DESIGN AND TECHNOLOGY

Paper 0445/11
Design

Key Messages

- To score high marks throughout the paper candidates need to use specific terms when referring to design issues, materials and manufacturing techniques.
- Successful responses to the design process are more likely to be achieved where each stage flows on from and is related to the one before.

General comments

The majority of 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 problem as set.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded as and where required were able to evidence their design and thinking skills successfully.

Comments on specific questions

Question 1

This was, by far, the most popular question and the majority of candidates clearly understood the requirements of a storage unit for the basic bathroom items shown.

(a) Many candidates scored full marks on this starting point for the design process as they were able to identify four specific functional points required of the storage unit. Successful responses included: easy to clean; resists water; appropriate height/position; items easy to access; matches bathroom; allows water to drain out; separate section for each item; etc. General responses such as 'durable' or 'lightweight' can be awarded marks only where the specific reason for the requirement is given.

(b) Most candidates were able to identify places in a bathroom where a storage unit of this type could be positioned. Appropriate responses included: on a wall; on the surface next to the basin; on a shelf; on a window ledge; in a cupboard; in a drawer; etc.

(c) The majority of candidates presented three ideas and showed that they were able to be quite creative in their response to the design problem. Successful candidates enhanced their drawings with colour or other forms of highlighting and added annotations to help describe the nature and detail of each design idea. Candidates are advised to use all the space allocated for the answer for this part of the question so that they can show all detail clearly.

(d) Successful candidates identified both positive and negative aspects of their design ideas so that they could discriminate between all three of them. This was often more effective where some of the comments related to the functional points raised earlier. High marks were scored where comments included valid judgements rather than just simple descriptions of each idea. Evaluation tables that simply ticked or awarded marks against each idea without adding meaningful comment could not be awarded maximum marks.

(e) The level of response to this part of the question continues to show an improvement 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 annotation. 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 part. 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 different materials in this context.

(g) Outlines that described an appropriate step by step manufacturing method for one part of the design solution, including the tools used, scored high marks. Responses to this part need to develop beyond general marking out and preparation methods that could be applied to any product.

Question 2

There were some good responses to this question which was intended for those candidates following the Graphic Products option. Most candidates described how the game would be played but the most successful answers included full detail of how the game and its packaging would be made.

(a) The majority of candidates identified four additional points about the function of the game and successful responses included: appealing to children; simple instructions; easily assembled; compact when stored; sturdy for children's play; reflects the chosen issue; etc.

(b) Candidates, generally, had no difficulty listing four environmental issues on which a game of this type might be based. Appropriate responses included: water conservation; wasting energy; loss of forests; pollution, use of finite reserves; carbon footprint; global warming; recycling; etc.

(c))

(d)) See **Question 1 (c)** – **(g)**

(e))

(f))

(g))

Question 3

The requirements for the cooking device were such that candidates could make use of their knowledge and experience of systems and control, including electronic, in an interesting way. Proposed designs were generally suited to the environment in which the product would be used.

(a) Most candidates had little difficulty identifying four additional points about the function of the cooking device and these included: will not tip over; easy to clean; hygienic; adjustable; food easy to put on; handle keeps cool; fireproof; easy to store; etc.

(b) Candidates responded quite well to the drawing of two different types of mechanism that would allow food to be turned and those identified included: offset/wheel turning handle; clockwork motor; electric motors; vertical/horizontal rotating spit; cams/cranks; etc.

(c))

(d))

(e)) See **Question 1 (c)** – **(g)**

(f))

(f))

DESIGN AND TECHNOLOGY

Paper 0445/12
Design

Key Messages

- To score high marks throughout the paper candidates need to use specific terms when referring to design issues, materials and manufacturing techniques.
- Successful responses to the design process are more likely to be achieved where each stage flows on from and is related to the one before.

General comments

The majority of 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 problem as set.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded as and where required were able to evidence their design and thinking skills successfully.

Comments on specific questions

Question 1

This was, by far, the most popular question and the majority of candidates clearly understood the requirements of a storage unit for the basic bathroom items shown.

(a) Many candidates scored full marks on this starting point for the design process as they were able to identify four specific functional points required of the storage unit. Successful responses included: easy to clean; resists water; appropriate height/position; items easy to access; matches bathroom; allows water to drain out; separate section for each item; etc. General responses such as 'durable' or 'lightweight' can be awarded marks only where the specific reason for the requirement is given.

(b) Most candidates were able to identify places in a bathroom where a storage unit of this type could be positioned. Appropriate responses included: on a wall; on the surface next to the basin; on a shelf; on a window ledge; in a cupboard; in a drawer; etc.

(c) The majority of candidates presented three ideas and showed that they were able to be quite creative in their response to the design problem. Successful candidates enhanced their drawings with colour or other forms of highlighting and added annotations to help describe the nature and detail of each design idea. Candidates are advised to use all the space allocated for the answer for this part of the question so that they can show all detail clearly.

(d) Successful candidates identified both positive and negative aspects of their design ideas so that they could discriminate between all three of them. This was often more effective where some of the comments related to the functional points raised earlier. High marks were scored where comments included valid judgements rather than just simple descriptions of each idea. Evaluation tables that simply ticked or awarded marks against each idea without adding meaningful comment could not be awarded maximum marks.

(e) The level of response to this part of the question continues to show an improvement 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 annotation. 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 part. 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 different materials in this context.

(g) Outlines that described an appropriate step by step manufacturing method for one part of the design solution, including the tools used, scored high marks. Responses to this part need to develop beyond general marking out and preparation methods that could be applied to any product.

Question 2

There were some good responses to this question which was intended for those candidates following the Graphic Products option. Most candidates described how the game would be played but the most successful answers included full detail of how the game and its packaging would be made.

(a) The majority of candidates identified four additional points about the function of the game and successful responses included: appealing to children; simple instructions; easily assembled; compact when stored; sturdy for children's play; reflects the chosen issue; etc.

(b) Candidates, generally, had no difficulty listing four environmental issues on which a game of this type might be based. Appropriate responses included: water conservation; wasting energy; loss of forests; pollution, use of finite reserves; carbon footprint; global warming; recycling; etc.

(c))

(d)) See **Question 1 (c)** – **(g)**

(e))

(f))

(g))

Question 3

The requirements for the cooking device were such that candidates could make use of their knowledge and experience of systems and control, including electronic, in an interesting way. Proposed designs were generally suited to the environment in which the product would be used.

(a) Most candidates had little difficulty identifying four additional points about the function of the cooking device and these included: will not tip over; easy to clean; hygienic; adjustable; food easy to put on; handle keeps cool; fireproof; easy to store; etc.

(b) Candidates responded quite well to the drawing of two different types of mechanism that would allow food to be turned and those identified included: offset/wheel turning handle; clockwork motor; electric motors; vertical/horizontal rotating spit; cams/cranks; etc.

(c))

(d))

(e)) See **Question 1 (c)** – **(g)**

(f))

(f))

DESIGN AND TECHNOLOGY

Paper 0445/13
Design

Key Messages

- To score high marks throughout the paper candidates need to use specific terms when referring to design issues, materials and manufacturing techniques.
- Successful responses to the design process are more likely to be achieved where each stage flows on from and is related to the one before.

General comments

The majority of 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 problem as set.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded as and where required were able to evidence their design and thinking skills successfully.

Comments on specific questions

Question 1

This was the most popular question and the majority of candidates clearly understood the requirements of a mobile fishing unit for the transportation of equipment to a fishing site.

(a) Many candidates scored full marks on this starting point for the design process as they were able to identify four specific functional points required of the mobile unit. Successful responses included: waterproof; easy to transport; travel over wet ground; easy to clean; easy to access small items (e.g. hooks, floats); items not damaged; separate compartments; easy access when sitting; etc. General responses such as 'durable' or 'lightweight' can be awarded marks only where the specific reason for the requirement is given.

