DESIGN AND TECHNOLOGY

Paper 0445/11
Product Design 11

Key messages

Candidates who performed well demonstrated a good understanding of the question requirements and produced creative design work that was underpinned with sound technical understanding.

Candidates should be aware that the focus for **Question 1** is Resistant Materials, for **Question 2** Graphic Products and for **Question 3** Systems and Control.

Candidates should be advised to read each question carefully. They should follow the instructions for each individual question, especially the number of points, ideas, materials or methods that the question is asking for. This supports good time management when completing the question paper.

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 advised that in **part (e)** marks are specifically allocated for construction details and important dimensions.

General comments

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

The overall standard of work was good, with freehand sketching and knowledge of materials and processes being strengths for many candidates.

Some candidates may benefit from adopting a more structured approach in order to express their thoughts clearly in the written parts of the paper. 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 a freestanding device that would allow a child to safely reach a bathroom sink that they considered to be important. Commonly seen answers related to ease of use, hygiene, making sure it would appeal to a child or ensuring the device would not slip on a wet surface. Candidates should be advised against repeating points that are given in the question or giving generic points, such as strong or cheap, that might apply to almost any product.

(b) Most candidates used sketches and notes to good effect to show two methods of making a product collapsible. Commonly seen answers included telescopic legs, removable sections, hinged pieces, or folding parts. Candidates should be reminded that the question asks for sketches and notes and, therefore, just sketches will not be awarded full marks.

(c) A very good range of sketches with annotations was seen for this question, with almost all candidates producing the required three ideas. The strongest candidates added annotations that referred to the design requirements to their sketches and used a range of presentation techniques, including freehand exploded views. Some candidates' ideas did not fully encompass the requirements for the device to be freestanding or collapsible. It is important that all design ideas fully meet the design requirements if candidates are to access the full range of marks.

(d) The evaluations of ideas were generally well reasoned, with candidates able to demonstrate a good understanding of the positive and negative features of their design proposals. Commonly seen answers referred to how easy it would be to manufacture and use the device, stability or features that would mean the device would appeal to the child. It is important that candidates evaluate their design proposals, rather than simply describing them, and do not repeat the same evaluation points for each idea. Almost all candidates chose one of their ideas to develop further, usually by giving the number of the idea, and justified their choice. The standard of written communication for this question was variable, and the use of bullet points or numbered points may have enabled some candidates to separate their thoughts more clearly.

(e) Some very impressive responses were seen to this question, with freehand sketches and notes clearly showing the full details of the final design proposal. Other drawing methods used included freehand orthographic drawings, freehand exploded views, freehand isometric views, and material lists. Colour was usually used to add clarity to drawings. Stronger responses provided sufficient information for a skilled third-party to make the product and usually included details of dimensions, materials, joining methods and finishes. Weaker responses were often missing construction details or important dimensions.

(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 aluminium, rubber and other specific types of polymers. Specific types of timber were rarely seen. Reasons for the choice of material included the visual appeal of the surface finish, hygiene or that it would be lightweight and therefore easy to lift. Candidates should be advised against giving generic names of materials such as plastic, or consumables such as adhesives, as these responses are not awarded marks.

(g) Most candidates used a combination of sketches and notes to outline a method to manufacture one part of their design proposal. Commonly seen methods involved the use of a laser cutter or injection moulding to make individual parts of their design. Hand production methods, involving marking out cutting and joining materials, were also commonly seen. Some very good responses were seen to this question, but it is important that candidates include the correct names of tools and equipment if they are to access the full range of marks.

Question 2

(a) Most candidates managed to list four additional points about a product that could be used to record and display when a child has cleaned their teeth that they considered to be important. Commonly seen answers included the product should be fun to use, colourful, include child friendly images or be freestanding. Candidates should be advised against repeating points that are included in the question, for example the product must show the days of the week or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes to good effect to show two methods of showing how daily events could be recorded and displayed. Commonly seen responses included check lists, stickers, shapes that could be attached to a board with Velcro or rotating discs. A small number of candidates interpreted the record and display element of the question as requiring an electronic product and showed the use of devices such as tablets or mobile phones. In almost all cases, the quality of the sketches and notes were sufficient to clearly communicate the method.

(c) A good range of sketches with annotations was seen for this question, with colour generally used to good effect. Commonly seen design proposals included display boards made from a folded sheet material, such as foamboard, or frames made from tubular aluminium or softwood strips with a board attached. Whilst most candidate's designs were freestanding, some showed solutions that were wall mounted or handheld. The annotations often revealed the candidate's true understanding of how the design proposal would function in the intended environment. It is important that all ideas fully meet the design requirements if candidates are to access the full range of marks.

(d) The evaluations of ideas were generally sound, with candidates able to demonstrate an understanding of the positive and negative aspects of their design proposals. Commonly seen answers focused on how effective it would be to display the information or communicate it to the parents. It is important that candidates justify their evaluations rather than making general statements, such as that it would work well, if they are to access the full range of marks. Almost all candidates chose one of their ideas to develop further, usually by giving the number of the idea, and justified their choice.

(e) Some very good responses were seen to this question, with a variety of methods used to show the full solution to the design problem. These methods included freehand orthographic drawings, freehand sketches, and materials lists. Colour was generally used effectively to show the material or surface finish. Many responses included an exploded three-dimensional (3D) sketch of the artefact, with supporting annotations. The question specifically asked for construction details and important dimensions but, particularly in weaker responses, these were often missing. All candidates need to consider whether the information they provide would be sufficient for a skilled third-party to make the product.

(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, Corriflute (corrugated plastic sheet), aluminium and pine were commonly named materials, with reasons often referring to specific properties, such as weight or strength, or the available range of colours and sizes. Some candidates also referred to how easy it would be to add surface graphics to the materials. Candidates should be advised against giving generic names of materials, such as plastic or metal, as these are not awarded marks.

(g) Most candidates were able to use sketches and notes to outline a method that would be used to manufacture one part of their design proposal. Hand production techniques, involving tools such as a craft knife, saw, drill and screwdriver were commonly seen but some candidates used computer-controlled technology to produce parts for their design. It is important that candidates include the correct names of tools and equipment to be used in the method of manufacture if they are to access the full range of marks.

Question 3

(a) Very few candidates answered this question. Most candidates that did answer this question managed to list four additional points about the function of the device that would indicate the amount of time spent in a shower that they considered to be important. Commonly seen answers stated that the device would need to waterproof, resist high temperatures, attach to the shower surround, or be ergonomically designed so that it would fit in one hand. Candidates should be advised against repeating points that are given in the question, for example the device must be used in a shower or sound an alert after an allotted time, as these responses are not awarded marks.

(b) Most candidates used sketches and notes to good effect to show two methods that would give an audible or visual alert. Most candidates showed electronic methods, that involved the use of flashing LEDs or buzzers, but some candidates showed spring loaded devices that did not rely on a battery as a power source. In almost all cases the quality of the sketches and notes were sufficient to clearly communicate the method.

(c) A good range of sketches with annotations were seen in response to this question. Colour was generally used appropriately to improve the visual impact of the design proposals, and, in most cases, one could visualise how the product would be used even though details of the components and case construction were sometimes less clear. A small number of candidates produced fewer than three ideas or three ideas that were very similar.

(d) The evaluations of ideas were often impressive, with candidates able to demonstrate an understanding of the positive and negative aspects of their design proposals. Many responses focused on the reliability of the device in a shower environment, how discreetly it could be positioned in a shower or how effective the alert would be after the allotted time had elapsed. It is important that candidates justify their evaluations rather than making broad statements, such as it is the best idea, if they are to access the full range of marks. Almost all candidates chose one of their ideas to develop further, usually by giving the number of the idea, and justified their choice.

(e) Responses to this question were generally good, with a variety of methods used to show the full solution to the design problem. These methods included freehand exploded sketches, freehand orthographic views, annotations, and materials lists. The question specifically asked for construction details and important dimensions but often in weaker responses these were unclear as only the external views of the device were shown. All candidates need to consider whether the information they provide would be sufficient for a skilled third-party to make the product.

(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 other specific polymers, with reasons including that it would be suitable for moulding into complex shapes, available in a wide range of colours or that it would be water resistant. Candidates should be advised against giving generic names of materials such as plastic, or generic reasons such as it is easy to work with, as these are not awarded marks.

(g) Most candidates used a combination of sketches and notes to outline a method of manufacture of one part of their design proposal. Commonly seen manufacturing methods included fabrication techniques or the use of a laser cutter or a 3D printer. The explanations of computer-controlled technology usually demonstrated a very good understanding of the process. It is important that all candidates include the correct names of tools and equipment to be used in the method of manufacture if they are to access the full range of marks.

DESIGN AND TECHNOLOGY

Paper 0445/12
Product Design 12

Key messages

Candidates who performed well demonstrated a good understanding of the question requirements and produced creative design work that was underpinned with sound technical understanding.

Candidates should be aware that the focus for **Question 1** is Resistant Materials, for **Question 2** Graphic Products and for **Question 3** Systems and Control.

Candidates should be advised to read each question carefully. They should follow the instructions for each individual question, especially the number of points, ideas, materials, or methods that the question is asking for. This supports good time management when completing the question paper.

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 advised that in **part (e)** marks are specifically allocated for construction details and important dimensions.

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)**.

Centres should not fasten the two response sheets together, with staples or string, or include the question paper with the response sheets.

General comments

Question 1 was the most popular question, although there appeared to be more candidates who attempted **Question 3** than in previous years.

Almost all candidates answered all the parts of their chosen question within the spaces provided and very few candidates used the additional space on the last page.

The strongest responses included a range of creative ideas for **part (c)** and in **part (e)** the final solution demonstrated a good level of technical accuracy and understanding.

