

# DESIGN AND TECHNOLOGY

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Paper 0445/11

Design

## Key messages

- Candidates need to use specific, not generic terms when referring to design issues, materials and manufacturing techniques at all stages of their design responses.
- Clear links between one stage of the design process and the next are more likely to result in successful responses.

## General comments

The majority of candidates appeared to be well prepared to respond to the question of their choice and many showed that they could engage competently in the design problem as set.

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.

## Comments on specific questions

### Question 1

This was the most popular question and the majority of candidates understood clearly the requirements of a storage unit for dirty clothes in the bathroom and responded in a very positive way.

- (a) Many candidates scored high marks on this starting point for the design process as they were able to identify four additional specific functional points required of the storage unit. Successful responses included: resists water, hygienic, easy access for items, matches bathroom style, sections labelled, acts as seat, reduces odour, etc. General responses such as 'durable' or 'lightweight' can be awarded marks only where the specific reason for the requirement is given.
- (b) Most candidates were able to show two ways of forming divisions in a storage unit. Appropriate sketched responses included: horizontal/vertical divisions, drawers, shelves, halving joint, housing joint, butt joint, dowels, fabric, etc.
- (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 responses included drawings enhanced with colour or other forms of highlighting, and annotations to provide information on the nature and detail of each design idea. Candidates are advised to use all the space allocated for the answer for this part of the question so that they can show all information clearly.
- (d) Successful responses identified both positive and negative aspects to could discriminate between all three 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. High marks were scored where comments included valid judgements rather than just simple descriptions of each idea. Evaluation tables that simply ticked or awarded marks against each idea without adding meaningful comment could not be awarded maximum marks.
- (e) The responses to this part of the question continue to show improvements. Successful responses selected a drawing format appropriate to, and large enough for, the design being presented. Constructional detail was added in the form of sketched and written annotations. Candidates are reminded of the need to add the overall dimensions and dimensions for some details 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.

### Question 2

This question, intended for those following the Graphic Products option, was answered by a reasonable number of candidates. Candidates appeared familiar with the requirements of the advertising unit and some imaginative ideas were offered.

- (a) The majority of candidates identified four additional points about the function of the advertising unit and successful responses included: appealing to potential customers, reflects 'laundry, colourful, stable in use, lightweight/easy to carry, folds for storage, etc.
- (b) Candidates, generally, had no difficulty showing two flexible joints including: scored line, tape, rings, comb, cord, plastic hinge, etc.
- (c) } See **Question 1 (c) – (g)**
- (d) }
- (e) }
- (f) }
- (g) }

### Question 3

Only a very small number of candidates answered this question. The requirements for the washing line modification were such that candidates could make use of their knowledge and experience of systems and control in an interesting way.

- (a) Most candidates had little difficulty identifying four additional points about the function of the modification and these included: will not dirty clothes, weatherproof, easy/simple to operate, cannot catch fingers, easy to reach, etc.
- (b) Candidates responded quite well to the drawing of two mechanisms that might form part of the modification including: rack and pinion, pulley system, gear train, chain and sprocket, ratchet, winding drum, etc.
- (c) } See **Question 1 (c) – (g)**
- (d) }
- (e) }
- (f) }
- (g) }

# DESIGN AND TECHNOLOGY

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Paper 0445/12

Design

## Key messages

- Candidates need to use specific, not generic terms when referring to design issues, materials and manufacturing techniques at all stages of their design responses.
- Clear links between one stage of the design process and the next are more likely to result in successful responses.

## General comments

The majority of candidates appeared to be well prepared to respond to the question of their choice and many showed that they could engage competently in the design problem as set.

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.

## Comments on specific questions

### Question 1

This was the most popular question and the majority of candidates clearly understood the requirements of a unit for holding fishing items and responded in a very positive way.

- (a) Many candidates scored high marks on this starting point for the design process as they were able to identify four additional specific functional points required of the unit. Successful responses included: resists water, easy access for items, lightweight/easy to transport, compact, items held firmly, etc. General responses such as 'durable' or 'lightweight' can be awarded marks only where the specific reason for the requirement is given.
- (b) Most candidates were able to show two ways of carrying such a unit. Appropriate sketched responses included: handles, shoulder strap, harness, belt clip, wheels, etc.
- (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 responses were enhanced by colour or other forms of highlighting, with annotations added to provide information on the nature and detail of each design idea. Candidates are advised to use all the space allocated for the answer for this part of the question so that they can show all information clearly.
- (d) Successful responses identified both positive and negative aspects to discriminate between all three 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. High marks were scored where comments included valid judgements rather than just simple descriptions of each idea. Evaluation tables that simply ticked or awarded marks against each idea without adding meaningful comment could not be awarded maximum marks.
- (e) The responses to this part of the question continue to show improvements. Successful responses 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 overall dimensions and some detail 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.

### Question 2

This question, intended for those following the Graphic Products option, was answered by a reasonable number of candidates. Candidates appeared to understand the requirements of the fishing game and some imaginative ideas were offered.

- (a) The majority of candidates identified four additional points about the function of the fishing game and successful responses included: appealing to children, easy to catch shapes, attractive colour/shape, realistic fish shapes, cannot see fish, etc.
- (b) Candidates generally had no difficulty showing two ways of catching fish including: magnet, hook/eye, 'Velcro', sticky pads, etc.

- (c)
  - (d)
  - (e)
  - (f)
  - (g)
- } See **Question 1 (c) – (g)**

### Question 3

Only a very small number of candidates answered this question. The requirements for the fishing alert system were such that candidates could make use of their knowledge and experience of systems and control in an interesting way.

- (a) Most candidates had little difficulty identifying four additional points about the function of the system and these included: weather resistant, easy to fix to rod, creates movement/noise, minimal power use, easy to set up, etc.
- (b) Candidates responded quite well to the drawing of two sensing devices including: tilt switch, sensing pad, movement sensor, strain gauge, simple lever mechanisms, etc.

- (c)
  - (d)
  - (e)
  - (f)
  - (g)
- } See **Question 1 (c) – (g)**

# DESIGN AND TECHNOLOGY

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Paper 0445/13

Design

## Key messages

- Candidates need to use specific, not generic terms when referring to design issues, materials and manufacturing techniques at all stages of their design responses.
- Clear links between one stage of the design process and the next are more likely to result in successful responses.

## General comments

The majority of candidates appeared to be well prepared to respond to the question of their choice and many showed that they could engage competently in the design problem as set.

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.

## Comments on specific questions

### Question 1

This was the most popular question and the majority of candidates clearly understood the requirements of a gardening tools holding device.

- Many candidates scored high marks on this starting point for the design process as they were able to identify four additional specific functional points required of the holding device. Successful responses included: easy to move around, easy to clean, easy access to tools, tools held firmly, sharp edges/points protected, easy to store, etc. General responses such as 'durable' or 'lightweight' can be awarded marks only where the specific reason for the requirement is given.
- Most candidates were able to show two methods of holding tools in place. Appropriate sketched responses included: holes, slots, spring clips, rubber bands, recesses, etc.
- 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 responses were enhanced with colour or other forms of highlighting, and annotations were added to provide information on the nature and detail of each design idea. Candidates are advised to use all the space allocated for the answer for this part of the question so that they can show all information clearly.
- Successful responses identified both positive and negative aspects to discriminate between all three 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. High marks were scored where comments included valid judgements rather than just simple descriptions of each idea. Evaluation tables that simply ticked or awarded marks against each idea without adding meaningful comment could not be awarded maximum marks.
- The responses to this part of the question continue to show improvements. Successful responses 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 overall dimensions and some detail 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.

### Question 2

This question, intended for those following the Graphic Products option, was answered by a large number of candidates. Candidates appeared familiar with the requirements of sandwich packaging and some imaginative ideas were offered.

- (a) The majority of candidates identified four additional points about the function of the sandwich packaging and successful responses included: suitable size/shape for handling, interesting theme/colour, items easy to access, protects items from damage, suitable for easy storage, hygienic, moisture resistant, etc.
- (b) Candidates generally had no difficulty showing two manufacturing methods including: part card/plastic constructions, vacuum formed, folded net, triangular/square/rectangular shapes, etc.

