DESIGN AND TECHNOLOGY

Paper 0445/11
Product Design

Key messages

- Candidates cannot be awarded marks if they simply repeat requirements from the design brief, as set out at the beginning of the question, when responding to part **(a)**. The question does ask for additional points.
- Candidates should remember that simple drawings are often better than words when describing manufacturing methods that they are suggesting in response to part **(g)**.

General comments

Most candidates appeared to be well prepared to respond to the question of their choice and many showed that they could engage competently in the design problems set in the context of children's toys and learning aids.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded appropriately were able to evidence their design and thinking skills successfully. Some candidates showed a high level of originality in their design work and should be congratulated on this. 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 the storage of waste products in a kitchen.

(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; lid to stop smells; hygienic; easy to wash out; easy to remove/empty; labelling of product types. Functional points 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 identify two places in a kitchen where such a unit might be positioned. Appropriate responses included: in a cupboard; on the wall; under a worktop; in a corner or other specific position.

(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. High marks were scored where comments included valid judgements rather than just simple descriptions of each design idea. Although 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 detail and overall dimensions for the award of maximum marks.

(f) Many excellent responses selected specific materials appropriate to the design presented in the previous section. Reasons given for choice indicated that candidates had considered the structure of their design and were familiar with the strengths and weaknesses of a range of specific materials in this context.

(g) Outlines that described an appropriate step by step manufacturing method for one part of the design solution, including the specific tools used, scored high marks. Responses to this part need to develop and include detail beyond general marking out and preparation methods that could be applied to any product. The use of simple drawings in addition to written text was generally successful.

Question 2

This question, intended for those following the Graphic Products option, was answered by a significant number of candidates. Candidates appeared familiar with the requirements of a display stand in a school to encourage the recycling of used products but imagination and flair that might be expected of those following a graphics option was often limited in the final product.

(a) The majority of candidates identified four additional points about the function of the display stand and successful responses included: attractive colour/shape; has impact; invites students to read; stable in use; lightweight to carry/transport; easy to fold up or dismantle for storage.

(b) Candidates had no difficulty showing two methods of holding two recyclable products on the stand including: ledges; pockets; rubber bands; clips; adhesives; 'velcro' and transparent pods.

(c)

(d) See **Question 1 (c) – (g)**

(e)

(f)

(g)

Question 3

Only a small number of candidates answered this question. The requirement for the device to crush empty cardboard containers was 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 crushing device and these included: simple to operate; cannot crush fingers; minimal force required; easy to clean; includes safety lock; waterproof in case of spilt liquid; can be fixed to a wall/flat surface.

(b) Candidates responded well in showing two different mechanisms that might be used in such a crusher. These included: screw jaws; levers; cams; rack and pinion and a pneumatic cylinder.

(c)

(d)

(e) **See Question 1 (c) – (g)**

(f)

(g)

DESIGN AND TECHNOLOGY

Paper 0445/12
Product Design

Key messages

- Candidates cannot be awarded marks if they simply repeat requirements from the design brief, as set out at the beginning of the question, when responding to part **(a)**. The question does ask for additional points.
- Candidates should remember that simple drawings are often better than words when describing manufacturing methods that they are suggesting in response to part **(g)**.

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 children's toys and learning aids.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded appropriately were able to evidence their design and thinking skills successfully. Some candidates showed a high level of originality in their design work and should be congratulated on this. 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 device for supporting babies when they are learning to walk.

(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 device. Successful responses included: safe for a child to use; will not topple over (stable); adjustable; colourful or attractive to children; easy to store; easy to move around. General responses such as 'durable' or 'lightweight' can be awarded marks only where the specific reason for the requirement is given.

(b) Most candidates were able to show two methods of attaching wheels to a frame. Appropriate responses included: screw and washer; threaded axle and nut; split pin through axle; rotating axle with fixed wheels; star/captive washer. All reasonable materials and axle types were accepted.

(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. High marks were scored where comments included valid judgements rather than just simple descriptions of each design idea. Although 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 detail and overall 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 packaging for point of sale display but imagination and flair that might be expected of those following a graphics option was often limited.

(a) The majority of candidates identified four additional points about the function of the packaging and successful responses included: appealing to customers; easy to open/close; stack for display; included details of the dolls; robust for storage; attractive logo; colourful and recycling potential.

(b) Candidates, generally, had no difficulty showing two methods of providing handles on packaging of this type including: integral handle; slots/holes; attached card or string/cord; fold up handle and additional carrying frame.

(c)

(d) **See Question 1 (c) – (g)**

(e)

(f)

(g)

Question 3

Only a small number of candidates answered this question. The requirements for the sit-on toy 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 toy and these included: safe for children to use; stable in use; waterproof for outside use; easy to get on; easy to clean; must not damage house if used inside.

(b) Candidates responded well in showing two different propulsion mechanisms for the sit-on toy. These included: direct pedals; chain sprocket system; belt and pulley system; treadle and linkages; electric motor; hand levers and gear systems.

(c)

(d)

(e) **See Question 1 (c) – (g)**

(f)

(g)

DESIGN AND TECHNOLOGY

Paper 0445/13
Product Design

Key messages

- Candidates cannot be awarded marks if they simply repeat requirements from the design brief, as set out at the beginning of the question, when responding to part **(a)**. The question does ask for additional points.
- Candidates should remember that simple drawings are often better than words when describing manufacturing methods that they are suggesting in response to part **(g)**.

General comments

Most candidates appeared to be well prepared to respond to the question of their choice and many showed that they could engage competently in the design problems set in the context of children's toys and learning aids.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded appropriately were able to evidence their design and thinking skills successfully. Some candidates showed a high level of originality in their design work and should be congratulated on this. 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 the storage of waste products in a kitchen.

(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; lid to stop smells; hygienic; easy to wash out; easy to remove/empty; labelling of product types. Functional points 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 identify two places in a kitchen where such a unit might be positioned. Appropriate responses included: in a cupboard; on the wall; under a worktop; in a corner or other specific position.

(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. High marks were scored where comments included valid judgements rather than just simple descriptions of each design idea. Although 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 detail and overall dimensions for the award of maximum marks.

(f) Many excellent responses selected specific materials appropriate to the design presented in the previous section. Reasons given for choice indicated that candidates had considered the structure of their design and were familiar with the strengths and weaknesses of a range of specific materials in this context.

(g) Outlines that described an appropriate step by step manufacturing method for one part of the design solution, including the specific tools used, scored high marks. Responses to this part need to develop and include detail beyond general marking out and preparation methods that could be applied to any product. The use of simple drawings in addition to written text was generally successful.

Question 2

This question, intended for those following the Graphic Products option, was answered by a significant number of candidates. Candidates appeared familiar with the requirements of a display stand in a school to encourage the recycling of used products but imagination and flair that might be expected of those following a graphics option was often limited in the final product.

(a) The majority of candidates identified four additional points about the function of the display stand and successful responses included: attractive colour/shape; has impact; invites students to read; stable in use; lightweight to carry/transport; easy to fold up or dismantle for storage.

(b) Candidates had no difficulty showing two methods of holding two recyclable products on the stand including: ledges; pockets; rubber bands; clips; adhesives; 'velcro' and transparent pods.