Some candidates may benefit from adopting a more structured approach in order to express their thoughts clearly in the written part of the paper. 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 were able to list four additional points about the function of a countertop storage unit to hold and display fresh fruit that they considered to be important. Most candidates developed their points into short sentences, rather than giving just a one-word answer. Commonly seen

answers indicated that the storage unit would need to be easy to wipe clean, prevent the fruit from being damaged, stand on a flat surface or allow customers to easily access the fruit. A few candidates considered that the storage unit must also display the names and price of the fruit. Candidates should be advised against repeating points that are given in the question or giving generic points, such as cheap, that might apply to almost any product.

(b) Most candidates used sketches and notes to good effect to show two methods of making a storage unit adjustable so that it could hold different shaped items. Commonly seen answers involved the use of sliding shelves, runners, slots, removeable partitions or linkages. The standard of written and visual communication for this question was often of an excellent standard.

(c) An impressive range of sketches with annotations was seen for this question. The most common solutions were made from pine, aluminium, or acrylic. The strongest candidates added detailed annotations to their sketches which made it clear that they had fully considered how different shaped fruits would be held in the storage unit. Most candidates designed a display unit that would sit on the countertop, as was stated in the question, but a small number of candidates produced designs for a wall-mounted storage unit. Some candidates were very creative in that they showed storage units in the shape of a fruit. A small number of candidates produced fewer than three ideas or three ideas that were very similar in form.

(d) The evaluations of ideas were generally very impressive, with most candidates able to clearly demonstrate a good understanding of the positive and negative features of their design proposals. Commonly seen answers referred to how easy it would be to use the storage unit or how it would protect the fruit from insects or the fruit from being stolen. Some candidates may have benefitted from using a more structured approach, such as bullet points, to express their thoughts clearly and concisely. Almost all candidates chose one of their ideas, usually by giving the number of the idea, and justified their choice of idea for development.

(e) A variety of methods were used to show the full solution to the design problem. These methods included freehand orthographic drawings, exploded views, isometric views, and material lists. Colour, and enlarged drawings of details, were commonly used to add clarity to drawings. This question specifically asked for construction details and important dimensions but, particularly in weaker responses, these were often missing. The strongest responses clearly indicated the materials, joining methods, dimensions, and finishes in their freehand sketches and notes. All candidates need to consider whether the information they provide would be sufficient for a skilled third-party to make the product.

(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 pine, acrylic and aluminium. The reasons for the choice of material often referred to the aesthetic qualities, working properties or structural strength of the material. Candidates should be advised against giving generic names of materials, such as plastic, as these responses are not awarded marks.

(g) Most candidates used a combination of sketches and notes to outline an appropriate method of manufacturing one part of their design proposal. Manufacturing methods, involving the use of marking out tools, saws, joints, and adhesives, were commonly seen. The use of computer technology, such as a laser cutter or 3D printer, to produce parts of the storage unit was also commonly seen. Many excellent responses were seen to this question, but it is important that candidates include the correct names of tools and equipment if they are to access the full range of marks.

Question 2

(a) Most candidates were able to list four additional points about the function of the freestanding interactive display that encourages young children to eat fresh fruit that they considered to be important. Commonly seen answers referred to ensuring the stability of the display, how the unit would encourage young children to eat fresh fruit or the surface graphics to be included on the display. Candidates should be advised against repeating points that are given in the question, for example the package must hold three coins, or giving generic points that might apply to almost any product.

(b) Most candidate used sketches and notes to good effect to show two methods of temporarily attaching lightweight graphic materials to a backing board. Many candidates showed the use of string, Velcro, pins, or magnets. To improve, some candidates need to ensure that they note the difference between temporary and permanent joining methods, as stated in the question. The standard of written and visual communication for this question was almost always sufficient to communicate the method, and often of an excellent standard.

(c) An impressive range of sketches with annotations were seen for this question, with colour used to good effect to show the materials and surface graphics. Many candidates correctly chose to use lightweight graphic materials, such as corrugated card or polypropylene sheet, for their display. Almost all the design ideas clearly linked to fresh fruit, for example a board in the shape of a pear with a friendly face to appeal to children, but for some, the interactive element was either omitted or unclear. It is important that all design ideas fully meet the design requirements if candidates are to access the full range of marks. A small number of candidates produced fewer than three ideas or three ideas that were very 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. Commonly seen answers focused on how the children would use the display, how easy it would be to manufacture, its suitability for use with children or whether it could be recycled after use. It is important that candidates justify their evaluations rather than making general statements, such as that it would work well, if they are to access the full range of marks. Almost all candidates chose one of their ideas, usually by giving the number of the idea, and justified their choice of idea for development.

(e) A variety of methods were used to show the full solution to the design problem. These included freehand orthographic drawings, freehand exploded views, and isometric views. Many responses included a freehand three-dimensional (3D) sketch and a development (net), with supporting annotations. This question specifically asks for construction details and important dimensions but, particularly in weaker responses, these were often missing. Stronger responses clearly showed the materials, dimensions, and construction methods through freehand sketches and notes. All candidates need to consider whether the information they provide would be sufficient for a skilled third-party to make the product.

(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. Corrugated cardboard and Corriflute (corrugated sheet plastic) were commonly named materials. The main reasons for choosing these materials were often linked to the method of manufacture, such as cutting or joining, structural strength of the material or how easy it would be to recycle the material after use. Candidates should be advised against giving the generic names of materials, such as plastic, or generic reasons for choosing the material.

(g) Most candidates used a combination of sketches and notes to outline a method of manufacturing one part of their design proposal. Many candidates described how the parts for the display would be cut out by hand, using a craft knife, safety rule and cutting mat, and then folded and glued together. Some candidates explained how a computer numerically controlled (CNC) machine, such as a laser cutter, could be used to cut out the parts of their design proposal. It is important that all candidates include the correct names of tools and equipment to be used in the method of manufacture if they are to access the full range of marks.

Question 3

(a) Candidates were usually able to list four additional points about the function of a device that would squeeze fresh fruit to make a juice drink that they considered to be important. Commonly seen answers referred to hygiene, being able to dismantle the product for cleaning or repair, the method of removing the pulp or pips from the juice or being able to use the device with different sized glasses. Candidates should be advised against repeating points that are given in the question, for example the juice must fall into the glass, or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes effectively to show two mechanisms that could be used to squeeze soft fruit. Many candidates showed mechanisms which focused on crushing or twisting the fruit to extract the juice. Commonly seen answers included clamping devices that squeezed the

fruit by pushing a handle or operating a screw thread mechanism or a spike on which the fruit was pressed and twisted. The standard of written and visual communication for this question was almost always sufficient to communicate the method, and often of an excellent standard.

(c) An impressive range of sketches with annotations were seen for this question, although it was not always clear that the candidate fully understood how the device would work. For example, some design proposals did not fully consider how the device would fit over the glass or how the juice would be directed into the glass. It is important that all design ideas fully meet the design requirements if candidates are to access the full range of marks. A small number of candidates produced fewer than three ideas or ideas that were very similar.

(d) The evaluations of ideas were generally very good, with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Many responses focused on how easy the device would be to use, how long it would last, or the practicalities involved in dismantling for cleaning or repairing. It is important that candidates justify their evaluations rather than making broad statements, such as that it is the best design idea, if they are to access the full range of marks. Almost all candidates chose one of their ideas, usually by giving the number of the idea, and justified their choice of idea for development.

(e) A variety of methods were used to show the full solution to the design problem. These included freehand orthographic drawings, freehand exploded views, freehand isometric views, and materials lists. Most candidates made extremely good use of the space provided to answer the question, with one main drawing in the centre of the page and notes and drawings of details, such as details of joining methods, around it. This question specifically asked for construction details and important dimensions but, particularly in the weaker responses, these were often only partly shown. Stronger responses included details of materials, construction, finishes and dimensions in their sketches and notes. All candidates need to consider whether the information they present would be sufficient for a skilled third-party to make the product.

(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 specific polymers and stainless steel, with the reasons relating to the aesthetic qualities or working properties of the material. Candidates should be advised against giving generic names of materials such as metal, or generic reasons such as that it is easy to work with, as these are not awarded marks.

(g) Most candidates used a combination of sketches and notes to outline a method of manufacturing one part of their design proposal. Commonly seen manufacturing methods included injection moulding of parts or cutting out parts with a laser cutter or hand tools. Most candidates used sketches and notes, usually with numbered stages, to show the method of manufacture. It is important that all candidates include the correct names of tools and equipment to be used in the method of manufacture if they are to access the full range of marks.

DESIGN AND TECHNOLOGY

Paper 0445/13
Product Design 13

Key messages

Candidates who performed well demonstrated a good understanding of the question requirements and produced creative design work that was underpinned with sound technical understanding.

Candidates should be aware that the focus for **Question 1** is Resistant Materials, for **Question 2** Graphic Products and for **Question 3** Systems and Control.

Candidates should be advised to read each question carefully. They should follow the instructions for each individual question, especially the number of points, ideas, materials, or methods that the question is asking for. This supports good time management when completing the question paper.

Candidates should 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, or repeat the same evaluation point for all three ideas.

Many candidates achieved high marks for **part (e)** using just freehand sketches and notes. The benefits of using accurately measured drawings need to be carefully considered against the time taken to produce such drawings.

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)**.

Centres should not fasten the two response sheets together, with staples or string, or include the question paper with the response sheets.

General comments

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

Almost all candidates answered all the parts of their chosen question within the spaces provided and very few candidates used the additional space on the last page.

For most candidates freehand sketching and knowledge of materials and processes were real strengths.

Some candidates may have benefitted from adopting a more structured approach in order to express their thoughts clearly. 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 were able to list four additional points about the function of a storage unit for food cans that they considered to be important. Commonly seen answers referred to the storage unit must hold the weight of heavy cans, must be easy to clean, stable or compact to take up as little space as possible on the worktop. Candidates should be advised against repeating points that are

given in the question, such as the cans must be easy to identify and reach, or giving generic points that might apply to almost any product, as these responses are not awarded marks.

