DESIGN AND TECHNOLOGY

Paper 0445/11
Product Design

Key messages

Candidates should be encouraged to plan the use of their time carefully so that they complete all parts of the question that they have chosen to answer. A small number of candidates did not complete **parts (f)** and **(g)** of their chosen question.

Candidates should be encouraged to thoroughly read their chosen question to ensure that they avoid repeating points given in the question in their answers to **part (a)**.

Candidates should be advised that in **part (d)** they should evaluate their design proposals, not simply describe them.

Candidates should be encouraged to view the paper as a holistic design exercise. A small number of candidates built their design proposals around largely pre-prepared answers for **parts (a)**, **(f)** and **(g)**.

General comments

Question 1 was the most popular question. A significant number of candidates answered **Question 2** from a resistant materials perspective, rather than using the lightweight materials stated in the question. Very few candidates attempted **Question 3**.

Candidates responded well to the given design situations and the standard of work was good, with creativity and materials knowledge particularly well demonstrated through freehand sketching with annotations.

Some candidates were unable to express their thoughts clearly in the written parts of the paper and may have benefitted from adopting a more structured approach. For example, in **part (d)** candidates may have found it beneficial to use a series of bullet points rather than continuous text.

Comments on specific questions

Question 1

(a) Most candidates managed to list four additional points about the function of the storage unit that they considered to be important. Answers often related to the unit fitting in with the decoration of the bedroom, organisation of the items to be stored, stability or ease of installation/assembly of the unit. Candidates should be advised against repeating points that are given in the question or giving generic points, such as nice, that might apply to almost any product.

(b) Most candidates used sketches and notes well to show two methods that could be used to make valuable personal items secure from theft. Commonly seen answers were locking cupboards and drawers, with either a padlock or a keypad security device. Some candidates used secret cupboards and drawers that were ingeniously hidden within the storage unit. The standard of written and visual communication for this question was excellent.

(c) An impressive range of sketches with annotations was seen for this question. The most common solutions were wall units with shelves, drawers and cupboards. There were also a significant number of candidates who interpreted the floor-mounted aspect of the question as being a unit that could slide under a bed. The strongest candidates added detailed annotations to their sketches and

used a range of presentation techniques, including exploded views. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks.

(d) The evaluation of ideas was generally good with candidates able to clearly demonstrate a good understanding of the positive and negative features of their design proposals. Commonly seen answers referred to the stability of the unit, storage capacity or the ability of the user to reach the higher or more inaccessible parts of the unit. It was important that candidates evaluated their design proposals rather than simply describing them if they were to access the full range of marks.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and material lists. Colour was commonly used to add clarity to drawings. The most frequently seen drawing methods were isometric sketches with annotations referring to the question requirements. This question specifically asked for construction details and important dimensions but in weaker responses these were often missing.

(f) Most candidates were able to name two specific materials that would be used in the construction of their design proposal and gave reasons for their choices. Commonly named resistant materials included melamine faced chipboard, medium density fibreboard (MDF) and pine. Reasons for the choice of material included references to specific working properties, aesthetics and structural stability. Candidates should be advised against giving generic names of materials such as wood, or generic reasons such as being easy to work with, as these responses are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. The most commonly seen methods included dowel joints, finger joints, screws and knock down fittings. Some excellent responses were seen to this question but candidates needed to use the correct names of tools and equipment to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

Question 2

(a) Most candidates managed to list four additional points about the artefact that would interest a baby lying in a cot that they considered to be important. Commonly seen answers related to safety, the location of the artefact or how the artefact would interest the baby. A small number of candidates did not fully comprehend that the question stated that the artefact must be out of reach of the baby and described how the artefact would attach to the baby. Candidates should be advised against repeating points that are in the question, for example the artefact must use colour and shapes to interest a baby or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes well to show two methods of joining lightweight materials. Many candidates showed glue, double-sided tape, staples, magnets or Velcro. A few candidates did not fully recognise that the question stated methods that can be used to join lightweight materials and described joints that could be used to join wood, such as finger joints or dowel joints. Many excellent responses were seen to this question.

(c) An impressive range of sketches with annotations were seen for this question and colour was generally used effectively. The most commonly seen answers were mobiles that hung from the ceiling or artefacts that attached to the cot and used movement or music to interest the baby. The solutions were often based upon an appropriate theme, such as animal shapes or stars and the moon. The annotations often revealed candidates' true understanding of how the design proposal would be constructed. It was important that all ideas fully met the design requirements for candidates to access the full range of marks.

(d) The evaluation of ideas was generally very impressive with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Commonly seen answers focused on safety, how the parent would clean the artefact or how well the artefact would interest the baby. It was important that candidates justified their evaluations rather than making general statements, such as that it would work well, if they were to access the full range of marks.

(e) Some very impressive responses were seen to this question and a variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and materials lists. Colour was generally used effectively. Many responses included an isometric sketch of the assembled artefact and then drawings of the individual parts, with supporting annotation. The question specifically asked for construction details and important dimensions but in weaker responses these were often missing.

(f) Most candidates were able to name two specific materials that would be used in their design proposal and gave reasons for their choices. Corrugated cardboard, foamboard and polypropylene sheet were commonly seen materials, with reasons often referring to specific properties of the material or why it would be suitable for this application. Candidates should be advised against giving generic names of materials such as plastic, or generic reasons such as being easy to work with, as these are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. The use of computer aided design (CAD) and computer aided manufacture (CAM) with a laser cutter was commonly seen. Hand-production techniques, involving the use of a craft knife, safety rule and cutting mat were also seen. It was important that candidates included the correct names of tools and equipment to be used in the method of manufacture if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

Question 3

(a) Most candidates managed to list four additional points about the function of the light that they considered to be important. Commonly seen answers related to safety, the power source to be used or how the light would be switched on and off. Candidates should be advised against repeating points that are given in the question, for example the light must be adjusted to different positions or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes effectively to show two methods that could be used to allow the position of the light to be adjusted. Many candidates showed a thumb screw used to join lengths of timber, a bendable arm or friction joints but methods involving the use of pulleys and weights were also seen.

(c) An impressive range of sketches with annotations was seen for this question. Colour was generally used well, improving the visual impact of the design proposals. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. For example, in some cases candidates did not fully consider the position of the light or how it would be operated by the young person. A small number of candidates produced fewer than three ideas or ideas that were similar.

(d) The evaluation of ideas was generally very impressive with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Many responses focused on the stability of the light, electrical safety or appeal to a young person. It was important that candidates justified their evaluations rather than making broad statements, such as that it is the best design idea, if they were to access the full range of marks.

(e) Responses to this question were usually of a high standard. A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views, circuit diagrams and materials lists. The question specifically asked for construction details and important dimensions but in weaker responses these were often only partly shown.

(f) Most candidates were able to name two specific materials that would be used in their design proposal and gave reasons for their choices. The most common materials named were acrylic, pine and aluminium, with the reasons often relating to appearance or weight. Candidates should be advised against giving generic names of materials such as wood, or generic reasons such as that it is easy to work with, as these are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. Commonly seen answers included drilling and joining materials with nuts and bolts or cutting out acrylic parts with a laser cutter. It was important that candidates included the correct names of tools and equipment to be used in the method of manufacture if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

DESIGN AND TECHNOLOGY

Paper 0445/12
Product Design

Key messages

Candidates should be encouraged to plan the use of their time carefully so that they complete all parts of the question that they have chosen to answer. A small number of candidates did not complete **parts (f)** and **(g)** of their chosen question.

Candidates should be encouraged to thoroughly read their chosen question to ensure that they avoid repeating points given in the question in their answers to **part (a)** and produce design proposals that meet all design requirements.

The benefits of using accurately measured drawings for **part (e)** needs to be carefully considered in terms of the time taken. Many candidates achieved high marks for this question using just freehand sketches and notes.

Candidates should be encouraged to view the paper as a holistic design exercise. A small number of candidates built their design proposals around largely pre-prepared answers for **parts (a)**, **(f)** and **(g)**.

General comments

Question 1 was the most popular question. Very few candidates attempted **Question 3**.

Candidates responded well to the given design situations and the standard of work was good, with creativity and materials knowledge particularly well demonstrated through freehand sketching with annotations.

Candidates should be advised that in **part (d)** they should evaluate their design proposals, not simply describe them.

Some candidates were unable to express their thoughts clearly in the written parts of the paper and may have benefitted from adopting a more structured approach. For example, in **part (d)** candidates may have found it beneficial to use a series of bullet points rather than continuous text.

Comments on specific questions

Question 1

(a) Most candidates managed to list four additional points about the function of the guitar stand that they considered to be important. Commonly seen answers related to stability, use of the stand during a performance or how it would be transported/stored after a performance. Candidates should be advised against repeating points that are given in the question or giving generic points, such as being safe, that might apply to almost any product.

(b) Most candidates used sketches and notes effectively to show two methods of preventing damage to a guitar whilst on the stand. Commonly seen answers involved the use of foam, rubber, fabric covers, shaped cases or the guitar having minimal contact with the stand. The standard of written and visual communication for this question was excellent.

(c) An impressive range of sketches with annotations was seen for this question. The most common solutions were based on a frame that the guitar leant against or a means of hanging the guitar from a stand. The strongest candidates added detailed annotations to their sketches and used a range

of presentation techniques, including exploded views. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. A very small number of candidates produced fewer than three ideas.

(d) The evaluation of ideas was often impressive with candidates able to clearly demonstrate a good understanding of the positive and negative features of their design proposals. Commonly seen answers referred to stability, ease of access, ease of manufacture or how much room the stand would take up on a stage. Many candidates used an area such as stability, as a positive feature in one design proposal and then a negative feature in another proposal. It was important that candidates justified their evaluations rather than making general statements, such as that it would work well, if they were to access the full range of marks.

(e) Responses to this question were usually very impressive and a variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and material lists. Colour was often used to add clarity to drawings. The most frequently seen drawing methods were exploded isometric sketches with annotations. This question specifically asked for construction details and important dimensions but in weaker responses these were often missing.