(c)

(d) See **Question 1 (c) – (g)**

(e)

(f)

(g)

Question 3

Only a small number of candidates answered this question. The requirement for the device to crush empty cardboard containers was 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 crushing device and these included: simple to operate; cannot crush fingers; minimal force required; easy to clean; includes safety lock; waterproof in case of spilt liquid; can be fixed to a wall/flat surface.

(b) Candidates responded well in showing two different mechanisms that might be used in such a crusher. These included: screw jaws; levers; cams; rack and pinion and a pneumatic cylinder.

(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**. Most candidates chose to answer Question **B4** with a small number choosing **B5**. A small number of candidates did not follow the rubric instruction and answered all the questions.

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

There are areas of the syllabus however, in which further improvements are needed. Candidates must be able to draw an exploded isometric view in alignment. The application of hatching to a sectional drawing and the drawing of a wire frame in isometric are also areas that need to be improved.

Comments on specific questions

Question A1

Tissue box

A pictorial image of a tissue box was given. Many Candidates added to the started development (net) a side and a base to the same dimensions of the top and side given. Three ends were required to be added and these could be tapered or square cut within a maximum of 25 mm. To complete the development (net), three glue tabs were to be added to the sides and a long glue tab to the top or bottom. Full marks were awarded to candidates who used the correct convention for all fold lines

Question A2

(a) Candidates were required to construct an ellipse to a given size on the centre lines provided. This ellipse represented the opening drawn on the top of the tissue box. Generally candidates drew some construction with some candidates drawing very clear construction. In some cases, ellipses were drawn without any construction evident. Where a question requires an ellipse to be constructed, a trammel can be used but it must be attached or drawn on the examination paper for marks to be awarded for construction.

(b) Candidates were asked to show a sketch and notes to explain what the term ‘perforation’ means. Successful candidates drew either a side section or a pictorial view showing a row of holes that were close to each other. The holes could be completely penetrating or in a V shape to be effective.

Question A3

Tissue box plastic cover

Unfortunately, not all candidates attempted all parts of this compulsory question.

(a) The question asked candidates to render the given pictorial drawing to make it look like shiny plastic. Many candidates applied some form of rendering that represented a flat surface. A number of candidates applied rendering that gave a 'shine'.

(b) Candidates were asked to complete the sectional view. The left half had been given. The right half needed to be a mirror image of the given part. Some candidates encountered problems with drawing the two arcs. Many candidates completed the outside shape. Few candidates applied hatching to the solid cut parts leaving the centre section plain.

(c) (i) A specific plastic that could be used to make the cover included:

- Acrylic
- Polypropylene (p.p.)
- Polystyrene
- ABS
- HDPE

(ii) The reasons why this plastic is suitable included

- Is available in a range of colours
- Can be recycled
- Softens with heat and can be vacuum formed
- Has a naturally shiny surface

Question B4

Model Litter Bin

This question was derived from an actual 'Graphic Product' used by a designer.

A classroom exercise to make a model litter bin, would be most beneficial to future Candidates' understanding of this Graphic Product.

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

(a) (i) Many candidates added the missing lines from view A to show the sides and two ends fitting together.

(ii) Most candidates drew the missing upright and vertical line.

(iii) Candidates correctly named the 'Plan' and 'Front view' (or 'Side View')

(b) Many candidates drew two ends and two sides above the completed base. Very few candidates drew the exploded parts in alignment with the base.

(c) (i) The abbreviation CAD stands for Computer Aided Design

The abbreviation CAM stands for Computer Aided Manufacture

(ii) The question asked candidates to describe the process of cutting out the symbol from self-adhesive vinyl using CAM. Many candidates described a hand method and not CAM. Correct answers included:

- Prepare CAD design for CAM use
- Download info to CAM cutter
- Load Vinyl into cutter
- Knife cuts out design
- Weed (remove waste)
- Pick design up on transfer sheet
- Stick to clean surface

Question B5

Model Lamp

This question was also derived from a real 'Graphic Product'.
This question was attempted by a small number of candidates. Overall, candidates gained a wide range of marks for their answers.

(a) (i) Many candidates managed to draw the solid base to the correct dimensions in isometric projection

(ii) Most candidates attempted this part. However, a large number did not use the 'crating' method and with the sides being sloping, this created problems in determining the true height from the information given in the orthographic views. Candidates were not penalised twice for this error and the sloping sides were awarded marks if they were to the candidate's solution

(b) The correct material for the model is Foam/Expanded polystyrene or Styrofoam. Some candidates misread the question and responded with materials that would have been suitable for a full size lamp.

Laminated paper is suitable for the shade because it is more rigid than paper and will keep its shape over a longer period. It is also easy to cut and fold and is translucent. The surface can easily be printed on.

Copper wire is the most suitable material for the frame. It can be easily bent, held in place with tape (or soft soldered with an iron) and it will not rust.

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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**. An equal number of candidates chose to answer Question **B4** and **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 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 an open box in isometric. The application of hatching to a sectional drawing and the process of manufacture of concept models from foam board are also areas that need to be improved.

Comments on specific questions

Question A1

Package for cheese

A pictorial image of a package for a cheese was given. Many candidates added to the started development (net) a second base and a right triangle. Most candidates added a top right glue tab, a bottom left glue tab and a side glue tab. Full marks were awarded to candidates who used the correct convention for all fold lines

Question A2

(a) A pictorial view of a hexagonal package for cheese was given. Candidates were required to complete the full size view of the hexagonal package. Many candidates extended the top line to the correct length and then drew in the top left line at 60° to the horizontal. A line at 60° was to be added to the top right and again to the bottom left.

(b) This question asked the candidate to explain what is meant by embossing. Marks were awarded for notes and a sketch that showed that the text is either raised or indented from the surface.

Question A3

Vacuum formed package

Unfortunately, not all candidates attempted all parts of this compulsory question.

(a) The question asked candidates to render the given pictorial outline of the former to show that it is made from solid wood. Marks were awarded for grain evident on the top surface, end grain (annular rings) evident and side and end grain aligning.

(b) Candidates were asked to complete the sectional view. The left half had been given. The right half needed to be a mirror image of the given part. Some candidates encountered problems with drawing the two sloping ends. Many candidates completed the outside shape. Few candidates applied hatching to the solid cut parts leaving the centre section plain and the top line in outline.

(c) The question asked why the sides were angled. The correct response is that 'draft' is used to ensure that the vacuum forming can easily be removed from the former.

Question B4

Model Chair

This question was derived from an actual 'Graphic Product' used for display purposes.

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

(a) (i) Many candidates added the outer edge and the inner edge to the left side of the front view and completed the line representing the top of the back of the seat. Projecting the top and thickness of the seat from the end view was challenging for some candidates. Generally two lines indicating the seat was shown by candidates' responses although these were not always in projection.

(ii) This part of the question required the candidate to project the front edge of the seat from the end view to the plan view. The top edge of the sloping side was also required to be in projection in the plan.