(b) Most candidates used sketches and notes to good effect to show two permanent methods of joining resistant materials. Commonly seen answers included various types of wood joints, welding, brazing, and adhesives. Some candidates did not fully appreciate the word permanent in the question and described temporary joining methods, such as screws or knock down fittings. The standard of written and visual communication for this question was often of an excellent standard.

(c) An impressive range of sketches with annotations was seen for this question. The most common solutions were based upon racks or storage boxes that sat on the kitchen work surface. Most solutions were made from pine, MDF (medium density fibreboard), or mild steel tube. The highest achieving responses included detailed annotations to their sketches that clearly showed how the cans would be identified and reached. It is important that all design proposals fully meet the design requirements if candidates are to access the full range of marks. For example, some candidates did not fully consider how the storage unit would accommodate four of each of the three different sized cans specified in the question. A small number of candidates produced fewer than three ideas or three ideas that were very similar.

(d) The evaluations of ideas were generally very impressive, with most candidates able to clearly demonstrate a good understanding of the positive and negative features of their design proposals. Commonly seen answers referred to ease of use, the importance of the design being compact in size, strength of the materials, or making sure the storage unit would not damage the kitchen work surface. Some candidates may have benefitted from using a more structured approach, such as bullet points, to express their thoughts clearly and concisely. Almost all candidates chose one of their ideas, usually by giving the number of the idea, and justified their choice of idea for development.

(e) Many excellent responses were seen to this question. Methods used to show the full solution included freehand orthographic drawings, exploded views, isometric views, and material lists. Colour, and enlarged drawings of details, were commonly used to add clarity to drawings. This question specifically asked for construction details and important dimensions but, particularly in weaker responses, these were often missing. All candidates need to consider whether the information they provide would be sufficient for a skilled third-party to make the product.

(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 pine, MDF (medium density fibreboard) and mild steel. The reasons for the choice of material often referred to its structural strength but aesthetics and cost were also sometimes considered. Candidates should be advised against giving generic names of materials, such as metal, as these responses are not awarded marks.

(g) Most candidates used a combination of sketches and notes, often arranged as numbered stages, to outline a method of manufacturing one part of their design proposal. Fabrication techniques, including wood joints and welding were commonly seen methods of manufacture. Many excellent responses were seen to this question, but it is important that candidates include the correct names of tools and equipment and ensure the manufacturing method is suitable for the solution they proposed in **part (e)**.

Question 2

(a) Most candidates were able to list four additional points about the function of the package for a long-reach picker that they considered to be important. Commonly seen responses referred to the importance of the package being eye-catching to attract customers, having space for images and information, being able to be easily stored or transported or the materials recycled after use. A small number of candidates appeared to not fully understand the requirement for the customer to be able to see and try the picker without opening the package. Candidates should be advised against repeating points that are given in the question, for example it must hang on a shop display, or giving generic points that might apply to almost any product, as these responses are not awarded marks.

(b) Most candidate used sketches and notes to good effect to show two methods of attaching a product to a package. Many candidates showed cable ties, slots in the package, staples, or blister packaging. Some candidates drew the full package, rather than concentrating on the method of attachment.

(c) An impressive range of sketches with annotations were seen for this question, with colour used to good effect to show the materials, construction methods and surface graphics. Most candidates chose to use lightweight materials, such as cardboard or plastic sheet, for their package but a few used resistant materials, such as MDF or pine. The annotations often revealed a candidate's true understanding of how the design proposal would be used in a shop. It is important that all ideas fully meet the design requirements if candidates are to access the full range of marks. A small number of candidates produced fewer than three ideas or three ideas that were very similar.

(d) The evaluations of ideas were 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 how easy it would be for customers to see and try the product, how environmentally friendly the package would be, or the cost of manufacturing. It is important that candidates justify their evaluations rather than making general statements, such as it would work well, if they are to access the full range of marks. Almost all candidates chose one of their ideas, usually by giving the number of the idea, and justified their choice of idea for development.

(e) A variety of methods were used to show the full solution to the design problem. Many responses included a freehand three-dimensional sketch and a development (net), with supporting annotations. Other methods used included freehand orthographic drawings and freehand exploded views. The question specifically asked for construction details and important dimensions but, particularly in weaker responses, these were often missing. All candidates need to consider whether the information they provide would be sufficient for a skilled third-party to make the product.

(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 and specific types of thin plastic sheet were commonly named materials. The main reasons for choosing these materials were often linked to the method of manufacture, such as printing, cutting out, folding, or joining, the 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 used a combination of sketches and notes to outline a method of manufacture of one part of their design proposal. Many candidates described how the development (net) for their package would be marked out, cut out by hand using a craft knife, safety rule and cutting mat and then joined together. Some candidates used computer numerically controlled (CNC) machines to cut out the parts of their design proposal. It is important that all candidates include the correct names of tools and equipment to be used in the method of manufacture and do not describe just a stage in manufacturing, such as cutting out a hole for hanging, if they are to access the full range of marks.

Question 3

(a) Very few candidates chose to answer this question. Candidates that did answer this question were usually able to list four additional points about the function of a device that would make it easier to remove a screw-top lid from a jar or bottle that they considered to be important. Commonly seen answers often referred to ease of operation, durability of the materials used, hygiene or the effectiveness of the grip. Candidates should be advised against repeating points that are given in the question, for example it must make it easier to remove a screw-top lid, or giving generic points that might apply to almost any product, as these responses are not awarded marks.

(b) Most candidates used sketches and notes effectively to show two methods of gripping cylindrical items. Many candidates showed variations on pliers but solutions that used cams or spring-loaded mechanisms were also seen. The quality of the sketches and notes were usually sufficient to adequately communicate the method. Candidates should be reminded that the question asks for sketches and notes and, therefore, just sketches will not be awarded full marks.

(c) An impressive range of sketches with annotations was seen for this question, although it was not always clear that the candidate fully understood how the device would work. For example, some candidates could improve by considering how the device would grip the screw-top or be held by the user. It is important that all ideas fully meet the design requirements if candidates are to access the full range of marks. A small number of candidates produced fewer than three ideas or three ideas that were very similar.

(d) The evaluations of ideas were generally very good with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. In weaker responses there was often a lot of repetition. Many responses referred to how effectively the device would grip different types and sizes of lids, ergonomics, aesthetics or how easy the device would be to manufacture. It is important that candidates justify their evaluations rather than making broad statements, such as it is the best design idea, if they are to access the full range of marks. Almost all candidates chose one of their ideas, usually by giving the number of the idea, and justified their choice of idea for development.

(e) A variety of methods were used to show the full solution to the design problem. These included freehand orthographic drawings, freehand exploded views, isometric views, and materials lists. Most candidates made extremely good use of the space provided to answer this question, with one main drawing in the centre of the page and notes and drawings of details, such as joints, around it. This question specifically asked for construction details and important dimensions but, particularly in the weaker responses, these were often only partly shown. All candidates need to consider whether the information they present would be sufficient for a skilled third-party to make the product.

(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 stainless steel, aluminium, and various specific polymers, with the reasons often based on the aesthetic qualities, strength, or ease of cleaning the material. Candidates should be advised against giving generic names of materials such as metal, or generic reasons such as that it is easy to work with, as these are not awarded marks.

(g) Most candidates used a combination of sketches and notes to outline a method of manufacture of one part of their design proposal. Commonly seen manufacturing methods included using a heat process to join metal, such as brazing, or shaping parts with hand tools or a lathe. Some candidates accurately described the use of injection moulding to form parts of their design. It is important that all candidates include the correct names of tools and equipment to be used in the method of manufacture if they are to access the full range of marks.

DESIGN AND TECHNOLOGY

Paper 0445/02
School Based Assessment

Key messages

- Most folders were well presented and very easy to follow. Some folders were disorganised and difficult for Moderators to find evidence to support marks awarded. It is important that candidates work is presented in the correct order, mirroring each of the assessment objectives.
- Many candidates are making very good use of 2D and 3D modelling to help decision making regarding overall shape, proportions, and functional feasibility for Assessment Criterion 4: Development of Proposed Solution. Candidates could benefit from showing reasoned decision making about the form, materials and construction of the final solution.
- Some candidates presented very limited or no evidence of the final product in their folder. Most candidates produced detailed photographic logs of the key stages of manufacture and clear photographic evidence of the completed product. This is important to confirm marks awarded for Assessment Criteria 6: Product Realisation.

General comments

Centres are reminded that Individual candidate Record Card information is only required for those candidates included in the sample sent for moderation.

Centres are encouraged to allow scope for candidates to explore different possible design opportunities. Themes for initial inspiration are acceptable but in a number of cases the themes provided were very narrow and work presented by candidates was very similar for research, design, and practical outcome.

When selecting to design and make an architectural concept model of a building, candidates need to communicate that they are making a model in the design brief. Candidates need to include the investigation of existing models, focus on designing the model, experiment with model making materials, construct the model, and evaluate the success of the model alongside the suitability of the building itself.

Guidance for assessing coursework and other very useful support for 0445/02 can be found on the teachers support hub.

Comments on specific sections

Question 1

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

This section was generally assessed accurately but some centres were slightly lenient. 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 for and what are the main functions of the product. They should also give details of why the product is needed and where and when will it be used.

Question 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. Most candidates generally researched the features of existing products well and gathered useful information. Some candidates would benefit from focusing 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 on materials, tools and manufacturing methods should be appropriate to the design brief. Most of this information could support Assessment Criterion 4: Development of Proposed Solution.

Writing a design specification at the end of this section is vital to the success of the project. The specification is used again in AC3 to check that the design proposal matches the needs and expectations of the user and again in AC7 when the candidate evaluates the success of the completed product.

Question 3

Generation and exploration of Design Ideas

This section was generally assessed consistently and accurately. A number of centres were lenient in awarding marks, particularly at the higher mark range.