- (c)
  - (d)
  - (e)
  - (f)
  - (g)
- } See **Question 1 (c) – (g)**

### Question 3

Only a small number of candidates answered this question. The requirements for the computer screen adjuster were such that candidates could make use of their knowledge and experience of systems and control in an interesting way.

- (a) Most candidates had little difficulty identifying four additional points about the function of the system and these included: easy to use by anyone, suited to table top use, stable in use, can be adjusted from front, lockable at any height, fixes to standard holes on screen, etc.
- (b) Candidates responded quite well to the drawing of two adjustment methods including: rack and pinion, ratchet, counter balance, worm gear, levers, pivots, etc.

- (c)
  - (d)
  - (e)
  - (f)
  - (g)
- } See **Question 1 (c) – (g)**

# DESIGN AND TECHNOLOGY

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Paper 0445/21  
Graphic Products

## Key messages

The focus of this assessment is graphic products. Future candidates would benefit from practical activities based on this paper and previous papers.

To improve performance on this paper, candidates should

- understand and use correct line conventions, e.g. fold lines in developments (nets),
- have some knowledge of commercial/industrial colour printing methods related to graphic products,
- appreciate the physical characteristics of materials used in graphic products, e.g. card, foam-board,
- practise the construction of 'circles in contact',
- not use generic terms unless qualified, e.g. 'glue', 'tape', etc.

## General comments

Candidates were required to complete all questions in **Section A (A1, A2 and A3)** and then answer either **B4** or **B5** from **Section B**. **Questions B4** and **B5** were equally popular optional questions for candidates. A small number of candidates did not follow the rubric instruction.

## Comments on specific questions

### **Section A**

#### **Question A1**

##### *Car body*

- (a) The drawing of the end elevation was generally creditworthy. Where marks were not earned it was usually due to omitting the top of the bonnet or windscreen line. The accuracy of the plan would have benefited from lines being projected upwards from the end elevation to a 45 degree line and then horizontally to the plan. The lines which denote the top of the roof and bottom of the windscreen were sometimes omitted.
- (b) The third angle projection symbol was very well completed by many candidates with the concentric circles correctly orientated.

#### **Question A2**

##### *Car stickers*

- (a) The circular headlight and three horizontal bars were added accurately and in the correct position.
- (b) There was good understanding of the rendering of glass seen.
- (c) Many candidates successfully completed a '0' in the same style as that shown on the illustration of the car.

### Question A3

*Development (net) of a model lorry*

- (a) The missing side was generally completed accurately and in the correct orientation, with the wheels correctly drawn. A significant number of candidates drew only the front or back of the lorry. Glue tabs were added by most candidates but few drew fold lines to the correct line convention.
- (b) Few candidates drew a 'safety rule' correctly and few correctly identified the 'craft knife'. Many Candidates used generic and uncreditworthy terms such as 'knife' or 'cutter' rather than 'craft knife' or 'scalpel'.

### Section B

#### Question B4

*Party hat*

- (a) (i) Where marks were not earned by some candidates for the drawing of the outline it was usually for inaccurate measuring of the 350 mm length. Many candidates did not accurately establish the centre of the R20 arcs. This was particularly important as the outline is in contact and blends in with both the R60 semi-circle and the top line.
- (ii) The elliptical logo was generally very well drawn with many candidates using the concentric circles method. Some candidates appeared to have used the 'trammel' method of drawing the ellipse. Centres are reminded that where a trammel has been used it must be attached to the candidate's script.
- (b) There were many good solutions as to how to join the two ends of the party hat. Using a slot and a tab of some kind were the most popular methods seen.
- (c) Candidates showed a good understanding of reinforcing the card, generally suggesting lamination techniques or folding the card.

#### Question B5

*Sweets*

- (a) Candidates usually gained some credit for this question showing understanding of the cuboid, triangular and hexagonal prisms. However, the quality of the drawings of these shapes was variable.
- (b) Candidates showed a good understanding of bar charts with the majority being able to turn quantities into accurate vertical scales. There was good use of colour and shading to enhance the appearance of the chart and the charts were generally well labelled.
- (c) Candidates showed a good understanding of isometric projection and some excellent drawings were produced. However, some candidates did not appreciate the 1:2 scale and their drawings were consequently inaccurate. Many candidates included the window although its position was not always accurate.
- (d) Although there were a few correct answers many candidates displayed little knowledge of the commercial/industrial colour printing methods suitable for multiple copies.



# DESIGN AND TECHNOLOGY

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Paper 0445/22  
Graphic Products

## Key messages

The focus of this assessment is graphic products. Future candidates would benefit from practical activities based on this paper and previous papers.

To improve performance on this paper, candidates should

- understand and use correct line conventions, e.g. fold lines in developments (nets),
- have some knowledge of commercial/industrial colour printing methods related to graphic products,
- appreciate the physical characteristics of materials used in graphic products, e.g. card, foam-board,
- practise the construction of 'circles in contact',
- not use generic terms unless qualified, e.g. 'glue', 'tape', etc.

## General comments

Candidates were required to complete all questions in **Section A (A1, A2 and A3)** and then answer either **B4** or **B5** from **Section B**. **Questions B4** and **B5** were equally popular optional questions for candidates. A small number of candidates did not follow the rubric instruction.

## Comments on specific questions

### **Section A**

#### **Question A1**

*Car body*

- (a) The drawing of the end elevation was generally creditworthy. Where marks were not earned it was usually due to omitting the top of the bonnet or windscreen line. The accuracy of the plan would have benefited from lines being projected upwards from the end elevation to a 45 degree line and then horizontally to the plan. The lines which denote the top of the roof and bottom of the windscreen were sometimes omitted.
- (b) The third angle projection symbol was very well completed by many candidates with the concentric circles correctly orientated.

#### **Question A2**

*Car stickers*

- (a) The circular headlight and three horizontal bars were added accurately and in the correct position.
- (b) There was good understanding of the rendering of glass seen.
- (c) Many candidates successfully completed a '0' in the same style as that shown on the illustration of the car.

### Question A3

*Development (net) of a model lorry*

- (a) The missing side was generally completed accurately and in the correct orientation, with the wheels correctly drawn. A significant number of candidates drew only the front or back of the lorry. Glue tabs were added by most candidates but few drew fold lines to the correct line convention.
- (b) Few candidates drew a 'safety rule' correctly and few correctly identified the 'craft knife'. Many Candidates used generic and uncreditworthy terms such as 'knife' or 'cutter' rather than 'craft knife' or 'scalpel'.

### Section B

#### Question B4

*Party hat*

- (a) (i) Where marks were not earned by some candidates for the drawing of the outline it was usually for inaccurate measuring of the 350 mm length. Many candidates did not accurately establish the centre of the R20 arcs. This was particularly important as the outline is in contact and blends in with both the R60 semi-circle and the top line.
- (ii) The elliptical logo was generally very well drawn with many candidates using the concentric circles method. Some candidates appeared to have used the 'trammel' method of drawing the ellipse. Centres are reminded that where a trammel has been used it must be attached to the candidate's script.
- (b) There were many good solutions as to how to join the two ends of the party hat. Using a slot and a tab of some kind were the most popular methods seen.
- (c) Candidates showed a good understanding of reinforcing the card, generally suggesting lamination techniques or folding the card.

#### Question B5

*Sweets*

- (a) Candidates usually gained some credit for this question showing understanding of the cuboid, triangular and hexagonal prisms. However, the quality of the drawings of these shapes was variable.
- (b) Candidates showed a good understanding of bar charts with the majority being able to turn quantities into accurate vertical scales. There was good use of colour and shading to enhance the appearance of the chart and the charts were generally well labelled.
- (c) Candidates showed a good understanding of isometric projection and some excellent drawings were produced. However, some candidates did not appreciate the 1:2 scale and their drawings were consequently inaccurate. Many candidates included the window although its position was not always accurate.
- (d) Although there were a few correct answers many candidates displayed little knowledge of the commercial/industrial colour printing methods suitable for multiple copies.

# DESIGN AND TECHNOLOGY

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Paper 0445/23  
Graphic Products

## Key messages:

The focus of this assessment is graphic products. Future candidates would benefit from practical activities based on this and previous papers.