(f) Most candidates were able to name two specific materials that would be used in the construction of their design proposal and gave reasons for their choices. Commonly named materials included steel, stainless steel, acrylic and pine. Reasons for the choice of material often related to the strength, weight or appearance of the material. Candidates should be advised against giving generic names of materials such as wood, or generic reasons such as it being easy to work with, as these responses are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. Fabrication techniques including welding and joining solid timber were commonly seen methods of manufacture. Candidates that used acrylic often concentrated on cutting out the parts with a laser cutter and then the use of a line bender to fold to shape. Many excellent responses were seen to this question, but it was important that candidates included the correct names of tools and equipment if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

Question 2

(a) Most candidates managed to list four additional points about the function of the display board that they considered to be important. Commonly seen answers related to the weight of the display board, how it would be moved in and out of the shop, how it would be assembled or the ability of the material to withstand the weather. Candidates should be advised against repeating points that are in the question, such as that the display board would be placed on a paved area or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes well to show two methods to promote musical instruments. Many candidates used large brightly coloured lettering or instrument images/shapes. Other methods involving the use of sound, and electronic displays and moving elements were seen. Many excellent responses were seen to this question.

(c) An impressive range of sketches with annotations were seen for this question and colour was generally used well. The annotations often revealed candidates' true understanding of how the design proposal would be constructed. A sketch of a development (net), with the joining method clearly shown often accompanied a three-dimensional (3D) sketch of the fully assembled display board. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. A small number of candidates produced fewer than three ideas or ideas that were similar.

(d) The evaluation of ideas was generally very impressive with candidates able to clearly demonstrate an understanding of the positive and negative features of their design proposals. Commonly seen answers focused on stability, how well the display board would attract customers or the cost of manufacturing. It was important that candidates justified their evaluations rather than making general statements, such as that it would work well, if they were to access the full range of marks.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and materials lists. Colour was generally used effectively, and many impressive answers were seen. Responses often included an isometric sketch and a development (net) with supporting annotation. The question specifically asked for construction details and important dimensions but in weaker responses these were often missing.

(f) Most candidates were able to name two specific materials that would be used in their design proposal and gave reasons for their choices. Foamboard, corrugated cardboard, Corriflute and acrylic were commonly seen materials. The reasons for the choice of the material often related to the working properties or suitability for outdoor use. Candidates should be advised against giving generic names of materials such as plastic, or generic reasons such as being easy to work with, as these are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. The use of a laser cutter was commonly seen but the use of a line bender and fabrication methods were also seen. It was important that candidates included the correct names of tools and equipment to be used in the method of manufacture if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

Question 3

(a) Most candidates managed to list four additional points about the function of the music stand that they considered to be important. Commonly seen answers related to the construction, the needs of the performer or that the page turning action must not disturb the performance. Candidates should be advised against repeating points that are given in the question, for example that the stand must turn pages, or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes effectively to show two methods which could be used to control the turning of a page of music. Many candidates showed a motor or hand turning device but some more ingenious methods involving the use of a fan or weights and pulleys were proposed. The quality of sketches and notes was usually sufficient to show the overall idea but often lacked sufficient detail to show the method of operation.

(c) An impressive range of sketches with annotations was seen for this question. Colour was generally used well. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. For example, in some cases candidates did not really consider how frequently the pages would need to be turned during a performance. A small number of candidates produced fewer than three ideas or ideas that were similar.

(d) The evaluation of ideas was generally very impressive with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Many responses focused on the fact that the device might damage the sheet of music, become jammed during operation or how easy it would be for the performer to operate. It was important that candidates justified their evaluations rather than making broad statements, such as this is the best idea, if they were to access the full range of marks.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views, circuit diagrams and materials lists. The question specifically asked for construction details and important dimensions but in weaker responses these were often only partly shown.

(f) Most candidates were able to name two specific materials that would be used in their design proposal and gave reasons for their choices. The most common materials named were acrylic, high impact polystyrene (HIPS), stainless steel and aluminium, with the reasons relating to working properties or structural stability. Candidates should be advised against giving generic names of materials such as wood, or generic reasons such as that it is easy to work with, as these are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal, with the use of vacuum forming and a laser cutter being the most common. It was important that candidates included the correct names of tools and equipment to be used in the method of manufacture if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

DESIGN AND TECHNOLOGY

Paper 0445/13
Product Design

Key messages

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General comments

Question 1 was the most popular question. Very few candidates attempted **Question 3**.

Candidates responded well to the given design situations and the standard of work was good, with creativity and materials knowledge particularly well demonstrated through freehand sketching with annotations.

Some candidates were unable to express their thoughts clearly in the written parts of the paper and may have benefitted from adopting a more structured approach. For example, in **part (d)** candidates may have found it beneficial to use a series of bullet points rather than continuous text.

Comments on specific questions

Question 1

(a) Most candidates managed to list four additional points about the function of the raised platform that they considered to be important. Commonly seen answers related to stability, safety, supporting the weight of the drummer, ease of access to the platform, speed of assembly, ease of transportation to a different venue or storage after a performance. Candidates should be advised against repeating points that are given in the question or giving generic points, such as that it must be aesthetic, that might apply to almost any product.

(b) Most candidates used sketches and notes well to show two temporary fixing methods that would allow a product to be easily taken apart and reassembled. Commonly seen answers involved the use of screws, nuts and bolts, slot fittings, magnets and dowels. The standard of written and visual communication for this question was excellent.

(c) An impressive range of sketches with annotations was seen for this question. The most common solutions were a metal or wooden framework with the top surface being made from a sheet of plywood or medium density fibreboard (MDF). The strongest candidates added detailed annotations to their sketches and used a range of presentation techniques, including exploded views. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. A small number of candidates produced fewer than three ideas.

(d) The evaluations of ideas were generally very impressive with candidates able to clearly demonstrate a good understanding of the positive and negative features of their design proposals. Commonly seen answers referred to the weight of the structure, the stability of the structure, ease of assembly or how the drummer would gain access to the raised platform.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and material lists. Colour and enlarged drawings of details were commonly used to add clarity to drawings. The most frequently seen drawing methods were isometric sketches with annotations. This question specifically asked for construction details and important dimensions but in weaker responses these were often missing.

(f) Most candidates were able to name two specific materials that would be used in the construction of their design proposal and gave reasons for their choices. Commonly named materials included steel, aluminium, plywood and MDF. The reasons for the choice of material often referred to the weight, strength or structural stability of the material. Candidates should be advised against giving generic names of materials such as wood, or generic reasons such as it being easy to work with, as these responses are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. Fabrication techniques, including welding and joining the parts using nuts and bolts or wood screws, were commonly seen methods of manufacture. Some excellent responses were seen to this question but it was important that candidates included the correct names of tools and equipment if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

Question 2

(a) Most candidates managed to list four additional points about the function of the disposable holder for drink and food that they considered to be important. Commonly seen answers related to the weight of the holder, ease of holding, keeping the food and drink separate, making sure the holder was not too bulky or explaining how the product could be recycled after use. Candidates should be advised against repeating points that are in the question, for example to be used at a concert, or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes effectively to show two methods of holding drink and food items. Many candidates showed pockets, slots for containers and trays with compartments. A few candidates approached this question in a slightly different way by showing how the container could be held in the hand, for example by gripping or in the palm of the hand. Many excellent responses were seen to this question.

(c) An impressive range of sketches with annotations was seen for this question and colour was generally used well. The annotations often showed candidates' true understanding of how the design proposal would be constructed. Many candidates chose to use lightweight materials, such as thin plastic sheet for their holder but a few used resistant materials such as wood. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. A small number of candidates produced fewer than three ideas.

(d) The evaluation of ideas was generally very impressive with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Commonly seen answers focused on the weight of the holder, ease of accessing the food and drink or suitability for use in a crowded concert. It was important that candidates justified their evaluations rather than making general statements, such as that it would work well, if they were to access the full range of marks.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views and isometric views. Colour was generally used effectively.

Many responses included an isometric sketch and a development (net) with supporting annotations. The question specifically asked for construction details and important dimensions but in weaker responses these were often missing.

(f) Most candidates were able to name two specific materials that would be used in their design proposal and gave reasons for their choices. Cardboard, expanded polystyrene and high impact polystyrene (HIPS) were commonly named materials. The main reasons for choosing these materials were often linked to the method of manufacture, such as vacuum forming, range of colours available or how the material could be recycled after use. Candidates should be advised against giving generic names of materials such as plastic, or generic reasons such as being easy to work with, as these are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. The use of vacuum forming was a commonly seen response to this question, but some candidates described how developments (nets) could be cut out by hand or by a computer numerically controlled (CNC) machine. It was important that candidates included the correct names of tools and equipment to be used in the method of manufacture if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

Question 3

(a) Most candidates managed to list four additional points about the function of a device that would automatically count and display the number of people passing through an entrance to a music venue that they considered to be important. Commonly seen answers related to the ease of operation, ability to see the display during the day or at night, not slowing down the entrance of people to the music venue or the reliability of the device over time. Candidates should be advised against repeating points that are given in the question, for example that the device would be used at music venues, or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes effectively to show two methods of displaying numerical information. Many candidates showed liquid crystal displays (LCD), light emitting diodes (LED) or 7 segment displays. A few candidates also considered flip charts and abacus type constructions to display the numerical information. The quality of sketches and notes was usually sufficient to show the overall method.

(c) An impressive range of sketches with annotations was seen for this question but it was not always clear that candidates fully understood how the device would work. For example, in some cases candidates did not consider how an electronic counting device would be powered. Colour was generally used well and enhanced the sketches. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. A small number of candidates produced fewer than three ideas or ideas that were similar.

(d) The evaluations of ideas were generally very impressive with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Many responses focused on the fact that the mechanism might jam, how easy it would be to see the display or if people could avoid being counted or be counted twice by mistake. It was important that candidates justified their evaluations rather than making broad statements, such as that it is the best design idea, if they were to access the full range of marks.

(e) A variety of methods was used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views, materials lists and circuit diagrams. The question specifically asked for construction details and important dimensions but in weaker responses these were often only partly shown.

(f) Most candidates were able to name two specific materials that would be used in their design proposal and gave reasons for their choices. The most common materials named were acrylic and aluminium, with the reasons relating to the appearance of the material or ease of forming the material. Candidates should be advised against giving generic names of materials such as wood, or generic reasons such as that it is easy to work with, as these are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. The most commonly seen manufacturing methods were vacuum forming and cutting out the parts of the device with a laser cutter. It was important that candidates included the correct names of tools and equipment to be used in the method of manufacture if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

DESIGN AND TECHNOLOGY

Paper 0445/02
Project

Key messages

- Some candidates could have improved the research section by adding personal comments about products being investigated. The analysis of existing products should lead to information and key points to take forward to the next stage of designing, what positive features could be included and what functions may not be necessary or could be improved upon.
- For Criterion 5, candidates must produce a sequence of stages of production to organise the making activity. Some candidates included excellent photographic evidence of the manufacture of the product but did not show evidence of a plan prior to making.
- Most candidates had clear photographic evidence of the testing of their product. The evaluation should have focused on the strengths and weaknesses of the product and proposals for improvement. Some candidates made comment, sometimes exclusively, on personal performance which was not required.