To gain a high mark in Assessment 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 evaluation and decision making and present work effectively and with clarity.

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

Question 4

Development of Proposed Solution

Most centres mark this section in line with the awarding body standard. Some centres are lenient in their assessment, awarding high marks when there is 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.

Candidates need to investigate what materials are available for construction and test these materials for suitability. Construction possibilities should be tested through modelling and decisions made. The application of colour and image needs to be trialled, exact sizes and shapes need to be established.

2D and 3D card modelling was well used by candidates to help to form decisions about proportions, functionality and aesthetics. Many candidates made good use of CAD to model developments.

Throughout this section, candidates should continue to explain which decisions are being made and why.

Question 5

Planning for Production

Most candidates produced a working drawing of their proposed solution. Drawings were generally fully detailed and dimensioned. Some of the CAD drawings were of a high quality but many could be improved by addng important detail such as dimensions required to make the product.

Candidates are required to produce a detailed, logical sequence of the stages of manufacture prior to making. Some candidates presented a photographic diary of the manufacture of their product as a plan, which is acceptable for Assessment Criteria 6: Product Realisation but did not satisfy the requirement of this Assessment Criteria.

Question 6

Product Realisation

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

Virtually 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.
Some folders had very limited or no evidence of the final product. Centres are reminded that there must be clear evidence of work produced for marks to be awarded.

Question 7

Testing and Evaluation

Most candidates carried out appropriate testing of their practical realisation, many included comments from clients or product users, and were able to clearly identify the strengths and weaknesses of their product. A significant number of candidates presented comments against a brief list of initial specifications with limited explanation or justification of points made.

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

DESIGN AND TECHNOLOGY

Paper 0445/31
Resistant Materials 31

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 clearer what they have drawn 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 in this section. Candidates need to improve on demonstrating a basic understanding of the processes, tools and equipment required.

Section B

This section always has questions with large mark allocations that require a combination of clear and accurate sketches supported by detailed written notes. It is essential that candidates attempt all parts of the question otherwise they deny themselves possible marks.

Comments on specific questions

Section A

Question 1

Most candidates identified three safe working practices. The most common practices included clamping the workpiece securely, wearing safety glasses, wearing an apron and making sure loose clothing and hair were tied back.

Question 2

(a) Only a few candidates named the smoothing plane correctly.

(b) Most candidates understood that planing with the grain, direction A, would produce the smoother surface.

Question 3

There were only some completely correct answers showing how the tabletop could be fastened to the rails of the table. The best answers showed some type of K-D block fitting, wooden corner blocks or metal brackets. Screws and dowels were possible good answers but needed more technical details, for example, length and diameter, and correct positioning.

Question 4

Very few candidates were able to name a suitable plastic for each of the products shown.

The most common correct answers named polypropylene for the crate and PVC for the electrical insulation.

Question 5

Many candidates completed the sentence correctly by adding the term 'quality control'.

Question 6

(a) A few candidates named a centre or dot punch correctly.

(b) Only a few candidates named dividers as the appropriate tool that would be used to mark out the circular shape on the metal. The most common incorrect answer was compass.

Question 7

(a) Very few candidates named Tensol or acrylic cement as the adhesive that would be used to join the acrylic pieces together.

(b) The most successful way to prevent the adhesive spoiling the surfaces of the acrylic was to apply tape or paper to an area 5 mm from the end of the acrylic. Very few candidates showed this solution.

Question 8

(a) Only a small number of candidates gained maximum marks for describing how the firebricks reflected the heat and helped speed up the soldering process. The most common answer, worth one mark, was a safety factor describing how the firebricks helped to retain the flame inside the hearth and prevented damage and/or injury.

(b) Only a few candidates correctly indicated the hottest part of the blowtorch flame.

Question 9

Only a few candidates completed the sentence correctly; '….thermochromic materials change colour'.

Question 10

(a) Most candidates used sketches and notes to show a functional improvement to the wall-mounted shelf. The most common correct answer was to add rails or sides that would prevent items from sliding off the shelf.

(b) Some candidates showed an aesthetic improvement than the functional improvement. The best answers showed simple curved shaping to the front edge of the shelf. Some candidates changed the appearance by painting the shelf, applying veneer or changing the material from MDF to a more attractive solid wood.

Section B

Question 11

(a) Many candidates attempted to show a finger (comb) joint but only some achieved maximum three marks. Finger joints should have an odd number of 'fingers' and be equally spaced. Many answers gained at least one or two marks.

(b) (i) The purpose of a bench stop which was not recognised by most candidates. The advantage over a vice is that a length of wood is better supported on a flat surface and the vice can interfere with the planing of the wood which would be pinched in a vice.

(ii) Many of the methods by which paper or canvas could be clamped to the lid were not practical. Some methods, including the use of dowel pegs, would not clamp the material tightly. The best methods used screws or small nuts and bolts that could be fastened easily and which would provide very tight clamping.

(c) The best constructions used to join the partition to the side of the box included dowels, mortise and tenon and a stopped housing. Many potentially good answers could be improved by better accuracy and clarity of the sketches shown.

(d) (i) Many candidates repeated information given in the question; for example, the slot was 10 mm wide, instead of stating that the fence of the router would need to be set to 10 mm. Good answers referred to the correct size of cutter, the speed of cutter and that the cutter was locked in position before switching on the machine.

(ii) Most candidates showed some understanding of an alternative method of producing the slot without the aid of a router. The best methods included chain drilling and the use of chisels and files, the use of a mortising machine or to drill holes and insert a coping saw blade to remove the waste.

(e) Only a few candidates chose the piano hinge to join the lid to the box. The piano hinge could be fitted along the whole length of the lid and box, offering maximum support.

(f) (i) Candidates could achieve one mark by referring to different users and a second mark by referring to comfortable positions when working at the easel. Only some candidates gained maximum two marks.

(ii) There were five marks available for a design solution that would enable the lid of the easel to be locked securely at a required angle. Some candidates achieved maximum marks. Other responses started with a type of connection between the box and lid, often a wooden or metal strip with a series of cut-outs or pins to lock it in position. These responses can achieve higher marks by including more technical details, for example, the named materials or fittings or clarity of sketches. This would help with understanding how the design would work.

Question 12

(a) (i) Many candidates understood what was meant by the term ‘ferrous metal’. Some could not provide a correct answer.

(ii) Most candidates correctly named an example of a ferrous metal other than mild steel.

(b) (i) Most candidates names tools such as coping saw in their response, which would be used to fuct wood or plastic. The question asked candidates to identify two tools that could be used to cut the 1.6 mm thick mild steel sheet. Candidates would benefit from exploring more into this topic area.

(ii) Very few candidates achieved the maximum four marks available for showing how a wooden former could be used when bending the mild steel sheet to form the base of the tape dispenser.

Marks were gained by some candidates for showing the mild steel sheet clamped to the former and stating the method of force used, a mallet or hammer and scrap wood, to achieve the bent shape.

(c) (i) Most candidates did not identify ‘close grain’ as the best type of grain structure in wood used for woodturning.

(ii) Candidates were required to give one safety check that would be carried out before switching on the lathe. Many candidates stated the use of personal protective equipment, (PPE), such wearing safety glasses, instead of checks that would be carried out to the woodturning lathe. The best answers referred to making sure that the hardwood was centred and secured and that the tee rest was at the correct height and clear of the hardwood to be turned.

(iii) Some candidates correctly named a tool used when shaping the wooden disk. The most common correctly named tools included a chisel and gouge.

(iv) A few candidates named an appropriate tool that could be used to check the diameter of the disk when turned on the lathe. The most appropriate tools were outside or external calipers and the use of a vernier caliper.

(d) (i) Only a few candidates correctly explained the method of cutting a screw thread on a metal rod.

(ii) Epoxy resin adhesive is often used to join wood and metal components together. Most candidates names adhesives that would not be successful when joining the mild steel tube inside the hardwood disk. The most common incorrect answer was PVA which is used exclusively with wood.

(e) There were some potentially good modifications shown by many candidates. There were five marks available for this question and candidates did achieve some marks for partially complete answers.

The most promising answers included some type of support with a 'letter box' through which the tape could be pulled, or the use of rod under which the tape could be pulled. Candidates should ensure they address all parts of the question to access all the marks available, such as stating 'the name of any additional materials used and all construction details'.

(f) Only some candidates correctly showed understanding on the dip coating process. Candidates would benefit from exploring this topic further and understanding the stages involved in the process.

(g) The majority of modifications involved the use of screws to enable the tape dispenser to be fixed to a workbench. Candidates would benefit from showing more details such as the names of materials, and ensuring more clarity in their sketches.

Question 13

(a) (i) Many candidates gained one mark for giving an advantage of using a template for marking out the t-shirt onto the acrylic. The most common answers referred to speed and accuracy.

(ii) Most candidates achieved at least one or two marks for naming the tools or equipment that would be needed to cut out the acrylic shape. Many candidates recognised that a hole would need to be drilled through which some type of saw blade could be inserted. Use of a band saw to cut out the enclosed shape was not possible. The most common correct saws included coping and scroll saws. Removing the waste could be carried out by using files and the surfaces made smooth by means of glasspaper.

Candidates should always try to name the actual type of abrasive paper rather than simply staing 'abrasive paper'.

(iii) Most candidates who achieved one of the two marks available described how, having made one frame, this could be traced around to produce a second, identical frame. Some candidates described how one frame could be taped to the acrylic and cut out.

(b) (i) The majority of candidates gave accurate explanations for the designer drawing only one half of the t-shirt design. The best answers stated that the selected drawing could be flipped over as a mirror image.

(ii) Candidates generally demonstrated little understanding of the actions required to produce the acrylic frame using CAM. Some candidates repeated the first stage given in the Table they were required to complete. Three marks were available for stating that the acrylic would be positioned in the CNC machine, that the tool parameters would need to be set and the Start button would then be pressed.

