section B

#### Question 11

Attempted by less than a quarter of all candidates.

- (a) (i)** Most candidates drew the four bend lines in the correct positions. A minority of candidates drew the lines in the wrong orientation.
- (ii)** Most candidates identified the felt marker as the method of marking the bend lines on the acrylic surface.
- (b)** Answers were generally good with the majority of candidates knowledgeable about the heating and bending of acrylic sheet. Candidates need to make sure that their sketches are large and clear.

- (c) Most candidates achieved at least one or two marks for showing how the waste acrylic could be removed and the rounded corners produced.
- (d) (i) A minority of candidates named the type of filing used to produce a smooth finish; draw filing.
- (ii) Candidates needed to improve their knowledge for this question. Many did not understand the basics of producing a high quality finish on acrylic. The same techniques could be applied to finishing metals.
- The reason for using two different grades of wet and dry (silicon carbide) paper is to remove the fine scratches produced by the first grade to be replaced with even finer scratches made by the second grade. Eventually the scratches would be fine enough to be removed and a high quality finish would be achieved using a polishing mop and compound.
- (e) (i) Most candidates understood that the acrylic cement could be applied by means of a brush or small piece of wood. Fewer candidates recognised that the joint would require additional clamping or the positioning of weights to ensure a good bond.
- (ii) Most candidates were well aware of the dangers of using acrylic cement. The most common correct answers referred to the toxic fumes and the flammable risks from the build up of the fumes.
- (f) There were some potentially good modifications suggested by candidates. Many candidates achieved at least two or three marks for showing how the tube of toothpaste could be stored. Sometimes the sketches lacked clarity and without clear added notes it was difficult to understand the design modification and how it could be made in a School workshop. For maximum marks candidates needed to name all the tools and equipment used.

### Question 12

Attempted by three-quarters of all candidates.

- (a) (i) The majority of candidates named an appropriate manufactured board for the desk top; the most common being plywood, MDF and chipboard.
- (ii) Only a minority of candidates suggested an appropriate thickness, 18–20 mm. Candidates should be familiar with standard sizes of solid wood.
- (iii) Most candidates named an appropriate hardwood.
- (iv) Most candidates correctly identified anthropometrics as the correct term.
- (b) (i) The majority of candidates were able to name two marking out tools used to mark out the corner bridle joint. The most commonly named tools included a marking knife, steel rule and a mortise gauge.
- (ii) The majority of candidates were able to name two tools that could be used to cut out the corner bridle joint. The most commonly named tools included tenon and dovetail saws, coping saw and chisels.
- (c) Most candidates did not achieve maximum marks because they did not realise that the end frames needed some additional support in the form of strips, blocks or brackets. Most candidates showed housing joints and/or nails and screws and PVA. This would not be strong enough without additional support.
- (d) (i) Most candidates named sash cramps or F cramps correctly. Some candidates named a G cramp which was inappropriate.
- (ii) Many candidates named PVA as a suitable adhesive to join the frame together. Those candidates who named PVC did not receive a mark and epoxy resin was unsuitable.
- (iii) There were a variety of checks given by candidates. The most relevant were to check that the joints were square, there were no gaps, the cramps were not over-tightened and excess glue was removed. Some candidates provided one-word answers such as 'squareness' which required more



detail. Candidates need to be familiar with command words.' Describe' does require at least a sentence and one word answers are not creditworthy.

- (e) (i)** There were a variety of advantages and disadvantages given by candidates to parts **(i)** and **(ii)**.

The best advantages referred to the manufactured board not requiring joints and that manufacture would be quicker. The best disadvantage was that it would produce a lot of waste.

- (ii)** The majority of candidates named a jig saw as a portable tool that could be used to cut out the shape.

- (iii)** Some of the safety precautions described included the wearing of PPE even though the question stated that precautions must be 'other than personal protection equipment'. The best answers referred to no trailing leads, to check the condition of the power tool before use, no obstacles below the material being worked and making sure that the work piece was secured. There were many answers that lacked specific detail such as 'keep fingers out of the way'. Candidates need to provide specific examples wherever possible.

- (f)** The two desks shown were from different eras.

This question required candidates to consider the influences that resulted in the change of design.

The main issues included the popularity of self-assembly furniture and fittings and modern materials.

Other issues included the advent of technology, specifically computers and less need for the storage of books and pens. Only a few candidates made reference to these issues.

### Question 13

This question was attempted by a small minority of candidates.