General comments

Centres provided all necessary paperwork with the samples for moderation.

The Individual Candidate Record Card information provided by teachers was very helpful in the moderation process.

Some of the work presented was of an exceptionally high quality. Creative and imaginative design ideas were proposed, and candidates used an integration of sketched ideas and modelling to clearly show their design decision making. Many candidates' development and application of ICT and CAD skills were strong and well executed.

Some candidates produced very similar research, design, and practical outcomes. Centres should allow scope for candidates to explore different possible design needs or design opportunities.

For new centres or teachers new to the specification, guidance for assessing coursework and other very useful support for 0445/02 can be found on the School Support Hub.

Comments on specific sections

Criterion 1: Identification of a need or opportunity with an analysis leading to a design brief

This section was assessed slightly leniently by a number of centres. A more detailed consideration of both the design need and the intended user(s) leading to a clear design brief is required to access the higher mark range. Candidates should consider who the product designed is for and what the main functions of the product are. They should also give details of why the product is needed and where and when it will be used.

Criterion 2: Research into the design brief resulting in a specification

The research into the design brief should lead to information and key points to take forward to the designing stage. As well as researching the features of existing products, candidates should focus closely on the design challenge. For example, candidates designing storage units should research the range and sizes of items to be stored. Candidates should also be encouraged to gather relevant information such as ergonomic considerations.

Research into materials, tools and manufacturing methods should be appropriate to the design brief. Most of this information could support Criterion 4: Development of proposed solution

Criterion 3: Generation and exploration of design ideas

This section was generally assessed consistently and accurately. However, a number of centres were slightly lenient in awarding marks in the higher mark range. To gain a high mark for Criterion 3 candidates need to produce a wide range of ideas appropriate to the design problem. Candidates must show creativity and imagination and annotate ideas with reference to the specification. They should also clearly show design decision making and present work effectively and with clarity.

Candidates would benefit from exploring and evaluating each idea in more detail, including material and constructional possibilities, aesthetic considerations and experimentation with proportions before going onto the next concept.

Criterion 4: Development of proposed solution

Most centres marked this section in line with the standard. However, some centres were lenient, awarding high marks when there was limited evidence of informed decision making about the final proposal, such as materials to be used and manufacturing methods and finishes in the samples presented.

2D and 3D card modelling can help to form decisions about proportions, functionality and aesthetics. Practical workshop experimentation can inform the suitability of materials and construction methods. Many candidates made good use of CAD to model developments.

Criterion 5: Planning for production

Most candidates produced a working drawing of their proposed solution, and most were fully detailed and dimensioned. Some of the CAD drawings presented did not include details such as dimensions.

Some candidates presented a photographic diary of the manufacture of their product but did not produce the required detailed, logical sequence of the stages of manufacture prior to making.

Criterion 6: Product realisation

Where it was possible to do so, candidates fully completed the manufacture of their proposed solution. Some of the work presented was innovative and made to a very high standard.

Almost all candidates included clear, well presented photographic evidence of the stages of manufacture, highlighting the skills used and the quality of construction.

Centres are reminded that marks allocated to making should reflect the overall complexity of the product, the level of skill demonstrated by the candidate, and the quality of the making of the final product.

Criterion 7: Testing and evaluation

Many candidates carried out appropriate testing, often including clients or product users, and were able to identify the strengths and weaknesses of their product. However, a significant number who completed this section produced comments against a brief list of initial specifications with limited explanation or justification of points made.

After testing their product, candidates needed to draw meaningful conclusions that would lead to proposals for further development or improvement. The modifications should ideally have been in the form of sketches and notes.

DESIGN AND TECHNOLOGY

Paper 0445/31
Resistant Materials

Key messages

- Candidates need to read the questions carefully before attempting to answer and should try to focus on the key elements of each question. The marks allocation for each question and the space provided to answer the question provides candidates with a clear indication of what is required.
- Candidates need to improve their knowledge and understanding of the practical processes and techniques required to work the resistant materials, wood, metal and plastic. In order to achieve this, candidates need to be able to match tools and equipment to specific purposes.
- Candidates need to improve their drawing 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 support and make what they have drawn clearer and not simply state the obvious.

General comments

Apart from a few candidates, most attempted **Question 11** from ***Section B*** leaving insufficient responses to **Questions 12** and **13** to construct a viable report on their performance.

Section A

In this section candidates need an all-round knowledge and understanding to answer all questions successfully. Most candidates did not demonstrate a basic understanding of the processes, tools and equipment required.

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. It is essential that candidates attempt all parts of the question to access the full mark range.

Comments on specific questions

Section A

Question 1

Most candidates gave three items of information required when ordering screws. The most common answers included the length, type of material, type of head and the gauge (often incorrectly stated as width or thickness).

Question 2

(a) Very few candidates recognised the lap joint, also referred to as a rebate or half-lap joint.

(b) Candidates did not show a knowledge of dovetail nailing. Dovetail nailing is a technique where the nails are inserted at a slight angle, in a dove tail shape, to make the joint less likely to be pulled apart.

Question 3

Only stronger candidates recognised all three marking/testing tools. The most common correctly named tool was the try square. The mitre and combination squares were not recognised.

Question 4

Most candidates had little knowledge of silver soldering.

Question 5

(a) The majority of candidates correctly named a coping saw to cut out the curved shape from 4 mm thick plywood.

(b) No candidates were able to give the name of a saw that could be used to cut out the curve from 1 mm thick brass sheet.

Question 6

The majority of candidates gave at least one reason for using melamine formaldehyde for plastic tableware that would be used outdoors.

Question 7

Many candidates identified redwood from the list as a material from a sustainable source.

Question 8

The majority of candidates were unable to recognise either the marking gauge or the odd leg calipers.

Question 9

Most candidates attempted to show some sort of slot that could be used to join the parts of the storage unit. Very often the quality of sketches was poor.

Question 10

(a) Many candidates positioned the two parts of the magnetic door catch correctly.

(b) Very few candidates named an alternative type of hinge, a butt hinge, correctly.

Section B

Question 11

(a) The majority of candidates gave two reasons why mahogany was suitable for the table and the most common correct answers included an attractive appearance and being long lasting.

(b) Few candidates recognised the scan fitting and therefore were unable to show how it could be used to join a side rail to a leg.

(c) Since candidates demonstrated little or no knowledge of knock-down fittings there were very few sketches resembling a corner block fitting or how one could be used to join two rails together.

(d) (i) The edges of plywood are unattractive when it is used as a tabletop. The use of varnish or paint would do little to hide the edges. The best method of making the edges attractive was to glue a small piece of veneer onto the edges.

(ii) To remove the waste material from the tabletop to accommodate a glass sheet required the following specific processes: drill a hole, insert a saw blade from an appropriate saw, cut out the waste and finish by cleaning up the edges with files and/or glasspaper.

Only a minority of candidates provided accurate details of some of the processes.

(iii) There were some successful methods showing how the glass sheet could be supported inside the space in the tabletop. Technical vocabulary was often lacking. The best methods included the use of rebates or applied beads.

(iv) Very few candidates gained a mark for this question showing how a rail could be joined to the tabletop. Appropriate methods included counterbored holes and pocket screwing.

(e) (i) Some candidates recognised that seasoning was in some way connected with the drying out of solid wood.

(ii) Only a few candidates were able to provide a sketch that showed how the shape of the solid wood board could be affected when it was seasoned incorrectly.

(f) Candidates were much more confident when providing benefits to the manufacture of producing flatpack products sold to customers for self-assembly. The strongest answers included lower labour costs, reduced prices for customers and no assembly costs.

Question 12

There were too few responses to this question to make a general comment appropriate.

Question 13

There were too few responses to this question to make a general comment appropriate.

DESIGN AND TECHNOLOGY

Paper 0445/32
Resistant Materials

Key messages

- Candidates need to read the questions carefully before attempting to answer and try to focus on the key elements of each question. The marks allocation given to each question and the space provided to answer the question provides candidates with a clear indication of what is required.
- Candidates need to improve their knowledge and understanding of the practical processes and techniques required to work the resistant materials, wood, metal and plastic. In order to achieve this, candidates need to be able to match tools and equipment to specific purposes.
- Candidates need to improve their drawing 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 what they have drawn clearer and not simply state the obvious.

General comments

Section A

In this section candidates need an all-round knowledge and understanding in order to answer questions successfully. Most candidates did not demonstrate a basic understanding of the processes, tools and equipment required.

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. It is essential that candidates attempt all parts of the question.

Comments on specific questions

Section A

Question 1

The majority of candidates identified at least one of the processes, steam bending and laminating, correctly.

Question 2

Many candidates drew a countersunk and clearance hole correctly. However, many sketches were not sufficiently clear or accurate to achieve the 2 marks available.

Question 3

The majority of candidates identified tempering correctly. Tempering is a process carried out to relieve stresses in metal.

Question 4

The steel rod would be chamfered so that the die could be positioned, ready to cut the screw thread. There were a few correct answers that referred directly to the end being chamfered and provided valuable notes to describe how this could be done, either by filing or the use of a centre lathe. Those candidates who described 'rounding off' the end of the steel rod also gained marks.

Question 5

Most candidates selected 'lasts for a fixed period of time' correctly.

Question 6

(a) Many candidates identified an appropriate plastic for the packaging. The most common answer was polyethylene and its variants.

(b) There were many excellent benefits for using plastic for food packaging, The most common answers related to it being lightweight, hygienic, transparent and that it did not react with food.

(c) The majority of candidates correctly stated that the use of plastics could harm the environment, for example, litter, landfill, non-biodegradable, and the fact that plastics are made from material of which there is a finite source.

Question 7

(a) Only a small minority of candidates could name the knock-down fitting.

(b) There were many unsuccessful attempts to show how the knock-down fitting could be used to join two sides of a cabinet. Many sketches lacked the clarity required to gain maximum marks.

Question 8

The majority of candidates gained at least 1 or 2 marks for stating advantages of the aluminium and canvas seat stool. The most common answers included that it was more comfortable, lightweight, easy to clean/open and close and more compact.

