

DESIGN AND TECHNOLOGY

Paper 0445/05
Project

General comments.

Moderators greatly appreciate the work that Centres do in preparing their students for this assessment unit and acknowledge the care and attention over the administrative tasks required to accurately complete documentation. Centres are reminded that only design folders should be submitted. Practical outcomes and prototype 3D models should be photographed and presented in the design folder; they should not be forwarded for external moderation.

Work submitted was generally well structured and covered the assessment criteria. There were a number of exceptional projects, some were very innovative and many candidates produced well manufactured, high quality, functional outcomes. Centres and candidates are to be congratulated on the effort and care that goes into their projects.

Group work is not recommended for this specification. Centres should contact CIE before they allow candidates to commence group work.

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

Work was detailed and well presented. Design ideas were scanned in and there was clear photographic evidence of manufacture, testing and evaluation. It is not necessary for candidates to over decorate their work or use over large fonts to produce lengthy folders. Some candidates were spending time on unnecessary embellishment which carries no additional marks.

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

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

Comments on specific sections

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

A number of Centres were lenient in awarding marks in this section, a brief statement is not enough to access the middle or higher mark ranges.

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

The design opportunity and design brief were often communicated well. Candidates would benefit from looking at the needs and expectations of the selected user group in more detail. It would be useful to consider the type of environment in which the designed product will be used and highlight key issues.

2. Research into the Design Brief resulting in a Specification

The majority of candidates produced focused and relevant research. There were a significant number of candidates however, who produced very large amounts of information, most of which was not related to the brief. Research needs to be more focused on the situation chosen and specifications should state the main functions and qualities of the product. Many candidates did not access specific research directly related to their brief. For example, candidates designing storage for shoes should research the range of measurements of male and female shoes. If designing a cosmetic unit, then the information about the items to be stored is critical and should be present in this section.

Most candidates analyse existing products as part of their research but many do not draw out details that will help them when designing. Candidates should highlight the particular design strengths and weaknesses and use this information when generating a specification and when designing. Many specifications were clear and justified, however a significant number were too brief and generic. By explaining the design criteria in more detail, candidates show a greater understanding and can access a higher level of attainment. The best examples of work focused on key, relevant information which helped to support the candidates designing. The high level of personal observation and analysis lead to a detailed and relevant specification.

3. Generation and exploration of Design Ideas

Some of the work sampled had exceptionally well-presented, innovative and creative design proposals. Although most Centres assess this section accurately and in line with CIE standards, there are a significant number who assess too leniently. To access the higher mark range, a wide range of different, well-annotated possibilities is required. Ideas should be evaluated on their suitability for further development and make reference to the specification.

Evaluation and specification checks from some candidates were often basic and it was not clear why ideas had been selected for further development.

4. Development of Proposed Solution

Whilst most candidates had clear evidence of developmental work, this section was assessed too generously by a significant number of Centres. Some candidates had little or no evidence in their folders.

Having established which design is to be made, candidates need to work out the most suitable materials and methods of construction. They need to explain why these specific materials have been selected. The number of components and their sizes need to be established. Many students find model making very helpful at this stage. Seeing their design in 3D helps to make sure items will fit or products will be stable. An increasing number of candidates make very good use of 2D and 3D modelling and computer aided images to develop their design proposal.

5. Planning for Production

Working drawings continue to be of a good standard with many candidates producing high quality work. To achieve the highest mark ranges, drawings should include all details necessary such as key dimensions, additional fixtures used e.g. hinges and screws, and finishes applied. The best drawings should enable a third party to have all the information required to manufacture the product.

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

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

6. Product Realisation

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

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

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

7. Testing and Evaluation

Centres are generally assessing this section accurately but a significant number tend to be too lenient. To access the higher mark range, candidates should, where possible, test the product in its intended environment and produce detailed evaluations of successes and possible weaknesses. Many candidates tested their products against their original specification but failed to use sketches and notes to suggest proposals for further development if they had the opportunity.

Photographic evidence should be included in this section. A number of candidates included third party evaluations from clients or potential users of the product which is to be encouraged.

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 many words when describing a manufacturing method 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 a child's room.

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 that would hold a child's personal items by their bed.

- (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 access for child; items cannot be knocked off; match bedroom furniture/décor; wall mounted; floor standing. General responses such as 'durable' or 'aesthetic' can be awarded marks only where the specific reason for the requirement is given.
- (b) Most candidates were able to show two ways of making furniture safe for children. Appropriate responses included: rounded corners; chamfered/round edges; countersunk screws; non-toxic materials; hygienic finishes.
- (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 many fewer 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. In giving reasons for the selection of one idea, it was not acceptable to say simply that the idea matched the specification points.

- (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 shown in part (e), 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 fairly small number of candidates. Candidates appeared familiar with the requirements of a flat-pack holder for writing and drawing equipment in a child's room 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 holder and successful responses included: easily folded/transported prior to use; attractive colour/shape; appeals to children; stable in use; sections for each item; easy for items to be put in/taken out.
- (b) Candidates, generally, had no difficulty showing two methods of making lightweight materials hinge or fold. Methods included: scored surface; flexible tape; lightweight hinges; rings; comb; string.
- (c)
- (d)
- (e) See **Question 1 (c) – (g)**
- (f)
- (g)

Question 3

Only a small number of candidates answered this question. The requirements for the low level lighting 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 child's bedroom light and these included: interesting topic; bright colours; safe in use; easy to switch on; low voltage supply; automatic/timed switch off.
- (b) Candidates responded well in showing two different places in a bedroom where the light might be located. These included: on bed head; bedside table; on wall; from ceiling; in electrical socket.
- (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 many words when describing a manufacturing method 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 camping.

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 by far and the majority of candidates understood clearly the requirements of a unit that would allow food items to be stored and carried.

- (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: hygienic; easy to clean; waterproof; keep items fresh; easy to carry; collapsible for storage; sections for each type of item. General responses such as 'durable' or 'aesthetic' can be awarded marks only where the specific reason for the requirement is given.
- (b)** Most candidates were able to show two methods of joining sheet materials at right angles. Appropriate joints included: butt; lap; finger; housing; dovetail for wood; glued butt; lap for plastics; welded; soldered; brazed for metal. In all cases appropriate fittings and fixings including KD 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 many fewer 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. In giving reasons for the selection of one idea, it was not acceptable to say simply that the idea matched the specification points.
- (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 shown in **part (e)**, 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 fairly small number of candidates. Candidates appeared familiar with the requirements of a flat-pack cover for food items 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 cover and successful responses included: easily transported/stored prior to use; easy to open/close; hygienic; reference to potential materials; recycling potential.
- (b) Candidates, generally, had no difficulty showing two methods of making cardboard waterproof including: laminating with plastic; specialist paint/varnish; impregnated; wax coating; covered with waterproof material.
- (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 collapsible shelving unit were such that candidates could make use of their knowledge and experience of structures and mechanisms in an interesting context.