(b) Most candidates were able to identify two methods of achieving mobility for such a unit. Appropriate responses included: wheels on one or two axles; castors; rollers; sledge/skis; carrying straps; rucksack style; etc.

(c) The majority of candidates presented three ideas and showed that they were able to be quite creative in their response to the design problem. Successful candidates enhanced their drawings with colour or other forms of highlighting and added annotations to help describe the nature and detail of each design idea. Candidates are advised to use all the space allocated for the answer for this part of the question so that they can show all detail clearly.

(d) Successful candidates identified both positive and negative aspects of their design ideas so that they could discriminate between all three of them. This was often more effective where some of the comments related to the functional points raised earlier. High marks were scored where comments included valid judgements rather than just simple descriptions of each idea. Evaluation tables that simply ticked or awarded marks against each idea without adding meaningful comment could not be awarded maximum marks.

(e) The level of response to this part of the question continues to show an improvement 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 annotation. 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 part. 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 different materials in this context.

(g) Outlines that described an appropriate step by step manufacturing method for one part of the design solution, including the tools used, scored high marks. Responses to this part need to develop beyond general marking out and preparation methods that could be applied to any product.

Question 2

There were some good responses to this question which was intended for those candidates following the Graphic Products option. Most candidates described how the carrier would function but the most successful answers included full detail of how the carrier could be assembled easily, as asked for in the question.

(a) The majority of candidates identified four additional points about the function of the cake carrier and successful responses included: attractive to shoppers; hygienic; includes a cover; includes carrying system; water/greaseproof; cake separation; balanced well; etc.

(b) Candidates, generally, had little difficulty showing two methods by which joints could be made in card without the use of glue. Appropriate methods included: slots; tabs; interlocking flaps; 'Velcro'; bifurcated rivets; paper clips; etc.

(c))

(d)) See **Question 1 (c)** – **(g)**

(e))

(f))

(g))

Question 3

The requirements for the retrieval device were such that candidates could make use of their knowledge and experience of systems and control, including electronic, in an interesting way. Proposed designs were generally suited to the environment in which the product would be used.

(a) Most candidates had little difficulty identifying four additional points about the function of the retrieval device and these included: adjustable reach; lightweight to carry; handgrip; magnetic/non magnetic pick up; articulated; flexible; etc.

(b) Candidates responded quite well to the drawing of two different types of mechanism that could be used in such a device including: scissor actions; levers; Bowden cable; sliders; gears systems; pulleys; chains; belts; solenoids; etc.

(c))

(d))

(e)) See **Question 1 (c)** – **(g)**

(f))

(g))

DESIGN AND TECHNOLOGY

Paper 0445/21
Graphic Products

Key Message

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

General Comments

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

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

There are areas of the syllabus however, in which further improvements are needed. Candidates must be able to construct regular polygons given the distance across the flats or the corners and also from a circumscribing circle. Drawing circles in isometric is also an area that needs to be improved. Candidates need to understand the difference between Pie, Bar and three-dimensional data charts.

Comments on specific questions

Question A1

Signboard outline

Many candidates drew an Octagon. Successful candidates drew an 80 A/F square first and then connected the corners to find the centre. Drawing arcs from each corner through the centre gave the correct size of Octagon. Candidates who added to the two vertical sides an equilateral triangle, used either compass arcs or 30º/60º set squares to construct the triangles

Candidates who had located the centre of the octagon used this datum to give the centre of the semi-circle and constructed the arc accurately.

Question A2

LUCKY TREATS signboard

Many candidates completed the vertical and horizontal part of the outline of the signboard. Not all candidates repeated the angle of 45º accurately. The letter **Y** was printed correctly by most candidates. Candidates who did not 'crate' the letter **K**, found this letter challenging. Whilst most of the lettering seen was to the correct height, the spacing of the letters was somewhat arbitrary by a large number of candidates.

Question A3

Ice-cream model

Unfortunately, not all candidates attempted this compulsory question losing the 10 marks available.

(a) Many candidates drew the base to size and to scale in isometric projection. Most candidates drew the rectangle below the semi-circle to scale and in line with the base. For the tapered sides, it was necessary to draw the inset of 22 mm on the base before connecting up to the 20 x 50 rectangle. It was also necessary to draw the semi circle R40 in elevation first with equally spaced vertical divisions and then to add the same number of vertical divisions to the isometric view. The lengths of each vertical can then be plotted on the isometric to give the R40 curve required. The 50 depth (rear line) can then be repeated accurately by transferring the vertical plots at 30º.

Question B4

PYO (Pick Your Own) box

This question was derived from an actual 'Graphic Product' used in retail outlets.

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

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

(a) It was necessary for candidates to study the given pictorial view and especially the position of the side flaps. The given view showed that the flaps were joined to the sides. The instructions below the pictorial view stated that the sides were joined together by arrow-tabs and slots. Candidates who obtained this information from the pictorial view drew one of two possible developments (nets) for the box. The position of the given base allowed for many candidate types of developments (net). Many candidates added 7 extra sides, of which two were fold-out side flaps 45 long with R14 ends. The tuck-in flap on the lid needed to be consistent with the pictorial view (10 mm deep) and have symmetrically angled ends. Successful candidates managed to use the correct convention for a fold line where appropriate.

(b) Many candidates added four arrow tabs but not always all to a similar shape and size. For the arrow-tab to work well, the slot needs to be the same length as the neck of the arrow-tab.

(c) Successful candidates showed the letters PYO added to the correct face and in the correct orientation.

(d) Many candidates showed a method of joining the side flaps together using halving slots or tuck-in tabs. The use of glue was not allowed in the question.

Question B5

Shop sales data

This question was also derived from a real 'Graphic Product' used to show data in company reports.

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

(a) Many candidates managed to draw a circle and divide it into 6 sectors. Successful candidates realised that the quantities added up to 3600 and by dividing by 10 the quantities converted into angles that could be drawn with graphic equipment (i.e. 120º, 90º, 60º, 45º, 15º and 30º). To be complete, the pie chart needed to have labels to identify each sector and its relative portion size.

(b) Candidates who read the question clearly drew a simple bar chart for ice-cream sales only, over the three seasons. The resulting chart was a rising chart from winter to summer. The space given allowed a scale of 1:10 in millimetres.

(c) Only a few candidates drew a '**three-dimensional** bar chart'. Many drew the bar chart in two-dimensions only. Successful candidates drew three bars representing three products for the winter and three bars representing three products for the summer. To gain full marks, the bars needed to be labelled with the correct product and the correct quantity.

DESIGN AND TECHNOLOGY

Paper 0445/22
Graphic Products

Key Message

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

General Comments

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

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

There are areas of the syllabus however, in which further improvements are needed. Candidates must be able to construct regular polygons given the distance across the flats or the corners and also from a circumscribing circle. Drawing circles in isometric is also an area that needs to be improved. Candidates need to understand the difference between Pie, Bar and three-dimensional data charts.

Comments on specific questions

Question A1

Signboard outline

Many candidates drew an Octagon. Successful candidates drew an 80 A/F square first and then connected the corners to find the centre. Drawing arcs from each corner through the centre gave the correct size of Octagon. Candidates who added to the two vertical sides an equilateral triangle, used either compass arcs or 30º/60º set squares to construct the triangles

Candidates who had located the centre of the octagon used this datum to give the centre of the semi-circle and constructed the arc accurately.

Question A2

LUCKY TREATS signboard

Many candidates completed the vertical and horizontal part of the outline of the signboard. Not all candidates repeated the angle of 45º accurately. The letter **Y** was printed correctly by most candidates. Candidates who did not 'crate' the letter **K**, found this letter challenging. Whilst most of the lettering seen was to the correct height, the spacing of the letters was somewhat arbitrary by a large number of candidates.

Question A3

Ice-cream model

Unfortunately, not all candidates attempted this compulsory question losing the 10 marks available.