(iii) Many candidates attempted the drawing of the symbol for first angle projection. While most responses showed two concentric circles and a truncated cone, they were not always drawn in the correct position. (Cone on the left of two concentric circles with the small diameter on the left – first angle projection)

(b) The cutting list for the materials to make the chair should have been completed with: Sides 2 off, seat and back (one piece) 170/190 and 1 off

(c) The description of the marking out needed to include: the use of a pencil/marker pen and rule/template/try square.

The description of the cutting stage needed to include: the use of a craft knife, safety steel rule and cutting mat.

The description of the folding stage needed to include: part of foam board removed at 45°on the bend line; or cut through the top layer, foam removed and back layer used as a hinge; or a Slot and tennon type joint.

The description for joining needed to include: a suitable adhesive and the joint held together to allow adhesive to set.

Question B5

'Special Offer' paper band

This question was also derived from a real 'Product'.
This question was attempted by a small number of candidates. Overall, candidates gained a wide range of marks for their answers.

(a) Many candidates completed an isometric view of a 100 long box with a 30 × 25 end. A joining tab needed to be evident in the correct position and this could only be achieved if the box was drawn 'open'

(b) This question required candidates to use sketches and notes to show a non-permanent method of joining the paper band together. Many candidates illustrated an arrow and slot system as a correct solution.

(c) Candidates were required to draw the development (net) of an alternative band that fitted the corner of the packet of biscuits. This question required candidates to think very carefully about the direction of the band as it wrapped around the packet. Successful solutions showed a mirror left end to that given on the right of the centre line of the half drawn band. On each side a vertical band was to be drawn at least half the length of the top line. A joining tab should then be added on one or both of the vertical bands.

(d) Candidates were required to complete a table to outline how a computer could be used to design (CAD) and make (CAM) the modified paper band in (c).

CAD was to include: understanding that CAD includes design; how a computer program is used to design, draw, and save a design file.

CAM was to include: how a design drawing is sent to a CAM machine such as a plotter/cutter for the design to be cut accurately.

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**. Most candidates chose to answer Question **B4** with a small number choosing **B5**. A small number of candidates did not follow the rubric instruction and answered all the questions.

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

There are areas of the syllabus however, in which further improvements are needed. Candidates must be able to draw an exploded isometric view in alignment. The application of hatching to a sectional drawing and the drawing of a wire frame in isometric are also areas that need to be improved.

Comments on specific questions

Question A1

Tissue box

A pictorial image of a tissue box was given. Many Candidates added to the started development (net) a side and a base to the same dimensions of the top and side given. Three ends were required to be added and these could be tapered or square cut within a maximum of 25 mm. To complete the development (net), three glue tabs were to be added to the sides and a long glue tab to the top or bottom. Full marks were awarded to candidates who used the correct convention for all fold lines

Question A2

(a) Candidates were required to construct an ellipse to a given size on the centre lines provided. This ellipse represented the opening drawn on the top of the tissue box. Generally candidates drew some construction with some candidates drawing very clear construction. In some cases, ellipses were drawn without any construction evident. Where a question requires an ellipse to be constructed, a trammel can be used but it must be attached or drawn on the examination paper for marks to be awarded for construction.

(b) Candidates were asked to show a sketch and notes to explain what the term ‘perforation’ means. Successful candidates drew either a side section or a pictorial view showing a row of holes that were close to each other. The holes could be completely penetrating or in a V shape to be effective.

Question A3

Tissue box plastic cover

Unfortunately, not all candidates attempted all parts of this compulsory question.

(a) The question asked candidates to render the given pictorial drawing to make it look like shiny plastic. Many candidates applied some form of rendering that represented a flat surface. A number of candidates applied rendering that gave a 'shine'.

(b) Candidates were asked to complete the sectional view. The left half had been given. The right half needed to be a mirror image of the given part. Some candidates encountered problems with drawing the two arcs. Many candidates completed the outside shape. Few candidates applied hatching to the solid cut parts leaving the centre section plain.

(c) (i) A specific plastic that could be used to make the cover included:

- Acrylic
- Polypropylene (p.p.)
- Polystyrene
- ABS
- HDPE

(ii) The reasons why this plastic is suitable included

- Is available in a range of colours
- Can be recycled
- Softens with heat and can be vacuum formed
- Has a naturally shiny surface

Question B4

Model Litter Bin

This question was derived from an actual 'Graphic Product' used by a designer.

A classroom exercise to make a model litter bin, would be most beneficial to future Candidates' understanding of this Graphic Product.

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

(a) (i) Many candidates added the missing lines from view A to show the sides and two ends fitting together.

(ii) Most candidates drew the missing upright and vertical line.

(iii) Candidates correctly named the 'Plan' and 'Front view' (or 'Side View')

(b) Many candidates drew two ends and two sides above the completed base. Very few candidates drew the exploded parts in alignment with the base.

(c) (i) The abbreviation CAD stands for Computer Aided Design

The abbreviation CAM stands for Computer Aided Manufacture

(ii) The question asked candidates to describe the process of cutting out the symbol from self-adhesive vinyl using CAM. Many candidates described a hand method and not CAM. Correct answers included:

- Prepare CAD design for CAM use
- Download info to CAM cutter
- Load Vinyl into cutter
- Knife cuts out design
- Weed (remove waste)
- Pick design up on transfer sheet
- Stick to clean surface

Question B5

Model Lamp

This question was also derived from a real 'Graphic Product'.
This question was attempted by a small number of candidates. Overall, candidates gained a wide range of marks for their answers.

(a) (i) Many candidates managed to draw the solid base to the correct dimensions in isometric projection

(ii) Most candidates attempted this part. However, a large number did not use the 'crating' method and with the sides being sloping, this created problems in determining the true height from the information given in the orthographic views. Candidates were not penalised twice for this error and the sloping sides were awarded marks if they were to the candidate's solution

(b) The correct material for the model is Foam/Expanded polystyrene or Styrofoam. Some candidates misread the question and responded with materials that would have been suitable for a full size lamp.

Laminated paper is suitable for the shade because it is more rigid than paper and will keep its shape over a longer period. It is also easy to cut and fold and is translucent. The surface can easily be printed on.

Copper wire is the most suitable material for the frame. It can be easily bent, held in place with tape (or soft soldered with an iron) and it will not rust.

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DESIGN & 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.
- 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. It is essential that candidates **do actually provide sketches** with notes otherwise they deny themselves access to maximum marks.
- 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 lacked the all-round knowledge and understanding required to answer all questions in this section and performed less well 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.

It is essential that candidates following a D&T course are familiar with the different classifications of resistant materials: i.e. hardwoods, softwoods and manufactured boards; ferrous and non-ferrous metals; thermoplastics and thermosetting plastics.

Comments on specific questions

Section A

Question 1

(a) The majority of candidates did not name the smoothing plane. Many gave ‘jack’ and a variety of names that were not genuine woodworking planes.

(b) The direction of the grain was not always made clear.

Question 2

There were many excellent specification points for the desk tidy and most candidates achieved at least one mark for this question. To answer this type of question accurately candidates are advised to start with the statement: *‘the desk tidy must…’*

Question 3

It was disappointing that some candidates had no knowledge of the hardening and tempering process. The majority of candidates provided the correct answer, carbon steel.

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Most candidates drew a through housing joint. Some showed an exploded view of the two parts.