- (a) Most candidates had little difficulty identifying four additional points about the function of the shelving unit and these included: safe when unfolding; stable in use; waterproof for outside use; easy to clean; must not damage tent if used inside; easy to carry when folded.
- (b) Candidates responded well in showing two different methods by which the shelving unit could be used on uneven ground. These included: adjustable legs; adjustable feet; triangular base; system to reduce area of contact with ground; some form of anchor; packing blocks; wedges.
- (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 many words when describing a manufacturing method 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 tools and workshop equipment.

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 that would allow marking out tools to be held for storage and use.

- (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 transport/carry; stable in use on the bench; sensible shape for storage; space for each tool; easy to put tool in/take out; tools not damaged. General responses such as 'durable' or 'aesthetic' can be awarded marks only where the specific reason for the requirement is given.
- (b)** Most candidates were able to show two ways of holding tools in place. Appropriate methods included: in shaped recess; holes; clips; magnets; slots; tubes.
- (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 many fewer 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. In giving reasons for the selection of one idea, it was not acceptable to say simply that the idea matched the specification points.

- (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 shown in part (e), 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 drills 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: attractive colour/shape/layout; simple wording; window/opening to see drills; easy access to drills; stable as a stand.
- (b) Candidates, generally, had no difficulty showing two ways of holding items inside packaging including: holes; slots; vacuum formed tray; clips; rubber bands.
- (c)
- (d) See Question 1 (c) – (g)
- (e)
- (f)
- (g)

Question 3

A very small number of candidates answered this question. The requirements for the holding device for small items when soldering were such that candidates could make use of their knowledge and experience of systems and control in an interesting context.

- (a) Most candidates had little difficulty identifying four additional points about the function of the holding device and these included: adjusts to different sizes/shapes/distances; heatproof; stable in use; access for soldering iron; does not damage items being held; clear view of items.
- (b) Candidates responded well in showing two different ways of gripping small items. These included: jaws; crocodile clips; spring clips; rubber bands; tapered slots/holes; tweezers.
- (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**. 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 part of **Question A3** or answered all the questions.

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

There are areas of the syllabus however, in which further improvements are needed. Candidates must be able to draw a planometric view of a simple circular shape from given information and enlarge a geometric shape using one-point perspective.

Comments on specific questions

Question A1

Designs for Card Packages

- (a) Part **A** required an isometric view to be completed. Successful candidates drew the window with equal space top and bottom and the window extending half way across each face. Inside back and bottom edges were also required to be drawn
- (b) Part **B** required orthographic views of a packaging with a clear window to be completed. The correct solution showed a complete rectangular front view, with a diagonal line from the top left corner to the bottom right corner. A plan view with a diagonal line from the top right corner to the bottom left and an end view with a diagonal line from the top right corner to the bottom left.

Question A2

- (a) (i) A suitable plastic for the windows would be acetate or cellophane or acrylic or polypropylene.
- (ii) The main reasons for using the above materials for the window were: easy to cut; see through; tough; can be folded into shape.
- (b) A sketch and notes were required to show how the transparent window could be fixed in place on the card package. The most common correct answers showed the window overlapping the opening with adhesive or double-sided tape securing the window in place.

Question A3

Packaging for a metal cup

Most candidates attempted all parts of this compulsory question.

- (a) The question asked candidates to complete a full size planometric view of the metal cup. Many candidates attempted to draw the cup in isometric. In planometric projection, circular objects are drawn as a true circle which makes the solution easier to draw.
- (b) Candidates were asked to draw a pie chart to show the relative sales figures for the red, blue and yellow versions of design **B** in 2015. The given data added up to 1800 and by simple calculation, this gave sectors of 160°, 80° and 120°.

Question B4

Perfume Bottle

A classroom exercise to make the packaging in corrugated cardboard would be useful for future candidates' understanding, as this is a commonly used application.

This question was attempted by a large number of the candidates.

- (a) Candidates were asked to complete the two point-perspective of the perfume bottle. Most candidates completed the right side of the bottle using lines to VP2. Completing the label for 'glow' required candidates to align the top and bottom to VP1 and add relative space to the left of the label. The drawing of the top required candidates to, determine the mid-point of each side of the top and project this vertically to give the height of the top. Using parallel lines the top can then be drawn in and the visible side lined in.
- (b) (i) Candidates were required to give two decisions that needed to be made when selecting the lettering. Two responses from: font; size; style (bold italic etc.) and colour were accepted.
(ii) Using a sketch and notes candidates were asked to explain how thermochromic ink is affected by changes in temperature.
- (c) (i) Candidates were required to draw a sectional view of corrugated cardboard. Successful responses showed a top and bottom layer of card with corrugations in the middle.
(ii) Acceptable answers for the properties of corrugated card that make it suitable for packaging were: gives protection; has a smooth surface to write/print on; easy to cut and be recycled.

Question B5

Sports Company Logo

This question was attempted by many of the candidates.

- (a) Candidates were required to complete the enlargement of the given logo using a single point-perspective drawing system. Lines needed to be projected back through the given logo to the VP. By projecting verticals from the box containing 'LEAP', reference points (corners) can be plotted on the lines projected from the VP to give the corners of the enlarged squares.
- (b) This part of the question required candidates to describe the process of screen printing. The question required the following to be evident in the candidate's answer: frame; mesh/screen; positioning screen on tee-shirt; ink; squeegee across tee-shirt; logo appears on the tee-shirt. The correct order was also required in the response.
- (c) Candidates were required to apply the thick and thin line technique to the given view. Correct responses showed thick lines applied to all the outer edges and the inner triangle. The principal required was, thick lines are only applied where only one side can be seen producing the edge.
- (d) It is very important that candidates understand the scales that are commonly used in drawing.

DESIGN AND TECHNOLOGY

<p>Paper 0445/22 Graphic Products</p>

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 answered all the questions.

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

There are areas of the syllabus however, in which further improvements are needed. Candidates must be able to apply lettering in isometric and draw a solid object to size in two-point perspective projection.

Comments on specific questions

Question A1

Designs for Boxes

- (a) Candidates were required to complete the drawing in full size isometric view, of a box made from card. Successful candidates completed the isometric rectangle on the end face and applied lettering to make the word 'FRAGILE' in isometric. The arrow given in the front view in orthographic projection was then to be applied to the front view in isometric. Successful candidates took the sizes of the arrow from the orthographic and used these to draw an arrow centrally on the front face.
- (b) Candidates were required to complete the two orthographic views given the isometric view of a box with a lid. The front view required a vertical line and a horizontal line to be added. The end view required the box outline to be completed. A diagonal line drawn from the right side, but below the top line, to a point on the left side that coincided with the horizontal line of the front view completed the question requirement.

Question A2

- (a) An understanding of the use of self-adhesive vinyl was required. Candidates were asked to give two reasons why self adhesive vinyl was suitable for the FRAGILE label. Acceptable answers included: resists moisture; easy to apply; available in a range of colours; smooth flat surface for printing on; does not require glue to fix to the box.
- (b) The question asked for sketches and notes to show a design that would allow the lid to lift off the base. Successful candidates showed a sketch of a liner of a slightly smaller size to the base or top. Accompanying notes supported the design sketch.