(a) Many candidates drew the base to size and to scale in isometric projection. Most candidates drew the rectangle below the semi-circle to scale and in line with the base. For the tapered sides, it was necessary to draw the inset of 22 mm on the base before connecting up to the 20 x 50 rectangle. It was also necessary to draw the semi circle R40 in elevation first with equally spaced vertical divisions and then to add the same number of vertical divisions to the isometric view. The lengths of each vertical can then be plotted on the isometric to give the R40 curve required. The 50 depth (rear line) can then be repeated accurately by transferring the vertical plots at 30º.

Question B4

PYO (Pick Your Own) box

This question was derived from an actual 'Graphic Product' used in retail outlets.

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

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

(a) It was necessary for candidates to study the given pictorial view and especially the position of the side flaps. The given view showed that the flaps were joined to the sides. The instructions below the pictorial view stated that the sides were joined together by arrow-tabs and slots. Candidates who obtained this information from the pictorial view drew one of two possible developments (nets) for the box. The position of the given base allowed for many candidate types of developments (net). Many candidates added 7 extra sides, of which two were fold-out side flaps 45 long with R14 ends. The tuck-in flap on the lid needed to be consistent with the pictorial view (10 mm deep) and have symmetrically angled ends. Successful candidates managed to use the correct convention for a fold line where appropriate.

(b) Many candidates added four arrow tabs but not always all to a similar shape and size. For the arrow-tab to work well, the slot needs to be the same length as the neck of the arrow-tab.

(c) Successful candidates showed the letters PYO added to the correct face and in the correct orientation.

(d) Many candidates showed a method of joining the side flaps together using halving slots or tuck-in tabs. The use of glue was not allowed in the question.

Question B5

Shop sales data

This question was also derived from a real 'Graphic Product' used to show data in company reports.

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

(a) Many candidates managed to draw a circle and divide it into 6 sectors. Successful candidates realised that the quantities added up to 3600 and by dividing by 10 the quantities converted into angles that could be drawn with graphic equipment (i.e. 120º, 90º, 60º, 45º, 15º and 30º). To be complete, the pie chart needed to have labels to identify each sector and its relative portion size.

(b) Candidates who read the question clearly drew a simple bar chart for ice-cream sales only, over the three seasons. The resulting chart was a rising chart from winter to summer. The space given allowed a scale of 1:10 in millimetres.

(c) Only a few candidates drew a '**three-dimensional** bar chart'. Many drew the bar chart in two-dimensions only. Successful candidates drew three bars representing three products for the winter and three bars representing three products for the summer. To gain full marks, the bars needed to be labelled with the correct product and the correct quantity.

DESIGN AND TECHNOLOGY

Paper 0445/23
Graphic Products

Key Message

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

General Comments

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

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

There are areas of the syllabus however, in which further improvements are needed. Candidates must be able to draw regular polygons in isometric projection given the distance across the flats or the corners. Determining arcs and lines in true length is also an area that needs to be improved.

Comments on specific questions

Question A1

Logo outline

Many candidates drew a Ø40 circle for the head. Successful candidates copied the elbow angle and drew in the upper and lower arm consistent with the given hand and shoulder circles. Candidates who drew the knee at 52 high and at 60º from the signboard were able to complete the front leg accurately. Successful candidates used their solution to the front leg knee height and upper leg thickness to complete the back leg.

Question A2

SPORTS CENTRE signboard

Not all candidates copied the name **CENTRE** correctly. Candidates should be advised to read the question carefully. The letter **E** was printed correctly by most candidates. Candidates who did not 'crate' the letter **R**, found this letter challenging. Whilst most of the lettering seen was to the correct height, the spacing of the letters was somewhat arbitrary by a large number of candidates.

Many candidates extended the horizontal part of the outline of the signboard. Not all candidates repeated the upper line angle of 60º accurately or extended the lower 60º line.

Question A3

Start line marker post

Unfortunately, not all candidates attempted this compulsory question losing the 10 marks available.

(a) Many candidates drew the base to size and to scale in isometric projection. Most candidates drew the shaded rectangle below the half octagon to scale and in line with the base. For the tapered sides, it was necessary to draw the lower side of the shaded rectangle to determine the top of the taper before connecting up to the 5 inset on the 40 x 80 base top surface

Successful candidates drew an 80x40 half square in orthographic connecting the corners to find the centre of the rectangle. Drawing arcs from each corner through the centre gave the correct size of half octagon. The 80 x 40 rectangle can then be drawn on top of the shaded rectangle. The length of side of the half octagon can now be plotted on to the isometric view.

(b) Candidates who added pencil shade to the correct part of the isometric did so accurately.

Question B4

Paper cone carry tray

This question was derived from an actual 'Graphic Product' used in fast-food outlets.

A classroom exercise to cut-out and make the tray from 4 mm card, would be most beneficial to future candidates' understanding of this Graphic Product.

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

(a) Many candidates drew the plan and elevation of the tray correctly to size. A small number of candidates did not orientate the tray so that the elevation displayed the open part in order that the thickness of the card could be awarded marks.

(b) The centre lines for the two holes needed to be 50 in from each side. The cup **C** needed to be drawn so that the top Ø80 was positioned in the correct space in the plan view.

(c) The cup **C** needed to have its top Ø projected from the plan to the front elevation. A Ø10 hole needed to be evident in the base of the carry tray. The conical sides (at 30º either side of the centre line) can then be drawn touching the Ø10 until they intersect with the Ø80 top projected to the front elevation.

(d) The drawing of the cup in the elevation gives the correct diameter of the circular hole that is needed in the upper surface of the tray. This Ø56 +/-2 hole needed to be visible in the remaining right hand position in the elevation and plan.

Question B5

Calendar desk tidy

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

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

(a) Many candidates managed to draw an octagon to the correct size and correct orientation for a plan view. Whilst many candidates drew an octagonal prism in projection to the plan and to the correct height, many did not get the orientation correct. For part **(b)** to be correct it was necessary for the top to have a 45º slope from the left hand side of 220.

(b) If part **(a)** above was drawn correctly first, then the development of the sides was a straightforward 'roll out' in line with the EV projection. Not all candidates started the development at the given join edge. Some candidates drew a regular hexagonal top. The corners of the hexagonal top needed to be plotted onto a vertical true length line before being projected across to the development. Similarly, the circle in the plan view needed to have divisions added and these projected up to a true length line in order that they too could be plotted on the development. Widths of the top including the circular hole can be taken from the plan and plotted to give the true shape of the developed top.

(c) Of those candidates who added JULY, many added it to the correct side and in the correct position and orientation.

DESIGN AND TECHNOLOGY

Paper 0445/31
Resistant Materials

Key messages

- To perform well on this paper, candidates need to use technical terms accurately. This is particularly important when naming tools and materials and describing processes and techniques.
- Candidates need to provide clearly drawn sketches and supportive written notes when attempting questions that begin with the statement: *Use sketches and notes to....*
- Candidates need to make sure that their ideas are clear and accurate so that the Examiner can understand what they are trying to communicate.

General comments

Section A

This section tests a very wide area of knowledge concerned with materials, tools and processes used when working with wood, metal and plastic. Some candidates did not have this all-round knowledge and understanding and performed less well on this section than on ***Section B***.

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. In some cases, candidates provided information not asked for in the question, which could not be given any credit.

Comments on specific questions

Section A

Question 1

(a) Most candidates gave a benefit of using a cordless rechargeable drill, the most common being that it could be used in places without an electricity supply.

(b) Most candidates stated correctly that the drill would eventually need to be recharged.

Question 2

(a) It was very disappointing that only a minority of candidates were able to give the correct technical name for the four files. Terms such as *rectangular* for the flat/hand file and *circular* for the round/rat tail file were not acceptable.

(b) The first and most important safety check that should be carried out before using a file is to see if the handle and tang are secure. Only a minority of candidates described this. Most candidates described how the work piece should be secured or to items of personal safety.

Question 3

(a) Only a minority of candidates were able to name the vernier caliper. Answers that included the term *vernier* were accepted.