- (a)** Most candidates named suitable specific materials for the three parts of the shelving system. Some candidates gave 'steel' for the metal rods. A specific type of steel, for example, mild steel or stainless steel, was required to gain a mark.
- (b) (i)** Many candidates did not understand the benefits and drawbacks of using veneers to cover the surface of a manufactured board. Some candidates thought that a benefit was to make it waterproof, whereas the real benefit was to make the board appear as an attractive solid wood by covering an unattractive surface.
- (ii)** Very few candidates understood that the main drawback of veneered surfaces is that they can be easily damaged or the veneer can peel away from the surface of the board.
- (c)** Candidates needed to improve their knowledge and understanding for this question as it required an understanding of jig design. There were some excellent drilling jigs described using clear sketches and annotated notes. The Mark Scheme 'breaks down' the award of marks to give partially correct answers the credit they deserve. For example one mark would be given for a 'plate' with three drilled holes; for the same plate with one side located against the wood a second mark would be given.
- (d)** Although candidates generally demonstrate limited knowledge of metalworking processes and techniques most candidates gained marks for showing at least some of the key stages; the metal rod supported in a vice with a block as a former and a hammer or mallet to bend the rod to shape.
- (e)** Many candidates needed to further develop their knowledge and understanding for this question. Candidates do not seem to understand the basic processes involved in preparing metal to take a specific finish. Candidates had the opportunity to achieve three marks for describing stages in preparing the metal rods for a lacquered finish. The first stage to degrease, the second to clean the metal with steel wool, emery cloth or wet and dry (silicon carbide) paper and the third stage to 'buff' the wheel on a polishing mop. Most candidates achieved one mark.

- (f) (i) Most candidates correctly named an appropriate marking out tool; the most common answers included a marking knife, try square and a marking gauge.
- (ii) There are two back saws that candidates could have named: the tenon saw and the dovetail (tenon) saw. Most candidates recognised one of these saws.
- (g) Answers showing how the metal rod could be fixed to the shelf for support were generally weak. Some candidates confused woodworking and metalworking techniques. Some very good answers showed the rod through the shelf with some sort of 'stop' underneath the shelf. The 'stop' was a metal 'plate' to which the rod could be brazed or screwed.
- (h) Candidates needed to look carefully at the design of the shelf unit to describe two good features. Most candidates achieved one mark. The best features included the adjustable shelves, the simple adjustment, good use of materials and simple to manufacture.

# DESIGN AND TECHNOLOGY

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Paper 0445/33  
Resistant Materials

## Key messages

- Candidates need to read the questions carefully before attempting to answer. Candidates should try to focus on the key elements of each question. The mark allocation given to each question and the space provided to answer the question provides candidates with a clear indication of what is required.
- Candidates need to improve their communication skills. They must try to provide clearly drawn sketches when attempting questions that begin with the statement: *Use sketches and notes to...* In addition, notes should enhance and make clearer what they have drawn.
- In order to achieve good marks for **Section A**, candidates need to develop a wide knowledge and understanding of materials, tools and processes used when working with wood, metal and plastic.

## General comments

### **Section A**

Many candidates needed to further develop the all-round knowledge and understanding required to answer all questions in this section.

### **Section B**

This section always has a number of questions with large mark allocations requiring a combination of clear and accurate sketches supported by detailed written notes. The comments made in the first 2 bullet points above are particularly relevant.

## Comments on specific questions

### **Section A**

#### **Question 1**

This question tested the candidates' knowledge of standard sections made from metal.

A small number of candidates could name the two metal sections. Most answers referred to the shapes rather than to the technical terms: round bar or rod and hexagonal bar or rod.

#### **Question 2**

- (a) A very small number of candidates could name the Surform tools.
- (b) Most candidates stated that the sharp teeth or the coarse cut would remove the waste wood quickly.

#### **Question 3**

Candidates needed to develop their knowledge for this question as very few could name the three different holes used when joining with screws. Many candidates recognised a countersunk hole and some the pilot hole. Very few named the clearance hole.

#### Question 4

A very small number of candidates could name **all four** materials from the descriptions provided. Many named acrylic and plywood correctly. Beech and brass were less common correct answers.

#### Question 5

There was a wide variety of answers to this question. Many candidates did show the spur and thumbscrew, not always in the correct position.

#### Question 6

- (a) Candidates needed to develop their knowledge for this question as only a small number could name the press forming/moulding process.
- (b) Most candidates understood that the purpose of the pegs was to align or locate the formers.

#### Question 7

Very few candidates described a benefit of using the wooden toy while there were many who described how the plastic toy would be more comfortable and lighter in weight. Many candidates did not read the question carefully and described the benefits of the manufacturing processes rather than the benefits to the children in use.

#### Question 8

Candidates needed to develop their knowledge for this question as many of them could not show how the corner of the frame construction could be strengthened by use of the hardboard plate and the corrugated fastener. Many candidates showed the hardboard plate incorrectly inside the frame rather than on top of the corner. Few candidates understood the purpose of the corrugated fastener.

#### Question 9

Many candidates provided a correct reading of the micrometer. Marks were awarded for partially correct answers: 7.00, 0.50 and 0.24.

#### Question 10

- (a) The item of equipment shown was a polishing or buffing wheel used to polish or finish metals and plastics. Many incorrect answers referred to the removal of wood and metal.
- (b) Most candidates gained at least one mark for giving a sensible safety precaution. The best answers referred to the wearing of a face mask, fastening loose clothing, keeping fingers out of the way and holding material firmly against the underside of the polishing mop.

### Section B

#### Question 11

Attempted by almost a quarter of all candidates.

