DESIGN AND TECHNOLOGY

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 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 a 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 a School/learning environment.

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.

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 that there is no requirement to include question papers when sending scripts 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 for holding School practical lesson equipment.

(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; keep items separate; sharp tools safe; stable in use; ease of carrying; lightweight; stackable; easy to clean. 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 types of carrying handle. Appropriate responses included: bar handle; twin handle systems; single handle; integral gripping feature/area; cut-out holes/slots; any form of add-on handle.

(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. Although very few in number this year, evaluation tables that simply ticked or awarded marks against each idea without adding meaningful comment could not be awarded maximum marks.

(e) The level of response to this part of the question continues 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 overall 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. 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 child's animal mask.

(a) The majority of candidates identified four additional points about the function of the mask and successful responses included: attractive colour/shape; has impact; easy to secure/remove; hygienic; non-toxic materials; does not fall off when moving.

(b) Candidates, generally, had no difficulty showing two methods of securing lightweight materials and these included: tabs/slots; 'velcro'; elastic strap; hook/eye; tying straps/cord.

(c))

(d)) See **Question 1 (c) – (g)**

(e))

(f))

(g))

Question 3

No candidates answered this question.

DESIGN AND TECHNOLOGY

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 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 a 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 tools and hardware equipment, fittings and fixtures.

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.

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 that there is no requirement to include question papers when sending scripts 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 portable unit that would organise repair items.

(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 portable unit. Successful responses included: easy to access; keep items separate; tough materials/robust construction; weatherproof; stable/anti tip over features; ease of carrying; protective cover. 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 making the unit portable. Appropriate responses included: bar handle; shoulder strap; twin handle systems; use of wheels; single handle; integral gripping feature/area.

(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. Although very few in number this year, evaluation tables that simply ticked or awarded marks against each idea without adding meaningful comment could not be awarded maximum marks.

(e) The level of response to this part of the question continues 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 overall 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. 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 free standing unit to promote the sale of screws.

(a) The majority of candidates identified four additional points about the function of the unit and successful responses included: appealing to customers; attractive colour/shape; stable in use; stands on counter/floor; clear information; easy access to boxes; number of boxes displayed; uses recyclable materials.

(b) Candidates, generally, had no difficulty showing two methods of strengthening cardboard and these included: corrugation; folding; laminating with card or other materials; addition of ribs; gussets.

(c))

(d)) See **Question 1 (c) – (g)**

(e))

(f))

(g))

Question 3

A small number of candidates only answered this question. The requirements for the mechanical puppet 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 mechanical puppet and these included: remote power source; easy to fit into shop; quiet in use; compact; stable in use; stated mechanical principles; attracts customers; continuous/timed operation.

(b) Candidates responded well by showing two different reciprocating mechanisms. These included: rack and pinion; relays; electromagnets; pneumatic cylinders; cams; crank/slider; gear and pulley systems.

(c))

(d))

(d)) See **Question 1 (c) – (g)**

(f))

(g))

DESIGN AND TECHNOLOGY

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 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 a 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 relaxing on the beach and protection from the sun.

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.

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 that there is no requirement to include question papers when sending scripts 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 holder for a drinks can and a book that could be attached temporarily to a sunbed.

(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 holder. Successful responses included: easy to access; hygienic; easy to clean; weatherproof; fits different sunbeds; easy to fit; keeps drink cool; protects from sand; book cannot get wet. 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 temporary methods of attachment for such a holder. Appropriate responses included: spring clips; bolts/wing nuts; sliding pins; clamps; hooks over frame; ‘velcro’; magnets; support under mattress.

(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. Although very few in number this year, evaluation tables that simply ticked or awarded marks against each idea without adding meaningful comment could not be awarded maximum marks.

(e) The level of response to this part of the question continues 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 overall 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. 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 point of sale display.

(a) The majority of candidates identified four additional points about the function of the point of sale display and successful responses included: appealing to customers; attractive colour/shape; sun colour; lightweight; stable in use; stands on counter/floor; easy to assemble; clear information; uses recyclable materials.

(b) Candidates, generally, had no difficulty showing two methods of strengthening sheet card and these included: corrugation; folding; laminating with card or other materials; tubular; gussets.

(c))

(d)) See **Question 1 (c) – (g)**

(e))

(f))

(g))

Question 3

A small number of candidates only answered this question. The requirements for the sunshade moving device 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: remote power source; easy to fit to sunshade; quiet in use; compact; fits different sunshade designs/sizes; weatherproof; sand proof.

(b) Candidates responded well by showing two different clamping methods. These included: screw into pole; wedges; over centre cam; spring clamp; adjustable jaws.

(c))

(d))

(e)) See **Question 1 (c) – (g)**

(f))

(g))

DESIGN AND TECHNOLOGY

Paper 0445/21
Graphic Products

Key messages

- 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***. An equal number of candidates chose to answer **Question B4** and **B5**. A small number of candidates did not follow the rubric instruction and answered all the questions.

The standard of work was slightly lower than that of the previous year.

There are areas of the syllabus in which further improvements are needed. Candidates must be able to draw simple solid objects in Orthographic projection. Candidates must also be able to apply thick and thin lines to a pictorial view to enhance the drawing. With the increasing use of computers, candidates need to know the different types of files that can be used to store computer images and their relevant advantages. The drawing of circular shapes in isometric projection is also an area that needs further improvement.

Comments on specific questions

Question A1

Logo for a holiday company

A concept drawing of a logo was given with relevant dimensions. Many candidates drew their solution on the given centre lines.

(a) Most candidates added the semi-circles of R35, R45 and R90. Marks were awarded equally to radiating lines at 20°, 20°and 40° to produce the rays.

(b) The half hexagon and dividing lines were achieved by most candidates.

(c) The lettering needed to be added in a similar style, with correct spacing and to the same height as that given.

Question A2

(a) This question asked the candidate to name a suitable type of computer file other than bitmap for storing an image. Many exist, with the most popular ones being: JPEG, TIF, GIF, PNG, etc.

(b) Candidates were asked to describe one advantage of vector images compared to bitmap images. Suitable answers referred to the ability to re-size the image without loss of quality and also the smaller size of the file.

Question A3

Toy windmill

Not all candidates attempted all parts of this compulsory question.

The question asked candidates to sketch in exploded isometric on the grid provided.

(a) The ∅130 backboard, this needed to be positioned behind the drawn spinner and slightly larger in size. The image should be an elliptical shape on the given centre line with a suitable hole for the split pin.

(b) The ∅30 spacer, this needed to be positioned between the spinner and the backboard and sketched as an elliptical shape on the given centre line with a suitable hole for the split pin.

(c) The handle, this was to be drawn behind the backboard and in a size proportionate to the other parts. The top of the handle had to display a hole for the split pin on the given centre line. The top surface of the circular handle should be illustrated as an elliptical shape.

(d) An incomplete sectional view of the assembled pieces was given. Candidates were required to add the split pin in the appropriate position. Correct solutions showed the split pin with the head on the left hand side and the two 'tails' opened and folded back on the handle, The split pin was not to have any section lines applied.

Question B4

Toy Boat

This question was derived from an actual 'Graphic Product' made as a concept model.

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

(a) Candidates were asked to complete the pictorial view of the toy boat by applying thick and thin lines to the drawing. The principal is that where only one edge is seen producing the corner, a thick line is applied. All edges where two sides are seen producing the corner are left as a thin line. Seven main lines were identified as thick lines for the awarding of marks.

(b) A part completed view of the cylindrical chimney of the boat was given. Candidates were asked to complete the drawing by constructing the elliptical top face and adding the sides. Various methods of drawing the ellipse were accepted including the use of a trammel if it was drawn or attached to the examination script. Some candidates used a vertical line and copy system that proved to be effective. The sides needed to complete the funnel were vertical lines that joined the drawn ellipse to the given semi-ellipse.

(c) Candidates were asked to complete the given orthographic views of the boat. The required side view had to be in projection to the plan and front view. By projecting lines down from the plan and across from the front view all the required lines to the outline could be drawn. The indent at the rear of the boat needed to be shown in hidden detail.

Question B5

Card model of a stand for ice cream cones

This question was also derived from a real 'Product'.