Question 9

(a) Most candidates were unable to name a router as the power tool used to cut out the rebate.

(b) The hand tools that could be used to cut out the rebate included the tenon or dovetail saw and a bevel-edge, firmer or mortise chisel. Many candidates could not name any of these hand tools.

Question 10

The majority of candidates gained marks for showing a recognisable base for the trophy and providing an important dimension. The weakest part of answers generally was showing how the trophy could be joined to the base. There were many answers that showed innovative grooves into which the trophy could slide and good use of an epoxy resin which would be excellent when joining wood to metal.

Section B

Question 11

(a) (i) The majority of candidates were unable to state one property of mild steel that made it suitable for the lantern lid. The most common properties included its ability to be shaped or that it was relatively cheap. Many candidates stated that it was heat resistant. This was irrelevant as the candle was made of plastic with an imitation flickering flame.

(ii) Many candidates stated appropriate finishes. The most common were paint, plastic coating and galvanising.

(b) (i) The majority of candidates recognised that model making was an effective method of finding out what was wrong with a design or that important sizes or dimensions could be checked before wasting valuable materials used to make the final product.

(ii) Some candidates provided benefits for using CAD for on-screen modelling that were no different to those for making a card model. There were many excellent answers with candidates stating correctly that CAD enabled ease and speed of editing, that no materials would be used and that design data could be transferred to CNC machines.

(c) (i) The majority of candidates named two marking out tools that could be used to mark out the development (net) on the mild steel sheet. The most common included a scriber, (steel) rule and some form of marker pen. Some candidates gave impressive answers showing their knowledge of engineers or marking blue.

(ii) Tinsnips would be used to cut out the mild steel sheet. Only a minority of candidates named this tool. There were many answers giving “metal scissors”.

(iii) Most candidates named an appropriate method of joining the flaps using heat. The most common answers included soldering, brazing and welding.

(iv) Although epoxy resin, (Araldite) was a common correct adhesive, there were many candidates who selected adhesives that would not be effective when joining metal, including PVA.

(d) This question was answered well by only a small minority of candidates. Many candidates did not read the question carefully and treated the development (net) of the lantern body as if it was made of metal. The question stated clearly that the lantern body was made from 5 mm thick acrylic. Those candidates who achieved good marks for this question described basic techniques involving the use of a strip heater or line bender to soften the plastic so that it could be shaped around a former and left to cool.

(e) The strongest answers showed some form of pin or peg inserted through both the lid and lantern body to secure the lid. There were many ideas that did not provide clear or accurate details relating to the constructions required.

(f) Many candidates achieved some marks for showing modifications to the lantern lid and the end of the support rod to suspend the lantern safely. However, 3 of the 6 marks were available for providing accurate and practical constructional detail. This was generally the weakest part of the question.

Question 12

(a) The most appropriate properties of beech are that it is hardwearing, close-grained and attractive. Very often candidates stated incorrect properties such as ‘easy to work’, ‘lightweight’ and gave vague answers such as ‘durable’ or ‘strong’.

(b) Most candidates stated two excellent safety considerations that would need to be included in the design of the pinball game.

(c) This question was answered well with many candidates naming an appropriate construction and some producing clear and accurate sketches of the chosen construction. There were many lap, dowel and finger (comb) joints.

(d) (i) Only a minority of candidates recognised the saw tooth or forstner drill bit. A common incorrect answer was a hole saw.

(ii) The majority of candidates incorrectly focussed on the purpose of the scrap wood being to protect the surface of the wood from bruising. There were some excellent answers from candidates who recognised that the purpose of the scrap wood was to protect the surface under the wood being drilled and/or that the scrap wood would prevent damage to the tip of the drill bit.

(e) The majority of candidates recognised that the base that fitted into a groove (method **B**) would be stronger. There were some excellent answers that stated that an adhesive (glue) was not required, that it improved the appearance and that it lifted the base off the ground.

(f) (i) Many candidates named two machine saws that could be used to cut out the curved shape from the 18 mm thick MDF base. The most common answers included a band saw, jig saw, router, laser cutter and scroll saw.

(ii) Many candidates were unable to demonstrate knowledge of the benefits of using PVA and a contact adhesive. PVA provides a strong bond and allows the joint to be adjusted before it sets. PVA does not create any toxic fumes and is safe to handle. The main benefit when using a contact adhesive is that it provides an immediate bond with no need to clamp the parts together.

(g) There were many very good answers to this question. However, many candidates did not show how the curved part would be fitted to the base of the pinball game. Many candidates recognised that the strip of beech would need to be steamed then bent and clamped around a former or mould.

(h) There were many good ideas showing how the pinball game could be supported at an angle. Many candidates used a hinge and some sort of leg that could be made to fold flat. Other good answers showed some sort of additional pivot with a pin or peg to allow the pinball game to fold flat. Often candidates did not address the part of the question that asked them to include details of materials and fittings.

Question 13

(a) (i) Most candidates stated a benefit of using plastics for parts of the toy lorry. The most common answers referred to the available variety of colours, that it was lightweight and easily shaped/moulded.

(ii) Candidates were less knowledgeable about benefits of using beech for parts of the toy lorry. The strongest answers referred to its close-grain, impact resistance and its attractive appearance.

(b) (i) Most candidates were able to provide at least one of the processes to be carried out when using CAM to produce the sides of the toy lorry. Some candidates described some of the processes involved in detail, demonstrating strong practical knowledge.

(ii) Only stronger candidates gained full credit. Very few candidates knew how a contact adhesive would be applied to create a strong joint. Many candidates gained 1 mark for stating that the adhesive would be applied to both surfaces: the toy lorry sides and base. However, most answers then described how the joint would then be clamped. The main feature of a contact adhesive is that the adhesive applied to both surfaces is allowed to become touch dry and then stuck together. Hence the term contact or impact adhesive.

(c) (i) The majority of candidates understood that MDF was cheaper than solid wood, that it was easier to cut and shape and that it provided a smoother surface with the absence of grain.

(ii) Vacuum forming is an important process when manufacturing plastic products. Many candidates were unable to state two features of the mould used to vacuum form the tipper part of the toy lorry. The strongest answers related to a draft angle rounded corners and edges and no undercuts.

(iii) It was clear from the answers to this question those candidates who had first-hand practical experience of vacuum forming. There some excellent detailed stages described.

(d) There were some innovative designs showing how the tipper could be made to tip. The most common answers included the use of hinges or an additional pivot connected to both the base and underside of the tipper. Many candidates did not present their design ideas with sufficient clarity or accuracy. Annotations that could be used alongside sketches to explain the design idea were often difficult to read or simply missing.

(e) Some sort of axle was the starting point to answering this question followed by the fixing of the wheel to the axle. The wheel needed to rotate freely with the use of washers. Many candidates used some sort of rod for the axle and accurately showed that the hole to take the axle was slightly larger in diameter to provide the free rotation. The wheel needed to be secured to the axle or the side of the toy lorry. Many candidates correctly added a nut to the end of a screw or bolt or simply glued some sort of stopper to retain it.

DESIGN AND TECHNOLOGY

Paper 0445/33
Resistant Materials

Key messages

- Candidates need to read the questions carefully before attempting to answer and should try to focus on the key elements of each question. The marks allocation given to each question and the space provided to answer the question provides candidates with a clear indication of what is required.
- Candidates need to improve their knowledge and understanding of the practical processes and techniques required to work the resistant materials, wood, metal and plastic. In order to achieve this, candidates need to be able to match tools and equipment to specific purposes.
- Candidates need to improve their drawing 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 what they have drawn clearer and not simply state the obvious.

General comments

Section A

In this section candidates need an all-round knowledge and understanding in order to answer all questions successfully. Most candidates did not demonstrate a basic understanding of the processes, tools and equipment required.

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. It is essential that candidates attempt all parts of the question to access the full mark range.

Comments on specific questions

Section A

Question 1

(a) Most candidates named an appropriate plastic for the building blocks. The most common was ABS, HIPS and variants of polyethylene.

(b) The majority of candidates provided two specification points for the building blocks. The most common answers included lightweight, smooth, colourful and made from safe materials.

Question 2

(a) Few candidates achieved full marks for this question. Many candidates provided sketches showing the positions of nails that were worth only 1 out of 2 marks.

(b) Hammer was an acceptable answer but very few candidates could name a nail punch.

Question 3

(a) The majority of candidates gave an acceptable answer by including the word casting.

(b) Most candidates named an appropriate item of PPE for the sand-casting process. The most common was the use of gloves, apron and face mask.

Question 4

Most candidates gained marks for this question. There were many excellent answers showing how the outside and inside calipers could be used for measuring the diameters of rod and tube.

Question 5

Most candidates completed the sentence given with the correct word, ergonomics.

Question 6

Many candidates provided good quality sketches showing how the 4mm thick panel could be fitted inside a hardwood frame. The most common method was by means of a groove. Some candidates showed a rebate which was also an excellent method.

Question 7

The two woodturning lathe processes were not commonly known. Faceplate turning and between-centres turning are the definitive methods. Woodturning is a specific area of the syllabus with which candidates should be familiar.

Question 8 (a) and (b)

More candidates named expanded polystyrene correctly for the inner cushioned lining than polycarbonate which was used for the shell of the cycle helmet.

Question 9

(a) The majority of candidates selected a ferrous alloy from the list.

(b) Candidates were less certain when selecting the non-ferrous alloy, duralumin, from the list and only a few answered correctly.

Question 10

There were many innovative design ideas presented for the device to help people with poor grip turn a tap on or off. The best ideas were placed on top of the tap and provided a longer lever that would assist turning. Many alternative designs were worthy of some credit. Candidates needed to make their sketches as clear as possible and to provide annotations to explain how their ideas would work.

Section B

Question 11

(a) Most candidates were able to describe how the acrylic could be cut out using CAM from a CAD drawing. Many answers described how the CAD file would be downloaded to a CNC machine, often a laser cutter, the workpiece set up and tool parameters set.

(b) Acrylic can be termed a smart material because when heated it can be formed. When reheated it will return to its original state. Most candidates who gained a mark for this question stated the first part of the definition but not the second.

(c) The use of a line bender or strip heater to soften acrylic so that it can be bent to shape is a process with which the majority of candidates were familiar. However, to achieve the maximum marks for this question candidates needed to show how the acrylic would be bent around some sort of mould or former. In addition, the acrylic needed to be clamped in position while it cooled.