To improve performance on this paper, candidates should

- understand and use correct line conventions, e.g. fold lines in developments (nets),
- have some knowledge of commercial/industrial colour printing methods related to graphic products,
- understand the physical characteristics of materials used in graphic products e.g. card, foam board,
- understand and use the projection of 'true shapes' from given views,
- not use generic terms unless qualified, e.g. 'glue', 'tape' etc.

## General comments

Candidates were required to complete all questions in **Section A (A1, A2 & A3)** and then either **B4** or **B5** from **Section B**. **Questions B4** and **B5** were equally popular. A small number of candidates did not follow the rubric instruction.

## Comments on specific questions.

### **Section A**

#### **Question A1**

*Orthographic projection of a boat*

- (a) The drawing of the plan view of the boat was generally well completed. However, a significant number of candidates missed the windscreen and the vertical line to denote the front edge of the roof. The end elevation was generally well completed given the small size of the radii to the windscreen corners. There was evidence of good projection from the front elevation although projection upwards to a 45 degree line and across to the plan would have assisted the drawing of the plan.
- (b) This question was very well completed with concentric circles correctly orientated.

#### **Question A2**

*Rendering of wooden block and completing the word 'Neptune'*

- (a) There was good use of appropriate colour but some rendering of the end and side grain did not match up correctly.
- (b) Completing the word 'Neptune' was very well attempted – there was good interpretation of the font style of 'u' and 'n,' with appropriate sizing and spacing.

## Section B

### Question B3

#### *Development (net) of small boat*

- (a) Some candidates did not add either the front or back of the development (net). The missing side was well drawn in both the correct orientation and correct size. However, a significant number of candidates missed the concentric circles logo. Glue tabs were added but many candidates omitted to use the correct convention for fold lines.
- (b) This part of the question was very well answered, although some candidates did confuse the 'set square' with a 'tee square'.
- (c) A small number of correct answers were seen. Many candidates displayed little knowledge of the commercial or industrial colour printing methods suitable for 10 000 copies.

### Question B4

#### *Aeroplane tail logo*

- (a) There were many excellent answers to this two part question.
  - (i) The elliptical logo with triangle and inscribed circle was generally very well drawn. Many candidates used the concentric circles method to draw an ellipse. Some candidates appeared to have used the 'trammel' method of drawing the ellipse. Centres are reminded that where a trammel has been employed it must be attached to the candidate's script.
  - (ii) The outline of the aeroplane tail was well constructed. Where marks were not earned it was usually due to the top left hand corner being inaccurately drawn. Some candidates did not establish correctly the centre for the top 10 mm radius.
- (b)(i) Most candidates gained some credit for this question by correctly identifying 'cutting mat' and 'craft knife' but did not earn a mark for stating 'rule(r)' instead of the correct 'safety rule'.
- (ii) Where marks were not earned for showing how to attach the logo to the foam board tail it was for using generic terms e.g. 'gluing' or 'sticking' rather than correct terms e.g. 'spray adhesive' or 'double-sided adhesive tape'.
- (c) Although most candidates gained some credit for this part of the question it was evident that there was a general lack of understanding of the folding characteristics of foam board.

### Question B5

#### *Orthographic projection of a fruit juice carton*

- (a)(i) There were many good answers to this question with candidates correctly adding the cap to the sloping face of the plan view. A number of candidates who attempted this question drew the cap as a circle (rather than elliptical) or did not add the visible thickness to the cap.
- (ii) Very few correct solutions to drawing the true shape of surface 'x' were seen. It is important that candidates are fully aware of the concept and the process of drawing 'true shapes'.
- (b) The pie chart was very well answered with all elements completed to a high standard. There were accurately drawn sectors, good use of appropriate colour to enhance the chart and clear labelling of the types of juice.
- (c) The 2:1 isometric scale drawing of the carton cap was well attempted. Many candidates used the 'four arcs method' of constructing an isometric circle. Where marks were not earned it was usually due to not scaling the given dimensions to 2:1 or, having constructed the top shape, not establishing the thickness correctly.

- (d) The specifications generally gained some credit but a significant number of candidates focussed on the surface graphics of the carton – colour, aesthetics etc. – rather than the physical characteristics of the carton.

# DESIGN AND TECHNOLOGY

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Paper 0445/31  
Resistant Materials

## Key messages

- Candidates need to have strong communication skills. They must 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 rather than repeating obvious points.
- It is essential that candidates develop an all-round knowledge and understanding of tools, equipment and processes used when working with wood, metal and plastics.
- Candidates need to read the questions carefully and be clear about what the question is asking **before** attempting an answer.

## General comments

### **Section A**

This section tests a wide area of knowledge concerned with materials, tools and processes used when working with wood, metal and plastic. Very often, candidates named metalworking tools and equipment that would only be used when working with wood. Many candidates achieved lower marks for this section than for **Section B**.

### **Section B**

This section has a number of questions with large mark allocations requiring a combination of clear and accurate sketches supported by detailed written notes. Careful reading of the questions is needed before answering. In some cases, candidates provided information not asked for in the question, which could not be given any credit.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a) Many candidates named steel or aluminium for the legs of the chair.
- (b) Very few candidates named polypropylene as the plastic used for the chair seat. There were many incorrect answers. Candidates should be familiar with a range of plastics, their properties and uses.
- (c) The majority of candidates named paint as an appropriate finish. Other correct answers included galvanising.
- (d) Most candidates stated that the reason for applying a finish was to protect the metal legs from rusting.

#### **Question 2**

Very few candidates named both tools correctly or gave specific uses for them. There were several acceptable answers for the saw, including rip, cross-cut, sheet, panel and handsaw. Many candidates stated a correct specific use. Many candidates confused the inside calipers with dividers and subsequently provided an incorrect use, usually stating that the tool was used to mark out. Inside calipers are used to measure the internal diameter of tubes.

### Question 3

- (a) The most popular benefit for the cordless drill was that it was portable. Although this was condoned other answers stated its versatility and the fact that it was not restricted by a trailing electrical lead.
- (b) Fewer candidates provided a benefit for the pillar drill. Many candidates stated that the pillar drill was more accurate. This was not accepted unless qualified by a statement such as 'because it can only drill vertically'. Another good answer occasionally seen referred to the pillar drill being more powerful.

### Question 4

- (a) Many candidates identified the tenon saw correctly. Some candidates incorrectly stated 'hacksaw'.
- (b) Many candidates named the bench hook correctly.

### Question 5

Many candidates named the scribe correctly for tool A but only a minority could name the centre square for tool B.

### Question 6

The vast majority of candidates could not recognise the sand casting process used to produce the split pattern for the hacksaw handle.

### Question 7

Most candidates achieved only one mark for showing the three acrylic shapes marked out with the minimum of waste. Those who achieved the maximum two marks also showed a space for waste material between the pieces that would be necessary when they were sawn from the sheet.

### Question 8

- (a) Very few candidates could identify the bench stop.
- (b) Very few candidates understood the purpose of the bench stop: a length of wood is pushed against the bench stop to enable the wood to be planed. Many candidates stated that its use was to support wood but could not achieve a mark without providing the specific reference to planing.

### Question 9

Very few candidates achieved maximum marks for this question. This question tested candidates' knowledge and understanding of two basic constructions in wood. The key issue in this question was the direction of the grain. A groove is cut **along** the grain of the wood while housing joints are cut **across** the grain.

### Question 10

- (a) Many candidates named a correct plastic for the blister packaging.
- (b) Many candidates stated that a benefit of the packaging was to offer security and protection of the product and that transparency meant that the product could be seen.