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

(a) Many candidates completed an estimated two point perspective view of the model ice cream cone stand. Some candidates did not use both VP1 and VP2 for their solution. The spacing of the given letters gave a good estimation for the candidate to the location of the left hand edge. The position of the back left vertical proved to be difficult if the hidden back corner was not projected.

(b) Many candidates added the missing letter I and S to the front face. Marks were awarded to the letters being in perspective and a similar type face to those given.

(c) Candidates were required to complete the development (net) of the stand given the position of corner A and the left hand edge. Most candidates managed to unfold the stand and put the fold lines in the correct position of 30, 20 and 30 (half full size). Not all candidates realised that the holes in the top had to be larger than the holes in the third surface to take the 'cones'. The position of the holes needed to be spaced at 25 centres.

DESIGN AND TECHNOLOGY

Paper 0445/22
Graphic Products

Key messages

- 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 majority of candidates chose to answer **Question B4** rather than **B5**. A small number of candidates did not follow the rubric instruction and omitted parts of **Question A3** or answered all the questions.

The standard of work was slightly lower than that of the previous year.

There are areas of the syllabus in which further improvements are needed. Candidates must be able to draw shapes with arcs in isometric. Candidates must be able to draw an ellipse to a given size and on any given axis. The ability to draw shapes derived from circles, curves and straight lines is a very important part of this syllabus as is the drawing of developments (nets) of packaging.

Comments on specific questions

Question A1

Cinema Leaflet

A pictorial image of a cinema leaflet was given. The leaflet was shown as an A4 sheet folded to give three equal sides.

(a) Candidates were asked to fill in a chart to give the relevant sizes of the card and one folded edge. The chart giving standard card sizes gave the information to answer the question correctly.

(b) Candidates were asked to complete the symbol of a cine camera by completing the second ellipse representing a film reel. Various methods of drawing the ellipse were accepted including the use of a trammel if it was drawn or attached to the examination script.

Question A2

(a) Candidates were asked to state two pieces of anthropometric data that were used in the design of the spectacles. Anthropometric refers to human sizes. Suitable answers were: width of head, distance front of face to ear, nose width across the bridge, etc.

(b) A pictorial view and a dimensioned view of a pair of 3D cinema spectacles were given. The outline consisted of arcs, circles and lines that touch. Candidates were asked to draw full size one half of the spectacles.

Two centre lines were given and the top corner of one optic space. Using the given centre lines, arcs could be drawn and straight lines added to complete the optic space and outer frame. The single arm of the spectacles could be drawn by adding the R10 and the R22 on the right centre and by joining up the top and bottom of the arm from the R22 and R10 to the optic frame. The ear loop was achieved by drawing the R6 in the correct location and then drawing verticals to meet the R22 and R10.

Question A3

Method of making the two arms adjustable

Not all candidates attempted all parts of this compulsory question.

Candidates were asked to show how the two arms could be made adjustable without using glue. Successful answers showed a system of slots and tabs or holes and dimples. Marks were awarded for showing some adjustment and also for being able to 'lock' at various lengths.

Question B4

Snack Tray

This question was derived from an actual 'Graphic Product' used by food outlets.

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

(a) Candidates were asked to complete the plan view of the snack tray by:

(i) Adding the rectangular tray outline 250 wide by 120 high.

(ii) Drawing the eight-sided hole for the 'fries' box. This was achieved by drawing two half hexagons 60A/C on the ends of a centrally placed rectangle 50 tall by 60 wide on the given centre line.

(ii) Drawing the square hole 90 side on the given centre lines for the burger box.

(iii) Drawing the circular hole R30 on the given centre lines for the drink carton.

(b) This part of the question asked the candidates to complete the front view of the snack tray complete with the individual items that were drawn pictorially.

From the left, the 'fries' packet was to be drawn 60 high and 60 wide, with a face of 30 centrally placed. The burger box was to be drawn 70 high with equally sloping sides from a top 80 long. The cup was to be drawn 85 tall on the centre line with a top of ∅70 and a base of ∅54. All lines below the top line of the tray were to be shown in hidden detail.

Question B5

Popcorn box

This question was also derived from a real 'Product' used by 'fast food' outlets.

This question was attempted by a slightly smaller number of candidates.

Overall, candidates gained a wide range of marks for their answers.

Two views in orthographic projection were given of a Popcorn box along with the relevant dimensions.

(a) Many candidates attempted the isometric view of the Popcorn box. Candidates who were successful 'crated' the 180 square by 120 tall box and then drew a 150 square base centrally placed on the 180 base. This enabled the tapering sides to be drawn accurately with sloping lines to the two outer corners. The front and rear corners were drawn vertically according to the isometric convention. By projection from the given top side, the remaining three top sides could be drawn. Using the construction above, the visible internal corners could be lined in to show the correct internal shape. Freehand arcs could then be added to represent the R220 curves to the tops of the four sides by taking reference points from the given example.

(b) The base of an incomplete, half size development (net) of the Popcorn box was given. Candidates were asked to complete the drawing.

Using the sloping length of side of the box (90) and the top length of 180, regular trapeziums could be drawn on each of the four sides of the given base aligned on the given centre lines. The vertical tops could then be added with edges that were at 90° to the base line for each trapezium. To construct the curved tops, an R220 arc was to be described from each end of the extended vertical top to the centre line of the base. By doing this from each top corner the centre of the arc that could be drawn was determined. All fold lines needed to be drawn to convention.

DESIGN AND TECHNOLOGY

Paper 0445/23
Graphic Products

Key messages

- 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***. An equal number of candidates chose to answer **Question B4** and **B5**. A small number of candidates did not follow the rubric instruction and answered all the questions.

The standard of work was slightly lower than that of the previous year.

There are areas of the syllabus in which further improvements are needed. Candidates must be able to draw simple solid objects in Orthographic projection. Candidates must also be able to apply thick and thin lines to a pictorial view to enhance the drawing. With the increasing use of computers, candidates need to know the different types of files that can be used to store computer images and their relevant advantages. The drawing of circular shapes in isometric projection is also an area that needs further improvement.

Comments on specific questions

Question A1

Logo for a holiday company

A concept drawing of a logo was given with relevant dimensions. Many candidates drew their solution on the given centre lines.

(a) Most candidates added the semi-circles of R35, R45 and R90. Marks were awarded equally to radiating lines at 20°, 20°and 40° to produce the rays.

(b) The half hexagon and dividing lines were achieved by most candidates.

(c) The lettering needed to be added in a similar style, with correct spacing and to the same height as that given.

Question A2

(a) This question asked the candidate to name a suitable type of computer file other than bitmap for storing an image. Many exist, with the most popular ones being: JPEG, TIF, GIF, PNG, etc.

(b) Candidates were asked to describe one advantage of vector images compared to bitmap images. Suitable answers referred to the ability to re-size the image without loss of quality and also the smaller size of the file.

Question A3

Toy windmill

Not all candidates attempted all parts of this compulsory question.

The question asked candidates to sketch in exploded isometric on the grid provided.

(a) The ∅130 backboard, this needed to be positioned behind the drawn spinner and slightly larger in size. The image should be an elliptical shape on the given centre line with a suitable hole for the split pin.

(b) The ∅30 spacer, this needed to be positioned between the spinner and the backboard and sketched as an elliptical shape on the given centre line with a suitable hole for the split pin.

(c) The handle, this was to be drawn behind the backboard and in a size proportionate to the other parts. The top of the handle had to display a hole for the split pin on the given centre line. The top surface of the circular handle should be illustrated as an elliptical shape.

(d) An incomplete sectional view of the assembled pieces was given. Candidates were required to add the split pin in the appropriate position. Correct solutions showed the split pin with the head on the left hand side and the two 'tails' opened and folded back on the handle, The split pin was not to have any section lines applied.

Question B4

Toy Boat

This question was derived from an actual 'Graphic Product' made as a concept model.

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

(a) Candidates were asked to complete the pictorial view of the toy boat by applying thick and thin lines to the drawing. The principal is that where only one edge is seen producing the corner, a thick line is applied. All edges where two sides are seen producing the corner are left as a thin line. Seven main lines were identified as thick lines for the awarding of marks.

(b) A part completed view of the cylindrical chimney of the boat was given. Candidates were asked to complete the drawing by constructing the elliptical top face and adding the sides. Various methods of drawing the ellipse were accepted including the use of a trammel if it was drawn or attached to the examination script. Some candidates used a vertical line and copy system that proved to be effective. The sides needed to complete the funnel were vertical lines that joined the drawn ellipse to the given semi-ellipse.