- (a) Only a very small minority of candidates gave correct sizes for **all four** missing dimensions. Most candidates gave the correct width of the top.

The question did state, '*not all dimensions are given*'. This was specifically aimed at the 'overhang' on the top of the unit and the 'set back' of the shelves. Candidates were expected to use their own judgement. With the exception of the top of the unit, each of the dimensions included a tolerance.

- (b) Candidates needed to develop their knowledge for this question as very few were able to provide two benefits of using veneered chipboard for *the* top. The best answers referred to its stability, availability and chipboard being cheaper (not cheap) than solid wood. Popular misconceptions included that chipboard was easier to use and that it was lighter in weight than solid wood.

- (c) Most candidates achieved at least one or two marks for showing some type of wheel or castor that would allow the unit to be moved about easily. There were some excellent sketches showing how the wheel or castor could be attached to the unit.
- (d) Candidates needed to develop their knowledge for this question as very few achieved maximum marks for this question. For maximum marks a clear sketch of a recognised K–D fitting was required. At least two K–D fittings were needed at each end and the method of fixing the shelf to the end by means of screws was required.
- (e) Most candidates did not understand that the edges of chipboard are unsightly and need to be covered. The covering is known as a ‘lipping’. Some candidates did show a thin piece of solid wood pinned and glued to the edge to achieve maximum marks.
- (f) There were some potentially good modifications suggested by candidates. Many candidates achieved at least three marks for showing how the additional items could be stored. Many candidates simply showed a separate storage unit without showing how it would be included in the original design. For maximum marks candidates needed to provide details of materials, constructions and fittings used.
- (g) Most candidates showed some sort of ‘back’ that could be added to the storage unit to prevent paper falling off the shelves. The best answers, achieving maximum marks, provided details of the size of the ‘back’ piece and how it would be fitted to the storage unit.

### Question 12

The most popular question attempted by almost two-thirds of all candidates.

- (a) The majority of candidates were able to give at least one good item of research to be considered when designing the headphone stand. The most common answers referred to the size of existing stands, their weight, the location of the stand and consumer preferences. Some candidates presented their answers in the form of a design specification for which no credit was given.
- (b) The majority of candidates were able to give at least one reason for making a model of the stand before making it from acrylic. The most common answers referred to checking the sizes, the overall appearance, the possibility of using the model as a development (net) and that checking a model for faults would prevent wastage of expensive acrylic.
- (c) (i) Most candidates achieved marks for showing the acrylic softened by means of a strip heater or line bender and the use of some type of former around which the shape could be made. Some candidates described use of a hot air gun that was acceptable but those who attempted to soften the acrylic by exposing it to a naked flame was not practical. Many candidates did not achieve maximum marks because they did not describe how the acrylic would be held while it cooled. The best methods involved some form of clamping device rather than holding it by hand.  
  
(ii) There were some excellent, concise, text book explanations of acrylic as a ‘smart’ material. Some candidates did not focus on the word ‘smart’ in the question and instead gave a list of properties of acrylic.
- (d) (i) Candidates needed to develop their knowledge for this question. To achieve two marks candidates need to describe how the acrylic cement would be applied to both parts of the stand and then clamped in position. Many candidates described the first part but were unable to describe how the joint would be held together.  
  
(ii) Most candidates gave two good safety precautions; the most common being to wear safety glasses, a mask to prevent inhalation of fumes, the wearing of gloves to avoid contact with the skin and to provide adequate ventilation.
- (e) (i) Most candidates sketched and named a suitable joint that could be used to join the support to the hardwood base. The most common answers showed a dowel joint or a mortise and tenon joint.

Candidates needed to develop their knowledge for this question as a butt joint was not considered appropriate. Sometimes candidates were unable to achieve maximum marks because they drew an appropriate joint but provided the wrong name.

- (ii) Very few candidates recognised the paper shape as a template.
- (iii) Most candidates named two appropriate saws that could be used to cut out the curved shape. The most common saws were the coping, scroll, band and jig saws.
- (f) This question required candidates to design a means of storing the headphone cable neatly. There were some good, innovative designs including the use of fabricated 'hooks', pegs of dowel or acrylic around which the cable could be wound and the use of a small box into which the cable would fit.

There were many potentially excellent ideas that did not achieve full marks because the sketches and notes did not always provide details of the materials, sizes and constructions for which two marks were available.

### Question 13

The least answered question.