Question A3

Corrugated card packaging

Unfortunately, some candidates did not attempt all parts of this compulsory question.

- (a) (i) The question asked candidates to complete the planometric view of a corrugated card divider. This is a common application in packaging and should not have been challenging for candidates. Three sides needed to be drawn (top right, bottom left and top left) to complete the drawing. The sides had to be the same width as that given and the corrugation shown clearly on the top face.
- (ii) Candidates were asked to draw slots on each part of the divider to show how the two parts would be joined at 90°. A central slot was needed on each piece of card to a width consistent with the thickness. The slot needed to be made exactly half way so that the two pieces could be joined as a cross-halving joint.
- (b) The box was available in three sizes, large medium and small. Candidates were asked to draw a bar chart showing the relative sales of the three sizes. The question required a solution that showed three bars of a consistent width, an accurate vertical scale, data correctly plotted and correct labels on the horizontal axis.

Question B4

Display Stand

This question was attempted by a number of candidates.

- (a) Many candidates were able to produce a two point perspective view of the base of the point of sale display stand.
- Many candidates managed to connect the front lines to VP1 and VP2. Most candidates drew in the back left and right lines correctly to VP1 and VP2. Once the bottom of the upright had been drawn to VP1, the left hand upright could be drawn. The top of the upright connected with the left upright line to complete the drawing of the upright. The top and bottom edges of the shelf needed to be drawn to VP1 and the end of the shelf determined by drawing the underneath edge from the right upright towards VP1.
- (b) (i) Candidates were asked to draw a sectional view of foam board. Successful solutions showed a top and bottom layer of card or paper with foam inner.
- (ii) Two properties of foam board were required. Suitable answers were: easy to cut, lightweight; smooth surface for printing on; rigid; available in a range of colours; can be written on by hand.
- (c) The question asked candidates to complete the three pieces of equipment needed to cut the foam board. A cutting mat was a common answer. Two other pieces of equipment would be a Stanley Knife or craft knife or scalpel, and, a steel rule or safety rule or straight metal edge. Knife and wooden rule were not accepted as correct answers.

Question B5

Blister Packaging

This question was attempted by many candidates.

- (a) This question required candidates to draw a reduced size drawing of the complete blister pack using one-point perspective. The outer corners of the backing needed to be drawn to VP1 and parallel lines to the original top and bottom lines drawn on the reduction to give the outer size. Similar lines to VP1 needed to be drawn from the original to VP1 and further parallel lines of the given blister plastic drawn to give the reduced size.
- (b) This question required candidates to show an understanding of lithography. Many candidates drew the side view of rollers but failed to explain or illustrate that colour separation of the digital image is

required to determine each of four plates. The plates have to be used to print the three separate colours and black. This process is commonly referred to as CYMK and requires each plate to be 'registered' to give a clear final print copy.

- (c) Candidates were required to explain why the flange is needed on the plastic blister. The correct answer is that it is needed to glue or staple the blister to the backing card.
- (d) A modification was required to enable the packaging to be hung on a point of sales rack. The simplest solution was a hole. However, the most common correct response from candidates was a 'euroslot'.

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

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

There are areas of the syllabus however, in which further improvements are needed. Candidates must be able to apply lettering in isometric and draw a solid object to size in two-point perspective projection.

Comments on specific questions

Question A1

Designs for Boxes

- (a) Candidates were required to complete the drawing in full size isometric view, of a box made from card. Successful candidates completed the isometric rectangle on the end face and applied lettering to make the word 'FRAGILE' in isometric. The arrow given in the front view in orthographic projection was then to be applied to the front view in isometric. Successful candidates took the sizes of the arrow from the orthographic and used these to draw an arrow centrally on the front face.
- (b) Candidates were required to complete the two orthographic views given the isometric view of a box with a lid. The front view required a vertical line and a horizontal line to be added. The end view required the box outline to be completed. A diagonal line drawn from the right side, but below the top line, to a point on the left side that coincided with the horizontal line of the front view completed the question requirement.

Question A2

- (a) An understanding of the use of self-adhesive vinyl was required. Candidates were asked to give two reasons why self adhesive vinyl was suitable for the FRAGILE label. Acceptable answers included: resists moisture; easy to apply; available in a range of colours; smooth flat surface for printing on; does not require glue to fix to the box.
- (b) The question asked for sketches and notes to show a design that would allow the lid to lift off the base. Successful candidates showed a sketch of a liner of a slightly smaller size to the base or top. Accompanying notes supported the design sketch.

Question A3

Corrugated card packaging

Unfortunately, some candidates did not attempt all parts of this compulsory question.

- (a) (i) The question asked candidates to complete the planometric view of a corrugated card divider. This is a common application in packaging and should not have been challenging for candidates. Three sides needed to be drawn (top right, bottom left and top left) to complete the drawing. The sides had to be the same width as that given and the corrugation shown clearly on the top face.
- (ii) Candidates were asked to draw slots on each part of the divider to show how the two parts would be joined at 90°. A central slot was needed on each piece of card to a width consistent with the thickness. The slot needed to be made exactly half way so that the two pieces could be joined as a cross-halving joint.
- (b) The box was available in three sizes, large medium and small. Candidates were asked to draw a bar chart showing the relative sales of the three sizes. The question required a solution that showed three bars of a consistent width, an accurate vertical scale, data correctly plotted and correct labels on the horizontal axis.

Question B4

Display Stand

This question was attempted by a number of candidates.

- (a) Many candidates were able to produce a two point perspective view of the base of the point of sale display stand.
- Many candidates managed to connect the front lines to VP1 and VP2. Most candidates drew in the back left and right lines correctly to VP1 and VP2. Once the bottom of the upright had been drawn to VP1, the left hand upright could be drawn. The top of the upright connected with the left upright line to complete the drawing of the upright. The top and bottom edges of the shelf needed to be drawn to VP1 and the end of the shelf determined by drawing the underneath edge from the right upright towards VP1.
- (b) (i) Candidates were asked to draw a sectional view of foam board. Successful solutions showed a top and bottom layer of card or paper with foam inner.
- (ii) Two properties of foam board were required. Suitable answers were: easy to cut, lightweight; smooth surface for printing on; rigid; available in a range of colours; can be written on by hand.
- (c) The question asked candidates to complete the three pieces of equipment needed to cut the foam board. A cutting mat was a common answer. Two other pieces of equipment would be a Stanley Knife or craft knife or scalpel, and, a steel rule or safety rule or straight metal edge. Knife and wooden rule were not accepted as correct answers.

Question B5

Blister Packaging

This question was attempted by many candidates.