(c) Candidates were asked to complete the given orthographic views of the boat. The required side view had to be in projection to the plan and front view. By projecting lines down from the plan and across from the front view all the required lines to the outline could be drawn. The indent at the rear of the boat needed to be shown in hidden detail.

Question B5

Card model of a stand for ice cream cones

This question was also derived from a real 'Product'.

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

(a) Many candidates completed an estimated two point perspective view of the model ice cream cone stand. Some candidates did not use both VP1 and VP2 for their solution. The spacing of the given letters gave a good estimation for the candidate to the location of the left hand edge. The position of the back left vertical proved to be difficult if the hidden back corner was not projected.

(b) Many candidates added the missing letter I and S to the front face. Marks were awarded to the letters being in perspective and a similar type face to those given.

(c) Candidates were required to complete the development (net) of the stand given the position of corner A and the left hand edge. Most candidates managed to unfold the stand and put the fold lines in the correct position of 30, 20 and 30 (half full size). Not all candidates realised that the holes in the top had to be larger than the holes in the third surface to take the 'cones'. The position of the holes needed to be spaced at 25 centres.

DESIGN AND TECHNOLOGY

Paper 0445/31
Resistant Materials

Key messages

- Candidates need to read the questions carefully and be clear about what the question is asking **before** attempting an answer. Many candidates gave one-word answers to questions requiring more detailed responses. The number of lines for the answer and the space provided give an indication of the depth of answer 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 and not simply state the obvious.
- 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 need to develop their knowledge and understanding in order to improve their responses when answering 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. Careful reading of the questions is needed before answering.

Comments on specific questions

Section A

Question 1

(a) Most candidates named polypropylene correctly.

(b) The most common benefits included: hardwearing, durable and lightweight to carry.

Question 2

(a) Candidates needed to improve their knowledge for this question as many could not name a specific tool that could be used to make the edge of the mild steel square. 'File' was stated but without a specific name it could not be rewarded.

(b) Candidates needed to improve their knowledge for this question as only a minority of candidates could name a smoothing plane or jack plane correctly.

Question 3

Most candidates achieved at least 1 mark for showing the addition of two nails or screws. For maximum 2 marks the nails or screws needed to be drawn off-set through the block.

Question 4

(a) Most candidates named aluminium for the non-ferrous metal.

(b) The main reason given was that it could be bent to shape easily (malleable) and that it was resistant to corrosion. Lightweight was considered an irrelevant material property for the desk stand.

Question 5

Candidates needed to provide more detail for this question as very few achieved the maximum 4 marks.

There were many corner blocks, brackets, gussets and the inclusion of cross rails that were awarded maximum 2 marks for each method. The vast majority of answers only noted what the corner joints could be; for example, dowel or mortise and tenon.

Question 6

Candidates needed to improve their knowledge for this question as only a small minority could identify all three materials from the descriptions given. The most commonly identified material was MDF and the least identified was 'ash'.

Question 7

Most candidates held the acrylic in position by the addition of blocks or weights behind both sides of the acrylic. Many answers showed the edges of the acrylic set in grooves or housings cut into the base. Often, there was an over-dependence on the use of cramps that would have been impractical.

Question 8

Candidates needed to improve their knowledge for this question as many thought, incorrectly, that the battery tester was an example of 'conductive' rather than 'thermochromic' technology. This is a relatively 'new' area of the syllabus with which candidates must be familiar.

Question 9

Candidates needed to improve their knowledge for this question as few knew what a corner bridle was in order to complete the exploded view given. The minority of candidates who did know what a corner bridle joint was, generally, produced very good, accurate sketches.

Question 10

(a) The question asked candidates to explain why injection moulding is only suitable for mass production. Candidates needed to read the question carefully as many ignored the word 'only' in the question. The best answers explained that the cost of the initial tool (mould) is expensive (1 mark) and that to recover these costs products would have to be produced in high volume (1 mark).

(b) Most candidates gained at least 1 mark for giving a good explanation of the harmful environmental effects of plastics. For the second mark candidates needed to refer to the fact that the cutlery was thrown away after its use and that plastics are made from oil which is from a finite source.

Section B

Question 11

(a) (i) Many candidates named an appropriate softwood with pine (and variants) accepted. There were a number of selections made that were not softwoods and some that were not made from wood at all.

(ii) Many candidates achieved maximum marks for this question. Most candidates recognised that conditions in a bathroom could become humid and materials would need to contend with this.

(b) (i) Many candidates named an appropriate corner construction for the box: the most common being a finger (comb), dowel, mitre and half-lapped joints. Butt joints and KD fittings were also accepted. The variable quality of sketches sometimes meant that candidates denied themselves access to the maximum marks available.

(ii) Many candidates simply cut down the size of the base to fit inside the box then glued it in position. This is not a practical method. Some candidates inserted nails or screws into the edge which was only 4 mm thick and would split. There were many good answers showing how a groove or rebate could be used so that the base would be fitted securely and the edges of the base not visible.

(c) Some candidates gained maximum 3 marks for showing a basic shape of handle (1 mark), an appropriately named material (1 mark) and a method of construction (1 mark). Many candidates gained at least 1 mark for a partially successful design.

(d) Candidates needed to improve their knowledge for this question as very few achieved maximum marks as completely workable designs for jigs were very rare. Candidates had the opportunity to choose **one** specific part of the storage unit and show how some sort of jig or similar device could be used to speed up production. Many designs involved the use of equipment such as circular saws that would be impractical. Some good answers involved the use of basic templates to mark off lengths of wood or jigs to position a drill to make holes.

(e) Many candidates gained at least 1 or 2 marks for showing how the box and upright could be screwed together. At least two screws were needed to fit each side of the upright to each box.

(f) There were some potentially good functional improvements suggested by candidates. These included partitions to divide the contents within each box, a lid to cover the contents and wheels so the unit could be moved easily. However, most designs needed more detail and sketches needed to be clearer.

(g) Most candidates gave good reasons for the popularity of self-assembly products. Many candidates stated that these products were cheaper but without giving reference to ready-assembled products. Most good reasons included the ability to collect as a flat-pack and the satisfaction of constructing a product. Some candidates thought that constructing self-assembly products was ‘great fun’.

Question 12

(a) The most common correct hardwood was oak. Some candidates named pine incorrectly.

(b) The majority of candidates were able to give at least one reason for using stainless steel; the most common reason being its resistance to corrosion and its attractive appearance. It is not ‘easy to bend’.

(c) (i) Very few candidates could name two bits that could be used to drill the holes. The most common bits were a flat bit and a forstner bit.

(ii) Many candidates gained at least 1 mark for describing **either** how the wood would be clamped securely or how the placement of scrap wood underneath the wood to be drilled would prevent it from splintering. Only a minority of candidates gave two points in their explanations.

(d) (i) Candidates needed to improve their knowledge of metalworking tools. Some candidates named correct tools such as a scriber (often written as ‘scribe’), marking blue and a permanent marker. Some candidates named tools that are used when marking out, such as a steel rule and try square, but the question stipulated ‘….tools that could be used to **show** the bend lines’.

(ii) Most candidates recognised that the centre punch helped drill an accurate hole (1 mark) and the best answers went on to describe how the centre punch made an indentation into which the drill would ‘sit’, making it less likely to slip and ‘wander’.

(iii) Candidates needed to improve their knowledge for this question. There was no need to heat the metal and no need to used bending devices. The minority of candidates who achieved good marks highlighted the use of a mallet or a hammer and scrap wood, a vice and some type of former over which the steel could be bent to shape. Additional explanatory notes assured a minority of candidates of maximum 6 marks.

(e) Candidates needed to improve their knowledge for this question as most candidates did not understand why metals would need to be annealed. Only a minority of candidates explained how metals can become work hardened and the stresses could be removed by heating which 'softened' the metal.

(f) This question required candidates to substitute the metal parts and replace them with wood-based materials. Some candidates literally tried to imitate the existing shape of the metal brackets in wood. This was difficult to achieve because it would require an understanding of laminating. The best answers simply replaced the metal bracket with a solid block of an appropriately named wood, then showed a sound method of construction and added two important sizes to achieve maximum 6 marks.