- (a) Some candidates gave reasons for applying a finish to the shelf unit. The key point of this question was why the shelf unit would be finished **before** it was assembled. Careful reading of the question is essential.
- (b) The most common benefit for using stainless steel was that it did not corrode. Answers such as 'strong' are not in sufficient detail to be credited.
- (c) (i) and (c)(ii) Candidates needed to develop their knowledge for this question. This question required an understanding of solid woods. Solid wood contains moisture and therefore under certain conditions they will dry out and shrink, causing them to split. A very small number of candidates demonstrated understanding of this and most concentrated on the causes of splitting being the result of inadequate constructional detail. Any form of screwing must allow for movement in solid wood to avoid splitting.
- (d) (i) Candidates needed to develop their knowledge for this question. Many candidates had limited understanding of sawing jigs. Candidates must be aware of this area of the syllabus for batch production purposes.
  - (ii) The most common correct joints were the mortise and tenon and dowel joints. Those candidates who showed a butt joint needed to show how it would be secured by means of pins and glue.
  - (iii) Most candidates who attempted this question achieved one or two marks for naming appropriate tools used to make the joint. Some candidates named equipment such as 'glue' which could not be considered a tool.
- (e) Most candidates suggested a good functional improvement; the most common being the addition of sides to prevent items from falling off the shelf or to add an additional rail to add strength.
- (f) Candidates could argue that Design **A** or Design **B** was the cheaper to mass-produce. Those who chose **A** argued that it involved more processes and therefore greater costs. Those who chose **B** argued that stainless steel was more expensive than hardwood.
- (g) (i) Most candidates described a benefit of self-assembly products as being personal satisfaction and ease of collection and delivery.
  - (ii) Most candidates correctly stated that because manufacturers were not required to assemble products they would be able to make more products at a lower cost.

# DESIGN AND TECHNOLOGY

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Paper 0445/41  
Systems and Control

## Key messages

- Candidates are reminded that only one question in **Section B** should be attempted. There were a few instances of all questions being answered. This significantly reduces the time available for the question that will eventually count toward the final mark. A more productive approach for candidates is to fully read through the questions before starting a response to the chosen question.
- Where sketches are required, care should be taken that they are large enough for detail to be clearly seen.
- There were very few 'no response' questions in this series, future candidates should be reminded though that if they do not even attempt a question part it is a guaranteed zero for that part.
- In tables that require a set number of responses candidates must ensure that they complete no more than the number asked for. Errors are best corrected by neatly crossing through the incorrect answer.
- Where explanations are asked for, any points made should be justified to ensure that a mark can be given.
- In calculation questions, the units used should be applied to the numerical figure when appropriate. The working for a calculation is a valuable part of the response which can gain marks even where the final figure is incorrect.

## General comments

The questions in **Section A** proved accessible to the majority of candidates with very few instances of questions with no response. Clear answers were seen with evidence that each area of the syllabus had been covered.

In **Section B** the majority of candidates chose the structures question; the mechanisms question was the least popular of the three.

As noted in the key messages there were still a number of candidates attempting all three questions. Candidates should be aware before the day of the exam how many questions to expect in each section and that **Section B** contains optional questions of which they will answer only one.

It is important that candidates read each question carefully, noting the command words and the number of marks available for the question.

Where sketches were required as part of the response, they were generally clear and good use had been made of the available space.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a) The majority of responses were correct for this question stating either 'push to make' or 'PTM' as the switch type. A small number of candidates chose to use the term, 'momentary action', which was also correct.

- (b) A number of candidates did not gain the mark for this question because they had chosen to describe the action of a toggle switch rather than give an alternative use for it. The alternative use most often suggested was, a domestic lighting circuit.

### Question 2

All candidates had attempted this question, with a high proportion gaining all of the marks. Of those who made errors the most common was to confuse microfarad and nanofarad. In most cases the line from picofarad to  $10^{-12}$  was correctly drawn.

### Question 3

The symbol for conductors crossing was generally known. The method of indicating conductors joined was also widely known, with, in most cases a connection 'blob' being drawn at the junction. The symbol for alternating current was accepted without terminals being shown.

### Question 4

- (a) Knowledge of the action of single and double acting cylinders was in many cases not given in enough detail to gain the marks. However, those candidates who correctly stated the number of connections on each were awarded marks. The required answer should have reflected that single acting cylinders are only powered by compressed air on the outstroke while double acting cylinders are powered in both directions.
- (b) Examples of all four types of motion were seen in the responses, reciprocating movement was the correct answer.

### Question 5

A number of higher achieving candidates gained the marks for describing the action of a reed switch cylinder. The part played by the magnetic nature of the piston ring was often overlooked though in most cases candidates had noted that the reed switch will be activated when the piston is close to the switch.

### Question 6

- (a) The third order lever in position **B** was correctly identified by most candidates. The other two levers were often confused, with the hammer head in lever **A** being called second order.
- (b) Regardless of the answers given in part **6(a)** most candidates had identified lever **B** as the one that does not give a mechanical advantage.

### Question 7

- (a) In many cases the reinforcement method shown was not identified as a gusset plate.
- (b) Candidates who identified the reinforcement in part **7(a)** as anything other than a gusset plate were credited in this part if they had chosen to use a gusset plate as the different form of reinforcement. A variety of other methods which used struts, ties or triangulation were seen, all of which gained marks.

### Question 8

- (a) Higher achieving candidates generally gained the mark for identifying torsion or torque as the force used when inserting a screw. Tension, compression and shear were often seen in answers from lower achieving candidates.
- (b) The fact that brass is a softer material that will suffer from excessive torque was widely recognised. Terms used to describe the properties of brass were in some cases confused and lacking accuracy. Candidates should be made aware that with a question that has two marks available it will generally be necessary to justify any facts given. For example, brass being a soft material will gain one mark, the second mark coming from the fact that a soft material will easily deform at the screw slot.