(d) (i) Most candidates stated two safety precautions that must be taken when using acrylic cement. The most common correct answers included the use of a face mask, protective gloves and a well-ventilated area.

(ii) Most candidates gained marks for showing two containers held together by means of one or two small G cramps.

(e) Many candidates provided potentially practical design solutions for adding a base to the organiser so that it could rotate. The key features required included some form of pivot, the stability of the base and details of the materials and constructions. There were many quite complex ideas that did not achieve all of the marks available due to a lack of clarity in the sketches and technical accuracy in the annotations.

(f) Most candidates achieved 1 or 2 marks at least for showing an ergonomic handle attached to the organiser. Some designs showed the handle across the whole organiser while many simply attached it to one of the containers. Often the method of attachment was either simple or impractical. The quality of communication in sketches and notes was often of a poor standard.

Question 12

(a) Generally, candidates were able to provide items of research undertaken by a designer designing a product. There were many good items of research stated for the cycle rack.

(b) (i) The majority of candidates named at least two of the three marking out tools used to mark out the mild steel sheet.

(ii) Only a minority of candidates produced sketches for a practical jig that could be used to locate the positions for a centre punch. The simplest form of jig would be a plate with four holes drilled, (a template), and then one or two sides would be added to the template to locate against the mild steel backplate.

(c) (i) Very few candidates were able to work out where three mild steel rods would be positioned to enable the mild steel rod to be bent to shape.

(ii) The majority of candidates understood that heating the mild steel rod before bending it would soften the metal and make it easier to bend to the required shape.

(d) (i) Many candidates recognised the blowtorch.

(ii) Many candidates named an abrasive such as sandpaper (glasspaper) to clean mild steel. Glasspaper is used with wood, not metal. Few candidates could name an abrasive such as wet and dry (silicone carbide) paper, steel/wire wool or emery cloth to clean the metal.

(iii) Even fewer candidates were familiar with the purpose of flux. Flux is used when brazing and its purpose is to keep the joint clean, making it free from oxides, to allow the brazing rod to flow.

(e) With paint excluded from possible answers, only a few candidates were able to state two alternative finishes for the mild steel cycle rack. The strongest answers included plastic/dip coating, electroplating and galvanising.

(f) The two main features of this question were that the box should be fastened to the side of the cycle rack and that the method must allow for quick removal. There were many potentially practical design ideas but the use of a screwdriver to remove the box could not be considered to offer quick removal. Some excellent solutions included the use of wing nuts, clips and hooks.

Question 13

(a) (i) Most candidates named a suitable softwood such as redwood, pine, spruce and cedar.

(ii) As in **(i)**, candidates confidently named a suitable manufactured board for the shelves. The most common answers were plywood, chipboard and MDF.

(b) Most candidates were able to give two factors to consider when designing products for use in a bathroom. Excellent considerations included resistance to moisture/steam, easily cleaned and to match the colour/style of the bathroom.

(c) Very few candidates were able to sketch a corner bridle joint that could be used to join parts of the softwood frame. Candidates should be familiar with a variety of frame constructions.

(d) Many candidates showed how the shelf could be joined to one of the ends. The most common methods included dowels and biscuit joints.

(e) Fully functioning shelves were seen only in a few answers. However, many candidates were able to access some of the available marks by showing partially successful designs. Many candidates did not recognise that the shelf fitted inside the frame and by simply cutting housings (slots) in the frame it could not be supported and would not work. There were some excellent innovative modifications by some candidates to deal with this feature.

(f) The majority of answers showed the shelf unit screwed to the wall. This method gained partial credit. Some candidates drilled holes in the frame but then used nails to fasten it. This was not a practical method. The strongest answers included the use of brackets that were screwed to the shelf unit and to the wall.

(g) The majority of answers focussed on the advantages and disadvantages of solid wood and manufactured boards. The question was about the manufacturing process and the advantages and disadvantages to the manufacturer of replacing the softwood frames with a manufactured board.

The most common advantages to the manufacturer included being faster to produce and having less labour involved. The most common disadvantages included the increased cost of using sheet material over softwood strips.

(h) Many candidates understood the term sustainable. Many answers referred to fast growing softwoods that could be replaced quickly and that many manufactured boards utilise wooden waste materials.

DESIGN AND TECHNOLOGY

Paper 0445/41
Systems and Control

There were too few candidates for a meaningful report to be produced.

DESIGN AND TECHNOLOGY

Paper 0445/42
Systems and Control

Key messages

- In both sections, candidates need to read the questions carefully before starting a response. This would avoid situations where an example is asked for in the question but not given in the response.
- Candidates should be advised to check that all required questions have been attempted. A question that is not attempted is guaranteed to get no marks.
- Questions requiring a 'State' or 'Give' answer will only require a short response. The 'Describe' or 'Explain' questions will require more detail, and responses should be given in sentences rather than as short notes. As a guideline one mark is awarded for each valid point, up to the total for the question.
- Use of general terms such as 'strong' or 'cheap' should be avoided unless they are justified by adding more information.

General comments

Questions in ***Section A*** were accessible to most candidates, with few questions not attempted. This reflected the fact that candidates had a good grounding in the key content area of the syllabus.

In ***Section B*** the mechanisms question was the most popular choice. The electronics question was the least popular.

A small number of candidates attempted more than one question in ***Section B***.

Calculations in all the ***Section B*** questions were answered well with the working provided as well as the answer.

Any questions answered in the additional space at the back of the question paper must be clearly marked with the question number.

Comments on specific questions

Section A

Question 1

(a) This question was answered well with all candidates gaining at least one of the three available marks. The majority correctly used durability as a property of steel. The important point for candidates to remember was that the properties given should have related to the axle stand. The photo of the stand showed that steel could be bent and welded, both of which were valid points. Those who gave 'strong' as a response did not gain a mark unless it was justified, for example 'strong in compression.'

(b) There were two marks available, one for the fact that it was a frame structure and one for the triangulation that was used to provide strength and stability. Both marks were awarded for a single point, well described.

(c) Sketches and notes were needed to describe the meaning of shear force. In many cases, opposing arrows were used to correctly show the result of this force in action and the example most often used was that of scissors. The second mark was for the two opposing forces meeting at a single contact point. With a gap between the forces, the result would be bending rather than shearing.

Question 2

(a) The reasons for reducing friction in a mechanism were well known. Most candidates were aware of the results of excessive friction in a mechanism.

(**b)** Lubrication and the use of bearings were the two ways of reducing friction that were commonly mentioned. A few candidates correctly stated that reducing the surface areas in contact or using materials such as nylon, with a low coefficient of friction would also have benefits.

Question 3

A variety of valid benefits for being able to disassemble a product were given in responses. The ability to repair or reuse parts from a product was a frequent response, as was the extra room provided for storage and transport when the product was disassembled.

Question 4

(a) The types of motion were well known and most candidates gained a mark for recognising oscillating movement in the clock pendulum.

(b) Rotary motion was the answer required for the clock hands. Anything resembling rotary was accepted but candidates should be made aware of the standard term for this type of motion.

Question 5

The question clearly asked for examples of the use of computers in stock control. Those who described any other uses such as CAD or CAM were not awarded marks.

Question 6

Most candidates gained the mark for knowing the function of an electrical switch in connecting or disconnecting components from a circuit.

Question 7

(a) Although many candidates were able to use the correct names for each of the switches, there were several who used colloquial terms such as flick switch for the toggle switch.

The reed switch was generally identified correctly but a few candidates thought that it was a fuse. The toggle switch was sometimes identified as an SPDT switch, which was accepted.

(b) Operation of a reed switch using a magnet was correctly described in most cases. Those candidates who just put magnet gained a single mark, but those who noted that the magnet opened or closed the contacts gained the second mark. Use of an electromagnet was also allowed but this is not the usual choice.

Question 8

Knowledge of the two methods of connecting components was common. Knowing which method was series and which was parallel proved a problem for a few candidates.

Section B

Question 9

(a) (i) Most candidates were able to give three valid forces that could affect stability of the chair.

(ii) Only a few candidates correctly interpreted the term lamination. In many cases it was understood to be a means of protecting the timber rather than a constructional technique. Several candidates recognised that it could be beneficial in producing a bend or curve in the top rail.

(b) (i) Accuracy was the most commonly recurring benefit given for CAM production, with just a few candidates taking it a stage further to say that repeatability was also a feature of CAM production.

(ii) Most responses to this question focused on the lower cost of hand production for one-off production. Those who said that it was faster did not gain a mark unless it was justified. This is because once set up, CAM production will be faster but for prototypes hand methods will be faster.

(iii) Specific knowledge of adhesive properties was not strong. Most candidates will have used adhesives on wood and they should have tried to make use of their own experience when putting a response together. Strength in tension and not leaving marks on the wood could have been used in the responses but they were very rarely given.

(c) (i) Sketches were generally limited in quality, but the notes with them clarified the differences between beams, struts and ties. Candidates found it easier to give the difference between struts and ties but had difficulty in giving a clear description of a beam as a structural member.

(ii) Most candidates gained at least one of the two available marks. Warping or termite damage were the most common answers. Knots, shakes and splits were not often seen in the responses.

(iii) Reading the question carefully was key to gaining marks on this question. An example of a composite material was asked for, but rarely given in the response. Most candidates knew what a composite material was but very few could accurately explain the improvements over the parent materials. Reference back to an example would have helped here.

(d) (i) Almost all candidates could identify the counterbalance weight in the workshop joist.

(ii) In general, this calculation was well done. Candidates knew the formula to apply and found the correct answer. Some candidates gained partial credit for the working, showing the benefit of always including the working in a calculation question. Those who then went on to make an error in the final answer, only got the single mark for the earlier working.

(iii) The term Factor of Safety was not widely understood with many responses describing PPE measures that would be taken. It was expected that reference to the breaking strain of the lift cable would be made or labelling that should be applied to inform a user of the safe working load.

Question 10

(a) (i) The question asked for one different benefit for each of the three methods of transmitting motion from one shaft to another. Although there are features that could be applied to more than one method, such as non-slipping, using the same feature twice or even three times did not answer the question. A few candidates gained the mark for the vee belt benefit by saying that it allows limited slip which could prevent damage to other areas of the mechanism. The vee belt was also the only method that does not require lubrication.

With the spur gears the benefit most often given was that the ratio can easily be adjusted.

The chain drive was recognised to have a long service life, the chain itself lasting far longer than a vee belt.