Question 13

(a) (i) Most candidates named a suitable softwood with pine (and variants) the most common.

(ii) Candidates needed to improve their knowledge for this question as only a minority of candidates were able to provide a reason for their choice other than 'strength'. Another good reason was that it could be finished with a clear varnish or paint.

(b) There were some innovative designs for a sawing jig. The bullet points listed in the question are there to guide candidates. It was not always clear whether or not the softwood was held securely while it was being sawn. An accurate length was generally achieved by some mark or measurement clearly visible or by means of a saw cut to guide a tenon saw. Clarity of sketches is essential when communicating design ideas.

(c) (i) Candidates needed to improve their knowledge for this question as they needed a basic knowledge of woodturning.

Few candidates understood that diagonals would need to be drawn on the ends of the wood, a saw cut made at one end, or that the corners of the wood would need to be planed off.

(ii) Candidates needed to improve their knowledge for this question. Some candidates named (outside or digital) calipers as a means of checking the diameter of the wheels. There were many inappropriate tools and items of equipment named.

(iii) Some candidates named a chisel as the most common tool used to 'turn' the wheels. Since PPE was accepted, the use of safety glasses (goggles) was rewarded. Glasspaper was also rewarded.

(d) Most candidates gained 1 or 2 marks for this question. For 3 marks candidates needed to show some sort of axle (either a 'stub' or continuous), a method of retaining the wheels and some sort of washer or 'spacer' to allow free movement of the wheel.

(e) (i) Smoothing and jack planes were named correctly by some candidates. Candidates needed to improve their knowledge for this question as many candidates named tools that were not even types of plane.

(ii) Candidates needed to improve their knowledge for this question as it was clear from the answers provided that few candidates knew about a bench stop. Some candidates drew the wood held in a vice and some showed it held against a bench hook.

(f) (i) Some candidates understood that the former would require draft-angled (tapered) sides and rounded corners and edges. Air holes, that are often drilled into the base on which the former 'sits', were not rewarded as the question asked for modifications to the former only.

(ii) Many candidates named polystyrene, HIPS and acrylic as a suitable plastic to vacuum form the car body.

(iii) The most common correct check carried out during the vacuum forming process related to the heating the plastic to the correct temperature. Other checks included clamping the plastic and making sure the former was positioned correctly.

DESIGN AND TECHNOLOGY

Paper 0445/32
Resistant Materials

Key messages

Candidates need to read the questions carefully and be clear about what the question is asking **before** attempting an answer. Many candidates gave one-word answers to questions requiring more detailed responses. The number of lines for the answer and the space provided give an indication of the depth of answer 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 and provide appropriate detail.

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 need to develop their knowledge and understanding in order to improve their responses when answering 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. Careful reading of the questions is needed before answering.

Comments on specific questions

Section A

Question 1

Most candidates gave two benefits of a chrome finish for the bathroom door bolt; the most common being to prevent corrosion [rust] and to improve the appearance of the steel.

Question 2

Most candidates gained marks for showing the leg fastening secured by means of two screws in each of the legs or a single bolt through the centre. Often, candidates drew nails or failed to state what type of fixing they had used. The use of an appropriate adhesive gained 1 mark only.

Question 3

Although very few candidates named all three drills correctly, most candidates did achieve at least 1 or 2 marks. The most common correct identification was the twist drill.

Question 4

(a) Candidates needed to improve their knowledge for this question as many candidates gave incorrect answers such as plywood, 'sheets', laminates, flexiply, laminboard and MDF. Few gave 'veneers'.

(b) Most candidates gave the correct term: 'laminating'.

Question 5

Many candidates showed some other acceptable kind of texturing to the edge of the handle. The best answers described the centre lathe process of knurling. Marks were not awarded for altering the basic shape of the handle or for the addition of rubber around the edge.

Question 6

Candidates should be familiar with modern composites such as Carbon Fibre Reinforced Plastic [CFRP] as well as the more traditional composite such as Glass Reinforced Plastic [GRP]. Answers such as 'carbon fibre' and 'glass fibre' were accepted.

Question 7

Candidates needed to improve their knowledge for this question as very few candidates understood the term 'work hardening'. Many thought that it was the result of a heat process. It was important to include 'hammering' as part of the work hardening process. A significant number of candidates did not state that the metal became hard and brittle.

Question 8

Most candidates showed only one groove instead of two in the top and bottom of the cabinet. Others had applied pieces of plastic, metal or wood to the front edges of the cabinet. Some candidates did show two grooves top and bottom, or applied track carrying two grooves. No candidates showed deeper grooves at the top to allow the glass to be inserted or removed.

Question 9

Candidates needed to improve their knowledge for this question as few could identify all three plastics from the list provided. However, many candidates did achieve at least 1 or 2 marks. PVC and polystyrene were the most common correctly identified plastics.

Question 10

Some candidates gave suitable ergonomic considerations for each of the three areas. Some needed to understand that:

A referred to the reach from the head/shoulders to the tips of the fingers for comfortable use of the keyboard or reach to the desk

B the seat height could be adjusted and set at a comfortable working height for the user

C the desk height must leave space beneath it for the individual's legs to fit comfortably under the table top.

Section B

Question 11

(a) (i) Many candidates stated that an advantage of using a template was that it was quicker than having to draw the outline straight onto the acrylic, or that it was more accurate. Another advantage was that it minimised risk of damaging the surface of the acrylic.

(ii) Many candidates achieved maximum marks for this question. Many candidates showed the acrylic held by means of a cramp or vice. A coping saw was the most common correctly named saw.

Precautions included; keeping the acrylic low in the vice or the use of scrap wood to prevent damage to the acrylic.

(b) Many candidates described how a strip heater/line bender or oven could be used to soften the acrylic. Clamping of the acrylic was not well-answered. Some candidates drew and described the use of a vacuum forming machine, others described injection moulding.

(c) (i) HIPS and polystyrene were the most common correct answers.

(ii) Many candidates attempted to show draft angles and rounded corners and edges. Sketches were not always clear. Some described air holes which, when vacuum forming are necessary, but this question related specifically to modifying the former and therefore air holes could not be rewarded.

(iii) Many candidates explained that vacuum forming would be a quicker process or that the mould could be used many times, giving repetitive accuracy.

(d) Many candidates described wearing gloves and/or goggles and keeping the work area well-ventilated when working with acrylic cement. The wearing of an apron received no credit.

(e) The most common correctly named equipment included the use of a file, wet and dry [silicon carbide] paper and a 'buffing' wheel, mop or polishing compound. The use of sandpaper or glasspaper is not appropriate when finishing acrylic. Most candidates did achieve at least 1 or 2 marks.

(f) There were many potentially good designs showing how the base could be made to rotate. The use of bearings and bearing surfaces demonstrated a good level of thinking. However, many candidates needed to improve on their sketches by making them clearer, showing how the designs would work.

Question 12

(a) Many candidates gained at least 2 marks for completing the parts list.

(b) The majority of candidates were able to describe items of research: the most common being the size and number of guitars as well as the location. Those candidates who gave three references to the size of the guitar; height, width and depth were awarded 1 mark unless they stipulated a specific dimension, for example, the width of the 'neck'.

(c) Many candidates named an appropriate saw that could be used to cut out the shape, with a coping, band saw, jig saw and scroll saw the most common correct answers. Some candidates named an appropriate shape of file to complete the curve with glasspaper, often referred to as 'sandpaper', to smooth the surfaces. A bobbin sander was also accepted to finish the shape of the curve or make it smooth.

(d) (i) Only a minority of candidates named a smoothing plane or jack plane to produce the rounded edges. Many candidates named tools that were not types of plane.

(ii) Most candidates recognised that the fabric would protect the guitar from being scratched.

(e) Most candidates gained at least 1 mark for this question. Some candidates did show the length of the screw from the top of the head to the tip of the thread. [An actual dimension was not necessary]. The type of head was countersunk and material could be steel, brass, or copper.

(f) For maximum marks candidates needed to show a 'plate' made from a specifically named metal, for example, mild steel, that could be used as a basic template. Two holes would be drilled in the plate and its location to fit against three sides would complete the design of jig. Many candidates gained some marks for providing location of the plate against one or two sides but only a minority achieved maximum marks.