(c) The majority of candidates did not produce practical methods to show how the two frames could be held together while allowing the photographs to be changed. It was still possible, in questions carrying a large allocation of marks, for candidates to gain some of the marks available.

Candidates were provided with three bullet points to focus their attention.

They must name the materials chosen for their solution, give details of constructions and provide two important sizes. With any design-type question it is important that candidates make their sketches large and clear so their ideas are presented clearly.

(d) Many candidates did achieve some of the six marks available for this question.

Marks were given for showing an ‘extension’ of the metal rail and some form of stable base. With constructional details and two important sizes provided some candidates did achieve high marks for this question.

DESIGN AND TECHNOLOGY

Paper 0445/32
Resistant Materials 32

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 clearer what they have drawn 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 in this section. Candidates need to improve on demonstrating a basic understanding of the processes, tools and equipment required.

Section B

This section always has questions with large mark allocations that require a combination of clear and accurate sketches supported by detailed written notes. It is essential that candidates attempt all parts of the question otherwise they deny themselves possible marks.

Comments on specific questions

Section A

Question 1

The majority of candidates identified at least two or three design features that would help consumers when using the wheelbarrow. The most common features referred to the handle grips, the strong frame, a large wheel and the shape of the lightweight polypropylene tray.

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Question 2

There were some excellent answers giving the names of suitable saws to cut out the waste wood. The most common answers included coping, band and scroll saws.

Question 3

Most candidates concentrated their modifications to the bracket fitting into the upright. Fewer concentrated on modifications to hold the shelf more securely to the bracket. Candidates needed to read the question more carefully. There were some excellent answers showing a ‘lip’ on the front of the bracket or holes drilled in the bracket through which screws could be inserted from underneath the shelf.

Question 4

(a) Most candidates stated an appropriate property of stainless steel for the sink unit: that it was corrosion (rust) resistant.

(b) Only a small number of candidates named a metal that could be added to steel to make stainless steel: chrome or nickel.

Question 5

(a) Many candidates named a suitable joint that could be used to join the sides of the wooden gate. The most common answers included mortise and tenon, dowel and halving joints.

(b) Only a few candidates named the tee hinge as the most suitable type of hinge used to hang the gate. Many candidates named a butt hinge which would not be suitable.

(c) Very few candidates drew a diagonal brace from the top right corner of the frame of the gate. One mark was awarded for a sketch showing two diagonal braces.

Question 6

The file that would be used to file shape **A** is a hand file and not a flat file. The hand file has a 'safe edge' that prevents it from removing metal on the vertical face.

The files that would be used to file shape **B** are a half round file or a round or rat tail file.

When candidates are asked to name a specific file, only technically correct names will be accepted and not variants such as 'rounded' or 'curved' files.

Question 7

Many candidates demonstrated a good understanding of the environmental benefits for products that can be disassembled. The best answers referred to components being replaced rather than the product being thrown away, to repair components, and the ability to recycle more easily. This could also help reduce landfill and pollution.

Question 8

Most candidates showed the remaining clamping blocks in the correct positions around the laminated table legs.

Question 9

(a) The majority of candidates named copper correctly as the pure metal, a good conductor of heat and electricity, and is corrosion resistant.

(b) Only some candidates named lead as the heaviest metal which is also soft and malleable.

Question 10

There were many correct answers with the heater and the wooden mould shown in the correct positions in the vacuum forming machine.

Section B

Question 11

(a) Many candidates stated at least one or two items of research for the paint holder. The most common answers referred to the size and number of paint tins, the dimensions of the ladder and suitable outdoor materials and finishes.

(b) Most candidates gave at least one property of aluminium. The most common properties stated that it was a lightweight metal, malleable and resistant to corrosion.

(c) Many candidates achieved only one or two marks of the four available for showing the mitre joint being marked out and the use of a tenon saw to shape the mitre. Some candidates did name the correct marking out tool - a mitre square or sliding bevel - and some candidates showed how a mitre box could be used when sawing the shape.

(d) (i) The majority of candidates did not name the groove for method **A** or the rebate/lapped joint for method **B**.

(ii) Many candidates gave one advantage of the groove over the rebate/lapped method by stating that it was stronger or more secure. Some candidates recognised that the base that fitted into a groove would not require the use of additional nails, screws or glue.

(e) Four marks were available for this question. Although only a small minority of candidates achieved maximum marks, many did achieve at least one or two marks for this question. Most candidates heated the aluminium before it could be bent but the method used was often inappropriate. Many candidates showed a former, usually a Ø30 rod around which the aluminium rod could be bent, and the use of a mallet or hammer as the correct method of force.

(f) There were some good designs showing how the tray could be supported by the ladder rung. More technical detail and improved clarity of sketches would allow candidates to access all four marks available.

(g) The majority of candidates achieved marks for this question. Many candidates described how outdoor conditions would affect the paint holder specifically, while other candidates described how outdoor conditions would affect any products being used outdoors. Both approaches were rewarded.

The most common issues included climate, theft and vandalism.

Question 12

(a) Many candidates stated two or three excellent questions that the candidates could ask at the nursery to help them design a chair for 3 – 4-year-olds. The most common questions included the height of the children, the uses for the chair, the number required, their location and aesthetic preferences such as colour and materials.

(b) There were some very good examples of anthropometric considerations when designing the chair. The most common included the seat height and depth related specifically to body measurements.

(c) Many candidates achieved at least one advantage of MDF over beech veneered plywood, The most common answers stated that MDF was cheaper or that it was much easier to work.

(d) (i) Many candidates completed the drawing to show the correct grain direction in each of the layers (plies) of the plywood.

(ii) Only a minority of candidates gave a correct answer. The main advantage of using plywood over solid wood is that it is generally cheaper and more stable.

(iii) Very few candidates provided a disadvantage of using plywood rather than solid wood. The main disadvantages included that plywood is unattractive, it can be difficult to work with and there are limited methods of construction.

(e) (i) The majority of candidates recognised that the grooves on the dowel provided grip, increased the gluing area, and made the joint more secure.

(ii) Many candidates understood that the chamfer on the end of the dowel enabled easier entry when fitting it into the hole.

(f) (i) There were four marks available to candidates for showing how a hand hold could be produced in the chair back. Most candidates achieved marks for showing how the hand hold could be marked out. A hole needed to be drilled, through which a saw blade could be inserted. Many candidates named an appropriate saw, including a coping or scroll saw. Fewer candidates were clear about

how the edges of the sawn shape could be made flat and smooth. The clarity of sketches could be improved for some candidates to be able to access maximum marks.

(ii) The best methods to strengthen the dowel joint included the use of additional wooden blocks, K-D fittings or metal brackets shown underneath the seat, joining the seat and sides together.

(iii) The majority of candidates achieved at least one or two marks for showing how a cup holder could be attached to the side of the chair. Many candidates showed a type of holder in the correct position and the appropriate size for the cup. Improvements could be made with the practical details such as methods of construction and the suitability of chosen materials together with clarity of sketches and annotations.

Question 13

(a) (i) Most candidates gave a correct answer, stating that a scriber would leave a permanent mark on the acrylic whereas a mark made by a chinagraph pencil could be erased.

(ii) Some candidates named dividers as the tool that would be used to mark the arcs on the acrylic.

(iii) The most effective way to remove the waste to produce the radius was to cut most of the acrylic off and finish to the line by either filing or using the disk sander. The majority of candidates named tools that would not normally be used with acrylic.

(b) Many candidates achieved at least one or two marks for showing the acrylic clamped securely.

For maximum marks, sacrificial material should have been shown positioned underneath the acrylic.

(c) Some candidates gave correct answers to the finishing process. Many candidates named the use of files, but filing would have been carried out earlier. What was the needed was abrasive paper such as ‘wet and dry’, silicon carbide paper and the polishing mop/buffing wheel with additional polishing compound to produce a mirror-like finish.

(d) (i) Approximately half of all candidates named extrusion correctly as the process used to manufacture plastic tube.

(ii) Many candidates achieved at least one or two marks for showing the acrylic heated in an oven, (not by means of a strip heater), and the use of a former around which the acrylic sheet could be formed. Most candidates did not include correct details about how the heated acrylic could be held securely around the former or inside a mould and were unable to access maximum marks. The quality and clarity of sketches could be improved ensuring additional notes to explain the sketches are included to access more of the marks.

(e) Candidates were required to show some sort of fitting that would connect the acrylic lampshade to the bracket so that it could be tilted and locked in position. The fitting had to be adjusted and locked without the aid of tools such as spanners. Many solutions showed basic nuts and bolts or screws that did require the use of tools. The best solutions involved the use of wing nuts that could be tightened by hand.

(f) Many candidates achieved the first mark of the four available by recognising that to produce a base 20 mm thick would require four pieces of 5 mm thick acrylic glued together. Further marks could be achieved by describing how the four acrylic pieces would be marked out, glued together and then shaped and finished. Candidates should also provide the technical details required to achieve the final circular base to access more marks.

(g) A ‘channel’ of some form would be needed on the underneath of the base, where the electrical cable would come out. This detail was missed by most candidates. The cable had to be hidden so that it would not obstruct the base so that it could lie flat on a surface.

DESIGN AND TECHNOLOGY

Paper 0445/33
Resistant Materials 33

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.
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General comments

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Comments on specific questions

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Most candidates identified three safe working practices. The most common practices included clamping the workpiece securely, wearing safety glasses, wearing an apron and making sure loose clothing and hair were tied back.

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(a) Only a few candidates named the smoothing plane correctly.

(b) Most candidates understood that planing with the grain, direction A, would produce the smoother surface.

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There were only some completely correct answers showing how the tabletop could be fastened to the rails of the table. The best answers showed some type of K-D block fitting, wooden corner blocks or metal brackets. Screws and dowels were possible good answers but needed more technical details, for example, length and diameter, and correct positioning.

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Very few candidates were able to name a suitable plastic for each of the products shown.