(ii) Some candidates highlighted more than one area of the chain. Careful reading of the question would have revealed that it was a single area required.

(iii) Stronger candidates recognised that the joining link is held tight by the tension in the chain. This led to positive comments about the security of the method and the fact that the chain can easily be removed for cleaning or replacement.

(iv) The advantage of a toothed belt was generally seen to be in reducing slipping. In fact, with this method no slipping will be experienced. A few responses noted that two pulleys of the same size will remain in the same relative position.

(b) There were very few responses that used recognised methods of adjusting spur gears to mesh correctly. For one of the gears movement is required, and either a straight slot or a gear mounted on a quadrant was the expected answer. In a few cases candidates suggested using an idler gear to take up any slack. However, this would still require a method of adjusting the position of one of the gears, by use of a slot or quadrant.

(c) (i) Two reasons were required for using a cover on the drive components of a pillar drill. In several cases only one of the reasons given was valid. Prevention of dust and particles entering the mechanism is an example of a response that was not accepted. A good clue to one reason was the labelling of the cut-off switch. This should have led to the safety reasons for having a cover. Those who stated that the cover would avoid any damage to the user in the case a of a belt breaking gained a mark.

(ii) The calculation of the motor speed was answered well, with more candidates getting the correct velocity ratio than arriving at the correct drive speed. This illustrated the importance of showing all working, with two marks available for the intermediate stages in the calculation.

(iii) There were a few incorrect answers, giving either second or third order for the order of lever used. Most candidates recognised the arrangement as a first order lever.

(iv) This part was answered well, with most candidates realising that a longer lever would increase the effectiveness. The alternate method, reducing the distance between fulcrum and load was not often seen.

(d) Benefits of a worm gear were well known and most candidates gained at least one of the available marks for giving a valid benefit. The large reduction ratio possible and the inability to slip backwards were the responses seen most often.

(e) Knowledge of the standard mechanisms was generally very good. Answers for the conversion from rotary to linear movement were usually correct. For rotary to reciprocating movement the majority of candidates picked at least one correct mechanism. Very few chose to use the compound pulley from the given terms.

Question 11

(a) (i) Most answers for this part were correct in identifying the heat sensing transducer as a thermistor.

(ii) As with the calculations in the other two ***Section B*** questions those who included the working were able to gain partial credit even if the final result was incorrect. Reading the resistance value from the table was usually accurately carried out. Failing to substitute this value correctly into the formula was a common error.

(iii) There were only a few responses that showed understanding of the voltage requirements of a logic system. The fluctuating value from the potential divider could easily be less than the lower threshold of the logic system. Any candidates who mentioned that the voltage was not stable were given credit.

(iv) Either a voltage comparator or a transistor switch would be suitable for taking the output from the potential divider and turning it into a usable logic signal. Precise details for these circuits were not required for full marks but an understandable circuit diagram was needed.

(b) Knowledge of the NAND gate truth table was needed to answer this question. Several fully correct answers were seen, and marks could be awarded to candidates correctly completing individual columns in the table.

(c) (i) The two marks available were for it being identified as a NAND gate IC and the fact that there were four gates on the IC. The ideal answer would be ‘Quad NAND IC.’

(ii) If the connections were added in the order INPUTS – PROCESS – OUTPUT the solution was made easier. Candidates sometimes made errors in not connecting inputs of the gates together where NOT gates were needed.

The gates to be used in the solution were decided by candidates. When answering a question like this it is better to go for the obvious solution, for example using the two gates on the left for the inputs and then either the top or bottom gate on the right to complete the process and provide an output.

(iii) Very few candidates knew that the capacitor was there to prevent any voltage spikes giving false logic readings. There were a few candidates who gained one of the marks for stating that the low value capacitor would store and release charge.

(d) (i) Of the two components in the output circuit, the diode was correctly identified in more cases than the relay.

(ii) Reasons for using a relay in an output circuit did not appear to be fully understood but some candidates mentioned isolation of the low and high voltage circuits, which gained one of the available marks.

(iii) A power connection to the relay Common terminal was added to the correct position in a minority of cases.

The connections to the motor from the relay Normally Open terminal and from 0 V were more often shown correctly.

DESIGN AND TECHNOLOGY

Paper 0445/43
Systems and Control

Key messages

- Candidates should read all questions in ***Section A*** carefully to ensure that the requirements are understood.
- Candidates should read all ***Section B*** questions carefully before attempting to answer a single question.
- Clear, legible writing and carefully drawn sketches are important.
- If a question requires sketches and notes, both should be used in the response.
- In calculation questions all working should be shown. This allows marks to be awarded for any parts that are correct.

General comments

The questions in ***Section A*** were attempted by all candidates. In most cases, answers given were clear and showed that the Key Content had been covered by centres. It should be noted that Key Content can also be used in ***Section B*** questions.

In ***Section B*** most candidates answered **Question 10**, the structures question. Some candidates answered **Question 11**, the mechanisms question. A small number of candidates attempted **Question 12**, the electronics question.

Candidates should be reminded that if they need extra space for a response they should use the pages at the back of the booklet, adding a clear indication of which question the response belongs to.

There were only a few candidates this year who attempted more than a single ***Section B*** question.

Comments on specific questions

Section A

Question 1

The question asked for three types of man-made structure to be named. ‘Shell, frame and mass’ were all that was required for the marks to be awarded. Several responses included an example of each type. Some candidates only gave examples, some of which could have been more than one type of structure. If a candidate wrote ‘bridges’ this could be either a frame, mass or shell structure, so was not awarded any marks. A dam could only be a mass structure so the mark for this could be awarded.

Question 2

(a) The wooden support structure for railway track provided several opportunities for gaining marks. The most frequently given answers were the triangulation and cross bracing visible on the structure. Solid foundations with an increased width at the base were also noted. Those candidates who provided a detailed description of a single feature were awarded both marks.

(b) This part was answered well with most candidates gaining at least one of the marks. A plentiful supply of timber was a common reason given for the use of wood. In several responses candidates noted that it is a renewable resource.

Question 3

(a) This question was focussed on the contrast between wood and plastics when used for window frames. There was clear understanding of the main advantages of plastic for the frames. Reference was made in many cases to the insulation properties and stability of the plastic compared to a wooden frame.

(b) This part asked for disadvantages of using plastic. The fact that it is environmentally unsound was commonly given in answers. The effect of discolouration due to UV from sunlight was also stated.

Question 4

Reasons for using oil in a car engine were generally well known, with lubrication and reducing friction the most frequently seen. One misconception was that the oil is also used as fuel for the vehicle.

Question 5

Conversion of motion was a familiar topic for most candidates and almost all candidates managed to gain marks in the question. The rotary motion of both the cam follower and the pencil was correctly identified by most candidates. The resulting movement of the cam follower was correctly identified as reciprocating but it was given as linear in a small number of cases.

Question 6

The electronic symbols were well known with many candidates gaining all three marks. Errors tended to be with the transistor symbol being mistaken for a diode or a switch. The symbol with least errors was the ammeter.

Question 7

Understanding of the actions of PTM and PTB switches was very good. The actions were explained using clear examples of suitable uses for each type of switch.

Question 8

The majority of responses used copper as the example of an electrical conductor. Any named metal was acceptable.

Question 9

To retain the output voltage at +1.5 V it was necessary to connect the two batteries in parallel.

Stronger candidates added the correct connections, gaining both marks. A common feature of the incorrect responses was to connect positive to negative on both batteries, resulting in an arrangement that was neither parallel nor series.

Section B

Question 10

(a) (i) The majority of responses were correct in naming the construction method as lamination.

(ii) The adhesive properties required for the laminated propellor could be broken down into two categories; those properties particular to a propellor, such as weather resistance, resistance to shear or tension and the properties that could apply to any laminated structure, such as gap filling or resistant to movement of the wood. Some of the descriptions given were very clear, gaining both marks while others were too general such as ‘strong,’ without saying in what area the strength should be.

(iii) The benefits that lamination gives to the manufacturer could have included increased resistance to bending or avoidance of natural defects in the timber. In too many cases 'cheap' and 'easy' were given as single word responses and these did not gain any marks.

(b) (i) This question was answered well with a high proportion of candidates gaining all marks. The question involved analysing the methods that were illustrated and applying knowledge of forces that could be applied. There were very few candidates who gave more than the required two ticks in each row.

(ii) Many of the sketches were of excellent quality and gave a clear indication of how the improvement would work. Notes were usefully added providing further evidence of candidates' thinking. There were very few examples where the method of joining being improved was not clearly noted or the force being resisted was not specifically mentioned.

(c) (i) Knowledge of ties in a structure was good. Most responses gained the mark for the position of the tie. The second mark was for showing a suitable section of material for the tie and this mark was generally given as well.

(ii) The strut should have been drawn on the underside of the arm to resist compression. Stronger candidates realised that the material section for this should be greater than for a tie, resisting tension. Stronger examples of both the tie and strut included details of the fixing method.

(iii) Knowledge of gusset plates was slightly less than for the tie or strut. The mark for a suitable shape of plate was generally awarded. The mark for putting the plate in a suitable position was also awarded to most candidates.

(d) (i) The reason for the limit stop on the barrier was identified by stronger candidates as a means of preventing over-rotation of the arm. This could be applied to either the up or the down position of the arm. The second mark, which related to avoidance of strain on the motor, was rarely awarded. Without the stop the motor would have to keep the arm in a holding position, which could result in overheating or the motor burning out.

(ii) The calculation of force needed to keep the barrier in equilibrium was successfully completed by most candidates. Candidates who had a correct answer without including their working were awarded full marks. There were a few occasions where partial credit for the working could be awarded even though the answer was incorrect.

Question 11

(a) (i) This question required knowledge of material properties. It was answered well with a range of valid properties used in the responses. The most frequently found were corrosion resistant for stainless steel and self-lubricating for nylon. Some candidates put more than one property for each material, in most of these cases what they had put was correct but extra marks could not be awarded.

(ii) The mechanism used in the whisk was a crank, which only stronger candidates recognised. A crank is one of the conversion of motion terms listed in the syllabus that candidates should be familiar with.

(iii) The concept of velocity ratio was well known and the information from the given illustration was used. Errors occurred in putting the ratio the wrong way round, 1:5 instead of 5:1 or of doing the division correctly and not stating the answer as a ratio. Any candidates who gave 1:5 as the ratio and had the division correct were awarded one mark.