(g) Some candidates produced excellent, clear sketches of a set of feet, with dimensions, material stated and a method of attaching them to the guitar stand. However, many candidates needed to show more clarity in their sketches or state more appropriate materials that could be used for the feet or how they would be attached in order to achieve maximum marks.

(h) (i) Very few candidates understood that when finishing wood surfaces, to achieve the best results, it is necessary to apply glasspaper of varying grades to keep removing the 'scratches' produced by the preceding grade until a fine finish is achieved.

(ii) Some candidates did state that paint would cover and therefore hide the natural colour, figure and grain of the hardwood. Other good answers included that paint could either chip off or mark the base of the guitar's body.

(iii) Only a small minority of candidates gave the main advantage of applying wax rather than polyurethane varnish: that it would be quicker to apply or quicker to dry.

Question 13

(a) Most candidates gave at least one acceptable answer to this question. References to checking dimensions, ensuring that the glasses would fit the holder, giving a visual impression of the final design and saving wood or metal if errors were identified were the most common correct responses.

(b) (i) and (ii) Many candidates did state an appropriate ferrous and non-ferrous metal for these questions.

(iii) Many candidates identified correctly at least one or two of the marking out tools. The scriber, often referred to as a 'scribe' was accepted without penalty.

(iv) Many candidates did not recognise that the main disadvantage when using a hacksaw to cut sheet metal was the depth of the frame that restricted how far the teeth could actually cut. Some candidates did state that tin snips would be easier to control.

(c) (i) Most candidates achieved at least 1 mark for showing at least three layers or plies. There were many excellent sketches showing the alternating grain direction of an odd number of plies with good additional explanatory notes.

(ii) The majority of candidates named chipboard or MDF for the holder. Blockboard was not considered appropriate.

(iii) and (iv) Most candidates could not name a specific type of nail that could be used to join the parts together. To state a suitable length of nail that could be used candidates needed to look carefully at Fig.17, which stated that the sides were 9mm thick, and work out a practical length; 15–25 mm.

(v) and (vi) The most common appropriate adhesive was PVA. However, while the Mark Scheme set a limit on the time it would take to set, [1–4 hours], many candidates stated times well above the accepted range.

(d) (i) Answers to this question varied considerably in the clarity of sketches and annotations. They varied from one suggestion of nails in the wall and nails in the holder and hang from some rope, to a wooden angled bracket screwed to the back of the holder and sitting securely on a similarly angled bracket screwed to the wall. A significant number of candidates showed one hole with or without a screw or one bracket. Several candidates used nails into the wall rather than screws.

(ii) To show a design for some sort of lid for the holder relies on good quality, clear sketches and written notes. Some candidates were unable to name the material that they would use for the lid. Few candidates who hinged their lids realised that the use of small nuts and bolts is more practical in acrylic sheet than using screws. Most candidates designed a hinged lid, a 'lift-off' design or a sliding lid. There were some excellent answers to this question from a number of candidates who had clearly thought through the practicalities of making their lid work effectively.

DESIGN AND TECHNOLOGY

Paper 0445/33
Resistant Materials

Key messages

- Candidates need to read the questions carefully and be clear about what the question is asking **before** attempting an answer. Many candidates gave one-word answers to questions requiring more detailed responses. The number of lines for the answer and the space provided give an indication of the depth of answer 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 and not simply state the obvious.
- 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 need to develop their knowledge and understanding in order to improve their responses when answering 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. Careful reading of the questions is needed before answering.

Comments on specific questions

Section A

Question 1

(a) Most candidates named polypropylene correctly.

(b) The most common benefits included: hardwearing, durable and lightweight to carry.

Question 2

(a) Candidates needed to improve their knowledge for this question as many could not name a specific tool that could be used to make the edge of the mild steel square. 'File' was stated but without a specific name it could not be rewarded.

(b) Candidates needed to improve their knowledge for this question as only a minority of candidates could name a smoothing plane or jack plane correctly.

Question 3

Most candidates achieved at least 1 mark for showing the addition of two nails or screws. For maximum 2 marks the nails or screws needed to be drawn off-set through the block.

Question 4

(a) Most candidates named aluminium for the non-ferrous metal.

(b) The main reason given was that it could be bent to shape easily (malleable) and that it was resistant to corrosion. Lightweight was considered an irrelevant material property for the desk stand.

Question 5

Candidates needed to provide more detail for this question as very few achieved the maximum 4 marks.

There were many corner blocks, brackets, gussets and the inclusion of cross rails that were awarded maximum 2 marks for each method. The vast majority of answers only noted what the corner joints could be; for example, dowel or mortise and tenon.

Question 6

Candidates needed to improve their knowledge for this question as only a small minority could identify all three materials from the descriptions given. The most commonly identified material was MDF and the least identified was 'ash'.

Question 7

Most candidates held the acrylic in position by the addition of blocks or weights behind both sides of the acrylic. Many answers showed the edges of the acrylic set in grooves or housings cut into the base. Often, there was an over-dependence on the use of cramps that would have been impractical.

Question 8

Candidates needed to improve their knowledge for this question as many thought, incorrectly, that the battery tester was an example of 'conductive' rather than 'thermochromic' technology. This is a relatively 'new' area of the syllabus with which candidates must be familiar.

Question 9

Candidates needed to improve their knowledge for this question as few knew what a corner bridle was in order to complete the exploded view given. The minority of candidates who did know what a corner bridle joint was, generally, produced very good, accurate sketches.

Question 10

(a) The question asked candidates to explain why injection moulding is only suitable for mass production. Candidates needed to read the question carefully as many ignored the word 'only' in the question. The best answers explained that the cost of the initial tool (mould) is expensive (1 mark) and that to recover these costs products would have to be produced in high volume (1 mark).

(b) Most candidates gained at least 1 mark for giving a good explanation of the harmful environmental effects of plastics. For the second mark candidates needed to refer to the fact that the cutlery was thrown away after its use and that plastics are made from oil which is from a finite source.

Section B

Question 11

(a) (i) Many candidates named an appropriate softwood with pine (and variants) accepted. There were a number of selections made that were not softwoods and some that were not made from wood at all.

(ii) Many candidates achieved maximum marks for this question. Most candidates recognised that conditions in a bathroom could become humid and materials would need to contend with this.

(b) (i) Many candidates named an appropriate corner construction for the box: the most common being a finger (comb), dowel, mitre and half-lapped joints. Butt joints and KD fittings were also accepted. The variable quality of sketches sometimes meant that candidates denied themselves access to the maximum marks available.

(ii) Many candidates simply cut down the size of the base to fit inside the box then glued it in position. This is not a practical method. Some candidates inserted nails or screws into the edge which was only 4 mm thick and would split. There were many good answers showing how a groove or rebate could be used so that the base would be fitted securely and the edges of the base not visible.

(c) Some candidates gained maximum 3 marks for showing a basic shape of handle (1 mark), an appropriately named material (1 mark) and a method of construction (1 mark). Many candidates gained at least 1 mark for a partially successful design.

(d) Candidates needed to improve their knowledge for this question as very few achieved maximum marks as completely workable designs for jigs were very rare. Candidates had the opportunity to choose **one** specific part of the storage unit and show how some sort of jig or similar device could be used to speed up production. Many designs involved the use of equipment such as circular saws that would be impractical. Some good answers involved the use of basic templates to mark off lengths of wood or jigs to position a drill to make holes.

(e) Many candidates gained at least 1 or 2 marks for showing how the box and upright could be screwed together. At least two screws were needed to fit each side of the upright to each box.

(f) There were some potentially good functional improvements suggested by candidates. These included partitions to divide the contents within each box, a lid to cover the contents and wheels so the unit could be moved easily. However, most designs needed more detail and sketches needed to be clearer.

(g) Most candidates gave good reasons for the popularity of self-assembly products. Many candidates stated that these products were cheaper but without giving reference to ready-assembled products. Most good reasons included the ability to collect as a flat-pack and the satisfaction of constructing a product. Some candidates thought that constructing self-assembly products was ‘great fun’.

Question 12

(a) The most common correct hardwood was oak. Some candidates named pine incorrectly.

(b) The majority of candidates were able to give at least one reason for using stainless steel; the most common reason being its resistance to corrosion and its attractive appearance. It is not ‘easy to bend’.

(c) (i) Very few candidates could name two bits that could be used to drill the holes. The most common bits were a flat bit and a forstner bit.