The most common correct answers named polypropylene for the crate and PVC for the electrical insulation.

Question 5

Many candidates completed the sentence correctly by adding the term 'quality control'.

Question 6

(a) A few candidates named a centre or dot punch correctly.

(b) Only a few candidates named dividers as the appropriate tool that would be used to mark out the circular shape on the metal. The most common incorrect answer was compass.

Question 7

(a) Very few candidates named Tensol or acrylic cement as the adhesive that would be used to join the acrylic pieces together.

(b) The most successful way to prevent the adhesive spoiling the surfaces of the acrylic was to apply tape or paper to an area 5 mm from the end of the acrylic. Very few candidates showed this solution.

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(a) Only a small number of candidates gained maximum marks for describing how the firebricks reflected the heat and helped speed up the soldering process. The most common answer, worth one mark, was a safety factor describing how the firebricks helped to retain the flame inside the hearth and prevented damage and/or injury.

(b) Only a few candidates correctly indicated the hottest part of the blowtorch flame.

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Only a few candidates completed the sentence correctly; '….thermochromic materials change colour'.

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(a) Most candidates used sketches and notes to show a functional improvement to the wall-mounted shelf. The most common correct answer was to add rails or sides that would prevent items from sliding off the shelf.

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Question 11

(a) Many candidates attempted to show a finger (comb) joint but only some achieved maximum three marks. Finger joints should have an odd number of 'fingers' and be equally spaced. Many answers gained at least one or two marks.

(b) (i) The purpose of a bench stop which was not recognised by most candidates. The advantage over a vice is that a length of wood is better supported on a flat surface and the vice can interfere with the planing of the wood which would be pinched in a vice.

(ii) Many of the methods by which paper or canvas could be clamped to the lid were not practical. Some methods, including the use of dowel pegs, would not clamp the material tightly. The best methods used screws or small nuts and bolts that could be fastened easily and which would provide very tight clamping.

(c) The best constructions used to join the partition to the side of the box included dowels, mortise and tenon and a stopped housing. Many potentially good answers could be improved by better accuracy and clarity of the sketches shown.

(d) (i) Many candidates repeated information given in the question; for example, the slot was 10 mm wide, instead of stating that the fence of the router would need to be set to 10 mm. Good answers referred to the correct size of cutter, the speed of cutter and that the cutter was locked in position before switching on the machine.

(ii) Most candidates showed some understanding of an alternative method of producing the slot without the aid of a router. The best methods included chain drilling and the use of chisels and files, the use of a mortising machine or to drill holes and insert a coping saw blade to remove the waste.

(e) Only a few candidates chose the piano hinge to join the lid to the box. The piano hinge could be fitted along the whole length of the lid and box, offering maximum support.

(f) (i) Candidates could achieve one mark by referring to different users and a second mark by referring to comfortable positions when working at the easel. Only some candidates gained maximum two marks.

(ii) There were five marks available for a design solution that would enable the lid of the easel to be locked securely at a required angle. Some candidates achieved maximum marks. Other responses started with a type of connection between the box and lid, often a wooden or metal strip with a series of cut-outs or pins to lock it in position. These responses can achieve higher marks by including more technical details, for example, the named materials or fittings or clarity of sketches. This would help with understanding how the design would work.

Question 12

(a) (i) Many candidates understood what was meant by the term ‘ferrous metal’. Some could not provide a correct answer.

(ii) Most candidates correctly named an example of a ferrous metal other than mild steel.

(b) (i) Most candidates names tools such as coping saw in their response, which would be used to fuct wood or plastic. The question asked candidates to identify two tools that could be used to cut the 1.6 mm thick mild steel sheet. Candidates would benefit from exploring more into this topic area.

(ii) Very few candidates achieved the maximum four marks available for showing how a wooden former could be used when bending the mild steel sheet to form the base of the tape dispenser.

Marks were gained by some candidates for showing the mild steel sheet clamped to the former and stating the method of force used, a mallet or hammer and scrap wood, to achieve the bent shape.

(c) (i) Most candidates did not identify ‘close grain’ as the best type of grain structure in wood used for woodturning.

(ii) Candidates were required to give one safety check that would be carried out before switching on the lathe. Many candidates stated the use of personal protective equipment, (PPE), such wearing safety glasses, instead of checks that would be carried out to the woodturning lathe. The best answers referred to making sure that the hardwood was centred and secured and that the tee rest was at the correct height and clear of the hardwood to be turned.

(iii) Some candidates correctly named a tool used when shaping the wooden disk. The most common correctly named tools included a chisel and gouge.

(iv) A few candidates named an appropriate tool that could be used to check the diameter of the disk when turned on the lathe. The most appropriate tools were outside or external calipers and the use of a vernier caliper.

(d) (i) Only a few candidates correctly explained the method of cutting a screw thread on a metal rod.

(ii) Epoxy resin adhesive is often used to join wood and metal components together. Most candidates names adhesives that would not be successful when joining the mild steel tube inside the hardwood disk. The most common incorrect answer was PVA which is used exclusively with wood.

(e) There were some potentially good modifications shown by many candidates. There were five marks available for this question and candidates did achieve some marks for partially complete answers.

The most promising answers included some type of support with a 'letter box' through which the tape could be pulled, or the use of rod under which the tape could be pulled. Candidates should ensure they address all parts of the question to access all the marks available, such as stating 'the name of any additional materials used and all construction details'.

(f) Only some candidates correctly showed understanding on the dip coating process. Candidates would benefit from exploring this topic further and understanding the stages involved in the process.

(g) The majority of modifications involved the use of screws to enable the tape dispenser to be fixed to a workbench. Candidates would benefit from showing more details such as the names of materials, and ensuring more clarity in their sketches.

Question 13

(a) (i) Many candidates gained one mark for giving an advantage of using a template for marking out the t-shirt onto the acrylic. The most common answers referred to speed and accuracy.

(ii) Most candidates achieved at least one or two marks for naming the tools or equipment that would be needed to cut out the acrylic shape. Many candidates recognised that a hole would need to be drilled through which some type of saw blade could be inserted. Use of a band saw to cut out the enclosed shape was not possible. The most common correct saws included coping and scroll saws. Removing the waste could be carried out by using files and the surfaces made smooth by means of glasspaper.

Candidates should always try to name the actual type of abrasive paper rather than simply staing 'abrasive paper'.

(iii) Most candidates who achieved one of the two marks available described how, having made one frame, this could be traced around to produce a second, identical frame. Some candidates described how one frame could be taped to the acrylic and cut out.

(b) (i) The majority of candidates gave accurate explanations for the designer drawing only one half of the t-shirt design. The best answers stated that the selected drawing could be flipped over as a mirror image.

(ii) Candidates generally demonstrated little understanding of the actions required to produce the acrylic frame using CAM. Some candidates repeated the first stage given in the Table they were required to complete. Three marks were available for stating that the acrylic would be positioned in the CNC machine, that the tool parameters would need to be set and the Start button would then be pressed.

(c) The majority of candidates did not produce practical methods to show how the two frames could be held together while allowing the photographs to be changed. It was still possible, in questions carrying a large allocation of marks, for candidates to gain some of the marks available.

Candidates were provided with three bullet points to focus their attention.

They must name the materials chosen for their solution, give details of constructions and provide two important sizes. With any design-type question it is important that candidates make their sketches large and clear so their ideas are presented clearly.

(d) Many candidates did achieve some of the six marks available for this question.

Marks were given for showing an ‘extension’ of the metal rail and some form of stable base. With constructional details and two important sizes provided some candidates did achieve high marks for this question.

DESIGN AND TECHNOLOGY

Paper 0445/41
Systems and Control 41

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

DESIGN AND TECHNOLOGY

Paper 0445/42
Systems and Control 42

Key messages

- All questions in ***Section A*** are compulsory, candidates should read each question carefully before answering.
- Candidates should be advised to read all questions from ***Section B*** before attempting to answer a question. In a small number of cases the rubric had not been followed and all three questions were attempted.
- Clear, legible writing and annotation to sketches are vital.
- In questions requiring sketches *and* notes, both should be used in the response.
- In calculation questions, the answer should include the units or sub-units used.
  Working should always be shown as it is possible to gain marks from this even when the final answer is incorrect.
- 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 notes. As a guideline, one mark is awarded for each valid point, up to the total for the question.

General comments

All questions in ***Section A*** proved accessible to most candidates. There were only a few parts where an attempt to answer the question had not been made. The questions on electronic content were answered well.

In ***Section B*** most responses gained marks from the structures question; with a much lower number opting for the mechanisms and electronics questions.
Most candidates completed their responses in the correct response area of the paper. Only a few had made use of the space available on the last page of the booklet. Candidates should be made aware that if this extra space is used a question number should be added to the response.

Comments on specific questions

Section A

Question 1

(a) Most candidates were able to provide a valid reason for using triangulation. Anything referring to an increase in rigidity or stability of the frame gained the mark. Those candidates who referred to increased strength in the structure were awarded the mark.

(b) Several benefits of off-site fabrication were recognised by higher achieving candidates. Reference to the speed of assembly and the ability to test individual parts before assembly were frequently seen. In a number of cases marks were not awarded because of reference to transport or storage related responses, which would apply equally if the structure was built on-site or off-site.

(c) In most cases candidates related the drawback of concrete to its inherent weakness in tension. Higher achieving responses stated that an increase in assembly time is required because of the time taken for concrete to cure.

Question 2

The need for Personal Protective Equipment was clearly recognised with a high proportion of candidates demonstrating knowledge of the equipment suitable for particular tasks. In most cases the equipment was clearly related to work on a building site.

Question 3

Clear knowledge of static loads in a structure was shown by most candidates. Candidates should ensure that where a questions asked for an example to be given, a mark will be available for the example.

Question 4

Sketches of a third order lever were in most cases clear and included information on the relative positions of effort, load and fulcrum. In a minority of responses the example had not been named.