## Section B

### Question 11

- (a) There were many correct items stated by candidates. The most common correct answers referred to the number of coats, their size and the thickness of the door. Some candidates wrote their answers in the form of a specification; for example, 'The coat rack must have...'. This type of answer was not what was required and did not achieve any marks.
- (b)(i) Many candidates named a rule, scribe and try square as the most popular tools used to mark out mild steel. Odd-leg calipers, although a marking out tool, were not appropriate in this situation.
- (ii) Very few candidates were familiar with engineers blue, a quick drying 'inky' liquid applied to the surface of the metal, which makes marking out appear more clearly.
- (c) Many candidates achieved at least two marks for showing a combination of the following: use of a vice or the metal clamped securely, the use of folding bars or a suitable former and the means of force, usually a hammer or mallet.
- (d)(i) Many candidates understood that annealing metal resulted in it becoming softer so that it could be worked more easily. The quality of explanations varied considerably with some excellent answers referring to the metal becoming work-hardened and that annealing altered its structure.
- (ii) The method of annealing brass resulted in wide variations in the accuracy of explanations. Many candidates understood that brass would need to be heated. Some candidates gave more information and stated that the brass would be heated to a dull, cherry red. The best answers then stated that the brass would then be left to cool on its own. Many candidates incorrectly suggested quenching the brass after heating.
- (e) Many candidates chose paint correctly for the applied finish.
- (f) The majority of candidates did not describe the stages involved in producing a polished surface. The term 'preparation' means that which needs to be done to the metal **before** the finish is applied, and not after. The best answers referred to the use of draw filing, emery cloth and wet and dry (silicon carbide) paper of varying grades. These stages could be applied to the vast majority of situations involving the preparation of metals before applying a finish.
- (g)(i) Most candidates achieved at least two or three marks for this question. Candidates were expected to give a suitable design of hook, an appropriate material and relevant sizes.
- (ii) The method of joining the hook designed in the previous question was generally answered very poorly. Many candidates chose inappropriate methods including welding and soft soldering. Many candidates did not appear to understand the requirement in the question that the method of joining must be **permanent** and provided sketches and notes showing the hook being screwed to the plate. The best methods involved brazing and the use of rivets.

### Question 12

- (a) Many candidates provided at least one, if not two, advantages of plywood over solid wood for the sit-on toy. The best answers referred to cost, availability, its stability and width of boards. There were many popular misconceptions that plywood is lighter in weight than solid wood and that it is easier to work.
- (b)(i) The vast majority of candidates named a jig saw as a portable power tool used to cut the plywood sheet.
- (ii) There were many good safety precautions stated when using portable power tools, the most common being the use of safety glasses, ear defenders, making sure that the work was secured and having no trailing leads.



- (c) (i) There were many good answers showing how the slot would be cut out to accommodate the seat. The best answers showed the slot being cut with a tenon saw and the waste removed by means of a chisel and mallet. Candidates however also needed to name the correct tools; some candidates incorrectly named a hacksaw to cut the slot.
- (ii) Many candidates did not show a method of strengthening the seat joint. The best answers not only showed the seat pinned or screwed and glued in position but added strengthening blocks or brackets below the seat.
- (d) There were some very innovative designs of adjustable footrest provided. The weakest solutions simply showed a rod or dowel that could be moved into three different holes without the footrest being secured. Sometimes the poor quality of sketches meant that candidates were unable to communicate their ideas clearly enough to achieve any marks. Questions that state 'Include details of materials, sizes and fittings' have a number of marks allocated for providing such details and it is essential that candidates answer this as a specific part of the overall question.
- (e) Generally, the answers to this question were very encouraging and many candidates achieved at least one mark for demonstrating a basic understanding of anthropometrics.
- (f) (i) Most candidates named correctly injection moulding or blow moulding as the method of manufacture for the plastic wheel.
- (ii) Many candidates achieved at least one or two marks for showing some sort of rod for an axle and some form of 'stop' to prevent the wheel from slipping off the axle. The best answers included the use of 'spacers' or washers and included details showing important sizes.

### Question 13

- (a) For maximum marks candidates needed to provide details of the following stages involved in making the hardwood top: marking out, cutting the shape and making the sawn edges flat and smooth.
- Most candidates showed how the shape would be marked out. The method of cutting out the shape was not as well answered. Some candidates showed a hacksaw being used. A hacksaw is used to cut metal, not wood. The best answers showed the hardwood secured to a bench by means of a G clamp and use of a tenon saw or jig saw to cut out the shape. The sawn edge could then be planed or pushed against a disc sander to make it flat. Finally, glasspaper would be used to provide a smooth surface.
- (b) Few candidates achieved maximum marks for this question. Maximum marks were awarded to those answers that showed two sash cramps over the top and bottom of the DVD stand with scrap wood to distribute the pressure evenly. The use of G cramps was impractical.
- (c) This was answered very poorly. Candidates needed to provide some form of bearing surface for the parts to rotate freely. Many answers simply showed a connecting rod that would not support the stand nor keep it level in use.
- (d) There were mixed responses to this question. Some candidates showed the DVDs 'housed' into some type of groove that would be cut into the base of the stand. Other answers showed additional strips glued onto the surface of the stand into which the DVDs could be located. Both solutions were good. Some candidates did not achieve maximum marks because of poor quality sketches and a lack of written details. Often details about the depth of the cut out groove or how it would be produced were missing. Where additional strips were shown, the type of material, their size and method of joining were often missing.
- (e) (i) Generally, answers to this question were very poor. Hardwoods are best finished with polish, wax or a variety of oils. The application of paint is not a good choice as it hides the natural attractiveness of the grain, its colour and figure.
- (ii) Candidates were required to demonstrate basic knowledge of preparing wood to take a finish. Preparation means what is to be done to the hardwood **before** a finish is applied. There were many processes candidates could have described, such as how glasspaper would be used with a cork

rubber or block, the use of different grades of glasspaper and the use of a cloth to remove dust between stages.

- (f) Most candidates were able to describe when a template and jig could be used in the manufacture of the DVD stand. The template could be used to mark out the shape of the three parts of the DVD stand while a jig could be used when sawing the three parts or drilling the holes in the top and bottom.
- (g) Most candidates achieved partial credit for demonstrating a basic understanding of seasoning. The best answers referred to the need to remove excess moisture and the possibility of shrinkage and warping if seasoning was not carried out correctly.

# DESIGN AND TECHNOLOGY

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Paper 0445/32  
Resistant Materials

## Key messages

- Candidates need to have strong communication skills. They must 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 rather than repeating obvious points.
- It is essential that candidates develop an all-round knowledge and understanding of tools, equipment and processes used when working with wood, metal and plastics.
- Candidates need to read the questions carefully and be clear about what the question is asking **before** attempting an answer.

## General comments

### **Section A**

This section tests a wide area of knowledge concerned with materials, tools and processes used when working with wood, metal and plastic. Very often, candidates named metalworking tools and equipment that would only be used when working with wood. Many candidates achieved lower marks for this section than for **Section B**.

### **Section B**

This section has a number of questions with large mark allocations requiring a combination of clear and accurate sketches supported by detailed written notes. Careful reading of the questions is needed before answering. In some cases, candidates provided information not asked for in the question, which could not be given any credit.

## Comments on specific questions

### **Section A**

#### **Question 1**

Most candidates named the mallet and chisel correctly. Some candidates did not take sufficient care reading the question and named the mallet and chisel incorrectly for tool B and A respectively.

#### **Question 2**

- (a) Many candidates could not identify dovetail nailing, a basic construction used with butt joints.
- (b) More candidates understood that dovetail nailing provided a stronger joint or that it made it more difficult to pull the joint apart than could name the actual method.
- (c) The most common correctly named adhesive was PVA.

### Question 3

- (a) Many candidates correctly stated injection moulding and vacuum forming.
- (b) Many candidates named a suitable plastic, with acrylic and polystyrene the most common answers relating to vacuum forming.

### Question 4

Many candidates could not identify a ferrous alloy in part (a) or a non-ferrous alloy in part (b). Candidates following this syllabus should be familiar with a variety of ferrous and non-ferrous metals, their properties and uses.

### Question 5

The majority of candidates could not describe how to plane end grain without it splitting. There were two excellent alternative answers provided by some candidates, namely, the use of scrap wood the same thickness as the piece being planed positioned at the end of the wood, or to plane to the middle of the end grain, stop and then plane to the middle from the opposite end.

### Question 6

The vast majority of candidates were not able to complete the drawing of a tee bridge joint. Candidates should be familiar with a variety of constructions used to join wood.

### Question 7

Most candidates identified the tenon saw and the hacksaw. For a specific use it was only necessary to state 'to cut wood' or 'to cut metal'. Some candidates confused the names of the saws.