### Question 9

- (a) Glass reinforced plastic was rarely identified as a composite except by higher achieving candidates. Other responses did not gain a mark as they had focused on the plastics used in the structure, forgetting the glass strands used as reinforcement.
- (b) Responses to this question were generally very good with all abilities of candidate recognising the advantages offered by plastics when used in a structure.

### Section B

#### Question 10

- (a) The majority of responses included recognisable sketches and were named. There were a few responses that did not gain a mark because the structure was of an example that included more than one different type of structure. Candidates should be advised to use simpler examples which are definitely limited to a single type of structure.
- (b) (i) Responses to this question were good with a full range of candidates showing knowledge and gaining both marks. In most cases the reinforcement material used was steel though use of plastic fibres would have been acceptable.
- (ii) Good understanding of the natural resistance of concrete to compressive force was evident in the responses.
- (iii) A valid force was named in the majority of cases; this could have been torsion, bending or shear.
- (c) Higher achieving candidates gained full marks for this calculation question. Those who did not include the full working for their answer received no marks if the answer was incorrect.

In a number of cases the calculation resulted in the correct values which were then assigned to the reaction at the opposite end to that stated.

The correct answers were  $R_1 = 5.625 \text{ kN}$  and  $R_2 = 3.375 \text{ kN}$ .

A common feature in responses was to complete the full calculation for the reactions at each end of the beam rather than subtracting the value calculated for one reaction from the total load acting on the beam.

- (d) (i) A high proportion of answers were correct as there were a number of possible areas that included the use of triangulation.
- (ii) Only a few higher achieving candidates recognised that shear was the force acting on the pin when a load was placed on the axle stand.
- (iii) Use of a material with a higher tensile strength was a correct response in a number of cases; simply stating that the material should be changed was not accepted; a property of the new material was needed for the mark to be awarded. The second answer given should have related to the diameter of the pin, not the length of the pin.
- (iv) This part was well answered by a full range of candidates with only the lower achieving sector not gaining marks. Candidates must recognise that responses to questions which ask for an explanation must be justified to give access to the full mark.
- (v) Clear responses were seen from a full range of candidate ability. In most cases annotation was clear and suitable additions to the given drawing had been added.
- (vi) Understanding of the reasons for welding was good, many of the responses showed an appreciation of why a permanent method of joining was used and made valid comparisons with other possible methods of joining the materials together.
- (vii) Reasons for considering a Factor of Safety were appreciated by only the higher achieving candidates who recognised the duty of care that is the responsibility of the designer and

manufacturer. High proportion responses referred to situations where an accident of failure had occurred, rather than prevention of failure where conditions of use are beyond the control of the manufacturer.

### Question 11

- (a) (i) The majority of responses included two valid reasons for the use of gears. Transference of drive from one shaft to another was the reason most frequently seen, followed by the ability to increase or decrease the speed of a driven shaft.
- (ii) Candidates needed to improve on their knowledge for this question. It was not well answered as the majority of candidates had given the gear ratio (25:1) rather than the velocity ratio (1:25).
- (iii) This calculation was carried out successfully by almost all of the candidates answering the question. In the majority of cases the working for the calculation was included, resulting in a speed of 287.5 rpm.
- (iv) The action of a compound gear train was generally not fully understood by candidates.  
The 25:1 gear ratio required, was often noted but this was not then split correctly between the two pairs of gears. Each reduction needed to be 5:1 leading to the use of a 60t larger gear.
- (v) The compact nature of a compound gear train was recognised by the higher achieving candidates, with a few also mentioning the lower cost of smaller gears.
- (vi) A variety of methods for securing a gear onto a shaft were seen. In some cases, marks were lost by not using a method that allowed later removal of the gear. Sketching and annotation was very good, showing clearly the intended method.
- (vii) Reduction in energy demands was mainly based on efficient lubrication of the gear system, reducing the weight of components was rarely seen as a factor.
- (b) (i) Identification of the component parts was accurately carried out by higher achieving candidates.
- (ii) The purpose of a bell crank in changing the direction of motion by 90° was not widely appreciated.
- (iii) The importance of lubrication was recognised by the majority of candidates; reduction of friction being the factor most often used. Reducing wear and thereby maintenance was also noted.
- (iv) A high proportion of those answering the question correctly identified the reciprocating to rotary conversion in the mechanism.
- (c) (i) Suitable benefits for belt **B** were generally given, most of these focussing on the non-slipping of the belt. Valid benefits for belt **A** were given only by the higher achieving candidates.
- (ii) Methods of tensioning a belt were in most cases clearly shown in the sketches but lost marks through not achieving the desired result. Ability to adjust the belt tension was one of the factors that should have been considered in the response.