- (a) This question required candidates to draw a reduced size drawing of the complete blister pack using one-point perspective. The outer corners of the backing needed to be drawn to VP1 and parallel lines to the original top and bottom lines drawn on the reduction to give the outer size. Similar lines to VP1 needed to be drawn from the original to VP1 and further parallel lines of the given blister plastic drawn to give the reduced size.
- (b) This question required candidates to show an understanding of lithography. Many candidates drew the side view of rollers but failed to explain or illustrate that colour separation of the digital image is

required to determine each of four plates. The plates have to be used to print the three separate colours and black. This process is commonly referred to as CYMK and requires each plate to be 'registered' to give a clear final print copy.

- (c) Candidates were required to explain why the flange is needed on the plastic blister. The correct answer is that it is needed to glue or staple the blister to the backing card.
- (d) A modification was required to enable the packaging to be hung on a point of sales rack. The simplest solution was a hole. However, the most common correct response from candidates was a 'euroslot'.

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Resistant Materials

Key messages

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- 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

There were many occasions where answers by given by candidates did not relate to the question. For example, in Question 6, when asked to give a specific use for each of the saws shown, many candidates named the saws. In Question 8 when asked to name a process, many candidates named a material.

Generally it was both disappointing and worrying that many candidates failed to demonstrate even a basic knowledge and understanding of Design and Technology: Resistant Materials.

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 Design and Technology 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

- 1 Very few candidates could name a specific material for all three products. Many candidates achieved 1 or 2 marks.
- 2 Many candidates made reasonable or good drawings of dovetail nailing. However, there were many occasions where candidates had no understanding at all.
- 3(a)(b) It was disappointing that many candidates had no knowledge of a bench hook, [sometimes referred to as a sawing board]. Without this knowledge it was unlikely that candidates could describe how it would be used in part (b).
- 4 Most candidates were unable to draw a tongue and groove joint.
- 5(a) Very few candidates were able to name the process by which the upright part of the aluminium shelving system would be made: extrusion.
- (b) Very few candidates could name two finishes that could be applied to the aluminium shelving system: the best answers included paint, lacquer, dip coating and anodising. Many incorrect answers including varnish were suitable for wood-based products and the answer 'spray' needed to refer to paint to achieve a mark.
- 6 To provide a specific use for each of the 3 saws shown, candidates needed to identify them first as a tenon saw, coping saw and hacksaw. Only a minority of candidates provided correct specific uses for all 3 saws. There was much confusion about the coping saw and hacksaw as to whether they were used to cut wood, plastic and/or metal.
- 7 It was evident from the answers provided that the majority of candidates had no experience whatsoever of using a mortise gauge. There were a few excellent answers that described how the distance between the spurs would be set, followed by the distance from the stock to the first spur. A mark was awarded for those candidates who stated that the gauge would be tightened before use.
- 8(a)(b) Only an extremely small minority of candidates could name the processes by which the handset could be made from plastic, [injection moulding] or metal, [die-casting]. Sand casting was not considered an appropriate method of manufacture.
- 9 Many candidates attempted to show at least one fault due to poor seasoning: the most common answers included warp, bow, cup, shrink and split.
- 10(a) Very few candidates named the laminating process. Steam bending was not rewarded.
- (b) Some candidates were able to identify the former or mould for **A** and some form of clamp for **B**.

Section B

Question 11

- (a) Many candidates achieved a mark for describing a benefit of buying self-assembly furniture: the most common answers being the convenience of transporting the furniture home and the personal satisfaction of assembling it.
- (b) Many candidates gained at least 2 marks for describing the stages involved when cutting out the slot. The best answers showed a drilled hole for a coping or scroll saw blade, followed by the use of a file and abrasive paper.
- (c) The majority of candidates did not understand that the stand could not be joined to the table without the use of additional materials. The question did state: 'Additional materials may be used.' Many candidates used nails, screws and dowels inappropriately. A mark was awarded for a specifically named appropriate adhesive such as PVA. There were a few excellent answers where candidates attached an extra piece of wood to which the stand could be fixed permanently.

- (d)(i) Many candidates stated an appropriate diameter of dowel: minimum 6mm and maximum 12mm.
- (d)(ii) The question required candidates to 'Draw on Fig. 9...' However, many candidates did not follow this instruction. Many candidates were unable to mark out the positions clearly with many simply drawing the holes or dowel rather than the centres where the holes would be drilled.
- (e) There were 6 marks available for candidates to achieve for this question. The question gave four specific bullet points that needed to be addressed. The majority of candidates did not attempt to address all four bullet points and therefore denied themselves the opportunity of gaining marks. There were a few excellent answers where candidates named the material- mild steel, the length- 19mm-35mm, the type of head- countersink and the number required- at least 2 screws.
- (f)(i) The majority of candidates incorrectly stated that **A** would be the stronger design of rack. Design **B** was two pieces of wood joined together which would have provided a stronger structure.
- (ii) Many candidates gained at least 1 mark for explaining why **A** was more wasteful because a large amount of material would need to be removed when producing the rebate whereas **B** was constructed from two individually cut pieces of wood.
- (g) The majority of candidates did not read this question carefully enough and simply named 2 finishes for the table and magazine rack. The question asked for 2 properties of a finish that would be suitable. A minority of candidates answered the question correctly, describing how the choice of finish would need to be stain resistant, attractive, heatproof or hardwearing.

Question 12

- (a) Many candidates gained marks for stating that acrylic was attractive, it could be formed and worked easily and that it was self-finished and available in a range of colours. Answers such as 'lightweight' were not correct.
- (b) The best items of research related to the items to be stored, their dimensions and that of the desk. Many candidates simply stated 'pens' or 'pencils' without any further details and did not achieve any marks.
- (c) The majority of candidates understood that it would be easier to drill the holes in the acrylic before bending it and that there was a danger that it could crack due to the lack of support during drilling.
- (d) Many candidates correctly described how a coping or scroll saw to cut out the semi-circular shape would be used, followed by the use of round or half-round files and wet and dry [silicon carbide paper].
- (e) The majority of candidates achieved marks for demonstrating a sound knowledge of bending acrylic to shape, using a strip heater or line bender, some type of former and a method of keeping the shape while the acrylic cooled down.
- (f) The majority of candidates provided practical modifications to prevent the pencils from sliding about and storage for paper clips. Most methods for preventing the pencils from slipping involved the use of drilled holes below to retain the ends of the pencils. Some candidates described more complicated modifications for paper clip storage including a drawer. The best designs showed some form of 'box' attached to the side of the desk tidy.
- (g)(i) The best benefits of using hardwood for the base of the desk tidy were that it would be provide stability due to its weight and its attractive appearance.
- (ii) An appropriate thickness would have been between 10mm minimum and 20mm maximum. Many candidates gave an appropriate thickness.
- (iii) Only a small minority of candidates understood that the bevelled edges could be produced by means of a smoothing or jack plane or a machine saw. The hardwood could have been supported in a vice and the edges planed. Some candidates showed the use of a band saw with either the table tilted to the required angle or with the work piece tilted at the required angle on a level table.