(b) Even if candidates were unable to name the vernier caliper correctly in the previous question, more candidates correctly recognised that it was used for measuring diameter, depth or thickness of materials. However, the question did require candidates to give a **specific** use which many candidates did not give.

Question 4

(a) Many candidates stated incorrectly that one advantage of air seasoning was that it was *cheap*. The best answers referred to the even drying out of the timber or that it produced better quality, stable boards.

(b) The vast majority of candidates recognised that kiln seasoning would be much quicker than air seasoning.

Question 5

(a) Only a small minority of candidates were able to name a suitable plastic for the body of the jug kettle. Many candidates named a plastic such as phenol formaldehyde that could be used for the fittings.

(b) Stainless steel and aluminium were the most common correctly named metals.

Question 6

Many candidates achieved at least one mark for this question. However, it was disappointing that candidates were unable to label the parts of the mortise and tenon joint accurately.

Question 7

Only the minority of candidates were able to describe two ways of planing end grain without it splitting. The best answers described the use of scrap wood clamped behind the end or planing to the middle, stopping and planing to the middle from the other end. Candidates need to be careful when referring to *ends, sides* and *edges* of solid wood as these can have an effect on the accuracy of answers.

Question 8

Many candidates did complete the drawing of the odd-leg calipers although the quality of sketches was varied. For maximum two marks it was essential that the drawing showed a *spur* marking the metal and a *foot* against the edge of the metal.

Question 9

There were many variations of blockboard provided to this question. Candidates were rewarded if they showed the wooden strips along the length of the board and if they showed the strips sandwiched between top and bottom plies or layers.

Question 10

Many candidates recognised that an allen key gave good grip, that it was less likely to slip and damage the head of the screw or that it provided increased leverage. These were excellent answers. However, some candidates were not specific and gave vague answers such as *easy to screw on* or *easy to tighten* that were not rewarded.

Section B

Question 11

(a) Many candidates provided an explanation of anthropometrics relating to the design of the tray. The best answers referred to the position of hands and arms, reach and the comfortable height above the person's legs.

(b) The majority of candidates used a hinge to allow the legs to fold. This solution had limited potential. A butt hinge was the most commonly named hinge. A back flap hinge would have been better as a butt hinge would have resulted in screw holes too near to the end grain. A few candidates attempted excellent solutions involving the use of dowel rod and wooden or metal brackets. Candidates are reminded that the notes they add to their sketches should clarify the details about sizes, materials and fittings wherever possible.

(c) (i) It was pleasing to see many answers showing the end of the dowel chamfered or with saw cuts along its length. However, only a minority of candidates provided both methods.

(ii) The majority of candidates provided excellent sketches showing a sash cramp positioned over the dowel clamping the legs and dowel together. The use of G cramps was not feasible.

(iii) The most common correctly named adhesive was PVA. Trade names were acceptable but vague answers such as *wood glue* were not. The drying times for all adhesives stated varied from several minutes to days. When candidates use adhesives they should try to remember the 'official' drying or curing times.

(d) There were many innovative functional improvements to the tray. Some of the most popular answers showed the tray with sides or raised edges to prevent items from falling off, cup holders, or hand holds to enable the tray to be lifted more easily.

(e) (i) Many candidates provided excellent reasons for using polyurethane varnish for the tray top. The most common being its resistance to moisture and heat, easily cleaned and it making the wood attractive.

(ii) Preparation of the tray top to take the polyurethane varnish was not well answered. Candidates are advised to read the questions carefully. Many candidates failed to provide sufficient details and some gave information about how the actual varnish would be applied. The best answers named glasspaper, usually called *sand paper,* the use of different grades and wiping the surface to make it dust free before applying the varnish. Some excellent answers included the use of a damp cloth to raise the grain between different grades of glasspaper.

(f) Many candidates recognised that using a plastic for the tray top would provide a more hardwearing surface, that it could be more attractive or that it could be cleaned more easily. Answers relating to plastic being more lightweight or that it could be shaped and moulded were not rewarded. Many candidates provided one correct answer.

Question 12

(a) Most candidates were able to state at least one property of mild steel applicable to the bracket. However, some candidates stated *strong* without any qualification. For example, *strong* on its own is too vague, but when qualified with a statement such as *strong enough to support the weight of the garden tools,* it becomes more relevant.

(b) There were some excellent answers to this question. Many candidates stated that the sizes of the tools would need to be determined, how many tools and where they would be located.

(c) Most candidates were able to draw the shape of the bracket and the positions for the holes.

(d) (i) Many candidates recognised that a centre punch is used to mark the centre for a hole to prevent the drill from slipping. Other excellent answers referred to preventing the drill from *skating* and to provide a guide for the drill.

(ii) Most candidates achieved at least one mark for this question. The best answers referred to clamping the sheet metal securely and to items of personal safety such as eye protection.

(e) Candidates generally demonstrated a good understanding of the use of a template and there were many excellent answers to this question. *Speed* and *repetitive accuracy* were the most common correct answers.

(f) (i) The majority of answers described how the mild steel sheet could be cut using a hacksaw. This gained only limited reward since it could not cut out the whole shape. The best answers, provided by a minority of candidates, showed the use of tin snips held in a vice or by hand, correctly named tools and additional supportive notes.

(ii) There were three key points when answering this question: how would the metal be held, the former around which the metal could be shaped and the method of force to achieve the shape.

The best answers showed the metal held in a vice or clamped down; the use of a round rod or bar as a former and the use of a hammer and scrap wood or a mallet to shape the metal. Many candidates achieved one mark but few achieved maximum three marks for this question.

(g) (i) Most candidates gave sensible reasons for painting the bracket: *to make it look attractive* and *to protect it from corrosion* being the most popular correct answers.

(ii) Candidates could achieve two marks if they included references to filing, the use of emery cloth or wet and dry paper and the use of varying grades of abrasive. Most candidates achieved one mark.

(h) Round head screws would be used to screw the bracket to the side of a wooden shed. Many candidates named countersunk headed screws which would be unsuitable on thin sheet metal.

Question 13

(a) Most correct answers referred to the 'dips' in the vacuum formed tray that enabled the tubes of paint to be removed. Other good explanations included the overall size that would be easy to carry and the clear layout of the paints making selection easier.

(b) (i) This question was very poorly answered. Only a minority of candidates provided some form of beading or blocks of wood that would support the thin vacuum formed tray.

(ii) Many candidates were able to give only one advantage of a vacuum formed tray over wooden partitions. Many answers pointed out that the paints have their own shaped storage space, that the whole case would be lighter to carry or that the plastic tray could be removed for cleaning.

(c) (i) The majority of candidates were unable to name a butt hinge.

(ii) The majority of candidates named two marking out tools that could be used to mark out the recess.

(iii) The recess would be cut out using a chisel with a mallet. The use of a saw was inappropriate.

Although many candidates did name a chisel, a hammer was then named as the tool to provide the force. This is not good practice. For maximum marks candidates needed to describe the method by which the chisel and mallet would be used: a combination of vertical and horizontal paring.

(d) Only a minority of candidates showed the lid fitted by means of a groove or rebate. Many ignored the instruction in the question that the edges of the plywood must not be seen and simply pinned and glued or screwed and glued the base onto the edges of the frame.

(e) The majority of candidates were unable to show a pre-manufactured fitting that could be used to fasten the case securely. Some candidates made good attempts to draw quite complex fittings and gained some reward. Other fittings included a hasp and staple which, although it would work, was considered quite crude and unattractive.

(f) There was a range of different solutions provided showing how paint brushes could be stored inside the lid of the case. Many candidates suggested the use of a vacuum formed tray similar to that used to store the paints. This was rewarded, but much less clear were the subsequent methods to show how the paints would be secured and how the bristles would be protected. Those solutions that included the use of rubber bands and other compliant materials gained some credit.