### Question 8

Many candidates gave a correct reason for a surface finish for the wheelbarrow. The most common reason given was to prevent rust. Many candidates named paint as a suitable finish and some stated galvanising, which is an excellent choice of finish.

### Question 9

Very few candidates completed an accurate drawing of a back flap hinge and only a few could give an advantage of the back flap hinge over a butt hinge. However, there were some excellent answers describing how the larger surface area of the back flap hinge would provide greater strength.

### Question 10

- (a) Only a minority of candidates understood that a marking knife is used to mark out on wood where the line will be sawn or chiselled.
- (b) This part of the question was slightly better answered with a marking gauge being the most common correct answer. Many candidates named a scribe which is used primarily to mark out on metal.

## Section B

### Question 11

- (a) (i) Only a minority of candidates gave dowel as the correct term for round section wood.
- (ii) While some candidates named Cascamite as an excellent waterproof adhesive, the most common correct answer was PVA.
- (b) A template enables shapes to be drawn out accurately, especially where more than one identical shape has to be drawn. Many candidates stated that it was easier. This was not credited unless accompanied by some additional explanation.

- (c) Many candidates scored for providing correctly named tools or items of equipment used to produce the boat hull. Some candidates confused wood and metalworking tools, for example, naming a hacksaw to cut wood.
- (d) Many answers showed the rudder fitted to the hull by means of a screw.. The best answers added a washer under a round headed screw to prevent free movement.
- (e) Many candidates stated that polystyrene was lightweight and waterproof or water resistant.
- (f) This question offered candidates the opportunity to demonstrate a sound working knowledge of the vacuum forming process. Eight marks were allocated to this question to reflect the level of detail required. Some candidates achieved high marks but others were unable to show detailed knowledge and understanding of the process. The best answers showed clear stages accompanied by detailed notes explaining how the hull would be formed.
- (g) Many candidates showed the deck secured to a bench by means of G cramps.
- (h) There were many sensible safety precautions provided when using polystyrene cement. Many correct answers described the need for a well-ventilated area or wearing of a face mask demonstrating an understanding of the toxic nature of the substance. Other answers, including wearing an apron, were not relevant to this situation.
- (i) Many candidates recognised that designers make toys appealing to young children by using colour, shape, noise and movement. Some candidates stated that the toys were lightweight or had no sharp edges or corners. While these may be important in the design of toys, for example from a safety perspective, they are not why they appeal to young children.

#### Question 12

- (a) (i) The most common correct constructions were a mortise and tenon joint and a dowel joint. For a complete answer the constructions needed to be drawn clearly and accurately.
- (ii) Some candidates understood that a sliding bevel could be set to a particular angle and used to mark out. This would be very useful when marking out the construction for the stand of the tray table.
- (b) (i) No candidates could state a suitable standard size for square metal tube. Candidates need to be familiar with standard stock sizes for a variety of wood, metal and plastic forms.
- (ii) This question offered candidates the opportunity to demonstrate their understanding of the brazing process. Six marks were available for answers which showed, using a variety of sketches and notes, how the work would be prepared, heated and brazed. Some candidates answered this question without demonstrating any specific knowledge and subsequently did not score.
- (c) Most answers as to how the stand could be fixed to the underside of the tray showed the stand joined directly to the tray without any additional support. These methods were only partially successful. The best answers showed an additional metal plate or a wooden block to which the stand could be joined before joining it to the underside of the tray.
- (d) Most candidates were credited for showing how the tray would be marked out, cut out and the edges made smooth. For a complete answer the names of tools used needed to be technically accurate and sketches made clear and accurate.
- (e) (i) Most candidates understood that a plastic laminate would protect the surface of the tray from spillages and that it would provide a very smooth surface that could be cleaned easily.
- (ii) Only a minority of candidates knew that the plastic laminate would be joined to the tray using a contact or impact adhesive. Numerous incorrect answers included PVA, which requires pressure and has a drying time of at least one or two hours. Candidates need to be familiar with a variety of adhesives used to join a variety of resistant materials. In addition, a knowledge of adhesives should include their preparation, drying times and special precautions necessary when using them.

### Question 13

- (a) Most candidates gave advantages of manufactured boards over solid wood, such as it was generally cheaper, more stable and available in wide boards. This question required candidates to differentiate between MDF and other manufactured boards, not solid wood. There were some excellent answers that noted the smooth finish of MDF and the fact that it did not splinter like some manufactured boards.
- (b) There were many good items of research that a designer would consider when designing the desk tidy, with the most common being the items to be stored, the size of the items and the type of desk.
- (c) (i) This was generally answered poorly. There are several ways by which a base can be fitted inside a box or tray without the edge of the material being visible. The main methods are by groove or rebate. Both the groove and the rebate can be cut out or produced by applying strips. Many answers that were credited involved the base being butted inside the sides of the tray. Some answers showed only a butt joint, some answers described the butt joint glued and other answers showed the butt joint glued and pinned or screwed.
- (ii) There were some excellent sketches showing how the partition could be fixed to the sides and base. The best solutions showed a housing joint or dowel joint.
- (d) There were mixed responses to this question. Some candidates showed the trays on top of each other with wooden strips or beads to locate the two trays. Other solutions involved the use of clips, some of which were crude in their design but which achieved a measure of success. As with other questions demanding sketches and notes, the quality of communication varied greatly and some candidates produced ideas which were difficult to comprehend.
- (e) (i) Candidates who named varnish as a suitable finish for the desk tidy did not score. MDF is a very unattractive material in its unfinished state and to apply a clear varnish would not enhance its appearance. Either a wood stain or spray paint is a more appropriate finish that hides the natural colour of the MDF.
- (ii) Candidates were required to demonstrate basic knowledge of preparing wood to take a finish. Preparation means that which is done to the hardwood before a finish is applied. There were many processes candidates could have described, namely: how glasspaper would be used with a cork rubber or block, the use of different grades of glasspaper and the use of a cloth to remove dust between stages.
- (f) Most candidates did not focus on the prompt in the first line of the question: the MDF used for the desk tidy is only 6 mm thick. Therefore traditional carcass constructions such as finger joints and lap joints were not possible. There were a minority of excellent answers that showed additional corner strips or blocks that would increase the thickness of the material so that it could be pinned, screwed or dowelled safely.
- (g) Most candidates achieved at least one mark for describing a sensible functional improvement, with the most common being an additional container for pens and pencils and an additional partition to separate items further.
- (h) There were some good advantages of plastic over MDF when making a desk tidy, with the most common being the ability to mould plastic more easily, more easily cleaned, and inherent colour meant no need for an applied finish.

# DESIGN AND TECHNOLOGY

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Paper 0445/33  
Resistant Materials

## Key messages

- Candidates need to have strong communication skills. They must 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 rather than repeating obvious points.
- It is essential that candidates develop an all-round knowledge and understanding of tools, equipment and processes used when working with wood, metal and plastics.
- Candidates need to read the questions carefully and be clear about what the question is asking **before** attempting an answer.

## General comments

### **Section A**

This section tests a wide area of knowledge concerned with materials, tools and processes used when working with wood, metal and plastic. Very often, candidates named metalworking tools and equipment that would only be used when working with wood. Many candidates achieved lower marks for this section than for **Section B**.

### **Section B**

This section has a number of questions with large mark allocations requiring a combination of clear and accurate sketches supported by detailed written notes. Careful reading of the questions is needed before answering. In some cases, candidates provided information not asked for in the question, which could not be given any credit.

## Comments on specific questions

### **Section A**

#### **Question 1**

Many candidates were credited for selecting the correct metal for each product. Candidates need to be familiar with a range of ferrous and non-ferrous metals, their properties and uses.

#### **Question 2**

Many candidates thought incorrectly that the scrap wood was on top of the wood to protect it from the G cramp. Fig. 2 showed clearly the scrap wood under the work piece. The most common reason given for the scrap wood was to protect the bench surface. A minority of candidates gave the more important reason; to make sure that the hole being drilled was a 'clean' hole without any splitting underneath.

#### **Question 3**

It was disappointing that most candidates could not name the Surform tool or the dividers correctly. Consequently, only a minority of candidates provided a correct specific use.