### Question 12

- (a) In nearly all cases full marks were awarded for identification of the polarised components in the table. The small number of errors concerned the polyester capacitor, which is not polarised.
- (b) (i) Higher achieving candidates correctly identified switch symbols as push to make and push to break switches.
- (ii) In the majority of responses, the correct arrangement of Ohm's law had been used, leading to an accurate calculation of the current giving an answer of 250 mA or 0.25 A.
- (iii) The candidates who had made use of the view from below of the relay were able to identify the coil contacts.

- (c) (i) Compact size and lower current draw of the logic gate relay were the two features most frequently mentioned.
  - (ii) The reduced current handling capacity of a logic gate was recognised by the higher achieving candidates.
  - (iii) Candidates needed to develop their knowledge for this question. In a number of cases marks were lost through connection of the outputs to a logic level in addition to the inputs. Another error seen was the connection of output pins direct to inputs.
  - (iv) Practical methods of avoiding static damage to ICs were known to the majority of candidates. Grounding or earthing was mentioned by lower achieving candidates without going on to state the reason for grounding.
  - (v) The transistor amplifier circuit required was understood in general by many candidates, but the solutions drawn suffered from missing components such as the current limiting resistor to the base leg and in some cases the transistor symbol was inaccurately drawn.
- (d) (i) The use of pins 1 and 5 was given as providing power by a minority of candidates. The fact that they were common terminals which would be connected to the supply voltage was generally overlooked.
  - (ii) Few candidates identified the reason for the display having two pins with the same purpose. In practice either pin can be used as a connection, having two pins allows easier routing of PCB tracks, in what can be a crowded layout.
  - (iii) A common error with this question was for candidates to give the segment letter rather than the pin number for the required segments.

# DESIGN AND TECHNOLOGY

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Paper 0445/42  
Systems and Control

## Key messages

- Candidates are reminded that only one question in **Section B** should be attempted. There were a few instances of all questions being answered. This significantly reduces the time available for the question that will eventually count toward the final mark. A more productive approach for candidates is to fully read through the questions before starting a response to the chosen question.
- Where sketches are required, care should be taken that they are large enough for detail to be clearly seen.
- There were very few 'no response' questions in this series, future candidates should be reminded though that if they do not even attempt a question part it is a guaranteed zero for that part.
- In tables that require a set number of responses candidates must ensure that they complete no more than the number asked for. Errors are best corrected by neatly crossing through the incorrect answer.
- Where explanations are asked for, any points made should be justified to ensure that a mark can be given.
- In calculation questions, the units used should be applied to the numerical figure when appropriate. The working for a calculation is a valuable part of the response which can gain marks even where the final figure is incorrect.

## General comments

The questions in **Section A** proved accessible to the majority of candidates with very few instances of questions with no response. Clear answers were seen with evidence that each area of the syllabus had been covered.

In **Section B** the majority of candidates chose the structures question; the mechanisms question was the least popular of the three.

As noted in the key messages there were still a number of candidates attempting all three questions. Candidates should be aware before the day of the exam how many questions to expect in each section and that **Section B** contains optional questions of which they will answer only one.

It is important that candidates read each question carefully, noting the command words and the number of marks available for the question.

Where sketches were required as part of the response, they were generally clear and good use had been made of the available space.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a) The majority of responses were correct for this question stating either 'push to make' or 'PTM' as the switch type. A small number of candidates chose to use the term, 'momentary action', which was also correct.

- (b) A number of candidates did not gain the mark for this question because they had chosen to describe the action of a toggle switch rather than give an alternative use for it. The alternative use most often suggested was, a domestic lighting circuit.

### Question 2

All candidates had attempted this question, with a high proportion gaining all of the marks. Of those who made errors the most common was to confuse microfarad and nanofarad. In most cases the line from picofarad to  $10^{-12}$  was correctly drawn.

### Question 3

The symbol for conductors crossing was generally known. The method of indicating conductors joined was also widely known, with, in most cases a connection 'blob' being drawn at the junction. The symbol for alternating current was accepted without terminals being shown.

### Question 4

- (a) Knowledge of the action of single and double acting cylinders was in many cases not given in enough detail to gain the marks. However, those candidates who correctly stated the number of connections on each were awarded marks. The required answer should have reflected that single acting cylinders are only powered by compressed air on the outstroke while double acting cylinders are powered in both directions.
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### Question 6

- (a) The third order lever in position **B** was correctly identified by most candidates. The other two levers were often confused, with the hammer head in lever **A** being called second order.
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- (b) The fact that brass is a softer material that will suffer from excessive torque was widely recognised. Terms used to describe the properties of brass were in some cases confused and lacking accuracy. Candidates should be made aware that with a question that has two marks available it will generally be necessary to justify any facts given. For example, brass being a soft material will gain one mark, the second mark coming from the fact that a soft material will easily deform at the screw slot.

### Question 9

- (a) Glass reinforced plastic was rarely identified as a composite except by higher achieving candidates. Other responses did not gain a mark as they had focused on the plastics used in the structure, forgetting the glass strands used as reinforcement.
- (b) Responses to this question were generally very good with all abilities of candidate recognising the advantages offered by plastics when used in a structure.