DESIGN AND TECHNOLOGY

Paper 0445/32
Resistant Materials

Key messages

- To perform well on this paper, candidates need to use technical terms accurately. This is particularly important when naming tools and materials and describing processes and techniques.
- Candidates need to provide clearly drawn sketches and supportive written notes when attempting questions that begin with the statement: *Use sketches and notes to....*
- Candidates need to make sure that their ideas are clear and accurate so that the Examiner can understand what they are trying to communicate.

General comments

Section A

This section tests a very wide area of knowledge concerned with materials, tools and processes used when working with wood, metal and plastic. Some candidates did not have this all-round knowledge and understanding and performed less well on this section than on ***Section B***.

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. In some cases, candidates provided information not asked for in the question, which could not be given any credit.

Comments on specific questions

Section A

Question 1

(a) Most candidates gave a benefit of using a cordless rechargeable drill, the most common being that it could be used in places without an electricity supply.

(b) Most candidates stated correctly that the drill would eventually need to be recharged.

Question 2

(a) It was very disappointing that only a minority of candidates were able to give the correct technical name for the four files. Terms such as *rectangular* for the flat/hand file and *circular* for the round/rat tail file were not acceptable.

(b) The first and most important safety check that should be carried out before using a file is to see if the handle and tang are secure. Only a minority of candidates described this. Most candidates described how the work piece should be secured or to items of personal safety.

Question 3

(a) Only a minority of candidates were able to name the vernier caliper. Answers that included the term *vernier* were accepted.

(b) Even if candidates were unable to name the vernier caliper correctly in the previous question, more candidates correctly recognised that it was used for measuring diameter, depth or thickness of materials. However, the question did require candidates to give a **specific** use which many candidates did not give.

Question 4

(a) Many candidates stated incorrectly that one advantage of air seasoning was that it was *cheap*. The best answers referred to the even drying out of the timber or that it produced better quality, stable boards.

(b) The vast majority of candidates recognised that kiln seasoning would be much quicker than air seasoning.

Question 5

(a) Only a small minority of candidates were able to name a suitable plastic for the body of the jug kettle. Many candidates named a plastic such as phenol formaldehyde that could be used for the fittings.

(b) Stainless steel and aluminium were the most common correctly named metals.

Question 6

Many candidates achieved at least one mark for this question. However, it was disappointing that candidates were unable to label the parts of the mortise and tenon joint accurately.

Question 7

Only the minority of candidates were able to describe two ways of planing end grain without it splitting. The best answers described the use of scrap wood clamped behind the end or planing to the middle, stopping and planing to the middle from the other end. Candidates need to be careful when referring to *ends, sides* and *edges* of solid wood as these can have an effect on the accuracy of answers.

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There were many variations of blockboard provided to this question. Candidates were rewarded if they showed the wooden strips along the length of the board and if they showed the strips sandwiched between top and bottom plies or layers.

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(ii) Preparation of the tray top to take the polyurethane varnish was not well answered. Candidates are advised to read the questions carefully. Many candidates failed to provide sufficient details and some gave information about how the actual varnish would be applied. The best answers named glasspaper, usually called *sand paper,* the use of different grades and wiping the surface to make it dust free before applying the varnish. Some excellent answers included the use of a damp cloth to raise the grain between different grades of glasspaper.

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(ii) Most candidates achieved at least one mark for this question. The best answers referred to clamping the sheet metal securely and to items of personal safety such as eye protection.

(e) Candidates generally demonstrated a good understanding of the use of a template and there were many excellent answers to this question. *Speed* and *repetitive accuracy* were the most common correct answers.

(f) (i) The majority of answers described how the mild steel sheet could be cut using a hacksaw. This gained only limited reward since it could not cut out the whole shape. The best answers, provided by a minority of candidates, showed the use of tin snips held in a vice or by hand, correctly named tools and additional supportive notes.

(ii) There were three key points when answering this question: how would the metal be held, the former around which the metal could be shaped and the method of force to achieve the shape.

The best answers showed the metal held in a vice or clamped down; the use of a round rod or bar as a former and the use of a hammer and scrap wood or a mallet to shape the metal. Many candidates achieved one mark but few achieved maximum three marks for this question.

(g) (i) Most candidates gave sensible reasons for painting the bracket: *to make it look attractive* and *to protect it from corrosion* being the most popular correct answers.

(ii) Candidates could achieve two marks if they included references to filing, the use of emery cloth or wet and dry paper and the use of varying grades of abrasive. Most candidates achieved one mark.

(h) Round head screws would be used to screw the bracket to the side of a wooden shed. Many candidates named countersunk headed screws which would be unsuitable on thin sheet metal.

Question 13

(a) Most correct answers referred to the 'dips' in the vacuum formed tray that enabled the tubes of paint to be removed. Other good explanations included the overall size that would be easy to carry and the clear layout of the paints making selection easier.

(b) (i) This question was very poorly answered. Only a minority of candidates provided some form of beading or blocks of wood that would support the thin vacuum formed tray.

(ii) Many candidates were able to give only one advantage of a vacuum formed tray over wooden partitions. Many answers pointed out that the paints have their own shaped storage space, that the whole case would be lighter to carry or that the plastic tray could be removed for cleaning.

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(ii) The majority of candidates named two marking out tools that could be used to mark out the recess.

(iii) The recess would be cut out using a chisel with a mallet. The use of a saw was inappropriate.

Although many candidates did name a chisel, a hammer was then named as the tool to provide the force. This is not good practice. For maximum marks candidates needed to describe the method by which the chisel and mallet would be used: a combination of vertical and horizontal paring.

(d) Only a minority of candidates showed the lid fitted by means of a groove or rebate. Many ignored the instruction in the question that the edges of the plywood must not be seen and simply pinned and glued or screwed and glued the base onto the edges of the frame.

(e) The majority of candidates were unable to show a pre-manufactured fitting that could be used to fasten the case securely. Some candidates made good attempts to draw quite complex fittings and gained some reward. Other fittings included a hasp and staple which, although it would work, was considered quite crude and unattractive.

(f) There was a range of different solutions provided showing how paint brushes could be stored inside the lid of the case. Many candidates suggested the use of a vacuum formed tray similar to that used to store the paints. This was rewarded, but much less clear were the subsequent methods to show how the paints would be secured and how the bristles would be protected. Those solutions that included the use of rubber bands and other compliant materials gained some credit.

DESIGN AND TECHNOLOGY

Paper 0445/33
Resistant Materials

Key messages

- To perform well on this paper, candidates need to use technical terms accurately. This is particularly important when naming tools and materials and describing processes and techniques.
- When describing the use of a single tool or piece of equipment, (for example, a laser cutter, sheet metal bender or power router) to fulfil a process normally carried out by a combination of tools and equipment it is important that candidates provide full supporting details.
- Candidates need to provide clearly drawn sketches and supportive written notes when attempting questions that begin with the statement: *Use sketches and notes to....*
- Candidates need to make sure that their ideas are clear and accurate so that the Examiner can understand what they are trying to communicate.

General comments

Section A

This section tests a very wide area of knowledge concerned with materials, tools and processes used when working with wood, metal and plastic. Some candidates did not have this all-round knowledge and understanding and performed less well on this section than on ***Section B***.

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. In some cases, candidates provided information not asked for in the question, which could not be given any credit.

Comments on specific questions

Section A

Question 1

Very few candidates knew the purpose of a bradawl. Most answers referred to it being used either as a small screwdriver or as a chisel. It has one purpose: to make a small hole in wood as a start for a wood screw.

Question 2

(a) Most candidates stated that PVA would be used to glue wood to wood.

(b) Epoxy resin is used to glue wood to metal, metal to metal or with glass or ceramics. Many candidates incorrectly stated that it would be used to glue plastic.

(c) Contact adhesive can be used to glue plastics, some excellent answers stated that it could be used to glue veneer to the edge of a board or that it could be used with some compliant materials.