#### Question 4

There were few accurate completed drawings of the sliding bevel. Some credit was given for sketches that were partially correct.

#### Question 5

Many candidates named the two methods of filing correctly: cross filing and draw filing.

#### Question 6

- (a) The vast majority of candidates could not state one property of ash that made it suitable for the hammer handle. There were many vague references to strength seen. There was a clue to the answer if candidates considered how the hammer would be used. In use, the hammer needs to be flexible and needs to withstand the impact from blows.
- (b) Only a very small minority of candidates understood the purpose of the wedge shape of the hammer head, namely, to enable short nails to be held and driven into wood without fingers being bruised.

#### Question 7

- (a) Most candidates could not name a suitable plastic for the outer shell of the cycling helmet. Correct answers included ABS, carbon fibre and GRP.
- (b) Many candidates named a suitable plastic for the inner shell. The correct answer was polystyrene.
- (c) Very few candidates named polypropylene for the buckle of the cycling helmet.

#### Question 8

- (a) Many candidates identified the fault as warping.
- (b) Many candidates gave a correct reason for the fault, namely that it had not been seasoned properly.

#### Question 9

- (a) Many candidates showed a screw through the table top and into the rail. This received no marks. The best methods were pocket screwing and counterboring in the rail with the screw inserted in the underside of the table top. The most common methods that gained some marks included use of KD fittings or corner blocks.
- (b) The majority of candidates recognised that the use of screws allowed products to be taken apart. Other benefits stated that screws are stronger than nails. Because this answer included a justification, comparing screws with nails, it was credited.

#### Question 10

The majority of candidates named the tin snips, straight snips or snips correctly and provided a benefit for holding them in a vice while in use. The most common correct answers included: easier to move the sheet metal around, provided a straight cut and more force could be applied.

#### Section B

#### Question 11

- (a) There were many correct features of the play table given, with the most common being the appropriate height, the curved ends and the sides to prevent items from falling off.
- (b)(i) Many candidates gave two benefits of using a template to mark out the sides and ends of the play table, with the most common being that it was more accurate, it was quicker than other methods and it could be reused.



- (ii) The vast majority of candidates named a jig saw for the portable power tool used to cut out the shapes for the play table.
- (c) (i) Many candidates gave a benefit of using MDF for the play table. The most common benefits were its ability to produce a fine finish, that it did not splinter easily and that it was relatively cheap.
- (ii) Many candidates understood the advantages of spray painting over using a brush. The main advantages given included a more even finish and no brush strokes.
- (d) (i) Most candidates understood that covering the table top with a plastic laminate would make the surface more durable, easier to wipe and keep clean and it provided a very smooth surface with an attractive appearance.
- (ii) Only a minority of candidates knew that the plastic laminate would be joined to the table top using a contact or impact adhesive. Numerous incorrect answers included PVA, which requires pressure and has a drying time of at least one or two hours. Candidates need to be familiar with a variety of adhesives used to join a variety of resistant materials. In addition, a knowledge of adhesives should include their preparation, drying times and special precautions necessary when using them.
- (e) Many candidates showed a corner/modesty block or scan fitting used to join an end to a side.
- (f) Many candidates showed clearly how the table top could be supported inside the sides and ends. Some candidates added wooden strips while others used blocks and some KD fittings.
- (g) The majority of candidates drew some sort of hand hold that would be cut out of ends of the play table. The hand hold was usually produced by first drilling a hole in the MDF before sawing out the shape and cleaning it up to a smooth finish. Some candidates alternatively drew designs for separate handles that would be joined to the table.
- (h) A minority of candidates replaced the MDF sides and ends with four separate legs and four connecting rails.

#### Question 12

- (a) Many candidates could not give an advantage or disadvantage for using melamine faced chipboard for the workstation. Advantages included: relatively cheap compared to solid wood, no surface finish required and a durable surface. Disadvantages included: difficult to work and traditional wood constructions were difficult to achieve.
- (b) The majority of candidates drew variations of a butt joint, including the use of pins, screws and glue to reinforce the construction. Better alternatives included lapped joints and dowel joints.
- (c) (i) There were several marking out tools other than a pencil and rule that could have been named; including, marking gauge, cutting gauge, try square and marking knife.
- (ii) Candidates generally could not name two other tools used to produce the construction they had previously sketched and named.
- (d) The best permanent joints used to join the partition to the base were the housing and dowel joints. For three marks candidates needed to sketch the joint clearly and accurately.
- (e) Generally, most candidates attempted to show the shelf in three positions using some type of removable peg or pin. Where sketches were not clear candidates did not always use written notes to explain their design ideas and support their sketches.
- (f) Most candidates did not understand that a 4 mm thick back would not be thick enough to support the weight of the workstation using screws inserted into a wall. Therefore the thickness of the back needed to be increased. A minority of answers showed an additional rail that would be joined to the 4 mm back to provide extra support.

- (g) (i) Most candidates did not understand the purpose of pre-manufactured fittings in the design of the workstation. Pre-manufactured fittings could have been used in the following ways: hinges to allow the door to open and close, a stay to prevent the door opening too far, pegs or pins for the adjustable shelves to rest on and a lock to secure the door.
- (ii) Some candidates gave advantages of using pre-manufactured fittings, including; quicker than making them yourself, made to measure components and their convenience.

### Question 13

- (a) Most candidates gave at least one benefit of using acrylic for the desk tidy, with the most common being the variety of colours available and that it was self-finished and easy to bend to shape.
- (b) (i) Part (b) gave candidates the opportunity to gain nine marks for demonstrating a good working knowledge of acrylic. Most candidates did not score highly on this question. Some answers got as far as showing the acrylic clamped securely while it was cut, the sawn edges filed and then made smooth using various grades of wet and dry (silicon carbide) paper, but did not give a full description.
- (ii) Candidates needed to show the acrylic being heated to make it soft, the use of a former to achieve the shape and a method of retaining the acrylic while it cooled.
- (c) Most candidates completed the stages for extruding the tube.
- (d) There were mixed responses to this question. The tray could only be attached to the tube by means of an additional 'bracket' that would also allow it to be removed. There were some very good ideas which were let down because the sketches and notes lacked clarity and information about the constructions and fittings used.
- (e) (i) Most candidates were able to draw some form of simple, stable. However they did not always produce a full answer because it was not always clear how the tube would be fixed to the base or details about the base itself were incomplete.
- (ii) Most answers included the use of a try square to check for upright. The position of the try square, however, was not always correct and an accurate check would not have been possible.

# DESIGN AND TECHNOLOGY

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Paper 0445/41  
Systems and Control

## Key messages

- Candidates must ensure that the rubric is followed and only one question in **Section B** is answered.
- Candidates should be reminded that clear written responses and clear sketches with annotation are in their interest.
- It is important that responses are produced only in the allocated response area for the question. However, if a response is placed in a space on a page other than the intended one, candidates should add an arrow from the correct space to the actual position of the response. If more space is required extra sheets can be attached to the booklet.
- Unqualified single word or short responses such as 'cheap' or 'fast' or 'easy' will gain no credit.
- There was evidence that candidates were not familiar with formulae for calculation that appear in the syllabus. This resulted in lengthy explanations when a simple application of the formula would have gained the mark.
- Some candidates did not give any sort of response to parts of a question; candidates should be encouraged to offer a response that could potentially gain a mark rather than leaving a blank space.

## General comments

All of the questions on the paper proved accessible to candidates and the majority had followed the instructions on question choice; only a small number had attempted to answer more than one question in **Section B**.

Communication and presentation in general were clear, in both written and graphic responses. This was most apparent in **Question 5** of **Section A** where fitting and soldering an LED had to be described; some excellent sketches were seen in response to this question.

There were a number of examples of single word or short responses being used, such as 'cheap' and 'light' offered as benefits of manufactured board in **Question 9(d)(ii)**. Candidates should be advised that if they are going to use this type of response it will need to be qualified in order to gain a mark, e.g. manufactured board costs less than solid hardwood. A more reliable approach would be to choose a functional reason such as referring to the size of sheets available.