(iv) Despite there being errors in the previous part almost all candidates managed to calculate the speed of each beater correctly.

(v) There were two observations needed to gain the marks for movement of one beater relative to the other. First, the beaters rotate at the same velocity. Second, they are rotating in opposite directions. There seemed to be the same level of understanding relating to both factors but often only one factor was included in the description. Candidates should be aware that where two marks are available two relevant points are required.

(b) (i) This question was answered well with candidates having clear knowledge of different bearing types.

(ii) This question was another example of a description being required, with two marks available for two relevant points. The most common answers related to reducing friction and reducing wear in the parts of the mechanism. Where full justification was included for a single point, both marks could be awarded.

(iii) The question was about control of end-to-end movement of a shaft. In many cases the sketches given were clear, but the solutions controlled radial rather than axial load. The simplest solution would have been either a single ball or a plain bearing placed at the end of an axle to prevent any sideways movement. In a few responses from stronger candidates, thrust races using ball bearings were used.

(c) (i) Knowledge of the orders of lever was very good, with clear descriptions involving the position of the fulcrum relative to the effort and load. Suitable examples of each order were added in some cases.

(ii) The importance of levers in hand operated machines was frequently explained using the fact that mechanical advantage is increased, thus reducing the effort that the operator must apply.

(d) (i) The mechanical advantage of the pulley system could be found by counting the number of pulleys included in the system. Stronger candidates understood this method. Some of the examples seen included complicated calculations that involved taking measurement from the drawing. Any figures required for a calculation will always be included in the question.

(ii) The conversion to Newtons could have been carried out either before or after the main calculation. Error carried forward from part **(i)** was allowed and rounding of the result was also allowed.

Question 12

(a) (i) The circuit shown was a transistor switch using an NPN transistor. The resistor R2 was there to function as a pull up resistor providing a 9 V signal when the transistor was not powered. Without this resistor the switch output can only be 0 V or have a floating value.

(ii) The transistor switch has several advantages over a mechanical switch. The main ones being the extremely small size that is possible and the high rate of switching.

(iii) The main practical disadvantage of a transistor switch is that it can only carry a small current compared to a mechanical switch. Another drawback is that an LED indicator is needed to know the state of the switch, whereas most mechanical switches give a visual indication of the switch state.

(b) (i) The circuit diagram showed a transistor amplifier with two lamps connected. The reason that the first lamp would not light is that there is only a very low current able to pass through it. The second lamp is connected through the collector/emitter which has an amplified current passing through it.

(ii) The calculation required use of two formulas, both of which were given in the question, The case current was calculated using the resistor values given in the circuit diagram and the collector current could be taken from the circuit diagram. This part was answered well.

(iii) The resistor R1 was included in the circuit to give protection to the transistor if the variable resistor was adjusted to give 0 ohms resistance.

(c) (i) Correct identification of each LED leg is a practical concern when building circuits. With a standard LED the flat on the side of the casing will give indication of which is the negative leg (cathode). The negative leg is also the shorter of the two. For both marks to be awarded the method had to be shown, as well as an indication of which leg had been identified.

(ii) To identify the legs on an IC the dot or marker on the IC case is found first. This will show which end pin 1 will be found. Pin 1 is the top left pin. Two marks were awarded for both stages being correct.

(iii) This part was answered well with clear knowledge of which components are polarised.

(d) A potential divider arrangement was needed with a light dependent resistor (LDR) and a variable resistor in the divider. Having the LDR at the top of the divider would cause the output voltage to rise with increasing light level. Having a variable resistor at the bottom of the divider would allow adjustment of the sensitivity.

(e) (i) Producing a three in put OR gate using two 2-input gates required the output of the first gate to become one of the inputs to the second gate. This arrangement was known to most candidates.

(ii) This part used the latched relay circuit which is one of the specified switch circuits from the syllabus. The explanation should have included how the relay initially latches, why it remains switched on when the original signal is removed and how the reset of the relay is accomplished. Full marks could rarely be awarded for the explanations given.

DESIGN AND TECHNOLOGY

Paper 0445/51
Graphic Products

Key messages

The focus of this assessment is Graphic Products. Future candidates would benefit from practical activities based on the questions contained in this paper with a focus on drawing accurately using instruments.

General comments

Candidates were required to complete all questions in ***Section A*** (**A1**, **A2** and **A3**) and then go on to answer either **Question B4** or **B5** from ***Section B***. An equal number of candidates chose to answer **Questions B4** and **B5**. A small number of candidates did not follow the instructions and answered all questions.

There are areas of the syllabus where some candidates did not perform well. With the increased use of computers in graphic design and graphic products, candidates need to be aware of CAD/CAM equipment, how it is used and the advantages of it. The commercial manufacturing processes of graphic products and sectional views are areas where many candidates did not perform well.

Comments on specific questions

Section A

Question A1

(a) Candidates were required to draw the three missing pages of the leaflet. Many candidates drew the overall size correctly but drew the individual pages to the incorrect size. Many candidates did not show any distinction between cut and fold lines. The strongest candidates used correct line conventions.

(b) Candidates were required to draw the circle on the given centres on the front page. Most candidates completed this successfully and achieved both marks.

(c) Candidates were required to draw the rectangle on the front of the leaflet. Most candidates drew the rectangle to the correct size and in the correct position and achieved both marks.

Question A2

(a) This question required candidates to describe how a computer could be used to source an image and add it to the leaflet. For the two marks available, candidates were expected to describe how they would find or create the image, then capture, download or copy it so it could be used on the leaflet. Many candidates were able to state that a suitable image could be found on the internet but did not explain that the image would need to be downloaded, copied or saved.

(b) This question required knowledge of commercial printing processes for quantity production. Many candidates did not answer this correctly and gave answers relating to batch production techniques.

(c) This question required candidates to calculate the number of leaflets that could be produced from a given size of card. Many candidates did not answer this correctly.

Question A3

(a) (i) Candidates were required to complete the drawing of the hexagonal pet identity tag to the sizes given. The vast majority of candidates were able to complete this correctly and achieved all 3 marks.

(ii) Candidates were required to complete the drawing of the pentagonal pet identity tag to the sizes given. Many drew irregular pentagon shapes and few achieved the full 4 marks. To achieve higher marks for this question, candidates should have ensured they knew how to construct basic geometric shapes using the correct methods. They should also have made sure they drew accurately to the dimensions given.

(b) This question asked candidates to complete the full size two-point perspective view of the pet identity tag. Candidates were required to project lines to the relevant vanishing points and use the dimensions given to complete the perspective view. Many candidates were able to project lines correctly but drew the base of the identity tag to the wrong length. Many candidates did not draw the identity tag to the correct thickness.

Section B

Question B4

(a) Candidates were required to complete the isometric view of the assembled pet bed to a scale of 1:10. Most candidates were able to draw the basic outline of the pet bed to the correct size. Many candidates failed to draw the sloping sides correctly or the internal corners and glue tabs.

(b) (i) Candidates were asked to describe one property of corrugated cardboard that makes it suitable for the pet bed. There was a wide range of responses. Many candidates stated a property of corrugated card but this was not always one that made it suitable for the pet bed. Many candidates named a suitable property but did not explain why this made it suitable.

(ii) This question asked candidates to state a suitable type of adhesive for fixing the net together. A range of responses was seen and many candidates achieved the mark.

(iii) Candidates were asked to show a modification to the development (net) that would allow it to be assembled without the use of adhesive. Candidates showed various methods including slots and tabs. Many candidates showed a method of preventing the tongue from coming out of the slot in the development (net) so that it locked together. Candidates who clearly sketched a method that would work effectively achieved full marks.

(c) This question asked candidates to apply thick and thin line technique to the pet toy. The principle was that where only one edge is seen producing the corner, a thick line was applied. All edges where two sides were seen producing the corner were left as thin lines. Many candidates applied the technique correctly and achieved all three marks. Many other candidates showed some knowledge of the technique and gained marks but could have improved on the use of this technique.

(d) Candidates were asked to draw a bar chart showing the results of the survey. Many candidates were able to draw a bar chart to an appropriate scale showing the information correctly. Some candidates did not label the X and Y axis and so could not be awarded full marks.

Question B5

(a) Candidates were required to complete the orthographic views of the pet food bowl to a scale of 1:2 showing all hidden detail. This question was not well answered by the majority of candidates. Many candidates did not complete the plan view by adding the two circles. Many candidates attempted the end view but did not draw the circular bowls to the correct depth or width. Many candidates completed the outline of the side view correctly but did not add the hidden detail correctly. Candidates who carefully studied the isometric view, read the necessary dimensions and drew accurately from the given start points achieved the best results.

(b) This question required candidates to construct an ellipse and half ellipse on the given axis lines to the sizes stated. Many candidates did not achieve full marks on this question. Some candidates used incorrect construction methods or joined the plotted points of the ellipse with straight lines rather than a smooth elliptical shape. Many candidates completed the top full ellipse to a reasonable standard but did not complete the bottom half-ellipse to the same accuracy. Where a trammel is used for constructing an ellipse, this must be attached or drawn adjacent to enable marks for construction to be awarded.

(c) (i) Candidates were asked to name one method of making the pet bowl from thin plastic. A range of responses was seen. Many candidates did not give a correct answer. Vacuum forming was the most popular correct answer.

(ii) Candidates were asked to name a suitable type of thin sheet plastic for the bowl. A range of different answers was seen. The best responses were polystyrene sheet (HIPS) which is common in many schools.

(iii) This question asked candidates to complete a full-size sectional view through the pet food bowl. Candidates were required to show knowledge of sectional drawing and use the information given in the isometric view. Many candidates drew the bowl to the correct height but could not complete the inner bowl or sloping outer sides correctly. Very few candidates achieved full marks on this question.

DESIGN AND TECHNOLOGY

Paper 0445/52
Graphic Products

Key messages

The focus of this assessment is Graphic Products. Future candidates would benefit from practical activities based on the questions contained in this paper with a focus on drawing accurately using instruments.

General comments

Candidates were required to complete all questions in ***Section A*** (**A1**, **A2** and **A3**) and then go on to answer either question **B4** or **B5** from ***Section B***. An equal number of candidates chose to answer **Questions B4** and **B5**. A small number of candidates did not follow the instructions and answered all questions.

There are areas of the syllabus where some candidates did not perform well. With the increased use of computers in graphic design and graphic products, candidates need to be aware of CAD/CAM equipment, how it is used and the advantages of it. The drawing of 3D shapes, sectional views and the correct use of hidden detail are areas where many candidates did not perform well.