Question 3

Most candidates completed the drawing to show the construction of plywood. If the drawing showed an even number of plies maximum two marks could still be achieved as long as the alternate grain of each ply was shown clearly.

Question 4

The vast majority of candidates were unable to name any of the three items of equipment used with a centre lathe. Occasional correct answers naming the chuck and knurling tool were provided.

Question 5

Only a minority of candidates were able to complete the drawing of a corner bridle joint.

Question 6

(a) Many candidates gave a benefit of using a hot glue gun. The most common correct answers referred to it being a fast process with the glue cooling and setting quickly or that it could be used to glue a variety of materials.

(b) The majority of candidates stated that gloves should be worn to protect from possible burning.

Question 7

For maximum two marks candidates needed to draw the ends of the inside calipers inside the end of a length of tube. Often the calipers were drawn as dividers and sometimes the ends of the calipers were hidden inside the tube.

Question 8

(a) Very few candidates understood that webbing was caused by either the mould being too deep or that the plastic was too hot. Many candidates thought that the plastic was not hot enough.

(b) There were many good answers providing a variety of faults that can occur when vacuum forming. The most common correct answers included *no draft* or *insufficient draft angle, mould stuck to plastic* and *the plastic not hot enough.*

Question 9

(a) There were many well drawn flush hinges. Sometimes the smaller flap was drawn inaccurately with incorrect screw holes.

(b) Very few candidates stated an advantage of using a flush hinge. Only a minority of candidates recognised that there would be no need to cut out a recess.

Question 10

It was disappointing that the majority of candidates were unable to name the smoothing and jack planes. These are basic tools that candidates should be aware of and preferably should have used. A smoothing plane is used during the finishing process to provide a smooth surface. One candidate provided a text book purpose of the jack plane when stating its use as *the quick removal of waste wood*.

Section B

Question 11

(a) (i) Many candidates gained at least one mark for giving an advantage of using a manufactured board rather than a solid wood. Only a minority gained maximum two marks. The most common correct answers were that they are available as wide sheets and are stable. Popular misconceptions included that manufactured boards are lightweight and that they are easy to work.

(ii) There was a very mixed response to what was meant by the term *veneered*. There were a minority of excellent answers with explanations that veneers were thin layers of solid wood often glued to manufactured boards to give them the appearance of quality hardwood.

(iii) Very few candidates included the use of veneer or solid lipping applied to the edges of manufactured boards. Some credit was given for paint.

(b) (i) The majority of candidates recognised that the reason for 10 mm waste between each of the lengths marked out was to allow for the thickness of the saw cut.

(ii) Most candidates thought that the lines were marked out with a marking knife rather than a pencil so that they could be seen better. This is not correct. The reason for using a marking knife on veneered manufactured board is to cut the fibres of the veneer so that when the saw makes a cut the veneer does not split.

(iii) Most answers correctly named a jig saw, Hegner saw or equivalent, circular saw or table saw.

(iv) Most candidates stated that eye protection, *goggles*, must be worn. Where a jig saw was named in part **(iii)** some candidates correctly described the need for no trailing leads or that the board must be clamped down securely.

(c) It was pleasing to see many answers providing clear and detailed instructions on how to assemble the table. Many candidates achieved high marks.

(d) There were some innovative methods of ensuring that the holes for the dowel pegs would line up.

Those answers that simply described how careful measurements could be transferred from one piece to the other gained one mark only. The best answers described the use of a template or a dowelling jig.

(e) There were three parts to this question: some sort of pivot or bearing surface, a means of keeping the table top level and written details about the materials, sizes and fittings used. Many candidates provided a central pivot, often dowel or metal rod or tube. Often there were some supportive written details provided. The method of keeping the table top level proved more difficult. Some of the best answers combined the pivot and level issues by drawing a bearing that would rotate and maintain a level position.

Question 12

(a) (i) Most candidates were able to name two tools used to mark the centres of holes to be drilled.

(ii) The majority of candidates drilled a hole first to remove most of the waste metal. The remaining waste metal could have been removed using a file. However, many candidates did not consider the size of the square shape and suggested the use of a saw which was not practical. Two additional marks were available for showing how the metal could be secured during drilling and filing.

(iii) Most candidates named one file that could fit in the rectangular spaces but only a few named both the hand and flat files for two marks.

(b) There were some excellent answers to this question. There were three main parts to be addressed: how the metal would be secured, the use of a former or folding bars and the method of force, i.e. a hammer with scrap wood or a mallet. Those candidates who suggested a sheet metal bender could also access maximum marks as long as there was a detailed description of how the

process would be carried out. Simply stating *sheet metal bender* was not sufficient to achieve maximum marks.

(c) Most candidates were able to provide solutions to the two problems stated in the question. The addition of brackets or fillets to strengthen the rack were good solutions. Enlarging the spaces for the files or adding slots provided good solutions to the problem of difficulty in removing the files from the rack.

(d) (i) Very few candidates were able name the angle iron section. Knowledge of all standard material sections is an important part of the syllabus.

(ii) The advantage of using *angle* is that the metal does not require bending. The disadvantage is that the shaped metal is more awkward to work with. These answers were very rarely seen.

(e) Candidates generally were able to sketch a nut and bolt that could be used to fix the rack to a cupboard door. Most sketches showed a hexagonal headed bolt.

(f) There were some good designs showing how the file rack could be modified to make it freestanding. These included the use of legs and fitted ends. For maximum five marks candidates needed to support their designs with practical details of the materials they would use, sizes and any fittings.

Question 13

(a) (i) The vast majority of candidates were able to name a suitable hardwood for the notelet holder.

(ii) The most common attractive features of hardwoods were the grain and colour. Some candidates described strength and hardness which are irrelevant when describing appearance.

(b) There were some excellent answers showing the slot being drilled then sawn, followed by filing. Candidates should show how the work piece is held securely while the processes are carried out.

(c) (i) The majority of candidates did not understand the different purposes of a marking gauge and cutting gauge. The marking gauge is used along or down the grain while a cutting gauge is used in place of a marking knife to cut the wood fibres across the grain.

(ii) The majority of candidates achieved marks for this question. Some candidates used only a tenon saw while others used a combination of tenon saw with a chisel and mallet. There were some outstanding detailed sketches and notes showing how the lapped joint would be cut out. These also included details showing the work piece held against a bench hook or in a vice. The use of an electric router was also excellent and gained maximum marks when supported with detailed sketches and notes describing how it would be set up.

(d) (i) Only a minority of candidates achieved maximum marks for this question. String cramps, the use of rubber bands or corner cramps were good methods shown by very few candidates.

(ii) Most candidates described how a try square would be used to test for squareness and achieved one mark. Very few candidates described a second method, that of measuring diagonally across the inside corners.

(e) The majority of candidates were able to show a base fitted to the notelet holder. Some sketches showed the base fitted onto the edge which was not acceptable. Others showed a base inserted between the sides with glue or with pins or screws. This gained some reward. The best answers showed a base fitted into a groove or rebate.

(f) There were some excellent designs showing a notelet holder made from a single piece of acrylic sheet. Many candidates took the opportunity to demonstrate an excellent understanding of working with acrylic. The best answers showed a development (net), gave details of marking and cutting out, finishing and bending. In addition, the use of acrylic cement was often evident for 'gluing' the sides.

DESIGN AND TECHNOLOGY

Paper 0445/42
Systems and Control

Key messages

- Candidates must ensure that the rubric is followed regarding the number of questions to be answered; there were a number of candidates who had attempted to answer all of the questions in part **B**. Where this was the case all answers were marked and the highest mark was used in the total.
- Candidates should be instructed to only use the response area for the question, avoiding the use of extra space between questions.

General Comments

Candidates could access all questions on the paper and appeared to have completed the paper in the time allowed.

The majority of candidates had attempted to answer all of the part **A** questions.

The standard of written and graphic communication from candidates was generally high, with clear annotation on drawings required for Part **A**.

Responses to the questions in Part **B** showed that in general candidates were well prepared and had a good level of understanding.