Question 5

(a) Many candidates named polystyrene or polypropylene correctly but there were many alternative incorrect answers.

(b) (i) Very few candidates described how the plastic retained the heat within the container.

(ii) Only a minority of candidates described how the plastic could not be recycled or that it was non-biodegradable. Answers such as '*harmful to environment'* were too vague.

By using a product such as the fast food container, candidates were given a context with which, it was hoped that they were familiar with.

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(b) There was a minority of good answers referring to the thick, 'chunky' blade and the ferrule at the end of the handle to prevent splitting when struck with a mallet.

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The most common correct answers referred to the shape of the remote fitting the shape and/or size of a hand, the position of the buttons in terms of ease of pressing and also in their position. Some answers described the useful colour-coded buttons.

Unfortunately, some candidates simply stated features such as *'shape'* and *'size'* that required more detail to achieve marks.

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Only an extremely small minority of candidates drew a flat file. The vast majority of answers showed a hand file. Candidates were awarded 1 mark for completing the drawing of a hand file since the differences between the two files are subtle.

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(a) Many candidates named steam bending or laminating.

(b) Few candidates gave correct benefits of the process. Many answers included the word 'strong' but without qualification achieved no marks. Qualification such as 'because fewer joints are required' or 'the curved shape provides a stronger structure than traditional joints' would have been rewarded.

Question 10

Many candidates demonstrated no knowledge whatsoever of the centre lathe and the location of the lathe tools **A, B** and **C**.

Section B

Question 11

(a) (i) Many candidates named a softwood for the cabinet with pine and parana pine the most common answers. Disappointingly, there were many hardwoods and manufactured boards named.

(ii) Standard or stock sizes of materials is important when designing and making products. Candidates demonstrated very poor knowledge of this. Many candidates named plywood, hardboard or MDF for the back of the cabinet. Chipboard was not appropriate. Suitable thicknesses often exceeded 10 mm.

(b) (i) This question was reasonably answered with many candidates recognising that using pre-manufactured components gave the product quality, that it would be quicker than making components yourself and that they were readily available.

(ii) Most candidates understood where the pre-manufactured components would be used but were often less sure about how they would be fitted. Some candidates neglected to answer the 'fitting' part of the question.

(c) Many candidates provided sketches of finger and dowel joints. There were many variations of butt joints that were awarded fewer marks. Butt joints can be made to provide excellent strength by the addition of dowel and nails or pins but always with an adhesive. Often candidates did not provide these additional strengthening techniques.

(d) The best answers showed the glass shelves supported at three different positions using a variety of methods including pins, pegs, studs and added wooden or metal strips.

(e) (i) There were many suitable corner joints named: dowel; mortise and tenon; corner halving and bridle. Constructions such as mitre, lap and butt were not appropriate.

(ii) Many candidates showed some type of groove, often referred to as a 'slot', 'housing' or 'indent'. Marks were awarded if the groove was recognisable. Some candidates described how the groove would be cut out by means of a chisel or router. A rebate was also an excellent method. However, many candidates simply glued the glass panel into the space of the door frame, often with an over-dependence on the capabilities of epoxy resin adhesive.

(f) The majority of candidates recognised the 'see-through' property as the advantage of the glass panel.

Question 12

(a) (i) Many candidates gave a valid reason for their choice of metal. For mild steel it was its cost and durability; for aluminium its lightness and resistance to corrosion.

(ii) To prevent wear some sort of 'bush' or tube inserted within the side of the cabinet was required. The material could have been metal or plastic, not rubber as some candidates stated.

(b) (i) Some candidates described the two part adhesive, mixing both the resin and hardener in equal amounts. Most candidates gained a mark for describing how it would be applied.

(ii) Most candidates demonstrated no knowledge of polymorph. Polymorph is a relatively 'new' addition to the syllabus as a modern material. The granules can be softened in very hot water then moulded easily to shape. Candidates should have first-hand knowledge of its capabilities within their workshop experience.

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(iii) No candidate gave a correct explanation for injection moulding being suitable for large scale production only. Most answers referred to the amount of plastic being used. The reason is that the initial cost of tooling is very high and to recoup these costs high volume production is essential.

(d) Some candidates correctly named [sand] casting while others named processes that were only appropriate for plastics or would be carried out industrially.

(e) There were some innovative scoring systems designed. Some showed potential without the detail necessary to achieve maximum marks. Some candidates thought that the scoring system could be activated by the ball actually scoring a goal. A combination of sliders on rods and flip cards were the most common design solutions. Candidates are reminded that the bullet points listed in the question are to help them focus on the key points of their design.

Question 13

(a) (i) The majority of candidates gave two good benefits, the most common being speed and repetitive accuracy.

(ii) Most candidates recognised that a template made from paper or card would lack the durability of one made from wood or metal.

(b) (i) The majority of candidates failed to provide an explanation of the term 'self-finished'. Some gained one mark for suggesting that an applied finish would not be required but very few went on to explain how the surfaces of the materials would need to be treated.

(ii) To achieve maximum marks when making the bracket from either acrylic or aluminium, candidates needed to provide details of how the shape would be cut out and how the cut edges would be smoothed. In addition to this, all the tools and equipment used needed to be named accurately.

It was disappointing that some candidates used tools and techniques that were not appropriate to the material of their choice. Some candidates provided a written list rather than a combination of sketches and notes and therefore denied themselves the opportunity of achieving maximum marks.

(c) (i) Most candidates understood the process of bending plastic using a strip heater and a former to achieve the required shape.

(ii) While there were some excellent answers, generally knowledge of metalworking processes is not very good.

(d) Very few candidates understood that to countersink thin sheet would result in a large hole being drilled almost through the sheet, therefore providing little strength.

(e) Generally, answers to this question were poor. Very few candidates concentrated on the fact that hardwood expands and contracts and to fail to provide for this movement could result in the hardwood splitting.

(f) Overall, the results to this question were very poor. Many candidates ignored the key statement in the question, *'....**without** the use of fittings, fixings or adhesive'* and showed additional blocks of wood or screws to secure the shelf. There were some good answers showing a modified design with flaps to the front and/or the side that would prevent the shelf from moving in at least one or two directions.

DESIGN & 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.
- 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 lacked the all-round knowledge and understanding required to answer all questions in this section and performed less well 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. For example, in **Question 12(c)**, when the question asked candidates to "*show how the groove could be produced …",* **no marks** are allocated for providing details of marking out.

Comments on specific questions

Section A

Question 1

Most candidates named at least one of the tools correctly. Some candidates did not read the question carefully and simply named each of the fastenings shown.

Question 2

Only a small minority of candidates showed the bevel edge of the chisel placed in the corner of the dovetail joint.

Question 3

(a) Many candidates correctly named the finger/comb and dovetail joints.

(b) Many candidates described how the sloping angle on the dovetail meant that it could only be removed in one direction. However, a majority of candidates incorrectly stated that it was stronger due to increased surface area.

Question 4

Very few candidates could name the standard metal sections: round tube and angle. There were many variations of these named incorrectly. There were only 2 acceptable answers. Candidates should be familiar with the names given to standard sections in wood, metal and plastics.

Question 5

(a) Many candidates were unable to give the correct name for the knurled texture.