(ii) Many candidates gained at least 1 mark for describing **either** how the wood would be clamped securely or how the placement of scrap wood underneath the wood to be drilled would prevent it from splintering. Only a minority of candidates gave two points in their explanations.

(d) (i) Candidates needed to improve their knowledge of metalworking tools. Some candidates named correct tools such as a scriber (often written as ‘scribe’), marking blue and a permanent marker. Some candidates named tools that are used when marking out, such as a steel rule and try square, but the question stipulated ‘….tools that could be used to **show** the bend lines’.

(ii) Most candidates recognised that the centre punch helped drill an accurate hole (1 mark) and the best answers went on to describe how the centre punch made an indentation into which the drill would ‘sit’, making it less likely to slip and ‘wander’.

(iii) Candidates needed to improve their knowledge for this question. There was no need to heat the metal and no need to used bending devices. The minority of candidates who achieved good marks highlighted the use of a mallet or a hammer and scrap wood, a vice and some type of former over which the steel could be bent to shape. Additional explanatory notes assured a minority of candidates of maximum 6 marks.

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(f) This question required candidates to substitute the metal parts and replace them with wood-based materials. Some candidates literally tried to imitate the existing shape of the metal brackets in wood. This was difficult to achieve because it would require an understanding of laminating. The best answers simply replaced the metal bracket with a solid block of an appropriately named wood, then showed a sound method of construction and added two important sizes to achieve maximum 6 marks.

Question 13

(a) (i) Most candidates named a suitable softwood with pine (and variants) the most common.

(ii) Candidates needed to improve their knowledge for this question as only a minority of candidates were able to provide a reason for their choice other than 'strength'. Another good reason was that it could be finished with a clear varnish or paint.

(b) There were some innovative designs for a sawing jig. The bullet points listed in the question are there to guide candidates. It was not always clear whether or not the softwood was held securely while it was being sawn. An accurate length was generally achieved by some mark or measurement clearly visible or by means of a saw cut to guide a tenon saw. Clarity of sketches is essential when communicating design ideas.

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(ii) Candidates needed to improve their knowledge for this question. Some candidates named (outside or digital) calipers as a means of checking the diameter of the wheels. There were many inappropriate tools and items of equipment named.

(iii) Some candidates named a chisel as the most common tool used to 'turn' the wheels. Since PPE was accepted, the use of safety glasses (goggles) was rewarded. Glasspaper was also rewarded.

(d) Most candidates gained 1 or 2 marks for this question. For 3 marks candidates needed to show some sort of axle (either a 'stub' or continuous), a method of retaining the wheels and some sort of washer or 'spacer' to allow free movement of the wheel.

(e) (i) Smoothing and jack planes were named correctly by some candidates. Candidates needed to improve their knowledge for this question as many candidates named tools that were not even types of plane.

(ii) Candidates needed to improve their knowledge for this question as it was clear from the answers provided that few candidates knew about a bench stop. Some candidates drew the wood held in a vice and some showed it held against a bench hook.

(f) (i) Some candidates understood that the former would require draft-angled (tapered) sides and rounded corners and edges. Air holes, that are often drilled into the base on which the former 'sits', were not rewarded as the question asked for modifications to the former only.

(ii) Many candidates named polystyrene, HIPS and acrylic as a suitable plastic to vacuum form the car body.

(iii) The most common correct check carried out during the vacuum forming process related to the heating the plastic to the correct temperature. Other checks included clamping the plastic and making sure the former was positioned correctly.

DESIGN AND TECHNOLOGY

Paper 0445/41
Systems and Control

Key Messages

Candidates should be reminded that they are required to answer every question in ***Section A*** but only one question in ***Section B***. There were several instances in the June examination where all three ***Section B*** questions had been attempted. In this case, time is wasted on the other questions instead of focusing on one question and attempting a complete and thorough response.

Clear, legible writing and annotation to sketches are vital. Where responses cannot be read no mark will be awarded.

All responses should appear in the space allocated for that response. If there is not enough room the response can be continued on additional sheets attached to the booklet. If additional sheets are used the question and part number must appear clearly next to the response.

Candidates should be reminded that failure to make a response will always result in no mark being awarded for that question. If an answer is offered there is a chance that it will gain a mark.

In questions that require either a single answer or a set number of answers, it is important that candidates do not enter additional answers as this will result in the Examiner not being able to give credit to a correct response because an incorrect one has also been offered.

If a comparison is required, for example, in a question asking for advantages, the response should reflect this and provide reference to the items being compared.

Where a list in a question provides terms to be chosen it is important that candidates restrict themselves to the words or terms in the list.

In calculation questions, units should be applied to the answer wherever it is appropriate. Any working should always be shown as it is possible to gain marks from this even if the final answer is incorrect.

General Comments

The questions in ***Section A*** proved accessible to most candidates with very few instances of questions without any response. Clear answers were seen in the majority of cases and there was evidence that each area of the syllabus had been covered.

In ***Section B*** there was clear evidence of a move by candidates this year toward the structures question; the electronics question was the least popular of the three.

It is important that candidates read each question carefully, noting any important features that appear in bold type. In the structures question asking for **three** additional scaffolding poles to be used, a significant number of responses showed more than three additional poles.

As noted in the key messages, there was an increase shown in those attempting all three questions. In almost all these cases, time would have been better spent concentrating on a single question. Candidates need to follow the rubric for this question paper. 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 answers correctly gave torque or torsion. The most common incorrect answer was tension.

(b) There were several allowable benefits of using a nylon lining to the cable. Candidates who applied the bearing properties and reduction in friction provided by nylon generally gained both marks.

(c) Answers should have mentioned the restriction in movement caused by tight bends in the cable. The possibility of the cable snapping was allowed though it is a less likely effect than general loss of efficiency in the movement of the inner cable.

Question 2

(a) A number of responses correctly noted that steel is ductile, allowing it to be drawn into wire. There were also incorrect assumptions made that steel does not rust or corrode. The better responses noted that steel is extremely strong in tension; just stating that it is strong is not enough evidence for a mark.

(b) The force used in operating a control cable was generally recognised as tension.

Question 3

Compression was the correct answer given in most cases. Those who had answered with ‘pressure’ did not get a mark as it was not considered precise enough.

Question 4

(a) In most cases the fulcrum and effort positions were correctly identified; rather fewer candidates had placed the load accurately, incorrectly putting it in the centre of the lever.

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Question 5

Knowledge of the purpose of particular gear systems was generally good with most candidates getting all three correct; any errors were generally made in confusing the idler and worm gear.

Question 6

Knowledge for this question needs further development as the term ‘pitch’ did not seem to be understood. The most common fault was to use the 3 mm thread width. A significant number of answers had used either the outside diameter or the core diameter of the thread.

Question 7

(a) The logic symbols were identified by most candidates with only a few instances of AND, OR and NOT gates being named.

(b) This part of the question needed improvement; in some cases, decimal numbers, 2, 3, 4 appeared in the truth table and in a number of responses the logic for OR and AND gates was given.

Question 8

(a) Knowledge of capacitor markings needed further improvement. Many candidates had noted that ‘V’ in the description referred to volts or voltage but very few recognised that in each case it was the maximum voltage that could be applied to the capacitor without causing damage.

(b) Tolerance in the manufacturing of capacitors was not particularly well understood or stated in the response. Candidates who showed understanding that the ± values given referred to different tolerance, gained the mark.

Question 9

The correct answer was any type of resistor; however, this was given by a minority of candidates. Those who had not read or understood the term 'discrete component' frequently gave the name of an integrated circuit.

Section B

Question 10

(a) (i) In most cases candidates had correctly identified the scaffold as a frame structure.

(ii) To gain all three marks the structure had to be made rigid on three different faces, front, side, and top. Those who had used too many poles were awarded a maximum of 2 marks.

(iii) The two features at the base of the scaffold were to spread the load from the scaffold and feature **Y**, the plank prevented any sinking into soft ground, this feature could also be used to level the scaffold. The majority of candidates gained at least one of the marks. Those who gained both marks frequently did so by fully explaining a single point.

(iv) Higher achieving candidates showed a clear understanding of what a factor of safety is and how it is used in structures to ensure that unknown loads that may be encountered in the future will not endanger users. Lower achieving candidates confused the factor of safety with general safety rules when using equipment.