- (iv) Some candidates did read the question carefully and described how the acrylic desk tidy could be joined to the hardwood base by means of screws. For maximum marks candidates needed to show the positions for the screws and give some indication of their length or type of head. Unfortunately many candidates did not read the question carefully and showed the desk tidy and base joined by means of PVA glue. The question stated ‘...without the use of an adhesive.’

Question 13

This question was attempted by very few candidates. Generally, candidates showed little or no knowledge or understanding of practical techniques when working with aluminium.

- (a) The best reasons for using aluminium for the bird feeder included its resistance to corrosion, lightweight and that it could be bent to shape easily.
- (b) (i) Most answers included at least one correctly named marking out tool, including a steel rule and try square. Some candidates named tools such as a marker pen and pencil that were not appropriate.
- (ii) Candidates demonstrated little or no understanding of how the shape of the bird feeder could be cut out of sheet aluminium.
- (iii) Knowledge of bending the aluminium to the required shape was non-existent. Some candidates described how a strip heater could be used. A strip heater is used when heating plastic to be bent to shape.
- (c) (i) Candidates showed no knowledge of the pop riveting process.
- (ii) Some candidates stated correctly that pop riveting was quicker and easier to carry out over traditional riveting techniques.
- (d) (i) It was disappointing that most candidates could not draw an appropriate shape for a vacuum formed plastic container to hold water for the birds.
- (ii) Without a suitable design for the container, candidates were generally unable to draw the design of a mould that could be used to vacuum form the container.
- (iii) Some candidates correctly named polystyrene for the vacuum formed plastic.
- (e) Generally, answers to this question were poor. Very few candidates concentrated on making modifications to the design of the bird feeder and tended to concentrate on the use of rope which could be used to hang up the bird feeder.

DESIGN AND TECHNOLOGY

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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 of the questions tested the candidate's knowledge and understanding of tools, materials and processes. There were many good performances by candidates answering this section.

Section B

This section always has a number of questions with large mark allocations requiring a combination of clear and accurate sketches supported by detailed written notes. Careful reading of the questions is needed before answering. In some cases, candidates provided information not asked for in the question, which could not be given any credit. For example, in **Question 11(c)**, when the question asked candidates to "*show how the clock hand could be cut out....*" **no marks** are allocated for providing details of marking out. In addition candidates need to be clear about those techniques that are used specifically when working with plastic, metal and wood. For example, glass paper was often used inappropriately when finishing acrylic.

Comments on specific questions

Section A

Question 1

Most candidates named at least two of the saws correctly.

Question 2

Most candidates named stainless steel and copper correctly for the metal spoon and metal wire respectively. Candidates were less sure about the plastic used to make the bowl. HDPE was the best material.

Question 3

Many candidates produced an accurate sketch of a half lap joint.

Question 4

Most candidates named at least two of the marking out tools correctly.

Question 5(a)

The majority of candidates thought that a marking knife would be used rather than a pencil so that the marks would be clearer and could not be easily erased. The correct reason was that the marking knife provided a cut in the fibres of the wood which would act as a guide for the saw.

Question 5(b)

Although many candidates named incorrect tools for marking out the angled lines it was pleasing to read many correct answers naming a sliding bevel and mitre square.

Question 6

Only a small minority of candidates were able to name both extrusion and blow moulding as the processes used to manufacture the plastic channel and plastic container respectively.

Question 7(a) and (b)

Very few candidates could sketch a square haunch tenon in **part (a)**. Many candidates did describe how the square haunch would provide increased strength and stability in **part (b)**.

Question 8

Most candidates were able to name only one of the drill bits correctly.

Question 9

Most candidates named at least two of the tools used to cut sheet metal.

Question 10

Many candidates did not read the question carefully and provided incorrect answers. In **part (a)** candidates were required to name a suitable adhesive to glue two pieces of pine together. Many candidates named PVA correctly. Some candidates carelessly named PVC incorrectly. In **part (b)** there were many correct answers: epoxy resin being the best choice of adhesive. However, many candidates named brazing or welding which are not adhesives.

Section B

Question 11

- (a) Many candidates gave at least one specification point. Candidates are encouraged to tackle questions like this by stating: 'the clock must.....', followed by points such as wall-mounted, freestanding or be seen from a distance.
- (b) (i) Many candidates gave two safety precautions to be taken when using a jigsaw: the most common being to wear glasses/goggles, to secure the plywood sheet and to make sure there were no trailing leads or obstacles below the plywood sheet.
- (b) (ii) Most candidates achieved 2 marks for describing how the shape would be made round using a combination of disk sander, files and glass paper. Some candidates ignored the part of the question that stated '...after it has been cut out with a jigsaw' and either described how it would be cut out using a jigsaw or an alternative appropriate saw. No marks were awarded for these descriptions.

- (c) It was disappointing that many candidates confused the processes associated with cutting out and finishing acrylic with those used with wood or metal. To achieve maximum marks candidates needed to use a combination of sketches and notes to show how the acrylic could be sawn using a scroll saw or coping saw; the use of files to shape precisely and the use of wet and dry [silicon carbide] paper, polishing mop and compound to produce a high quality finish.
- (d) Many candidates did not provide benefits of using acrylic for the clock hands. Many answers referred to acrylic being lightweight which is irrelevant. The best answers related to its inherent colour, the range of colours available and its attractive appearance.
- (e) There were many good answers showing the hands fitted by means of nuts and bolts to provide a secure fitting. However, most candidates did not include a washer to assist movement.
- (f) There were many vague answers that gained no marks. Many candidates simply stated 'quicker', 'faster' or 'easier'. To gain a mark candidates needed to state 'faster than drawing by hand' or 'easier to produce many of the same quality'. Centres are reminded that the use of CAD/CAM is an increasingly important area within Design and Technology.
- (g) For a maximum of 3 marks candidates needed to show a practical stand or support. An additional 2 marks were available for details of materials, fittings and constructions. Often candidates produced sketches showing a potentially successful design but failed to provide sufficient clarity in the sketches or additional details such as the materials used and how they would be joined.
- (h) Most candidates provided sketches showing how the clock could be wall-mounted by means of a single nail or screw fixed into the wall. These answers tended to be very crude. Better answers included the use of wooden or metal brackets attached to the back of the clock and to the wall.

Question 12

- (a) While many candidates gave one advantage of veneered chipboard over solid wood for the shelves of the unit there were many misconceptions about the material, including: chipboard is lighter than solid wood and that it is easier to work. While manufactured boards are available in greater widths than solid wood this particular benefit was not relevant to this design as the shelves were only 140 mm wide.
- (b)(i) Most candidates lacked any knowledge of how the mild steel rod would be held around the former in order to achieve the bent shape for the end frame.
- (ii) The vast majority of candidates did not understand what was meant by the term 'work hardened'.
- (c) The majority of candidates had some knowledge of brazing although some did confuse brazing with welding. There were some excellent accounts of the brazing process including how the steel would be prepared prior to being heated. Some candidates were able to achieve the maximum 8 marks for showing detailed stages in sequence.
- (d) Many candidates achieved up to 3 marks for showing the shelf fitted to the end frame by means of screws. This was the simplest but not the best method and up to 3 marks were allocated dependent on the details provided about the screws, for example, their material, length, type of head. The best answers showed additional 'plates', usually made from steel, that were joined to the end frames allowing the shelves to then be screwed onto the plates. For these answers a maximum of 6 marks was available.
- (e) Many candidates demonstrated a reasonable knowledge of environmental issues relating to mild steel and veneered chipboard. The best answers stated that steel could be recycled or reused and that veneered chipboard often used reclaimed materials and therefore did not use up new resources.
- (f) Only a minority of candidates could give two reasons for making the unit with chipboard ends rather than steel frames. The best answers referred to the ends giving a more solid appearance, that items were less likely to fall off the shelves and that it would be easier to construct.