(b) The majority of candidates recognised that the texture provided grip.

(c) Some candidates correctly named a [centre] lathe as the machine on which the knurling would be produced but the majority of candidates did not know how it would be produced.

Question 6

Very few candidates were able to name the cutting gauge [line **A**] and the marking gauge [line **B**]. Marking gauge was often named twice. It was disappointing that many candidates thought that odd-leg calipers were appropriate.

Question 7

The most common correct answers referred to the lightness in weight and resistance to corrosion as the advantages of CFRP over steel.

Question 8

There were many excellent specification points describing the sit-on toy's suitability for children, including: anthropometric features relating to height off the ground, reach to the handlebars and the comfortable seat and backrest. Additional points such as the use of colour and smooth, rounded edges were also valid.

Question 9

The majority of candidates stated flammable correctly but the symbol relating to high voltage was answered with wide variations, some of which were unacceptable.

Question 10

Many candidates named appropriate metals that corresponded to the properties in the table.
Unfortunately some candidates did not pay attention to the instruction in the question:
'*Complete the table below by naming a different metal …*'

Section B

Question 11

This was the most popular question attempted by candidates.

(a) Very few candidates understood that making the stand with a solid piece of hardwood would result in movement, for example shrinkage causing warping. Some good answers described how the frame would make the whole stand lighter or that it would use less material.

(b) The only acceptable constructions at corner **A** included mortise and tenon, dowel, biscuit and variations of a strengthened butt. Candidates needed to look carefully at the arrangement of rails and the end grain to realise that halving and bridle joints were not acceptable. There were some excellent sketches of dowel and mortise and tenon joints.

(c) (i) Many candidates showed the frame clamped with G cramps which was not practical. Some candidates gained maximum marks for naming sash cramp, showing 3 cramps along the length of the frame and including scrap wood to protect the edges and distribute the pressure.

(ii) Candidates generally achieved 1 or 2 marks for naming a smoothing, jack or bench plane and describing the use of glasspaper, [usually referred to as 'sandpaper']. Those candidates who achieved full marks showed the wood secured in a vice, described how they would plane the end grain without splitting or described how various grades of glasspaper would be used.

(d) Most candidates described how the ledge would be attached using a combination of pins/nails, screws, dowels and glue. Some constructions such as housings and mortise and tenon were not practical.

(e) There were many potentially good ideas for keeping the book open at a particular page. The most common designs included the use of 'hooks' or flaps, pins and clips. However, many candidates did not address the final part of the question, to: '*Include details of materials and/or fittings used',* therefore denying themselves the opportunity to gain maximum 4 marks.

(f) There were many potentially ingenious methods of allowing the stand to adjust to 3 different positions. Many solutions included the use of a hinged backing strip with slots or applied beads against which the strip would locate. As in the previous question, practical detail about the materials used and their construction was often lacking.

Question 12

This was the second most popular question attempted by candidates.

(a) Many candidates were unable to provide reasons for using beech for children's toys. Popular misconceptions included that beech was cheap, soft and easy to work with. The best correct answers described the hard, durable nature of beech, its impact resistance and its close grain meaning that it did not splinter easily.

(b) (i) While many candidates did name chinagraph pencil or some form of marker pen correctly there were many references to a scriber [that would leave a permanent scratch on the surface] or woodworking tools such as a marking knife.

(ii) The best answers described how a hole would be drilled, the blade of a coping or scroll saw inserted and the shape cut out, and the use of files and wet and dry [silicon carbide paper]. It was pleasing to read answers that included information about the specific 'grit' of the wet and dry paper used.

(iii) Many candidates described processes where precautions needed to be taken when using acrylic. The most common referred to sawing, [keeping the material low in the vice and well supported] and drilling, [when the material would be clamped with sacrificial wood beneath].

(c) The majority of candidates gained at least 1 mark for naming any tool or item of equipment that could be used to produce the groove. Many candidates did not understand how the process could be completed successfully.

(d) As in the previous question candidates achieved at least 1 mark for naming a tool or an appropriate item of equipment. Some of the best answers described how a tenon saw could be used by sawing half way through the block of wood, turning it around and sawing from the other end. The reason for this is that the back of the tenon saw would prevent it from being sawn straight through. Some candidates showed a band saw with a jig designed to hold the block at the required angle.

(e) Many candidates had only a very basic knowledge of wood turning. Marks were awarded to candidates if they described how diagonal lines would be drawn on one end, a small hole drilled at the centre, a circle drawn on the end and the removal of the sharp edges by means of a plane.

(f) (i) The best advantages for using plastic shapes were that it was ready coloured, easy to clean and that there was no danger of splinters. Many candidates focused on the manufacture of plastic which was irrelevant as the question concentrated on the '*use'* of the plastic shapes.

(ii) Many candidates named extrusion or injection moulding correctly as the manufacturing process for the shapes.

Question 13 This was the least popular of the questions in Section B.

(a) (i) The majority of candidates attempting this question recognised at least one correct marking out tool. It was apparent that some candidates have a poor understanding of metalworking techniques and named tools that would be used when marking out wood or plastic.

(ii) Engineers blue or variations of this such as 'marking blue' were common correct answers.

(b) The most common correct answers described the use of a drill to make a hole in the aluminium, then to remove most of the waste metal. An Abra file, piercing saw, and a hegner saw with a metal cutting blade were the best options. A hacksaw and tin snips were not practical. There was often good information relating to the use of files and abrasive papers to finish the shape. As in previous questions many candidates named tools that would have been used when working with wood, not metal.

(c) (i) Most candidates understood the self-finishing principle but were not always knowledgeable about how it would be undertaken with aluminium. Some candidates described the use of wet and dry [silicon carbide] paper, often referring to different 'grits' [or coarseness] and use of the polishing/buffing wheel to achieve a high quality finish.

(ii) Many candidates understood what was meant by the term 'anodising'.

(d) (i) Many candidates gained at least 1 mark for naming a tool or item of equipment that could be used to cut out the recess. The most common correct answers included a chisel and mallet, a router and a variety of drills and bits. Candidates need to be careful about describing methods that are clearly industrial and not included in accepted school workshop practice.

(ii) There were some excellent answers describing how a two-part epoxy resin adhesive would be prepared applied and the parts of the key rack clamped together. Contact adhesive was also an excellent answer but some candidates did describe how the parts would be clamped together rather than allowing the surfaces to become touch dry and then being joined on impact or contact.

(e) Generally, answers to this question were good. Many answers simply stated that CAM was a quick and accurate method of production. Some candidates described the repetitive accuracy of CAM for batch production.

(f) Overall, the results to this question were very poor. Many candidates ignored the key statement in the question, *'Screw holes must not be visible in the front of the key rack'* Some candidates chose to screw the base of the rack to the wall **then** attach the aluminium 'front'. This was not rewarded. The question required some sort of bracket that could be hidden behind the rack. Very few examples of this method were seen.

(g) Generally candidates seem well versed in environmental/sustainable issues. The question referred to the *'impact'* of aluminium on the environment. This did not necessarily mean negative issues. The most common answers related to harmful emissions produced during the production of aluminium. Some candidates described how aluminium was not harmful as it could be recycled.