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(ii) A weakness in many responses was to ignore the visible ribs in the shell which contribute to its strength. Several responses gave examples of how any shell provides strength rather than using the given example.

(c) (i) The elastic limit was shown clearly on responses and most gained the mark for this. The curve after the ultimate stress point should have shown a dip, in many cases it continued up. The feature that caused the most problem was the upper yield point. The curve immediately after this should have included a dip, the dip was frequently shown as coming before point **B**.

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(iii) The features being looked for in responses were a recognisable shape for the dial gauge, central placement underneath the rail being tested and a method of supporting the dial gauge. Sketches were generally very good with the relevant features clearly drawn. A common failing was to have the tip of the dial gauge on top of the rail, making it very difficult to simulate force applied to the rail.

(e) Higher achieving candidates had no problem with calculating the stress on each pillar and then deciding which pillar was subject to the greatest stress. Finding the area of the round pillar was an area where weaker candidates needed to improve their knowledge. In a few cases, the stress calculations were carried out accurately but the final mark for stating which of the two pillars was under the greatest stress could not be awarded as there was no decision made.

Question 11

(a) (i) The function of the jockey wheels in keeping the chain tensioned was recognised in most cases. The function of aligning the chain with different sprockets was not so well known.

(ii) In most cases the correct formula, multiplication of the number of chainrings by the number of sprockets was correctly used. In the few cases where error was made the two figures were either added or divided.

(iii) Higher achieving candidates gained the mark for naming the wheel diameter as the additional factor.

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(ii) Many responses showed understanding that grease is a more viscous lubricant, and this was enough to gain the mark.

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(ii) The grooves in the ceramic bearing serve two purposes, the one most widely recognised was to act as a reservoir for oil; rather fewer referred to giving abrasive material somewhere to collect, rather than damaging the surface of the bearing.

(iii) Knowledge for this question needed further development. The main benefit of the plain bearing lies in the low manufacturing cost. Very few candidates referred to this. The sealed ball bearing was correctly seen as a method of reducing maintenance and reducing friction between the moving surfaces. Very few responses referred to the ability of a ball bearing to resist both axial and radial load.

(d) (i) Most candidates recognised the rack and pinion mechanism. In the few cases where different answers were given they were clearly guessed answers rather than using the visual evidence.

(ii) The conversion of motion provided by rack and pinion was well known, with a minority using reciprocating instead of linear motion.

(iii) Sources of energy loss in a machine were well known and most responses gained marks.

(iv) This part proved rather more difficult; most responses focussed on reduction of friction in the machine, very few went for the simpler approach of switching the machine off when not in use.

(v) There were some very good explanations given for the use of cams. Clear recognition of the speed of adjustment and limited movement needed was evident but very few commented on the fact that no tools are required to operate the cam.

(e) (i) Most responses had correctly counted the pulleys but in some cases the advantage was incorrectly given as 1/8.

(ii) Those who had correctly stated the mechanical advantage were generally able to calculate the pulling for the given load. Answers were accepted in either newtons or kilonewtons. It is important in questions like this for candidates to add the unit used to their numerical answer.

Question 12

(a) Sketches of the switch connected to the multimeter were in most cases recognisable. The question stated that the multimeter should be on resistance setting but sketches that included a battery were commonly found. Understanding of the difference between PTM and PTB switches was generally good with notes clearly explaining how each type would behave.

(b) (i) The correct connecting wire for a switch to a circuit board was the stranded insulated type.

(ii) The reason for choice in most cases was given as insulation, very few candidates referred to the flexibility of the wire in a situation where movement is likely to take place. Those who had not gained the mark for the previous part were allowed a mark in this part if a good reason for choice was given.

(iii) The soldering process was well known, and some excellent sketches were seen. Candidates should be reminded that in a process like soldering where there are many stages to choose from they should avoid the ones not directly related to the process. For example, there were responses which included switching on the soldering iron as one stage and allowing it to heat up as a second stage; neither of these gained marks.

(c) This part was well answered in all responses. The advantages of being able to quickly connect or disconnect the cable along with a reduction in wires breaking were the most common. Not many candidates commented on the notch used to orientate the plug in the socket.

(d) (i) Knowledge for this question needed further development. Failure to use the forward voltage of the LED correctly was a factor in many responses; it was common to find the forward voltage being used directly in the calculation rather than deducted from the supply voltage. This question was another instance of where showing all steps in the calculation could lead to marks being awarded even with an incorrect final answer.

(ii) The purpose of a potential divider in reducing voltage was widely recognised, the precise method, using resistors in series was in most cases not appreciated. The fact that the reduction in voltage at the centre is in proportion to the resistor values was also missing from many responses.

(iii) Knowledge for this question needed further development. The general features of a voltage comparator were known to higher achieving candidates, but explanations often failed to show precisely how the comparator operates, with reference to the inverting and non-inverting inputs. Very few candidates had made reference to one of the inputs being a reference voltage.

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(v) The circuit symbol for a transistor was generally recognisable though the majority of responses had failed to use a current limiting resistor on the base connection. Emitter and collector connections were generally correct. Candidates should be reminded that connection ‘blobs’ should be used to indicate on a circuit diagram where a connection is intended.

(vi) Uses of a relay in isolating input and output sides of a circuit were well known and reference was made in several cases to the high current in the motor circuit.

DESIGN AND TECHNOLOGY

Paper 0445/42
Systems and Control

Key Messages

Candidates should be reminded that they are required to answer every question in ***Section A*** but only one question in ***Section B***. There were several instances in the June examination where all three ***Section B*** questions had been attempted. In this case, time is wasted on the other questions instead of focusing on one question and attempting a complete and thorough response.

Clear, legible writing and annotation to sketches are vital. Where responses cannot be read no mark will be awarded.

All responses should appear in the space allocated for that response. If there is not enough room the response can be continued on additional sheets attached to the booklet. If additional sheets are used the question and part number must appear clearly next to the response.

Candidates should be reminded that failure to make a response will always result in no mark being awarded for that question. If an answer is offered there is a chance that it will gain a mark.

In questions that require either a single answer or a set number of answers, it is important that candidates do not enter additional answers as this will result in the Examiner not being able to give credit to a correct response because an incorrect one has also been offered.

If a comparison is required, for example, in a question asking for advantages, the response should reflect this and provide reference to the items being compared.

Where a list in a question provides terms to be chosen it is important that candidates restrict themselves to the words or terms in the list.

In calculation questions, units should be applied to the answer wherever it is appropriate. Any working should always be shown as it is possible to gain marks from this even if the final answer is incorrect.

General Comments

The questions in ***Section A*** proved accessible to most candidates with very few instances of questions without any response. Clear answers were seen in the majority of cases and there was evidence that each area of the syllabus had been covered.

In ***Section B*** there was clear evidence of a move by candidates this year toward the structures question; the electronics question was the least popular of the three.

It is important that candidates read each question carefully, noting any important features that appear in bold type. In the structures question asking for **three** additional scaffolding poles to be used, a significant number of responses showed more than three additional poles.

As noted in the key messages, there was an increase shown in those attempting all three questions. In almost all these cases, time would have been better spent concentrating on a single question. Candidates need to follow the rubric for this question paper. 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 answers correctly gave torque or torsion. The most common incorrect answer was tension.

(b) There were several allowable benefits of using a nylon lining to the cable. Candidates who applied the bearing properties and reduction in friction provided by nylon generally gained both marks.

(c) Answers should have mentioned the restriction in movement caused by tight bends in the cable. The possibility of the cable snapping was allowed though it is a less likely effect than general loss of efficiency in the movement of the inner cable.

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(a) A number of responses correctly noted that steel is ductile, allowing it to be drawn into wire. There were also incorrect assumptions made that steel does not rust or corrode. The better responses noted that steel is extremely strong in tension; just stating that it is strong is not enough evidence for a mark.

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Compression was the correct answer given in most cases. Those who had answered with ‘pressure’ did not get a mark as it was not considered precise enough.

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(a) The logic symbols were identified by most candidates with only a few instances of AND, OR and NOT gates being named.

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(b) Tolerance in the manufacturing of capacitors was not particularly well understood or stated in the response. Candidates who showed understanding that the ± values given referred to different tolerance, gained the mark.

Question 9

The correct answer was any type of resistor; however, this was given by a minority of candidates. Those who had not read or understood the term 'discrete component' frequently gave the name of an integrated circuit.