Question 13 based on structures was the least popular from part **B** with a fairly even split between the electronics and mechanisms questions.

Comments on specific questions

Section A

Question 1

(a) The question was based on *structural* weakness in the garden shed, rather than weakness in materials or components. A large number of responses focused on potential weakness in the hinges and mentioned the door breaking and planks coming apart.

(b) The requirement was for two diagonal braces to be placed so that they would be in compression when the outer edge of the door started to sag. Those who had placed additional diagonal braces or attached them to be in tension were rewarded with a single mark.

Question 2

The majority of candidates correctly identified the jointing method as a gusset plate.

Question 3

There was general recognition that the material under test was extending due to the load acting on it but rather fewer candidates knew that this was elastic extension and that the material would go back to its original length when the load was removed. A number of responses noted that the extension was proportional to the load and referred to Hooke's law.

Question 4

(a) A high number of correct responses stated that the worm gear was the input, and the worm wheel the output.

(b) There were a number of candidates who had chosen the correct numbers for the gear ratio but had put them the wrong way around. The first number should refer to the number of times the worm gear has to turn and the second to the single turn of the worm wheel. A worrying number of responses appeared that had numbers totally unrelated to the given number of teeth on the worm wheel.

Question 5

The drawing that was required for the spur gears was to illustrate a reduction of speed. Only those who had used different sized spur gears gained both marks. The action of a crank and slider required both type of motion to be given, most had recognised rotary motion but a number had confused linear motion with reciprocating motion.

Question 6

The calculation was in general very well done. A high proportion of answers were correct and most had the intermediate stages clearly laid out.

Question 7

Almost all candidates gained marks for stating the resistor value; any marks that were lost were for the multiplier band. Units had been used correctly in most cases.

Question 8

The slide switch was often incorrectly identified as either a rocker switch or a toggle switch. Those who called it a DPDT switch were rewarded with a mark.
Drawings of the reed switch were generally recognisable enough for the mark to be awarded.

Question 9

Knowledge of the electrolytic capacitor was overall very good, with the majority of candidates knowing that it was polarised and incorrect connection will result in damage to the component. Another potential problem that was recognised in a few responses was that the working voltage of the capacitor that should not be exceeded.

Question 10

The outline shape of a NOR gate was widely known; however one mark was lost by a few candidates who had omitted the negation circle at the output of the gate.

Section B

Question 11

(a) (i) This was a six mark opening part to the question. There was more than one way of completing the input section of the circuit but the placement of a protective diode and the connection of the relay coil had to be correct to gain all of the marks. A resistor connected to the base of the transistor was a feature that was on occasions missed out. The output circuit connecting the pump through relay contacts was in general accurately completed.

(ii) Most candidates correctly stated that soldering would be used to connect the transistor.

(iii) A choice of responses was accepted for the sensing device at the input, moisture sensor being the term most commonly encountered.

(iv) The majority of candidates chose to use a variable resistor or potentiometer to increase sensitivity; also allowed were Darlington pair and operational amplifier. The sketch could have been either the circuit symbol or a pictorial view of the component.

(b) (i) The circuit symbol for an SPST toggle switch was widely known and very few candidates lost marks on this question.

(ii) The alternative switch could have been any other type of latching switch, such as rocker or slide switch. No marks were awarded to those who had suggested a toggle switch as this was given in part **(i)**.

(iii) The action of a PTM switch was widely recognised and most candidates noted that its momentary action would be unsuitable for an on/off switch.

(c) A number of responses noted that voltage can be controlled by a potential divider formed from two or more resistors; reference to the relationship between voltage, current and resistance was rewarded with a mark.

(d) Knowledge of the operation of a relay was rather mixed. The majority knew that the coil acts as an electromagnet when energised. Operation of the switch contacts was less well explained. The isolation of the input and output circuits and the ability to use different input and output voltages was not well explained in most cases.

(e) (i) The potential divider was widely recognised, the few who noted that the resistors were in series did not gain the mark.

(ii) The calculation for the value of the resistor was completed accurately in many cases; ability to use Ohms law and to rearrange the formula was evident.

Question 12

(a) (i) The majority of candidates answering this question correctly identified the first class lever.

(ii) Surprisingly this question was not well answered. Nearly all of the responses correctly identified the fulcrum but the load, which was the rubber band, was incorrectly marked as the effort in most cases. This led to the free end of the lever being labelled as the load. In a question of this type candidates should be advised to look carefully at the lever and identify the load by which end of the lever will provide resistance to movement; in this case it was the rubber band.

(iii) Responses to this part were generally good with understanding of levers being shown. In addition to extending the arm from fulcrum to effort, wrapping the rubber band round twice to increase the resistance and raising the height of the fulcrum to provide greater movement of the lever both gained marks.

(b) (i) Those candidates who had used the correct distance from effort to fulcrum generally completed the calculation accurately. In a significant number of responses the distance from effort to load had been used, which resulted in an incorrect answer.

(ii) This part of the question discriminated well between candidates with less than half of the responses identifying the force as shear.

(c) (i) Of the two forces to be identified the rotary movement was more commonly identified than the oscillation.

(ii) In this part the majority of responses gained a mark for identifying a cam; rather fewer gave the correct name for the cam. In a similar way the follower was identified but the variety of follower was rarely given.

(iii) There were a number of appropriate examples that gained marks; if the application required regular movement such as in a toy or for point of sale advertising the marks were awarded.

(d) (i) The most popular examples given were car steering and the table on a pillar drill. Other suitable examples were also awarded the mark.

(ii) The calculation of distance moved by the rack was accurately completed in many cases. Those who did not get it correct had generally gone wrong when converting metres to millimetres.

(e) (i) Understanding of the part played by bearings and lubrication in the efficiency of a mechanical system was generally good. The majority of responses reflected the fact that a high level of friction would lead to losses through heat and noise and any reduction in this would also reduce the amount of power needed to drive the mechanism.

(ii) Almost all responses were correct. Candidates should be advised to avoid trade names for oils and to stick with the generic terms 'oil' and 'grease'.

Question 13

(a) (i) The majority of responses correctly gave tension as the force acting on the shackle. The force acting on the bolt was identified by most as shear but the second mark was rarely awarded; this was for recognising that there was a shear force at each end of the bolt where it passed through the shackle.

(ii) The elastic property of mild steel was correctly identified in a minority of responses.

(b) The most common responses suggested that the load is spread out, where this was linked to the curved shape of the shackle it gained a mark. Few candidates noted that there would be an even flow of stress around the shackle because of the curved shape. The lack of corners which could concentrate stress was not widely recognised.

(c) (i) The reason for the threaded bolt was not clearly identified by candidates. Few had noted that a rope or cable would need to be passed through the shackle.

(ii) Most candidates identified welding as the permanent fixing and went on to give a suitable example where welding would be appropriate.

(d) The use of a brace to triangulate the structure was recognised by the majority of candidates, who went on to gain the second mark for stating the result of using a brace.

(e) The concept of a component of the structure that served no purpose was familiar to candidates; sketches were frequently clear and well annotated.

(f) (i) The calculation was generally carried out accurately and the formula for calculating stress appeared to be well known.

(ii) There was evidence of clear understanding of strain in most cases.

(iii) The calculation for strain on the sample was generally carried out accurately.

DESIGN AND TECHNOLOGY

Paper 0445/43
Systems and Control

Key messages

- Candidates must ensure that the rubric is followed regarding the number of questions to be answered; there were a number of candidates who had attempted to answer all of the questions in part **B**. Where this was the case all answers were marked and the highest mark was used in the total.
- Candidates should be instructed to only use the response area for the question, avoiding the use of extra space between questions.

General Comments

Candidates could access all questions on the paper and appeared to have completed the paper in the time allowed.

The majority of candidates had attempted to answer all of the part **A** questions.

The standard of written and graphic communication from candidates was generally high, with clear annotation on drawings required for Part **A**.