The mechanisms and structures questions in **Section B** proved to be the most popular with candidates.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a) Most candidates referred to the reduced force needed to move the load. There were few references made to the increased length of rope that would pass through the hands of the user.
- (b)(i) Very few candidates gave a method of determining the mechanical advantage of the system. One simple correct response was to divide load by effort.
- (ii) Those candidates who had answered part (i) correctly generally stated the mechanical advantage as a numerical value.

### Question 2

- (a) A significant number of candidates referred to the ease of storing compressed air. Very few gave provision of reciprocating movement as their answer.
- (b) A wide range of correct responses were given, showing knowledge of the applications of pneumatics.

### Question 3

Clear drawings of bevel gears were seen with some candidates also making the gears the same size to avoid altering the speed.

### Question 4

- (a) This question was answered well with the majority of responses recognising that not all of the LEDs would stop working with a parallel connection.
- (b) Cathode identification was generally good, though a few thought the longer leg was the cathode.

### Question 5

The sketches and annotations seen were generally clear and informative with the separate stages identified.

### Question 6

- (a) Explanations in some cases were limited to a few words. Candidates should be aware that an explanation will need to include factual details as well as relevance.
- (b) The use of crumple zones to absorb energy and reduce injuries was clearly understood.

### Question 7

The required response was force divided by cross sectional area to determine stress. A number of responses described the condition of stress but omitted to show how it can be calculated.

### Question 8

This question was based on the analysis of a real situation leading to a description of how the adjuster worked. Some accurate points were made in many cases and the majority of candidates gave a creditworthy answer.

## Section B

### Question 9

- (a) (i) A number of responses gave the correct meaning of 'moment' by describing it as force  $\times$  distance.
- (ii) A number of fully correct solutions to the calculation were seen together with a few that were partially correct.
- (iii) The majority of candidates knew the term 'gusset plate' but in some did not secure the plate to all three pieces of timber.
- (b) (i) This question was well answered with advantages of concrete clearly described in most cases.
- (ii) Increasing the tensile strength by using steel rods was known to a minority of candidates.
- (iii) The difference in weight was widely recognised but the implications of this were in many responses not included.
- (c) (i) A range of functional ideas were used to answer this question and in general the quality of sketches and annotation was very good.

- (ii) The concept of a structure in equilibrium was clearly known though, in a few cases, the description did not go far enough. A few of the better responses referred to the clockwise moments being equal to the anti-clockwise moments.
- (d)(i) Answers concentrated on the time and skill needed to manufacture traditional joints; few recognised that modern materials such as MDF or extruded plastics will not benefit from the use of traditional joints.
- (ii) As mentioned in the general comments, a number of candidates used short, unqualified answers. There were very few who mentioned the stability of manufactured board or the fact that decorative finishes can be easily applied.

#### Question 10

- (a)(i) Use of a ratchet and pawl in cases where access is restricted was not widely recognised. Removing the need to take a hand off the tool during use was a valid response that could have been used.
- (ii) A variety of errors were seen in responses in addition to the correct one, namely 'oscillating movement is converted to rotary movement'.
- (iii) The principle of reversing the action was known in many cases but this was not then applied to the given tools, e.g. a screwdriver will need to be used to remove screws.
- (iv) Most candidates recognised that the screwdriver would provide the least leverage and therefore the least mechanical advantage.
- (b)(i) Descriptions of the cam action frequently gave detail of a single rise and fall of the follower but did not mention that it would do this three times in a single revolution of the cam.
- (ii) The second order lever was correctly recognised in most responses.
- (iii) The position of the load, effort and fulcrum were correctly marked in the majority of cases.
- (iv) This part proved difficult for a number of candidates. In some cases the drawing given earlier in the question had been repeated with no modification.
- (c)(i) In most cases the belt was correctly drawn in the top position of the pulleys.
- (ii) Knowledge of bearings and their application was not demonstrated in most cases. In questions of this type candidates should assess how fast the shaft will be rotating and the potential load on the bearing.
- (iii) Reasons for lubricating bearings were well known.
- (iv) 'Nylon' was widely recognised as a bearing needing no lubrication; an allowable alternative was phosphor bronze pre-soaked in oil.
- (d) Although the standard of sketches was generally high, suitable techniques needed to prevent the pulley from slipping and the nut from coming loose were not widely known. Use of a key or spline, to prevent slipping and a 'stiff' or 'nyloc' nut would have led to a full answer.

#### Question 11

- (a)(i) A few responses recognised that natural light will not be consistent.
- (ii) The switching voltage for the transistor was within the allowable range in only a few cases.
- (iii) Use of the potentiometer to set sensitivity of the circuit was not understood in the majority of cases.
- (iv) Functional designs for a case were given in most cases; consideration had been given to a suitable gap for a finger to be placed between the LED and sensor.

- (b) (i)** Use of a relay to isolate input and output voltages was only recognised by a few candidates.
- (ii)** The reciprocating action of a solenoid was not widely recognised.
- (iii)** Although the formula was given the values were not correctly substituted in many cases.
- (c) (i)** Identification of pin 1 by use of the dot on the IC was known in most cases.
- (ii)** Correct amplitude of the signal was more often correct than the on/off time.
- (iii)** Full understanding of the result of the trigger pin remaining low was not understood in most cases.
- (d)** The operation of a rotary switch was not generally understood, and candidates did not mention the common terminal being connected in turn to each of the switch poles.

# DESIGN AND TECHNOLOGY

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Paper 0445/43  
Systems and Control

## Key messages

- Candidates must ensure that the rubric is followed and only one question in **Section B** is answered.
- Candidates should be reminded that clear written responses and clear sketches with annotation are in their interest.
- It is important that responses are produced only in the allocated response area for the question. However, if a response is placed in a space on a page other than the intended one, candidates should add an arrow from the correct space to the actual position of the response. If more space is required extra sheets can be attached to the booklet.
- Unqualified single word or short responses such as 'cheap' or 'fast' or 'easy' will gain no credit.
- There was evidence that candidates were not familiar with formulae for calculation that appear in the syllabus. This resulted in lengthy explanations when a simple application of the formula would have gained the mark.
- Some candidates did not give any sort of response to parts of a question; candidates should be encouraged to offer a response that could potentially gain a mark rather than leaving a blank space.

## General comments

All of the questions on the paper proved accessible to candidates and the majority had followed the instructions on question choice; only a small number had attempted to answer more than one question in **Section B**.

Communication and presentation in general were clear, in both written and graphic responses. This was most apparent in **Question 5** of **Section A** where fitting and soldering an LED had to be described; some excellent sketches were seen in response to this question.

There were a number of examples of single word or short responses being used, such as 'cheap' and 'light' offered as benefits of manufactured board in **Question 9(d)(ii)**. Candidates should be advised that if they are going to use this type of response it will need to be qualified in order to gain a mark, e.g. manufactured board costs less than solid hardwood. A more reliable approach would be to choose a functional reason such as referring to the size of sheets available.

The mechanisms and structures questions in **Section B** proved to be the most popular with candidates.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a) Most candidates referred to the reduced force needed to move the load. There were few references made to the increased length of rope that would pass through the hands of the user.
- (b)(i) Very few candidates gave a method of determining the mechanical advantage of the system. One simple correct response was to divide load by effort.
- (ii) Those candidates who had answered part (i) correctly generally stated the mechanical advantage as a numerical value.

### Question 2

- (a) A significant number of candidates referred to the ease of storing compressed air. Very few gave provision of reciprocating movement as their answer.
- (b) A wide range of correct responses were given, showing knowledge of the applications of pneumatics.

### Question 3

Clear drawings of bevel gears were seen with some candidates also making the gears the same size to avoid altering the speed.

### Question 4

- (a) This question was answered well with the majority of responses recognising that not all of the LEDs would stop working with a parallel connection.
- (b) Cathode identification was generally good, though a few thought the longer leg was the cathode.

### Question 5

The sketches and annotations seen were generally clear and informative with the separate stages identified.

### Question 6

- (a) Explanations in some cases were limited to a few words. Candidates should be aware that an explanation will need to include factual details as well as relevance.
- (b) The use of crumple zones to absorb energy and reduce injuries was clearly understood.