Question 13

- (a) Many candidates stated that oak was attractive, it was hardwearing, tough and moisture resistant.
- (b) Very few candidates achieved the maximum 5 marks for this question. Often, key stages were omitted from their answers. To produce the final shape the wood could be clamped to a bench and most of the waste sawn off using a tenon saw. Use of a scroll saw or band saw was equally efficient. Many candidates used files to get the surface flat and smooth. The use of files was not appropriate. Having removed most of the waste a smoothing or jack plane would be used and the surfaces made smooth by means of glass paper.
- (c) There were 8 marks available for this design-type question. The bullet points were to assist candidates to focus on the important points for which specific marks were allocated. There was a full range of answers. The best designs showed an additional 'bracket' to which a rod was inserted to enable a rail to swing from side to side. The rails could then be spaced apart without them dropping. To achieve maximum marks candidates needed to include as much detail about the additional materials they would use and how they would be constructed.
- (d) Many candidates gained at least 1 mark for showing a simple but crude single nail or screw in the wall and a hole in the back of the towel holder. Although the question specifically asked candidates not to drill holes in the front of the towel holder, some candidates did. The best designs involved the use of simple 'plates' or 'brackets' fitted to the back of the towel holder which, in turn, could be fixed against a wall.
- (e)(i) Generally, answers to this question were good. Many candidates correctly stated that clear polyurethane varnish would allow the natural beauty of the wood to be seen. Other good answers referred to the need to protect the surface of the wood and make it water resistant.
- (e)(ii) The important part of this question was to describe how the parts of the towel holder would be prepared to take a clear polyurethane varnish. This means **before** the varnish would be applied. Many candidates gave answers that included application and gained no reward. However, many candidates did include essential stages including the use various grades of glass paper and the removal of dust.

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There were many occasions where answers by given by candidates did not relate to the question. For example, in Question 6, when asked to give a specific use for each of the saws shown, many candidates named the saws. In Question 8 when asked to name a process, many candidates named a material.

Generally it was both disappointing and worrying that many candidates failed to demonstrate even a basic knowledge and understanding of Design and Technology: Resistant Materials.

Section A

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Section B

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Question 13

This question was attempted by very few candidates. Generally, candidates showed little or no knowledge or understanding of practical techniques when working with aluminium.

- (a) The best reasons for using aluminium for the bird feeder included its resistance to corrosion, lightweight and that it could be bent to shape easily.
- (b) (i) Most answers included at least one correctly named marking out tool, including a steel rule and try square. Some candidates named tools such as a marker pen and pencil that were not appropriate.
- (ii) Candidates demonstrated little or no understanding of how the shape of the bird feeder could be cut out of sheet aluminium.
- (iii) Knowledge of bending the aluminium to the required shape was non-existent. Some candidates described how a strip heater could be used. A strip heater is used when heating plastic to be bent to shape.
- (c) (i) Candidates showed no knowledge of the pop riveting process.
- (ii) Some candidates stated correctly that pop riveting was quicker and easier to carry out over traditional riveting techniques.
- (d) (i) It was disappointing that most candidates could not draw an appropriate shape for a vacuum formed plastic container to hold water for the birds.
- (ii) Without a suitable design for the container, candidates were generally unable to draw the design of a mould that could be used to vacuum form the container.
- (iii) Some candidates correctly named polystyrene for the vacuum formed plastic.
- (e) Generally, answers to this question were poor. Very few candidates concentrated on making modifications to the design of the bird feeder and tended to concentrate on the use of rope which could be used to hang up the bird feeder.

DESIGN AND TECHNOLOGY

Paper 0445/41
Systems and Control

Section 2

Key messages

- Responses should appear in the area of the paper allocated for the response. Any parts of a response that do not fit in the space provided 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. Continuing a response in the space for the response to the next question must be avoided.
- Candidates should be reminded that clear writing and clear annotation to sketches are important.
- Those candidates who had chosen to answer the electronics question had generally made use of the given formula for their response. It is good practice to then apply the correct units to the final answer.
- There were a number of candidates who failed to give any sort of response to parts of a question. It is important candidates are aware that no response means that no mark can be awarded; candidates should be encouraged to offer a response that could potentially gain a mark rather than leaving a blank space.
- 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.

Section 3

General comments

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 good.

Where necessary candidates should be encouraged to illustrate their answer if it will provide more information and prevent ambiguity. This was the case in **1(c)**, where a number of the responses seen did not give adequate clarity in the written description.

In **Section B**, all candidates had followed the rubric and only attempted one question. There were a few who had made a start on a question, and then moved on to another question.

The standard of sketches was generally high though in some cases better use could have been made of the response space. This applied in **Question 9(c)(i)** where a number of the sketches were so small that any detail could not be clearly seen. Candidates should be encouraged to produce sketches and notes to fill the available space.

When answering calculation questions candidates should be advised to include all stage of the calculation in their answers, this will allow part marks to be awarded where the final answer is incorrect. Candidates should look carefully at the units given in the question; particularly the electronics question.

In **Section B** the most popular choice was once again the Structures question, followed by the Electronics question with Mechanisms having almost as many responses.

The highest marks in Section B were seen in the Electronics question.

Section 4

Comments on questions

Section A

Question 1

- (a) There were a number of incorrect responses that named the test instrument as a strain gauge/ stress gauge/pressure gauge. Dial gauge, dial indicator gauge or clock gauge gained the mark.
- (b) The majority of responses were correct in referring to deflection, bending or flexing.
- (c) As noted in the general comments written descriptions of the method used were not always clear enough to gain a mark. The second mark for describing how the method reduced movement could not generally be awarded as it was not included in the response.

Question 2

- (a) The majority of responses identifying the order of lever used were correct.
- (b) Clear sketches and adequate annotation were seen in most cases.

Question 3

- (a) Almost all candidates gained the mark for identifying silver as the conductor in the list.
- (b) The expected response was that reference would be made to the moisture content of the wood. The fact that wood can burn if there is a fault was also credited with a mark.

Question 4

- (a) (i) The base pin was generally identified correctly. Positions of the emitter and collector were often reversed.
(ii) The emitter was correctly named in the majority of cases.
- (b) A number of advantages of larger pads and tracks could have been given and most candidates gained at least one mark. Very few of the responses referred to the advantages when manufacturing the board; less chance of drill breaking through the pad or track, less chance of track being etched away.