Responses to the questions in Part **B** showed that in general candidates were well prepared and had a good level of understanding.

Question 13 based on structures was the least popular from part **B** with a fairly even split between the electronics and mechanisms questions.

Comments on specific questions

Section A

Question 1

(a) The question was based on *structural* weakness in the garden shed, rather than weakness in materials or components. A large number of responses focused on potential weakness in the hinges and mentioned the door breaking and planks coming apart.

(b) The requirement was for two diagonal braces to be placed so that they would be in compression when the outer edge of the door started to sag. Those who had placed additional diagonal braces or attached them to be in tension were rewarded with a single mark.

Question 2

The majority of candidates correctly identified the jointing method as a gusset plate.

Question 3

There was general recognition that the material under test was extending due to the load acting on it but rather fewer candidates knew that this was elastic extension and that the material would go back to its original length when the load was removed. A number of responses noted that the extension was proportional to the load and referred to Hooke's law.

Question 4

(a) A high number of correct responses stated that the worm gear was the input, and the worm wheel the output.

(b) There were a number of candidates who had chosen the correct numbers for the gear ratio but had put them the wrong way around. The first number should refer to the number of times the worm gear has to turn and the second to the single turn of the worm wheel. A worrying number of responses appeared that had numbers totally unrelated to the given number of teeth on the worm wheel.

Question 5

The drawing that was required for the spur gears was to illustrate a reduction of speed. Only those who had used different sized spur gears gained both marks. The action of a crank and slider required both type of motion to be given, most had recognised rotary motion but a number had confused linear motion with reciprocating motion.

Question 6

The calculation was in general very well done. A high proportion of answers were correct and most had the intermediate stages clearly laid out.

Question 7

Almost all candidates gained marks for stating the resistor value; any marks that were lost were for the multiplier band. Units had been used correctly in most cases.

Question 8

The slide switch was often incorrectly identified as either a rocker switch or a toggle switch. Those who called it a DPDT switch were rewarded with a mark.
Drawings of the reed switch were generally recognisable enough for the mark to be awarded.

Question 9

Knowledge of the electrolytic capacitor was overall very good, with the majority of candidates knowing that it was polarised and incorrect connection will result in damage to the component. Another potential problem that was recognised in a few responses was that the working voltage of the capacitor that should not be exceeded.

Question 10

The outline shape of a NOR gate was widely known; however one mark was lost by a few candidates who had omitted the negation circle at the output of the gate.

Section B

Question 11

(a) (i) This was a six mark opening part to the question. There was more than one way of completing the input section of the circuit but the placement of a protective diode and the connection of the relay coil had to be correct to gain all of the marks. A resistor connected to the base of the transistor was a feature that was on occasions missed out. The output circuit connecting the pump through relay contacts was in general accurately completed.

(ii) Most candidates correctly stated that soldering would be used to connect the transistor.

(iii) A choice of responses was accepted for the sensing device at the input, moisture sensor being the term most commonly encountered.

(iv) The majority of candidates chose to use a variable resistor or potentiometer to increase sensitivity; also allowed were Darlington pair and operational amplifier. The sketch could have been either the circuit symbol or a pictorial view of the component.

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DESIGN AND TECHNOLOGY

Paper 0445/05

School Based Assessment

Key messages

- The main aim of this component is to develop in candidates an expertise in creative thinking and expressing it through their research, designing, planning and making skills.
- Projects should be well structured and allow candidates to access the assessment criteria.
- Candidates shouldbe encouraged to produce concise and focused projects, and should be discouraged from including a large amount of generic research material.

General comments.

Most Centres have embraced the aim of this Unit; to develop in candidates an expertise in creative thinking and expressing it through their research, designing, planning and making skills.

Moderators saw an increase in the number of outstanding examples of work this session. Some of the work submitted was highly innovative, exceptionally well presented with high quality outcomes.

The vast majority of projects were appropriate, with many having interesting and challenging briefs.

Some Centres, however, have a practice of allowing their candidates to present small-scale models of an item of furniture, for example, as their product realisation. This is to be discouraged 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 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. Some candidates present over-large research sections, containing mostly generic information that will not help them produce a detailed specification or aid them in designing.

The vast majority of candidates manage their time effectively to ensure that a functional product is completed leaving sufficient time for appropriate testing and evaluation.

Many Centres included individual candidate assessment sheets; these were very helpful for Moderators to see how and where marks were awarded.

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

Centres are reminded to submit all of the necessary documentation when they forward work for moderation. Centres must include an MS1 form (ensure that marks are included on the form), a fully completed Coursework Assessment Summary Form WMS301 and the required sample of projects.

Practical work or 3D models should not be submitted.

The majority of Centres apply marks consistently and accurately and in line with the standards set by the Awarding Body. Centres are encouraged to use the guidance given in this report and the focused information on the Moderators' Comments on School Based Assessment of Coursework form when assessing the work of candidates.

Comments on specific headlines

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

Candidates generally complete this section very well. They explain the need fully, using photographs where appropriate, and describe the user group before producing a clear and detailed design brief. Many include details of the client and their requirements.

2. Research into the Design Brief resulting in a Specification

Most candidates produced focused and relevant research. Many looked at existing products and highlighted positive design features that they could use as inspiration for their initial designs. Some candidates produced targeted questionnaires to potential users. The responses helped to define the specification.

Some candidates would benefit from sifting through their research and only include information that is relevant. When including anthropometric data for example, only select those particular anthropometric features that apply to their brief.

The best specifications were detailed, clear and justified. Candidates are reminded not to include generic statements such as ‘ must be value for money, must be aesthetically pleasing’ and so on.

To achieve the higher mark range in this section, candidates must include all relevant information such as important sizes and only include research that is related to their brief. Specifications should include specific details of the requirements for the product.

3. Generation and exploration of Design Ideas

Many candidates produced a range of creative and interesting designs. Most design pages were fully annotated and the quality of presentation was generally high. Some candidates focused on one idea from the outset and did not access the higher mark ranges.

There is an increased integration of annotated sketching, 2D and 3D modelling and computer aided images to explore design possibilities. This is to be encouraged.

To access the higher mark range, candidates must produce a wide range of creative and innovative possibilities. They must clearly evaluate their ideas with reference to the specification.

4. Development of Proposed Solution

This section was requires candidates to show their decision-making regarding the concept, materials and construction methods, through trialling, testing and modelling. Most candidates had clear evidence of developmental work.

Some candidates however, did not show any decision-making, simply stating the chosen material. To achieve the higher mark range, candidates must show clearly the trialling or testing of alternatives and of the decisions that they make.

5. Planning for Production

Most candidates produced thorough and detailed plans for production. They produced a logical sequence of the stages of manufacture, including detailed cutting lists, approximate time allocations and appropriate Health and Safety considerations.

Working drawings were generally of a very good standard, with candidates producing high quality technical drawings or using Computer Aided Design software. The best work submitted was fully dimensioned and would enable a third party to manufacture their product.

6. Product Realisation

The vast majority of candidates completed the manufacture of a practical outcome. The quality of manufacture in many cases was outstanding.

Most candidates used good quality photographs to show full details of their product. Many gave photographic evidence of key stages of manufacture of the product to emphasize the quality of making.

Centres must ensure that candidates include clear evidence of their practical outcome. Marks cannot be accepted for the practical realisation if there is no photographic evidence of the candidates' work. The best work included evidence of the product in use in its intended environment, which was also used in the Testing and Evaluation section.

Most Centres were accurate in awarding marks commensurate with the quality of work produced.

7. Testing and Evaluation

Most candidates tested their product, evaluated it fully and indicated areas for modification or improvement. An increasing number of candidates used their client to test the product and give their views on positive aspects and areas for improvement.

Centres tend to be slightly lenient when assessing this section. The assessment criteria require candidates to carry out objective testing with reference to the specification and user. They must produce detailed and meaningful conclusions leading to proposals for further development to access the higher mark range.