### Question 7

The required response was force divided by cross sectional area to determine stress. A number of responses described the condition of stress but omitted to show how it can be calculated.

### Question 8

This question was based on the analysis of a real situation leading to a description of how the adjuster worked. Some accurate points were made in many cases and the majority of candidates gave a creditworthy answer.

## Section B

### Question 9

- (a) (i) A number of responses gave the correct meaning of 'moment' by describing it as force  $\times$  distance.
- (ii) A number of fully correct solutions to the calculation were seen together with a few that were partially correct.
- (iii) The majority of candidates knew the term 'gusset plate' but in some did not secure the plate to all three pieces of timber.
- (b) (i) This question was well answered with advantages of concrete clearly described in most cases.
- (ii) Increasing the tensile strength by using steel rods was known to a minority of candidates.
- (iii) The difference in weight was widely recognised but the implications of this were in many responses not included.
- (c) (i) A range of functional ideas were used to answer this question and in general the quality of sketches and annotation was very good.



- (ii) The concept of a structure in equilibrium was clearly known though, in a few cases, the description did not go far enough. A few of the better responses referred to the clockwise moments being equal to the anti-clockwise moments.
- (d)(i) Answers concentrated on the time and skill needed to manufacture traditional joints; few recognised that modern materials such as MDF or extruded plastics will not benefit from the use of traditional joints.
- (ii) As mentioned in the general comments, a number of candidates used short, unqualified answers. There were very few who mentioned the stability of manufactured board or the fact that decorative finishes can be easily applied.

#### Question 10

- (a)(i) Use of a ratchet and pawl in cases where access is restricted was not widely recognised. Removing the need to take a hand off the tool during use was a valid response that could have been used.
- (ii) A variety of errors were seen in responses in addition to the correct one, namely 'oscillating movement is converted to rotary movement'.
- (iii) The principle of reversing the action was known in many cases but this was not then applied to the given tools, e.g. a screwdriver will need to be used to remove screws.
- (iv) Most candidates recognised that the screwdriver would provide the least leverage and therefore the least mechanical advantage.
- (b)(i) Descriptions of the cam action frequently gave detail of a single rise and fall of the follower but did not mention that it would do this three times in a single revolution of the cam.
- (ii) The second order lever was correctly recognised in most responses.
- (iii) The position of the load, effort and fulcrum were correctly marked in the majority of cases.
- (iv) This part proved difficult for a number of candidates. In some cases the drawing given earlier in the question had been repeated with no modification.
- (c)(i) In most cases the belt was correctly drawn in the top position of the pulleys.
- (ii) Knowledge of bearings and their application was not demonstrated in most cases. In questions of this type candidates should assess how fast the shaft will be rotating and the potential load on the bearing.
- (iii) Reasons for lubricating bearings were well known.
- (iv) 'Nylon' was widely recognised as a bearing needing no lubrication; an allowable alternative was phosphor bronze pre-soaked in oil.
- (d) Although the standard of sketches was generally high, suitable techniques needed to prevent the pulley from slipping and the nut from coming loose were not widely known. Use of a key or spline, to prevent slipping and a 'stiff' or 'nyloc' nut would have led to a full answer.

#### Question 11

- (a)(i) A few responses recognised that natural light will not be consistent.
- (ii) The switching voltage for the transistor was within the allowable range in only a few cases.
- (iii) Use of the potentiometer to set sensitivity of the circuit was not understood in the majority of cases.
- (iv) Functional designs for a case were given in most cases; consideration had been given to a suitable gap for a finger to be placed between the LED and sensor.

- (b) (i)** Use of a relay to isolate input and output voltages was only recognised by a few candidates.
- (ii)** The reciprocating action of a solenoid was not widely recognised.
- (iii)** Although the formula was given the values were not correctly substituted in many cases.
- (c) (i)** Identification of pin 1 by use of the dot on the IC was known in most cases.
- (ii)** Correct amplitude of the signal was more often correct than the on/off time.
- (iii)** Full understanding of the result of the trigger pin remaining low was not understood in most cases.
- (d)** The operation of a rotary switch was not generally understood, and candidates did not mention the common terminal being connected in turn to each of the switch poles.

# DESIGN AND TECHNOLOGY

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Paper 0445/05  
Project

## General comments

Work submitted for moderation was mostly well structured and covered the assessment criteria. An increasing number of projects were very innovative with many candidates producing well manufactured, high quality, functional outcomes.

The majority of projects chosen were appropriate. Many candidates selected interesting and challenging briefs. Most candidates selected a brief that allowed them to demonstrate appropriate manipulative skills and show an understanding of materials and their characteristics in relation to their use.

A number of projects submitted were very large, containing excessively large numbers of sheets. Centres are asked to advise candidates to produce more concise folders, make better use of space on each sheet and using smaller font size where necessary.

Some candidates submit an exceptionally large amount of generic and often unnecessary research material that will not help them produce a detailed specification or aid them in designing. Candidates should be encouraged to focus their research on the specific design brief and make fuller use of the space available on each sheet.

The majority of candidates manage their time effectively to ensure that a functional product is completed, leaving sufficient time for appropriate testing and evaluation. Some of the work produced is outstanding and Centres and candidates are to be congratulated on the effort and care that goes into their projects.

A growing number of Centres include individual candidate assessment sheets with supporting comment. These can be very helpful for Moderators to see how and where marks were awarded. The work that Centres do in preparing their candidates for moderation and the care and attention over the administrative tasks required to accurately complete documentation is appreciated.

Centres are reminded that if, after internal moderation, a different total mark is inserted on the Coursework Assessment Summary Form, it is helpful to Moderators if it is made clear on the form where any changes in marks for a particular assessment criterion have been made.

Some Centres submitted their work in a digital format. Work was detailed and well presented. Design ideas were scanned in and there was clear photographic evidence of manufacture, testing and evaluation. Any Centres wishing to submit their work in a digital form should contact Cambridge for details of the approved format.

To access the highest mark range for Testing and Evaluation, candidates should have photographic evidence of the product in use.

## Comments on specific headlines

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

Most candidates explained the need fully, using photographs where appropriate, and described the user group before producing a clear and detailed design brief. A number of 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.

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

Work in this section continues to improve. Most candidates produced focused and relevant research. A significant number of candidates, however, produce very large amounts of information, much of which is not related to the brief. Research needs to be focused on the situation chosen and specifications should state the main functions and qualities of the product.

Many candidates analyse existing products as part of their research. They should highlight the particular design strengths and weaknesses and use this information both when generating a specification and when designing.

This section should include information such as the details and dimensions of items to be stored or fitted into the product where applicable.

Specifications were generally detailed and justified; most candidates included the specific details of the requirements for their product.

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

Whilst the majority of Centres assess this section accurately and in line with Cambridge standards, a small number are lenient. To access the higher mark range, candidates must produce a wide range of different, well-annotated possibilities. Ideas should be evaluated on their suitability for further development making reference to the specification.

Much of the work sampled had well-presented, innovative and creative design proposals.

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

Centres tended to be too generous in their allocation of marks for this section. Candidates are required to show, from their evaluation of their initial design ideas, their thinking and their decision-making regarding the development of a final idea. This development should include details of materials and construction methods, through trialling, testing and modelling.

An increasing number of candidates make very good use of 2D and 3D modelling and computer aided images to develop their design proposal.

## **5. Planning for Production**

Working drawings continue to be of a very good standard, with candidates producing high quality working drawings. To achieve the highest mark ranges, drawings should include all details necessary for the product to be manufactured by a third party.

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.

To achieve the higher mark range candidates must produce an effective sequence of operations and a fully dimensioned and detailed drawing of their product.

## **6. Product Realisation**

Most candidates fully completed the manufacture of a practical outcome. There were many examples of very high quality manufactured products presented.

Candidates generally included 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.

The majority of Centres are accurate in awarding marks commensurate with the quality of work produced.

## **7. Testing and Evaluation**

Centres tend to be slightly lenient when assessing this section. To access the higher mark range, candidates should, as far as possible, test the product in its intended environment and produce detailed evaluations of its successes and possible weaknesses. Photographic evidence should be included in this section.

A tick list against the specification is not appropriate. Candidates should recommend modifications and possible improvements based on their evaluation.

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