Question 5

The voltmeter and ammeter were generally identified correctly; the motor symbol was frequently identified as a multimeter.

Question 6

There were a number of power sources that could have been used to answer this question. Most candidates had concentrated on those providing electrical power, very few had mentioned power provided by a spring or gravity.

Question 7

- (a) The mechanism was recognised by all but a few candidates as being a ratchet and pawl. Those who got it wrong had often named it as rack and pinion; almost all candidates had provided a response.
- (b) Clear knowledge of why the mechanism is used was shown, with most gaining a mark for knowing that the movement is restricted to one direction.

Question 8

This question was generally well answered with the majority gaining both marks. Errors included reversing the conversion of motion or using the same term for both input and output.

Section B

Question 9

- (a) There were very few errors seen in responses to this question. Lines had been drawn clearly between materials and properties.
- (b) (i) Responses showed understanding of how a tower crane is stabilised by the concrete blocks forming a counterweight. The second mark in the explanation should have referred to maintenance of equilibrium in the crane; simplified terms such as 'to stop the cranes from falling' were accepted.
 - (ii) Use of triangulation to give rigidity was clearly recognised in most cases.
 - (iii) Torsion was accurately described as a turning or twisting force in the majority of cases.
 - (iv) Two causes of torsion were given in most responses, weather conditions/high winds being the most popular choice with the acceleration/deceleration caused by moving the jib of the crane being offered by more able candidates.
- (c) (i) The requirement in this part was for an end to end joint, the position of the two pieces being given in the question. A number of candidates had failed to place any sort of support against the ends of the timber, using instead a variety of dowel joints.

Those who had used a recognised principle such as plates on either side were rewarded. Positions of fixings and details of extra components were required for the remaining marks. Sketches in general were clear but as previously noted were too small in some cases.

 - (ii) There were a number of allowable advantages of lamination that could have been used but in most cases the extended length of the beam that could be seen from the given drawing was used.
 - (iii) Some good answers with clear understanding of the purpose of wood joints were seen. The better responses noted that the dovetail shape of the horizontal member would resist tension.
 - (iv) Most of the correct responses referred to the temporary nature of a screwed joint. Few had noted that the precise position of the horizontal can be adjusted before final fixing.
- (d) (i) This question caused problems for a number of candidates and was one of the few parts where no attempt was made to provide an answer. The position of the vertical force right next to the wall was the key to recognising it as shear.
 - (ii) There were no answers to this question that showed understanding or knowledge of a factor of safety. A number of candidates had made an attempt and gained marks for referring to the safe working load. None had referred to the expected dynamic load or the static load. These figures should then have been matched to the yield strength of the material being used.
- (e) The calculation was in general not well done. Those who did complete it correctly understood that the sum of the absolute or total distance from fulcrum to load was required rather than the relative distance from one load point to the next. A number of the incorrect answers were arrived at by multiplying 800 by a distance of 0.9 m rather than the total distance of 2.25 m.

Question 10

- (a) (i) The drawing of the roller was in most cases accurate, with the bottom face of the roller touching the cam profile.
- (ii) Determining the quadrant of the cam which contained dwell could have been done by looking carefully at the given drawing. A more accurate method would have been to measure the quadrant dividing lines. Area **C** was the correct answer.
- (iii) The key to getting this part correct was in the direction of rotation. This was anticlockwise as indicated on the drawing. The description should also have started in the position shown in the drawing. Marks were awarded for correct interpretation of the follower movement for areas **A**, **B** and **D**, the mark for area **C** having already been rewarded in (ii).
- (b) (i) The position of the effort was in most cases correctly identified. The fulcrum and load were often reversed. Almost all candidates chose all three positions correctly; the errors came in the labelling. There were just a few responses that showed the load as being the part labelled as fitting the jacking point on the car.
- (ii) This part was very well answered by some candidates. A clear understanding of the principles of a hydraulic system was shown.
- (iii) Those who gained the marks for part (ii) generally gained at least one mark in this part with clear descriptions of movement of the fluid. The second mark was awarded for stating that the jack would retract or lower. No responses mentioned the control over speed of descent that could be provided by the relief valve.
- (iv) This part proved difficult in the majority of cases. There should have been recognition of the air in the pneumatic system being further compressed by the load; this would give a 'spongy' movement'. The continuing cost of compressing air was another area that could have been detailed.
- (c) (i) Most responses showed an understanding of the part played by the lever in reducing the effort needed or they showed understanding of the gear system in use.
- Almost none realised that the two factors would combine to decrease the effort needed still further.
- (ii) The benefits associated with nylon as a bearing material were generally understood with most responses gaining at least one of the marks available.
- (d) (i) Almost all responses had recognised friction as being the force opposing movement between the two parts.
- (ii) Clear sketches were seen in the majority of cases with functional methods being shown and annotated. Use of lubrication was often not mentioned.
- (e) In most cases the thread diameter was correctly noted while the pitch was frequently labelled with the width of a single thread.

Question 11

- (a) (i) Resistor **R1** was in most cases correctly identified as ‘current limiting’ or ‘providing protection for the transistor’.
- (ii) Resistor **R2** was not generally seen as being a ‘pull up’ resistor providing a high logic level when the transistor is not conducting. A common error was to refer to it as being part of a potential divider.
- (iii) A number of responses realised that there is no mechanical input needed to a transistor switch and that it is much smaller and has no moving parts. Very few referred to the speed of operation or lack of contact bounce.
- (iv) There were very few answers that referred correctly to the disadvantages of a transistor switch. Restricted current carrying capacity in comparison to the mechanical switch was one valid reason that would have gained the mark.
- (v) The first two colours were in most cases correctly identified, the multiplier band then gave difficulty in a few responses, with yellow being chosen rather than the orange which represented three zeros.
- (b) (i) Knowledge of logic in the truth table was accurately demonstrated with most candidates correctly showing each of the missing columns as 0111.
- (ii) The meaning of ‘dual in line’ was generally known with slightly fewer candidates stating the pins run in parallel sets.
- (iii) The fact that an IC holder will allow easy replacement or will avoid any chance of heat damage was known in most cases.
- (c) (i) Most responses had the contact arrangement of the switch on the relay correctly identified as SPST.
- (ii) The thermistor resistance was correctly read from the table as $4\text{ k}\Omega$ or $4000\ \Omega$ by most candidates.
- (iii) Clearly laid out calculations were seen in response to this question. Those who had used the formula generally arrived at the correct answer. A range of $4.13\text{ k}\Omega$ to $4.15\text{ k}\Omega$ was accepted to overcome the problem of rounding.
- (iv) Explanations for the most part showed some understanding of how a comparator operates, though a few had mixed up the role played by inverting and non-inverting inputs.
- (v) Responses seen were generally correct for at least one of the required tracks. The quality of drawing was in most cases very good.
- (vi) The component was correctly identified as a diode in the majority of responses; only a small number had named it as an LED.