DESIGN & TECHNOLOGY

Paper 0445/33
Resistant Materials

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Section A

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Section B

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It is essential that candidates following a D&T course are familiar with the different classifications of resistant materials: i.e. hardwoods, softwoods and manufactured boards; ferrous and non-ferrous metals; thermoplastics and thermosetting plastics.

Comments on specific questions

Section A

Question 1

(a) The majority of candidates did not name the smoothing plane. Many gave ‘jack’ and a variety of names that were not genuine woodworking planes.

(b) The direction of the grain was not always made clear.

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There were many excellent specification points for the desk tidy and most candidates achieved at least one mark for this question. To answer this type of question accurately candidates are advised to start with the statement: *‘the desk tidy must…’*

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It was disappointing that some candidates had no knowledge of the hardening and tempering process. The majority of candidates provided the correct answer, carbon steel.

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(f) Overall, the results to this question were very poor. Many candidates ignored the key statement in the question, *'....**without** the use of fittings, fixings or adhesive'* and showed additional blocks of wood or screws to secure the shelf. There were some good answers showing a modified design with flaps to the front and/or the side that would prevent the shelf from moving in at least one or two directions.

DESIGN AND TECHNOLOGY

Paper 0445/41

Systems and Control

Key messages

- Candidates must ensure only **one** question in ***Section B*** is answered.
- Candidates should be reminded that clear writing and clear annotation to sketches are important.
- Responses should appear in the area of the paper allocated for the response. Any parts of a response that does not fit the space should be placed 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 who had chosen to answer the electronics question generally made use of the given formula for their response. It is good practice to then apply the correct units to the final answer.
- As in previous examination series there were a number of candidates who failed to give any sort of response to parts of a question. The number continues to decrease but it is important candidates are aware that no response means that no mark can be awarded.
- In questions that require either a single answer or a set number of answers it is important that candidates do not put additional answers in; this could result in the examiner not being able to give credit to a correct response.

General comments

All of the questions in ***Section A*** proved accessible to the majority of candidates; clear answers were seen in the majority of cases and general knowledge of the syllabus content was noted.

In ***Section B*** the majority of candidates had followed the rubric and only attempted one question. There was a sizeable minority though who had made a start on a second question, realised that they could not provide answers and then moved on to another question. The number who had attempted all three questions was less than in previous years.

The standard of sketches was generally high though in some cases better use could have been made of the available space.

When answering calculation questions candidates should be advised to include all stages of the calculation in their answers. In some cases where a calculator had been used the answer given was incorrect and gained no marks; if each stage had been included partial marks could be awarded. Candidates should look carefully at the units given in the question; particularly the electronics question. Conversion from one unit to another, e.g. microfarads to farads, was a frequent cause of lost marks.

In ***Section B*** the most popular question was on Structures, followed by Mechanisms with the Electronics question trailing by some way.

Marks gained for the ***Section B*** questions were the reverse of the popularity order; highest in the Electronics question and lowest in the Structures question.

Comments on specific questions

Section A

Question 1

(a) Knowledge of technical terms regarding 'moments' was generally very good. A high proportion of correct answers gave the textbook definition of a 'moment'. Those who did not gain the mark frequently knew that it was concerned with force but did not go on to relate it to a turning force.

(b) (i) Higher order candidates had no problem with this question. Other responses included a variety of values some having no relationship to the given load.

(ii) Before giving the description candidates had to carry out the calculation with an extra load placed at a given distance from the fulcrum. In many cases this was accurately done and the description then gained both marks. Marks were awarded for understanding shown.

Question 2

The mistake frequently made was to use gusset plates in a position where they would make no difference. To gain all three marks candidates had to show that the bench was rigid in all directions; to do this, triangulation had to be used. At least one diagonal brace across the front and the side were required, along with annotation to explain why the additional pieces would keep the frame rigid.

Question 3

A high proportion of responses suggested measuring the crack in the beam with a ruler. This method would not work in practice in terms of giving warning over a period of time. The use of a strain gauge with subsequent change in resistance value gained both marks. Accurate measurement using an electronic calliper would have also gained the marks. The simplest monitoring device would be a strip of glass glued across the crack. Breakage of the glass would immediately show increased movement.

Question 4

(a) The drawing of the motor and drive shaft showed the shafts in position parallel to each other. A number of connection methods given required the shafts at 90º to each other. The instruction 'State' should have given a clue that it was standard methods of transmitting drive that were needed. It is important for candidates to know the full name of the method, for example, belt and pulley, not just pulley. Chain and sprocket rather than just chain. Simple or compound gear train, not just gears.

(b) The mark scheme allowed a number of effects of transferring motion. Candidates in most cases picked out the obvious ones such as change in speed or direction of motion. Only a few mentioned the potential for slipping in a friction drive.

Question 5

(a) The majority of responses gave the effort correctly, any errors were between load and fulcrum.

(b) Very few incorrect responses to this part; in many cases it was clear that candidates had used the space around the diagram of the paperclip to work out the order of lever.

Question 6

(a) The mark scheme listed eight possible ways that LEDs can differ. In many cases three valid ways were given, in most cases where errors were made, two valid differences were given with the third being given as 'resistance' or 'voltage'.

(b) This question was not well answered. There was often confusion between LEDs, signal diodes and capacitors. A number of responses stated that there is a difference in leg length but did not state which was the shorter. Very few commented on the marking on the body of an electrolytic capacitor that normally gives a series of minus signs or in a few cases a series of plus signs. A few responses incorrectly gave a multimeter as the identification method.

Question 7

The LED and light dependent resistor were well known, any errors generally took place on the diode

Section B

Question 8

(a) (i) Most candidates scored well on this question.

(ii) At least one method of protection was given in most cases, with higher order candidates giving two specific methods of treatment. In some cases there was confusion shown with zinc coating and galvanising both given as different methods.

(iii) This question caused some difficulty with only a few candidates gaining all three marks. Shear force was commonly confused with torsion, tension or compression.
Two sketches should have been shown to indicate parts joined by a bolt and then the result of shear force on the bolt. Without having the bolt hold two parts together it is difficult to indicate how shear force can be applied.

(b) (i) Benefits of using an 'I' section beam were not well known. There were a few that realised the rigidity of the beam would be improved and that the strength to weight ratio would improve. Lower cost was accepted if it was related to the beam being a standard part or to less material being used in the manufacture.

(ii) Strength of concrete in compression was widely recognised along with the use of steel reinforcement to provide strength in tension. Better responses showed understanding of how a variety of shapes could be produced on site because of the liquid nature of freshly mixed concrete.

(c) (i) Most responses correctly identified the forces being resisted by struts and ties.

(ii) The majority of responses gained a mark for the gusset plate, which could have been any one of the three shown. The strut was also correctly labelled in most cases. It was uncommon to find that the tie had been identified.

(iii) An answer gaining three marks was an exception. In most cases no thought had been given to joining the rafter to the tie, or an impractical method had been chosen. Fixing of gusset plates by nailing or screwing, to strengthen the joint, was a better known method.

(iv) Problems with the use of timber were generally well known with insect damage and natural defects being the most popular responses.

(v) The difference between static and dynamic load was generally well known. Better responses gave examples in their explanation.