Question 5

(a) The parallel linkage was correctly identified by higher achieving responses. Weaker responses would benefit from becoming familiar with the different types of linkages

(b) The parallel linkage provided a safe method of lifting a load from ground level while not affecting the horizontal position of the load, thus allowing liquid loads to be raised and moved without spilling. This was not seen in most responses.

(c) The bell crank linkage was the example used by most candidates. Only a few had used a crank and slider or crank and piston as the example. Sketches were in general clear but most could benefit from more detail in the notes on the operation of the linkage.

Question 6

The two types of motion in the Internal Combustion (IC) engine are rotary and reciprocating. Higher achieving responses were able to correctly identify that it is the reciprocating piston that converts to rotary motion in the crankshaft.

Question 7

(a) The fixed resistor and variable resistor were generally recognised; the transistor was identified as a diode in a minority of responses.

(b) Of the three units shown ‘nano’ was the one that was most frequently identified. There was some confusion between ‘mega’ and ‘milli’ and in many cased the symbol for micro was not recognised.

Question 8

The operation of a reed switch was accurately described by higher achieving candidates. A frequent error among was to describe the magnet used to operate the contacts as a part of the contact rather than as a separate component. Sketches were generally clear, showing accurately the internal parts of the reed switch.

Section B

Question 9

(a) (i) The answer for the force acting on beam **T** was ‘Tension’ or ‘Tensile force’. Some responses had suggested more than one force. Candidates should ensure they check the dimensions on the figures.The model shown was 350 mm wide and a small number of candidates had answered **(a)(iii)** thinking that it was a full-size truss.

(ii) With the load applied to the apex of the truss, joints **X** and **Y** would tend to slide away from each other allowing shear force to cause failure in the glued joints. The higher achieving responses gained credit for mentioning the shear force being applied.

(iii) A number of strengthening methods were seen but many of them involved the use of additional materials. A suitable method of strengthening should have included the use of a mechanical joint to prevent any movement in the joint. Credit was given to those who had used a mortise and tenon type of joint though the size of the timber used would have made it difficult to produce.

(iv) The test rig required was described in the question but it was common to find responses where parts of the requirement had not been followed. The weights should have been suspended below the apex of the truss, not placed above it. Candidates should ensure they read all of the details given in the question.

Very few responses included a method of supporting each end of beam **T** to allow the weights to be suspended in the correct position.

(v) There was clear understanding of the difference between static and moving loads and relevant examples of each were given in most cases.

(b) (i) Understanding of the two methods of working at a height was clear across a full range of responses. Many referred to the stability and increased load carrying capacity of the scissor lift.

(ii) A range of disadvantages of the scissor lift were used, with many giving the limited height and reach when compared to the aerial work platform.

(iii) Understanding of what a 'Factor of Safety' is, was clear in many responses and this led to correct recognition of who is responsible for identifying the safety consideration in lifting equipment.

(iv) Higher achieving responses correctly identified features of the equipment that would be protected by a Factor of Safety. Other responses had relied on generic items such as the materials used, without focussing on tensile strength of the materials or resistance to bending.

(c) (i) The question asked for the clockwise moment on the right-hand side of the beam. Some responses were able to correctly calculate the moment. In a few cases there were problems with the units used in the calculation.

(ii) Those candidates who had the correct answer for **(c)(i)** were generally able to calculate the load needed on the left to achieve equilibrium.

(iii) As the beam was balanced and on a central support, the reactions at $\mathbf{R_1}$ and $\mathbf{R_2}$ would be equal to zero. Partial credit was given to those candidates who had equal reactions which were greater than zero.

Question 10

(a) (i) In most cases the cam drawn was a regular shape though an irregular cam with four lobes would have been acceptable. Sketches were typically well proportioned and answered the question.

(ii) The majority of higher achieving responses recognised that the spring was above the cam follower to ensure that the follower remained in contact with the surface of the cam. A number of responses went further than this by explaining that 'bouncing' of the cam can be avoided if the spring provides sufficient resistance.

(iii) The mechanical properties of nylon that make it suitable as a bearing were recognised in most responses. References to the cost or weight of nylon were not accepted. The self-lubricating nature of nylon was well known. Resistance to corrosion was also an acceptable property used in several responses.

(b) (i) The conversion of motion when spinning a gyroscope rotor was correctly identified in most responses.

(ii) Knowledge of plain bearings was incomplete in many cases. Better responses recognised that plain bearings have no rolling or moving surfaces and that they reduce friction when an axle is turning.

(iii) Candidates at all levels of achievement gave credible responses to this question. Most recognised that adjustment and lubrication of the bearing played a part in extending the time that the rotor spins. Some responses also noted that the length of string used to initiate the spinning was also of importance.

(c) (i) At least one advantage of a vee belt when compared to a flat belt was recognised in all responses. Reduced slipping and durability were the two that were most frequently encountered. Improved torque transfer was mentioned by higher achieving responses.

(ii) Crossing a flat belt over to provide a change of direction was understood in most responses. Sketches were in most cases recognisable with the better responses including explanatory notes.

(iii) Most responses recognised that because a vee belt sits in the vee groove of a pulley to provide good traction it does not allow the belt to be reversed. Better responses also noted that a vee belt is not flexible enough to be twisted back on itself. Marks in this part were awarded where understanding was shown even if the explanation lacked in technical detail.

(iv) The three things to be included in the tensioning method were an idler wheel, preferably pressing against the outer face of the vee belt, adjustment for the position of the idler wheel and the position of the two pulleys to remain unaltered. In several responses the idler was pressed against the inside face of the vee belt, which is not mechanically efficient as it will reduce the amount of belt in contact with the pulley. There were very few responses where adjustment of the idler wheel position was allowed for. The best responses showed a spring-loaded idler wheel, which would be self-adjusting.

(d) (i) The velocity ratio of the jack required the distance moved by the handle in a single revolution to be calculated. This first answer was then divided by the thread pitch. Only a few higher scoring responses carried out the calculation accurately.

(ii) Candidates would benefit from exploring reasons for loss of efficiency in equipment, in this case specific to a jack. Gradual weakening over time was an incorrect response seen more than once. All mechanisms will lose efficiency due to friction, resulting in further losses due to heat and sound.

(iii) The effort needed to lift a given load required the answer from **(d)(i)** to be used. In cases where the velocity ratio was not correctly calculated use of an incorrect value from **(d)(i)** was allowed.

Question 11

(a) (i) The missing connection, from the emitter of the transistor to 0 V was successfully completed by all candidates who had chosen to answer the electronics question. As well as drawing the connection line, a dot or small circle where the connection met the 0 V rail should have been added. Not all candidates had done this.

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(ii) The calculation using a given formula was accurately completed in all cases. The question was an example of the importance of showing the working; allowing marks to be awarded even when the final answer is incorrect.

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DESIGN AND TECHNOLOGY

Paper 0445/43
Systems and Control 43

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(ii) The response should have shown a diode in reverse bias connected across the coil of the motor or relay. In a few cases the diode was present but it was shown connected in forward bias.

DESIGN & TECHNOLOGY

Paper 0445/51
Graphic Products 51

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

The standard of work was the same as that of the previous year.

There are areas of the syllabus where some candidates did not generally perform well and further improvements are needed. Questions requiring knowledge of CAD/CAM were not answered well just as in previous years. Centres must ensure candidates are aware of CAD/CAM equipment, how it is used, what its limitations are and the advantages/disadvantages of using it. The drawing of exploded views, sectional views and the construction of ellipses are areas where many candidates did not perform well.

Comments on specific questions

Section A

Question A1

Warning sign

Candidates were asked to complete a full-size drawing of the warning sign to the dimensions given.

(a) Candidates were required to complete the outer square of the warning sign by constructing the remainder of the square 106 × 160. Most candidates drew the overall size correctly and in the correct position. Some candidates drew the square too big or with angled sides.

(b) Candidates were required to draw the wall mount by constructing a regular half hexagon. Many candidates completed this successfully and achieved all three marks. A significant number of candidates drew a regular half hexagon but to an incorrect size. Some candidates drew irregular hexagons with un-even side lengths or internal angles. Other candidates constructed a half octagon instead of a hexagon.

(c) Candidates were required to draw the camera by constructing the rectangular main body of the camera and the lens. Most candidates drew the main body to the correct size and position using the given corner lines as a starting point. Most candidates also drew the small rectangular section of the lens correctly. Some candidates drew the end section to the wrong width or thickness and lost marks.

(d) Candidates were required to draw the missing parts of the bracket arm by adding the horizontal and vertical sections to a 10 mm thickness and then constructing the arc to the given size and in the correct position. Most candidates drew the horizontal and vertical arms in the correct position and to the correct thickness to their own solution and were awarded both marks. Some candidates drew the arms too thin and lost marks. Many candidates drew the arc to the correct diameter but a

significant number of candidates drew it in the wrong position. Many candidates used the centre of the given circle instead of the edge of the camera body as shown on the given drawing.

(e) Candidates were required to add the missing letters of CCTV. Candidates were expected to draw both letters to the same size and proportion in order to achieve both marks. Many candidates added both letters and achieved one mark. Fewer candidates ensured the letters were the same height, width and thickness as the existing letters and did not achieve the second mark.

Question A2

Warning sign exploded isometric view

This question required candidates to complete the exploded isometric view of the warning sign to a scale of 1:2.

(a) This part of the question required candidates to add the 20 mm thick backboard to the exploded view. Many candidates drew the backboard and in isometric but to the wrong size, in the wrong place or to the wrong thickness. Only a small proportion of candidates drew the backboard correctly and achieved all 5 marks. Many candidates drew the backboard directly behind the sign and did not use the centre lines provided. A significant number of candidates did not attempt this question.