DESIGN AND TECHNOLOGY

Paper 0445/42
Systems and Control

Section 2

Key messages

- Responses should appear in the area of the paper allocated for the response. Any parts of a response that do not fit in the space provided 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. Continuing a response in the space for the response to the next question must be avoided.
- Candidates should be reminded that clear writing and clear annotation to sketches are important.
- Those candidates who had chosen to answer the electronics question had generally made use of the given formula for their response. It is good practice to then apply the correct units to the final answer.
- There were a number of candidates who failed to give any sort of response to parts of a question. It is important candidates are aware that no response means that no mark can be awarded; candidates should be encouraged to offer a response that could potentially gain a mark rather than leaving a blank space.
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Section 3

General comments

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In **Section B**, all candidates had followed the rubric and only attempted one question. There were a few who had made a start on a question, and then moved on to another question.

The standard of sketches was generally high though in some cases better use could have been made of the response space. This applied in **Question 9(c)(i)** where a number of the sketches were so small that any detail could not be clearly seen. Candidates should be encouraged to produce sketches and notes to fill the available space.

When answering calculation questions candidates should be advised to include all stage of the calculation in their answers, this will allow part marks to be awarded where the final answer is incorrect. Candidates should look carefully at the units given in the question; particularly the electronics question.

In **Section B** the most popular choice was once again the Structures question, followed by the Electronics question with Mechanisms having almost as many responses.

The highest marks in Section B were seen in the Electronics question.

Section 4

Comments on questions

Section A

Question 1

- (a) There were a number of incorrect responses that named the test instrument as a strain gauge/ stress gauge/pressure gauge. Dial gauge, dial indicator gauge or clock gauge gained the mark.
- (b) The majority of responses were correct in referring to deflection, bending or flexing.
- (c) As noted in the general comments written descriptions of the method used were not always clear enough to gain a mark. The second mark for describing how the method reduced movement could not generally be awarded as it was not included in the response.

Question 2

- (a) The majority of responses identifying the order of lever used were correct.
- (b) Clear sketches and adequate annotation were seen in most cases.

Question 3

- (a) Almost all candidates gained the mark for identifying silver as the conductor in the list.
- (b) The expected response was that reference would be made to the moisture content of the wood. The fact that wood can burn if there is a fault was also credited with a mark.

Question 4

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This question was generally well answered with the majority gaining both marks. Errors included reversing the conversion of motion or using the same term for both input and output.

Section B

Question 9

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- (b) (i) Responses showed understanding of how a tower crane is stabilised by the concrete blocks forming a counterweight. The second mark in the explanation should have referred to maintenance of equilibrium in the crane; simplified terms such as 'to stop the cranes from falling' were accepted.
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Question 11

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DESIGN AND TECHNOLOGY

Paper 0445/43
Systems and Control

Section 2

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Section 3

General comments

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In **Section B**, all candidates had followed the rubric and only attempted one question. There were a few who had made a start on a question, and then moved on to another question.

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In **Section B** the most popular choice was once again the Structures question, followed by the Electronics question with Mechanisms having almost as many responses.

The highest marks in Section B were seen in the Electronics question.

Section 4

Comments on questions

Section A

Question 1

- (a) There were a number of incorrect responses that named the test instrument as a strain gauge/ stress gauge/pressure gauge. Dial gauge, dial indicator gauge or clock gauge gained the mark.
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- (a) The majority of responses identifying the order of lever used were correct.
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- (a) Almost all candidates gained the mark for identifying silver as the conductor in the list.
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Section B

Question 9

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- (b) (i) The position of the effort was in most cases correctly identified. The fulcrum and load were often reversed. Almost all candidates chose all three positions correctly; the errors came in the labelling. There were just a few responses that showed the load as being the part labelled as fitting the jacking point on the car.
- (ii) This part was very well answered by some candidates. A clear understanding of the principles of a hydraulic system was shown.
- (iii) Those who gained the marks for part (ii) generally gained at least one mark in this part with clear descriptions of movement of the fluid. The second mark was awarded for stating that the jack would retract or lower. No responses mentioned the control over speed of descent that could be provided by the relief valve.
- (iv) This part proved difficult in the majority of cases. There should have been recognition of the air in the pneumatic system being further compressed by the load; this would give a 'spongy' movement'. The continuing cost of compressing air was another area that could have been detailed.
- (c) (i) Most responses showed an understanding of the part played by the lever in reducing the effort needed or they showed understanding of the gear system in use.
- Almost none realised that the two factors would combine to decrease the effort needed still further.
- (ii) The benefits associated with nylon as a bearing material were generally understood with most responses gaining at least one of the marks available.
- (d) (i) Almost all responses had recognised friction as being the force opposing movement between the two parts.
- (ii) Clear sketches were seen in the majority of cases with functional methods being shown and annotated. Use of lubrication was often not mentioned.
- (e) In most cases the thread diameter was correctly noted while the pitch was frequently labelled with the width of a single thread.

Question 11

- (a) (i) Resistor **R1** was in most cases correctly identified as 'current limiting' or 'providing protection for the transistor'.
- (ii) Resistor **R2** was not generally seen as being a 'pull up' resistor providing a high logic level when the transistor is not conducting. A common error was to refer to it as being part of a potential divider.
- (iii) A number of responses realised that there is no mechanical input needed to a transistor switch and that it is much smaller and has no moving parts. Very few referred to the speed of operation or lack of contact bounce.
- (iv) There were very few answers that referred correctly to the disadvantages of a transistor switch. Restricted current carrying capacity in comparison to the mechanical switch was one valid reason that would have gained the mark.
- (v) The first two colours were in most cases correctly identified, the multiplier band then gave difficulty in a few responses, with yellow being chosen rather than the orange which represented three zeros.
- (b) (i) Knowledge of logic in the truth table was accurately demonstrated with most candidates correctly showing each of the missing columns as 0111.
- (ii) The meaning of 'dual in line' was generally known with slightly fewer candidates stating the pins run in parallel sets.
- (iii) The fact that an IC holder will allow easy replacement or will avoid any chance of heat damage was known in most cases.
- (c) (i) Most responses had the contact arrangement of the switch on the relay correctly identified as SPST.
- (ii) The thermistor resistance was correctly read from the table as $4\text{ k}\Omega$ or $4000\ \Omega$ by most candidates.
- (iii) Clearly laid out calculations were seen in response to this question. Those who had used the formula generally arrived at the correct answer. A range of $4.13\text{ k}\Omega$ to $4.15\text{ k}\Omega$ was accepted to overcome the problem of rounding.
- (iv) Explanations for the most part showed some understanding of how a comparator operates, though a few had mixed up the role played by inverting and non-inverting inputs.
- (v) Responses seen were generally correct for at least one of the required tracks. The quality of drawing was in most cases very good.
- (vi) The component was correctly identified as a diode in the majority of responses; only a small number had named it as an LED.