Question 9

(a) (i) The majority of responses to this question recognised the worm gear being used.

(ii) Most had gained the two available marks for the reasons for using a worm gear.

(iii) The two numbers involved in the ratio, 45 and 1, were frequently given in the wrong order. Candidates should remember that the first number refers to the number of turns of the drive gear and the second to the driven.

(b) (i) Apart from those who thought that there is physical contact between the moving piston and the reed switch, most correctly described how the magnetic piston ring will close the reed switch when it is in close proximity.

(ii) Those who had correctly answered the previous part generally gained marks for this part. Errors occurred where there was not clear understanding on the meaning of 'open' and 'closed' in relation to contacts.

(iii) Very few responses had explained how the position of the piston could be used to signal to the electronic system that another operation could safely proceed, thus integrating the two systems.

(c) (i) There were just a few occasions where personal protective equipment was suggested; the remainder generally chose valid checks that could be made. For mains electricity the most common precaution given was to keep water or damp away from the circuit, very few had mentioned fuses or circuit breaking devices.

(ii) This part was very well answered with almost all responses gaining marks for understanding of the renewable nature of wind power and the fact that it is not always windy enough to operate efficiently.

(d) (i) Unclear labelling of the parts led to lost marks in a few cases. Candidates should be precise when asked to apply labels to a drawing.

(ii) The two types of motion were frequently reversed, only a few had used linear motion in their answer.

(iii) Lubrication points were generally identified clearly enough for marks to be awarded.

(iv) Understanding of the nature of roller bearing and reasons for their use was not good.
A number of candidates had realised that they can be sealed for life but few made reference to the capability for resisting a high radial load. There was also some confusion between radial and axial loading of a bearing.

Question 10

(a) (i) Candidates who chose to answer this question generally knew what an astable signal was and could describe it using sketches and notes.

(ii) The PTM (push to make) switch action was well known to candidates but in some cases they had failed to note that the connection is broken when the switch is released.

(iii) Use of a multimeter for testing continuity was not widely known. Basic continuity testing is something that all candidates should be familiar with and able to perform. In this case either the continuity setting or the ohm setting could have been chosen.

(iv) For either setting the reading would be zero when the switch is pushed. The continuity setting would also give audible confirmation.

(v) This part was very well answered with all candidates gaining both marks.

(vi) There were three connections to make; the switch to positive was generally present, the resistor to 0V was on occasions missed out, the most common cause of lost marks was the switch/resistor connection to **S** on the AND gate.

(vii) There was generally some understanding that the AND gate acts as a filter for the astable signal, only passing it on when the AND gate output is positive. Failure to explain this clearly resulted in lost marks.

(b) (i) This was not an easy calculation but it was carried out successfully in a number of cases. The main cause of lost marks was in the conversion of the capacitor value to farads. In this case no marks were awarded for the correct use of units in the frequency but candidates should be advised that units should be used wherever possible.

(ii) This question was well answered with all three connections being given in most cases. Candidates should use ‘blobs’ to mark connection points to distinguish these from unconnected wires crossing.

(c) This was a standard transistor driver circuit but it was not well known to many candidates. The emitter connection was the one that was most frequently correct but this had to be accompanied by a correct base connection to gain the mark. Most errors occurred in the output connections through not having the LED and resistor connected in series between the collector and positive rail.

(d) The general principle of removing a component from a PCB was well known. The details were often poorly expressed or omitted. The required parts to the answer were, heat to melt the solder, removal of excess solder, removal of the component. Any practical method of achieving these was accepted. For those who simply stated the third stage as 'remove the LED' the mark was not awarded. It should either have been pushed out with the soldering iron or pulled out using long nose pliers.

DESIGN AND TECHNOLOGY

Paper 0445/42

Systems and Control

Key messages

- Candidates must ensure only **one** question in ***Section B*** is answered.
- Candidates should be reminded that clear writing and clear annotation to sketches are important.
- Responses should appear in the area of the paper allocated for the response. Any parts of a response that does not fit the space should be placed 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 who had chosen to answer the electronics question generally made use of the given formula for their response. It is good practice to then apply the correct units to the final answer.
- As in previous examination series there were a number of candidates who failed to give any sort of response to parts of a question. The number continues to decrease but it is important candidates are aware that no response means that no mark can be awarded.
- In questions that require either a single answer or a set number of answers it is important that candidates do not put additional answers in; this could result in the examiner not being able to give credit to a correct response.

General comments

All of the questions in ***Section A*** proved accessible to the majority of candidates; clear answers were seen in the majority of cases and general knowledge of the syllabus content was noted.

In ***Section B*** the majority of candidates had followed the rubric and only attempted one question. There was a sizeable minority though who had made a start on a second question, realised that they could not provide answers and then moved on to another question. The number who had attempted all three questions was less than in previous years.

The standard of sketches was generally high though in some cases better use could have been made of the available space.

When answering calculation questions candidates should be advised to include all stages of the calculation in their answers. In some cases where a calculator had been used the answer given was incorrect and gained no marks; if each stage had been included partial marks could be awarded. Candidates should look carefully at the units given in the question; particularly the electronics question. Conversion from one unit to another, e.g. microfarads to farads, was a frequent cause of lost marks.

In ***Section B*** the most popular question was on Structures, followed by Mechanisms with the Electronics question trailing by some way.

Marks gained for the ***Section B*** questions were the reverse of the popularity order; highest in the Electronics question and lowest in the Structures question.

Comments on questions

Section A

Question 1

(a) Knowledge of technical terms regarding 'moments' was generally very good. A high proportion of correct answers gave the textbook definition of a 'moment'. Those who did not gain the mark frequently knew that it was concerned with force but did not go on to relate it to a turning force.

(b) (i) Higher order candidates had no problem with this question. Other responses included a variety of values some having no relationship to the given load.

(ii) Before giving the description candidates had to carry out the calculation with an extra load placed at a given distance from the fulcrum. In many cases this was accurately done and the description then gained both marks. Marks were awarded for understanding shown.

Question 2

The mistake frequently made was to use gusset plates in a position where they would make no difference. To gain all three marks candidates had to show that the bench was rigid in all directions; to do this, triangulation had to be used. At least one diagonal brace across the front and the side were required, along with annotation to explain why the additional pieces would keep the frame rigid.

Question 3

A high proportion of responses suggested measuring the crack in the beam with a ruler. This method would not work in practice in terms of giving warning over a period of time. The use of a strain gauge with subsequent change in resistance value gained both marks. Accurate measurement using an electronic calliper would have also gained the marks. The simplest monitoring device would be a strip of glass glued across the crack. Breakage of the glass would immediately show increased movement.

Question 4

(a) The drawing of the motor and drive shaft showed the shafts in position parallel to each other. A number of connection methods given required the shafts at 90º to each other. The instruction 'State' should have given a clue that it was standard methods of transmitting drive that were needed. It is important for candidates to know the full name of the method, for example, belt and pulley, not just pulley. Chain and sprocket rather than just chain. Simple or compound gear train, not just gears.

(b) The mark scheme allowed a number of effects of transferring motion. Candidates in most cases picked out the obvious ones such as change in speed or direction of motion. Only a few mentioned the potential for slipping in a friction drive.