### Section B

#### Question 10

- (a) The majority of responses included recognisable sketches and were named. There were a few responses that did not gain a mark because the structure was of an example that included more than one different type of structure. Candidates should be advised to use simpler examples which are definitely limited to a single type of structure.
- (b) (i) Responses to this question were good with a full range of candidates showing knowledge and gaining both marks. In most cases the reinforcement material used was steel though use of plastic fibres would have been acceptable.
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  - (iv) This part was well answered by a full range of candidates with only the lower achieving sector not gaining marks. Candidates must recognise that responses to questions which ask for an explanation must be justified to give access to the full mark.
  - (v) Clear responses were seen from a full range of candidate ability. In most cases annotation was clear and suitable additions to the given drawing had been added.
  - (vi) Understanding of the reasons for welding was good, many of the responses showed an appreciation of why a permanent method of joining was used and made valid comparisons with other possible methods of joining the materials together.
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manufacturer. High proportion responses referred to situations where an accident of failure had occurred, rather than prevention of failure where conditions of use are beyond the control of the manufacturer.

### Question 11

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- (vii) Reduction in energy demands was mainly based on efficient lubrication of the gear system, reducing the weight of components was rarely seen as a factor.
- (b) (i) Identification of the component parts was accurately carried out by higher achieving candidates.
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### Question 12

- (a) In nearly all cases full marks were awarded for identification of the polarised components in the table. The small number of errors concerned the polyester capacitor, which is not polarised.
- (b) (i) Higher achieving candidates correctly identified switch symbols as push to make and push to break switches.
- (ii) In the majority of responses, the correct arrangement of Ohm's law had been used, leading to an accurate calculation of the current giving an answer of 250 mA or 0.25 A.
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- (c) (i)** Compact size and lower current draw of the logic gate relay were the two features most frequently mentioned.
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- (d) (i)** The use of pins 1 and 5 was given as providing power by a minority of candidates. The fact that they were common terminals which would be connected to the supply voltage was generally overlooked.
- (ii)** Few candidates identified the reason for the display having two pins with the same purpose. In practice either pin can be used as a connection, having two pins allows easier routing of PCB tracks, in what can be a crowded layout.
- (iii)** A common error with this question was for candidates to give the segment letter rather than the pin number for the required segments.



# DESIGN AND TECHNOLOGY

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Paper 0445/43  
Systems and Control

## Key messages

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- Where explanations are asked for, any points made should be justified to ensure that a mark can be given.
- In calculation questions, the units used should be applied to the numerical figure when appropriate. The working for a calculation is a valuable part of the response which can gain marks even where the final figure is incorrect.

## General comments

The questions in **Section A** proved accessible to the majority of candidates with very few instances of questions with no response. Clear answers were seen with evidence that each area of the syllabus had been covered.

In **Section B** the majority of candidates chose the structures question; the mechanisms question was the least popular of the three.

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## Comments on specific questions

### **Section A**

#### **Question 1**

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- (a) In nearly all cases full marks were awarded for identification of the polarised components in the table. The small number of errors concerned the polyester capacitor, which is not polarised.
- (b) (i) Higher achieving candidates correctly identified switch symbols as push to make and push to break switches.
- (ii) In the majority of responses, the correct arrangement of Ohm's law had been used, leading to an accurate calculation of the current giving an answer of 250 mA or 0.25 A.
- (iii) The candidates who had made use of the view from below of the relay were able to identify the coil contacts.

- (c) (i) Compact size and lower current draw of the logic gate relay were the two features most frequently mentioned.
  - (ii) The reduced current handling capacity of a logic gate was recognised by the higher achieving candidates.
  - (iii) Candidates needed to develop their knowledge for this question. In a number of cases marks were lost through connection of the outputs to a logic level in addition to the inputs. Another error seen was the connection of output pins direct to inputs.
  - (iv) Practical methods of avoiding static damage to ICs were known to the majority of candidates. Grounding or earthing was mentioned by lower achieving candidates without going on to state the reason for grounding.
  - (v) The transistor amplifier circuit required was understood in general by many candidates, but the solutions drawn suffered from missing components such as the current limiting resistor to the base leg and in some cases the transistor symbol was inaccurately drawn.
- (d) (i) The use of pins 1 and 5 was given as providing power by a minority of candidates. The fact that they were common terminals which would be connected to the supply voltage was generally overlooked.
- (ii) Few candidates identified the reason for the display having two pins with the same purpose. In practice either pin can be used as a connection, having two pins allows easier routing of PCB tracks, in what can be a crowded layout.
  - (iii) A common error with this question was for candidates to give the segment letter rather than the pin number for the required segments.

# DESIGN AND TECHNOLOGY

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Paper 0445/05  
Project

## Key messages

- Ensure that the problem selected will enable the candidate to access all of the assessment criteria. Candidates must create a 'product' that can be properly tested and evaluated in the environment it is intended for.
- Focus on quality rather than quantity. Use a reasonable size font and make full use of each page.
- Candidates should be encouraged to explore more innovative and creative design opportunities.

## General comments

Moderators greatly appreciate the work that centres do in preparing their candidates for this assessment unit and acknowledge the care and attention over the administrative tasks required to accurately complete documentation.