Comments on specific questions

Section A

Question A1

(a) Candidates were required to draw the circle to the sizes given and on the correct centre lines. Many candidates drew the circle on the centre lines but some drew the circle with an incorrect diameter.

(b) Candidates were required to draw the regular hexagon to the sizes given. Many candidates drew irregular hexagons with different side lengths and angles.

(c) Candidates were required to draw the octagon to the sizes given. Many candidates drew irregular octagons with different side lengths and angles.

(d) Candidates were required to draw the two isosceles triangles to the correct size and in correct positions. Many candidates drew isosceles triangles but not to the correct size or did not get them in the correct position.

(e) Candidates were required to complete the ACTIVE title by adding the missing letters C and E in a consistent format to the given text. Many candidates completed this to a high standard and achieved both marks. However, some drew the lettering to the incorrect size or thickness which did not match the existing style.

To achieve higher marks in this question, candidates needed to ensure they knew how to construct basic geometric shapes using the correct methods. They should also have made sure they drew accurately to the dimensions given.

Question A2

(a) Candidates were required to draw the plan view of the drinks bottle by projecting the widths of the cap, neck and bottle from the front view. Hidden detail for the bottle neck was required. Many

candidates were able to draw the outer bottle circle and lid circle to the correct diameter but very few candidates were able to add the neck detail correctly.

(b) Candidates were required to draw the label on the side view by projecting horizontal lines from the front view. The vast majority of candidates completed this successfully.

Question A3

(a) Candidates were required to draw the full-size development (net) including the 20 mm overlap. Many candidates projected the label horizontally but did not make the label the correct length (232 mm). Many drew both ends of the label the same length rather than making one side 20 mm longer.

(b) Candidates were required to identify the 20 mm long area the glue would be applied to. Many candidates did not achieve full marks on this question as they identified two areas (one each end). This would mean one of the glue areas was on the incorrect side of the development (net).

Section B

Question B4

(a) Candidates were required to complete the parts list of the point-of-sale display unit by drawing the individual parts to a scale of 1:10. Most candidates were able to draw the base of the unit to the correct size. Many candidates drew the front and side pieces to the correct overall dimensions but drew the cut-outs incorrectly.

(b) (i) Candidates were asked to name a suitable type of thin plastic for the point-of-sale display insert. There was a wide range of responses. Candidates who named a rigid plastic that is available in sheet form were awarded the mark.

(ii) This question asked candidates to state a suitable piece of CAM equipment that could be used to cut out the insert from the thin plastic sheet. A range of responses was seen but many candidates did not achieve the mark. It appeared that many candidates had very limited knowledge of the use of CAD/CAM.

(iii) Candidates were required to describe a method of bending the plastic sheet to shape. Many candidates described the use of a vacuum former which would be unsuitable due to the holes in the plastic. Candidates who described heating the plastic to soften it and the use of a former to achieve the correct shape achieved full marks.

(c) Candidates were asked to complete the one point perspective view of the point-of-sale display to a scale of 1:5. Many candidates drew the backboard to the correct height and successfully projected lines to the vanishing point but did not draw the display to the correct width. Many candidates did not include the inner detail of the point-of-sale display or drew the base lines incorrectly projected.

Question B5

(a) Candidates were required to complete the isometric view of the bottle package a scale of 1:3. Many candidates were able to draw the two vertical sides correctly but did not draw the sloping sides of the package correctly sloping in two directions. Many candidates drew the handle in the centre of the package but to an incorrect height and length. Candidates who correctly read the orthographic views and worked from the given corner achieved the best results.

(b) (i) This question required candidates to describe how a computer could be used to capture an image of a recycling symbol. For the two marks available, candidates were expected to describe how they would find, get or create the symbol, then capture, download or copy it so it could be used on the package.

(ii) Candidates were asked to explain a benefit of using a computer to capture and store images. A range of different answers was seen. The best responses described benefits associated with the storage, transferral and ease of access compared to paper documents.

(c) This question asked candidates to complete a sectional view through the recycling bin. Candidates were required to show knowledge of sectional drawing and hatching. Many candidates drew isometric views or plan views of the recycling bin. Some candidates drew a sectional view but with the base missing.

(d) Candidates were required to render the model of the recycling bin to look more realistic. Candidates were expected to apply tonal shading to the sides and top of the bin and show shadow or darker tone to the inside faces. Many candidates made the bin look like Styrofoam by adding textural rendering. Many candidates added colour to the bin but showed no difference in tone. The quality of shading was good on the whole, but some candidates' application of colour was uneven and untidy.

DESIGN AND TECHNOLOGY

Paper 0445/53
Graphic Products

Key messages

The focus of this assessment is Graphic Products. Future candidates would benefit from practical activities based on the questions contained in this paper with a focus on drawing accurately using instruments.

General comments

Candidates were required to complete all questions in ***Section A*** (**A1**, **A2** and **A3**) and then go on to answer either question **B4** or **B5** from ***Section B***. An equal number of candidates chose to answer **Questions B4** and **B5**. A small number of candidates did not follow the instructions and answered all questions.

There are areas of the syllabus where some candidates did not perform well. With the increased use of computers in graphic design and graphic products, candidates need to be aware of CAD/CAM equipment, how it is used and the advantages of it. The commercial manufacturing processes of graphic products and planometric views are areas where many candidates did not perform well.

Comments on specific questions

Section A

Question A1

(a) Candidates were required to draw the two missing button outlines onto the plan. Candidates were expected to project lines from the given buttons horizontally and vertically to draw the button outlines correctly. Many candidates completed this question correctly and achieved all 3 marks. Some candidates did not respond to this question.

(b) Candidates were required to complete the front view of the handset. Candidates were expected to draw the outline and add the missing button by projecting lines from the existing views and using the information given. The vast majority of candidates completed this successfully and achieved both marks.

(c) Candidates were required to complete the side view of the handset. Many candidates drew the handset to the correct height but did not draw the back edge with the angled portion correctly. Some candidates drew the side view upside down or facing in the wrong direction. Candidates who projected the button positions from the front view and then used the given information on the front view for the depth of the buttons achieved the best marks.

Question A2

This question required candidates to give one tool or item of equipment that would be used for each process given in the table. Many candidates gave ‘craft knife’ or similar answers for the first process but were not awarded marks as the blade of a craft knife is not long enough to cut the 55 mm deep angled back of the handset. Many candidates named ‘hot glue’ or solvent-based adhesives such as superglue for the last process and also did not achieve the mark. Hot glue and solvent-based adhesives melt the Styrofoam and are unsuitable.

Question A3

(a) Candidates were required to add the missing rectangle by mirroring the existing given one. Almost all candidates achieved full marks for this question.

(b) Candidates were required to complete the on/off button by adding two arcs to the radii given. The vast majority of candidates completed this correctly and achieved all 3 marks.

(c) Candidates were required to complete the octagon to the given size. Many candidates were able to draw a basic or regular octagon but many did not achieve full marks due to inaccurate construction of the octagon.

(d) Candidates were required to complete the equilateral triangle using the given starting line. Candidates were expected to scribe arcs using the existing given line to find the point of the triangle. Most candidates were able to complete this accurately and gained full marks. To answer this well, candidates needed to ensure they knew how to construct basic geometric shapes using the correct methods. They should also have made sure they drew accurately to the dimensions given.

Section B

Question B4

(a) Candidates were required to complete the isometric view of the holder for remote controls to a scale of 1:2. Most candidates were able to complete the front base parts of the holder but struggled with the two sloping back edges and the two compartments. Very few candidates achieved the full 13 marks on this question.

(b) Candidates were required to render the holder for remote controls to look like a solid block of plastic. Candidates were expected to add tonal shading to the three outside faces of the block and appropriate shadow to the sloping and vertical inner faces. There was a wide range of responses. Many candidates rendered the block to appear as clear or translucent plastic. Many candidates simply coloured the block and added no tonal shading or rendering techniques.

(c) For this question, candidates had to complete the TV label by adding the lettering in a style consistent with the lettering on the given label. Candidates were expected to draw the letters T and V to the same height, width and thickness as the given letters H and C. Many candidates completed the letters to the correct height, but the width and thickness of the letters was done incorrectly by many candidates. Very few candidates spaced the letters out appropriately so that there was an even gap between them and the edges of the label.

(d) For this question, candidates had to describe how CAD/CAM could be used to produce the self-adhesive labels. Candidates were expected to describe how the lettering would be created using CAD, then downloaded to a CAM machine before being produced using an appropriate item of CAM equipment. Many candidates appeared to have some knowledge of CAD but did not describe how the completed label design would be downloaded or name an appropriate piece of CAM equipment that could be used to cut out the self-adhesive vinyl.

Question B5

(a) Candidates were required to complete the 60/30 planometric view of the flat screen television to a scale of 1:5. This question was only answered well by stronger candidates. Many candidates responded by drawing in isometric rather than planometric. Some candidates successfully constructed the side of the television unit but did not complete the centre stand or base correctly. Very few candidates achieved full marks on this question.

(b) (i) Candidates were required to complete the development (net) of the flatscreen television package to a scale of 1:10. Many candidates completed the right-hand side and base of the package successfully but drew the base, back and side sections incorrectly. Most students correctly added the three glue flaps but fewer candidates used the correct dotted/dashed convention for the fold lines.

(ii) Candidates were required to state one property of corrugated cardboard that made it suitable for the television package. A wide range of responses was seen. Many candidates gave generic answers such as it being cheap, durable or strong and did not achieve the marks. The best responses gave a property and explained why this made it suitable for the package.

(c) (i) This question required candidates to show knowledge of commercial production methods for graphic products. Candidates were asked to name one suitable method of printing the text onto the cardboard development (net). Many candidates gave incorrect answers such as laser printing rather than a commercial printing process or methods that would be unsuitable for corrugated cardboard.

(ii) Candidates were asked to name one suitable method of cutting and creasing the corrugated cardboard development nets. Laser cutters were a common incorrect answer for this question. Candidates that showed knowledge of commercial printing, cutting and creasing processes achieved the best marks.

(d) This question asked candidates to give the meanings of the two standard symbols used on packaging. Many candidates were able to identify the meaning of the first symbol and gave answers relating to recycling. Fewer candidates were able to identify the meaning of the second symbol. However, many candidates achieved full marks on this question.