Question 5

(a) The majority of responses gave the effort correctly, any errors were between load and fulcrum.

(b) Very few incorrect responses to this part; in many cases it was clear that candidates had used the space around the diagram of the paperclip to work out the order of lever.

Question 6

(a) The mark scheme listed eight possible ways that LEDs can differ. In many cases three valid ways were given, in most cases where errors were made, two valid differences were given with the third being given as 'resistance' or 'voltage'.

(b) This question was not well answered. There was often confusion between LEDs, signal diodes and capacitors. A number of responses stated that there is a difference in leg length but did not state which was the shorter. Very few commented on the marking on the body of an electrolytic capacitor that normally gives a series of minus signs or in a few cases a series of plus signs. A few responses incorrectly gave a multimeter as the identification method.

Question 7

The LED and light dependent resistor were well known, any errors generally took place on the diode

Section B

Question 8

(a) (i) Most candidates scored well on this question.

(ii) At least one method of protection was given in most cases, with higher order candidates giving two specific methods of treatment. In some cases there was confusion shown with zinc coating and galvanising both given as different methods.

(iii) This question caused some difficulty with only a few candidates gaining all three marks. Shear force was commonly confused with torsion, tension or compression.
Two sketches should have been shown to indicate parts joined by a bolt and then the result of shear force on the bolt. Without having the bolt hold two parts together it is difficult to indicate how shear force can be applied.

(b) (i) Benefits of using an 'I' section beam were not well known. There were a few that realised the rigidity of the beam would be improved and that the strength to weight ratio would improve. Lower cost was accepted if it was related to the beam being a standard part or to less material being used in the manufacture.

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Question 9

(a) (i) The majority of responses to this question recognised the worm gear being used.

(ii) Most had gained the two available marks for the reasons for using a worm gear.

(iii) The two numbers involved in the ratio, 45 and 1, were frequently given in the wrong order. Candidates should remember that the first number refers to the number of turns of the drive gear and the second to the driven.

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(iv) Understanding of the nature of roller bearing and reasons for their use was not good.
A number of candidates had realised that they can be sealed for life but few made reference to the capability for resisting a high radial load. There was also some confusion between radial and axial loading of a bearing.

Question 10

(a) (i) Candidates who chose to answer this question generally knew what an astable signal was and could describe it using sketches and notes.

(ii) The PTM (push to make) switch action was well known to candidates but in some cases they had failed to note that the connection is broken when the switch is released.

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(b) (i) This was not an easy calculation but it was carried out successfully in a number of cases. The main cause of lost marks was in the conversion of the capacitor value to farads. In this case no marks were awarded for the correct use of units in the frequency but candidates should be advised that units should be used wherever possible.

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(c) This was a standard transistor driver circuit but it was not well known to many candidates. The emitter connection was the one that was most frequently correct but this had to be accompanied by a correct base connection to gain the mark. Most errors occurred in the output connections through not having the LED and resistor connected in series between the collector and positive rail.

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DESIGN AND TECHNOLOGY

Paper 0445/43

Systems and Control

Key messages

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General comments

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In ***Section B*** the majority of candidates had followed the rubric and only attempted one question. There was a sizeable minority though who had made a start on a second question, realised that they could not provide answers and then moved on to another question. The number who had attempted all three questions was less than in previous years.

The standard of sketches was generally high though in some cases better use could have been made of the available space.

When answering calculation questions candidates should be advised to include all stages of the calculation in their answers. In some cases where a calculator had been used the answer given was incorrect and gained no marks; if each stage had been included partial marks could be awarded. Candidates should look carefully at the units given in the question; particularly the electronics question. Conversion from one unit to another, e.g. microfarads to farads, was a frequent cause of lost marks.

In ***Section B*** the most popular question was on Structures, followed by Mechanisms with the Electronics question trailing by some way.

Marks gained for the ***Section B*** questions were the reverse of the popularity order; highest in the Electronics question and lowest in the Structures question.

Comments on questions

Section A

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Section B

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DESIGN AND TECHNOLOGY

Paper 0445/05
School Based Assessment

General comments

Moderators appreciate the work that Centres do in preparing their students for the coursework assignment and the care and attention over the administrative tasks required to accurately complete documentation.

The vast majority of work submitted was well structured and covered the assessment criteria. Some of the work submitted was creative and innovative with many candidates producing high quality, functional outcomes.

A growing number of Centres include individual candidate assessment sheets with supporting comments. These are very helpful for moderators to see how and where marks were awarded.

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

Some Centres submit 3D practical work and models with their folders for moderation. This is not required as there should be sufficient photographic evidence in the folders to show details of 2D and 3D modelling and of the final practical outcome.

This specification is not appropriate for group projects. Candidates must individually attempt all of the Assessment Objectives and must produce their own design folio.

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 well. Most candidates explained the need fully, using photographs where appropriate, and described the needs of the user group before producing a clear and detailed design brief. Some Centres were lenient in awarding marks in this section, a brief statement is not enough to access the middle or higher mark ranges.

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

2 Research into the Design Brief resulting in a Specification

The majority of candidates produced focused and relevant research. While most candidates produced research focused on the situation chosen, some candidates generate large amounts of generic information, much of which is not related to the brief.

Some specifications were very limited. They should state clearly the main functions and qualities of the product.

Most candidates made good use of the analysis of existing products to highlight particular design strengths and weaknesses and then used the information when generating a specification and when designing.

Specifications should include functional information such as the details and dimensions of items to be stored or fitted into the product.

3 Generation and exploration of Design Ideas

Although many Centres assess this section accurately and in line with CIE standards, a large number are still too generous. A wide range of different, well-annotated possibilities is required to access the higher mark range. Ideas should be evaluated on their suitability for further development making reference to the specification.

There were some excellent examples of exceptionally well-presented, innovative and creative design proposals.

4 Development of Proposed Solution

Most candidates presented clear evidence of developmental work.

Some Centres are generous with their assessment. Candidates must show evidence of their design decision – making and give reasons for selecting materials and manufacturing process to access the higher mark ranges.

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

5 Planning for Production

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

Many include appropriate Health and Safety considerations.

Most working drawings were of a good standard with many candidates producing high quality work. To achieve the highest mark ranges, drawings should include all details necessary such as all key dimensions and additional fixtures used e.g. hinges and screws, and finishes applied.

The working drawings should enable a third party to have all the information required to manufacture the product.

6 Product Realisation

Marking in this section is generally accurate and fair. Marks awarded are commensurate with the quality of work produced.

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

Candidates presented clear photographic evidence of the key stages of manufacture of the product to emphasize particular features and the quality of making. This is to be encouraged.

Centres are reminded to ensure that candidates present clear and detailed photographs of the completed product.

7 Testing and Evaluation

Some Centres tend to be generous when assessing this section. To access the higher mark range, candidates should, where possible, test the product in its intended environment and produce detailed evaluations of successes and possible weaknesses.

Many candidates included third party evaluations from clients or potential users of the product which is to be encouraged.

There should be clear photographic evidence of the product being tested in this section.

A tick list against the specification is not appropriate.

Candidates should use sketches and notes to recommend modifications and possible improvements based on their evaluation.