Work submitted was generally well structured and fully covered the assessment criteria. Centres are reminded that practical outcomes and three dimensional prototype models should not be forwarded with the sample for moderation. The folders should include sufficient photographic evidence to clearly show the work of the candidate.

There were a number of exceptional projects submitted, some were very innovative and many candidates produced well manufactured, high quality, functional outcomes.

A concise and detailed folder making the best use of each page is recommended. It is not necessary for candidates to over-decorate their work or use over large fonts to produce lengthy folders. Some candidates were spending time on unnecessary embellishment which carries no additional marks. A significant number of projects were presented on A3 photographic paper which is unnecessary.

The majority of centres apply marks consistently and accurately, and in line with the standards set by the Awarding Body. There were a few instances however, where individual candidates within the sample submitted were awarded disproportionate marks resulting in an inaccurate rank order. Centres are reminded to carry out a final check to ensure that a correct rank order of candidates is submitted. Moderators take great care in ensuring that all candidates are awarded marks in line with approved standards.

Centres are encouraged to use the guidance given in this report and the focused information on the Moderators Comments on School Based Assessment of Coursework form when assessing the work of candidates.

## Comments on specific sections

### **1. Identification of a need or opportunity with a brief analysis leading to a Design Brief**

Many centres were lenient in awarding marks in this section, a brief statement is not enough to access the middle or higher mark ranges.

To access the higher mark range, candidates must analyse the need in detail and consider the requirements of possible users.

The design opportunity and design brief tended to be communicated well. Candidates would benefit from looking at the needs and expectations of the selected user group in more detail.

## **2. Research into the Design Brief resulting in a Specification**

Research needs to be more focused on the situation chosen and specifications should state the main functions and qualities of the product. Many candidates did not access specific research directly related to their brief. For example, candidates designing a bathroom cabinet should find information about the range and sizes of items to be stored.

Most candidates analyse existing products as part of their research. To access the higher mark range, candidates need to draw out details that will help them when designing. Candidates should highlight the particular design strengths and weaknesses and use this information when generating a specification and when designing. Some candidates used existing products as their only source of information in this section. This alone cannot access full marks.

Many specifications were clear and justified. To access the higher mark range, candidates need to produce more detailed and specific specifications. By explaining the design criteria in more detail, candidates show a greater understanding and can access a higher level of attainment.

The best examples of work focused on key, relevant information which helped to support the candidates designing. The high level of personal observation and analysis lead to a detailed and relevant specification.

## **3. Generation and exploration of Design Ideas**

There were many examples of exceptionally well-presented, innovative and creative design work.

To access the higher mark range, a wide range of different, well-annotated possibilities is required. Ideas should be evaluated on their suitability for further development and make reference to the specification.

Evaluation and specification checks from some candidates needed further improvement as they were often simplistic. Candidates must make it clear why ideas had been selected for further development.

## **4. Development of Proposed Solution**

This section was assessed too generously by a significant number of centres. Some candidates had little or no evidence of the development of ideas in their folders.

Having clearly established which design is to be made, candidates need to work out the most suitable materials and methods of construction. They need to explain why these specific materials and possible joining methods have been selected. The number of components and their sizes need to be established. Many candidates find model making very helpful at this stage. Seeing their design in 3D helps to make sure items will fit or the product will be stable. An increasing number of candidates make very good use of two dimensional and three dimensional modelling and computer aided images to develop their design proposal.

## **5. Planning for Production**

Working drawings continue to be of a good standard, clear, detailed and fully dimensioned. CAD is being increasingly used to good effect in the generation of working drawings.

To achieve the highest mark ranges, drawings should include all details necessary such as key dimensions, additional fixtures used e.g. hinges and screws, and finishes applied.

Most candidates produced detailed plans for production. Many produced a logical sequence of the stages of manufacture, including detailed cutting lists and approximate time allocations.

Candidates should be reminded to include details of specific tools, equipment, adhesives and finishes.

## 6. Product Realisation

The majority of centres continue to be accurate and fair in awarding marks commensurate with the quality of work produced.

Most candidates fully complete the manufacture of a practical outcome and there were many examples of exceptionally high quality manufactured products presented.

Candidates generally include good quality photographs to show full details of their product. Many gave photographic evidence of key stages of manufacture of the product to emphasize particular features and the quality of making, which is to be encouraged.

Centres are reminded that marks allocated to making should reflect the overall complexity of the product, the level of skill demonstrated by the candidate, and the quality of the making of the final product.

## 7. Testing and Evaluation

Whilst most centres assess this section accurately, a significant number tend to be too lenient. To access the higher mark range, candidates should, where possible, test the product in its intended environment and produce detailed evaluations of successes and possible weaknesses.

Most candidates tested their products against their original specification and identified strengths and weaknesses. To improve on their responses, candidates needed to use sketches and notes to suggest proposals for further development.

Photographic evidence of testing should be included in this section.

A number of candidates included third party testing and evaluation from clients or potential users of the product which is to be encouraged.