Section B

Question 10

(a) (i) In most cases candidates had correctly identified the scaffold as a frame structure.

(ii) To gain all three marks the structure had to be made rigid on three different faces, front, side, and top. Those who had used too many poles were awarded a maximum of 2 marks.

(iii) The two features at the base of the scaffold were to spread the load from the scaffold and feature **Y**, the plank prevented any sinking into soft ground, this feature could also be used to level the scaffold. The majority of candidates gained at least one of the marks. Those who gained both marks frequently did so by fully explaining a single point.

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(a) (i) The function of the jockey wheels in keeping the chain tensioned was recognised in most cases. The function of aligning the chain with different sprockets was not so well known.

(ii) In most cases the correct formula, multiplication of the number of chainrings by the number of sprockets was correctly used. In the few cases where error was made the two figures were either added or divided.

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Question 12

(a) Sketches of the switch connected to the multimeter were in most cases recognisable. The question stated that the multimeter should be on resistance setting but sketches that included a battery were commonly found. Understanding of the difference between PTM and PTB switches was generally good with notes clearly explaining how each type would behave.

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(vi) Uses of a relay in isolating input and output sides of a circuit were well known and reference was made in several cases to the high current in the motor circuit.

DESIGN AND TECHNOLOGY

Paper 0445/43
Systems and Control

Key Messages

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General Comments

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Section A

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(a) Sketches of the switch connected to the multimeter were in most cases recognisable. The question stated that the multimeter should be on resistance setting but sketches that included a battery were commonly found. Understanding of the difference between PTM and PTB switches was generally good with notes clearly explaining how each type would behave.

(b) (i) The correct connecting wire for a switch to a circuit board was the stranded insulated type.

(ii) The reason for choice in most cases was given as insulation, very few candidates referred to the flexibility of the wire in a situation where movement is likely to take place. Those who had not gained the mark for the previous part were allowed a mark in this part if a good reason for choice was given.

(iii) The soldering process was well known, and some excellent sketches were seen. Candidates should be reminded that in a process like soldering where there are many stages to choose from they should avoid the ones not directly related to the process. For example, there were responses which included switching on the soldering iron as one stage and allowing it to heat up as a second stage; neither of these gained marks.

(c) This part was well answered in all responses. The advantages of being able to quickly connect or disconnect the cable along with a reduction in wires breaking were the most common. Not many candidates commented on the notch used to orientate the plug in the socket.

(d) (i) Knowledge for this question needed further development. Failure to use the forward voltage of the LED correctly was a factor in many responses; it was common to find the forward voltage being used directly in the calculation rather than deducted from the supply voltage. This question was another instance of where showing all steps in the calculation could lead to marks being awarded even with an incorrect final answer.

(ii) The purpose of a potential divider in reducing voltage was widely recognised, the precise method, using resistors in series was in most cases not appreciated. The fact that the reduction in voltage at the centre is in proportion to the resistor values was also missing from many responses.

(iii) Knowledge for this question needed further development. The general features of a voltage comparator were known to higher achieving candidates, but explanations often failed to show precisely how the comparator operates, with reference to the inverting and non-inverting inputs. Very few candidates had made reference to one of the inputs being a reference voltage.

(iv) There were three available methods of changing the sensitivity of the circuit and higher level responses generally gained at least one mark.

(v) The circuit symbol for a transistor was generally recognisable though the majority of responses had failed to use a current limiting resistor on the base connection. Emitter and collector connections were generally correct. Candidates should be reminded that connection ‘blobs’ should be used to indicate on a circuit diagram where a connection is intended.

(vi) Uses of a relay in isolating input and output sides of a circuit were well known and reference was made in several cases to the high current in the motor circuit.

DESIGN AND TECHNOLOGY

Paper 0445/05
Project

Key messages

- It is important that candidates be encouraged to plan their time effectively to ensure that they fully complete work that meets all aspects of the assessment criteria in the time allowed.
- Candidates should produce folders that make the best use of each page. For example, some candidates use overly large fonts, large headings and unnecessary embellishment. Candidates' folders should be detailed and concise.
- Many candidates use CAD to generate ideas. It is advisable for candidates to also use pencil or pen sketches so that they can explore their initial ideas quickly in order to produce a wider range of possible solutions. Candidates should be encouraged to explore innovative and creative possibilities at this stage.

General comments

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

The number of centres entering candidates for this component continues to increase.

All of the new centres have embraced the aim of this component; to develop in candidates, an expertise in creative thinking and expressing it through their research, designing, planning, making and evaluative skills.

There were many outstanding projects submitted this session, with candidates demonstrating a thorough understanding of the requirements of the assessment criteria and exceptional design, making and problem-solving skills. The approach to designing of many candidates showed good integration of sketching, modelling and on-going evaluation indicating mature and fluent design thinking.

In a few centres, the choices of projects were unrealistic and inappropriate to the demands of the assessment criteria. The presentation of non-working concept design is to be discouraged in this specification, as the quality and complexity of practical skills employed are generally not of the standard required and the product cannot be realistically tested and evaluated.

Whilst most of the work submitted was detailed and concise, there are still a significant number of candidates who produce exceptionally large folders. Candidates should be encouraged to focus their research and make fuller use of the space available on each sheet.

Centres are reminded to not forward practical work or 3D models; clear photographic evidence in the folder is sufficient.

The majority of centres apply marks consistently and accurately. Centres are encouraged to use the guidance given in this report and the focused information on the Moderator's 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

Centres were generally accurate in the assessment of this section. Most candidates considered in detail both the design need and the needs of the intended users and produced a clear design brief. Many identified a client or user and through questionnaire conclusions showed a good understanding of the needs of the potential user group. It is not necessary for candidates to include pages of other possible briefs or design opportunities, as these are not assessed.

2 Research into the Design Brief resulting in a Specification

More and more candidates are using primary research to have a clear understanding of the design task. Most candidates focus on the key, relevant information and apply this personal observation and analysis to obtain research information and go on to produce a detailed and relevant specification. However, a significant number of candidates produce generic information about materials and processes and include examples of existing products, with limited reference to the brief.

The analysis of existing products should lead to information and key points to take forward to the next stage of designing – what to include, what to avoid.

Research must be appropriate to the brief, a number of candidates designing storage units needed to include the range and sizes of items to be stored.

3 Generation and exploration of Design Ideas

A significant number of centres need to improve their reviewing of the evidence provided for this section ensuring more accurate application of the assessment criteria.

To access the higher mark range candidates must produce a wide range of different, well-annotated possibilities, with imaginative interpretation. There should be a detailed evaluation of the ideas with reference to the specification, candidates must explain why one design is better than another and a tick box table is insufficient on its own, as it does not show the candidates reasoning and justification.

Much of the work seen had well-presented, innovative and creative design proposals, where candidates clearly showed their design thinking and development.

4 Development of Proposed Solution

This section needed to be assessed more accurately by centres. Most candidates showed reasoned decision making about the form, materials and construction of their final solution. A significant number however, had very limited evidence of the development of the final design proposal but were marked very leniently. Many candidates found it beneficial to model the product or part of the product before construction to help work out proportions, mechanisms, joints etc.

To achieve the highest mark range candidates must have evidence of appropriate modelling and trialling resulting in reasoned decisions about the form, materials, construction methods and other items, for example additional fixtures or components to be used.

5 Planning for Production

This section was assessed accurately by centres. Working drawings were generally of a very good standard, with candidates producing high quality technical drawings with an increasing number of candidates showing great expertise in the use of Computer Aided Design software. The best work submitted was fully detailed and dimensioned and would enable a third party to manufacture their product.

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

6 Product Realisation

There were a number of exceptional products constructed, with candidates exercising care, skill and precision. Many products looked professional and contemporary.

Assessment of this section was generally accurate although some centres were lenient and awarded marks outside of an acceptable tolerance. 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

This section was generally assessed accurately although a significant number of centres were over generous in the marks awarded.

The majority of candidates tested their products against their original specification, a significant number however, needed to suggest proposals for further improvement or development. Some candidates needed to test their product in its intended environment or make reference to, or have feedback from, the intended user(s).

The product should be evaluated in detail against the original specification to identify strengths and weaknesses. A number of candidates used a tick box table which did not explain any reasoning and justification.