(b) On this part of the question, candidates were required to add the thin plastic sheet to the exploded view. Many candidates drew the thin plastic sheet in front of the sign, to the correct size and in isometric but in the wrong position. Only a small proportion of candidates drew the sheet correctly and achieved all 4 marks. Many candidates drew the sheet directly around the sign rather than in front. A significant number of candidates did not add any front sheet at all.

Question A3

Manufacture of the warning sign

(a) This question required knowledge of commercial and industrial printing methods. Many candidates gave a suitable correct answer and achieved the mark. Laser printing, inkjet printing, screen printing and photocopying were common incorrect answers.

(b) This question required knowledge of thin sheet plastics used in graphical applications. Candidates were required to state a suitable thin sheet plastic that could be used on the warning sign. A wide range of answers were received. Many candidates responded with thick sheet plastics such as acrylic, polycarbonate and plexiglass and were awarded the mark. Many candidates responded with very thin plastics such as cellophane and vinyl which were unsuitable and did not achieve a mark.

Question B4

Security camera

This question was the least popular of the two optional questions.

(a) Candidates were required to complete the isometric view of the security camera to a scale of 1:5 using the information given on the orthographic views. Many candidates who attempted this question did not achieve high marks. Some candidates were able to construct the main body section of the camera by completing the side view to the correct length and height, then projecting the lines to construct the front top section and front face of the camera.

However, many candidates were not able to construct the smaller top rear section correctly. Many of the candidates who attempted this question drew the sides vertical instead of slanted or did not attempt this part. Few candidates correctly constructed the entire security camera. The best responses drew the camera to the correct overall sizes and constructed the top section with good accuracy.

(b) This question asked the candidate to complete the drawing of the Styrofoam block by constructing the ellipse on the top surface to the sizes given. There are several different methods that can be

used to complete this task and all methods are acceptable. Whichever method is used, the candidate is required to plot a series of points and then use these to draw arcs using a pair of compasses or join them carefully using freehand to construct a smooth evenly curved ellipse. Very few candidates achieved full marks on this question. Many candidates made some attempt at drawing an ellipse shape by sketching freehand and achieved at least one mark. Fewer candidates marked out the major and minor axis' correctly and gained further marks. Some candidates used an appropriate method and plotted a few points on the ellipse but the number of points was insufficient to draw the whole of the ellipse in correctly. The best responses used the concentric circle method and plotted more than eight points which allowed the ellipse shape to be to draw in. A significant number of candidates used a trammel to plot clear points at close intervals to show the shape of the ellipse clearly. However, very few of these attached the trammel to the paper to show this. Where a trammel is used centres are required to attach this to the paper.

(c) This question required the candidate to show knowledge of CAD/CAM by describing how it could be used to produce the self-adhesive lettering on the side of the security camera.

Candidates were expected to describe how the lettering would first be typed out on a suitable CAD computer program, then saved and sent to a suitable CAM machine such as a vinyl cutter which would then be set up and used to cut out the letters in self-adhesive vinyl. This question was not answered well by many candidates. Many were able to describe the letters being typed onto computer but were unable to describe the next stages in the process. This is still an area of the syllabus that students will need to improve on.

(d) This question asked the candidate to complete the development (net) of the camera bracket. Candidates were required to project vertical lines from the given start points to construct the central rectangular section of the bracket, then use the information given to construct the left-hand side of the bracket around the given circular hole. Once completed, candidates were expected to mirror the left side onto the right-hand side so that the bracket was symmetrical. Many candidates were able to construct the rectangular centre section but drew the two side parts incorrectly. Many candidates drew one side incorrectly but were able to reproduce the other side as a mirror image. The best responses drew one side to the dimensions given then used this to project lines over to the other side to help ensure sizes on both sides were the same.

Question B5

Security light

(a) Candidates were required to complete the orthographic views of the security light to a scale of 1:4. This question was well answered by most candidates. Many candidates completed the front view correctly by projecting down the width of the light from the plan above and using the sizes on the given isometric view. Some candidates projected the side view to the right instead of the left and lost marks. Other candidates did not project lines across from the front view resulting in a side view different to the front. Many candidates projected the depth of the light too far because they did not use the plan view as a guide. The candidates who carefully studied the isometric view, read the necessary dimensions and drew accurately from the given start points achieved the best results.

(b) On this question, candidates were required to complete the estimated one-point perspective of the security light package using the given start points and vanishing point. Many candidates projected some of the lines to the vanishing point but omitted the sloped edge on the backboard section. Most candidates completed the shape of the bottom sections correctly and achieved most of the marks. Some candidates drew the package in isometric instead of perspective but still achieved some of the marks. Many candidates drew the sloping edges of the backboard out of proportion and lost marks. The best responses projected lines from all corners and edges of the package to the vanishing point, then linked these using the existing edges as a guide.

(c) This question required candidates to sketch a design for a symbol that showed the security light must not be placed in a recycling bin. Candidates were expected to show a recycling bin and a cross or prohibited type of symbol to show this was not to be placed in it. The best responses were where candidates drew neat and simple sketches that conveyed the message clearly and without the use of words. Some candidates drew sketches related to lights or safety. Other candidates used words to convey the message rather than a symbol and lost marks.

(d) This question required knowledge of standardised symbols used on products. Candidates were required to state the meaning of the given sign. Many candidates correctly identified the sign to mean flammable or inflammable and gained the mark. Many candidates gave a description of what flammable meant and were also awarded the mark.

(e) This question required knowledge of flowcharts and symbols used in them. Candidates were required to complete the missing parts of the flowchart by adding the missing information in the second decision box, the feedback loops and the missing time in the wait / delay box. Many candidates completed all three parts correctly and achieved full marks. Most candidates were able to add 2 minutes into the wait/delay box and achieve one mark. Many candidates did not write a question in the decision box and lost marks. Other candidates missed off the feedback loops and/or YES and NO labels and also lost marks.

DESIGN & TECHNOLOGY

Paper 0445/52
Graphic Products 52

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

The standard of work was the same as that of the previous year.

There are areas of the syllabus where some candidates did not generally perform well and further improvements are needed. Questions requiring knowledge of CAD/CAM were not answered well just as in previous years. Centres must ensure candidates are aware of CAD/CAM equipment, how it is used, what its limitations are and the advantages/disadvantages of using it. The drawing of exploded views, sectional views and the construction of ellipses are areas where many candidates did not perform well.

Comments on specific questions

Section A

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significant number of candidates drew it in the wrong position. Many candidates used the centre of the given circle instead of the edge of the camera body as shown on the given drawing.

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(a) This part of the question required candidates to add the 20 mm thick backboard to the exploded view. Many candidates drew the backboard and in isometric but to the wrong size, in the wrong place or to the wrong thickness. Only a small proportion of candidates drew the backboard correctly and achieved all 5 marks. Many candidates drew the backboard directly behind the sign and did not use the centre lines provided. A significant number of candidates did not attempt this question.

(b) On this part of the question, candidates were required to add the thin plastic sheet to the exploded view. Many candidates drew the thin plastic sheet in front of the sign, to the correct size and in isometric but in the wrong position. Only a small proportion of candidates drew the sheet correctly and achieved all 4 marks. Many candidates drew the sheet directly around the sign rather than in front. A significant number of candidates did not add any front sheet at all.

Question A3

Manufacture of the warning sign

(a) This question required knowledge of commercial and industrial printing methods. Many candidates gave a suitable correct answer and achieved the mark. Laser printing, inkjet printing, screen printing and photocopying were common incorrect answers.

(b) This question required knowledge of thin sheet plastics used in graphical applications. Candidates were required to state a suitable thin sheet plastic that could be used on the warning sign. A wide range of answers were received. Many candidates responded with thick sheet plastics such as acrylic, polycarbonate and plexiglass and were awarded the mark. Many candidates responded with very thin plastics such as cellophane and vinyl which were unsuitable and did not achieve a mark.

Question B4

Security camera

This question was the least popular of the two optional questions.

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However, many candidates were not able to construct the smaller top rear section correctly. Many of the candidates who attempted this question drew the sides vertical instead of slanted or did not attempt this part. Few candidates correctly constructed the entire security camera. The best responses drew the camera to the correct overall sizes and constructed the top section with good accuracy.

(b) This question asked the candidate to complete the drawing of the Styrofoam block by constructing the ellipse on the top surface to the sizes given. There are several different methods that can be

used to complete this task and all methods are acceptable. Whichever method is used, the candidate is required to plot a series of points and then use these to draw arcs using a pair of compasses or join them carefully using freehand to construct a smooth evenly curved ellipse. Very few candidates achieved full marks on this question. Many candidates made some attempt at drawing an ellipse shape by sketching freehand and achieved at least one mark. Fewer candidates marked out the major and minor axis' correctly and gained further marks. Some candidates used an appropriate method and plotted a few points on the ellipse but the number of points was insufficient to draw the whole of the ellipse in correctly. The best responses used the concentric circle method and plotted more than eight points which allowed the ellipse shape to be to draw in. A significant number of candidates used a trammel to plot clear points at close intervals to show the shape of the ellipse clearly. However, very few of these attached the trammel to the paper to show this. Where a trammel is used centres are required to attach this to the paper.

(c) This question required the candidate to show knowledge of CAD/CAM by describing how it could be used to produce the self-adhesive lettering on the side of the security camera.

Candidates were expected to describe how the lettering would first be typed out on a suitable CAD computer program, then saved and sent to a suitable CAM machine such as a vinyl cutter which would then be set up and used to cut out the letters in self-adhesive vinyl. This question was not answered well by many candidates. Many were able to describe the letters being typed onto computer but were unable to describe the next stages in the process. This is still an area of the syllabus that students will need to improve on.

(d) This question asked the candidate to complete the development (net) of the camera bracket. Candidates were required to project vertical lines from the given start points to construct the central rectangular section of the bracket, then use the information given to construct the left-hand side of the bracket around the given circular hole. Once completed, candidates were expected to mirror the left side onto the right-hand side so that the bracket was symmetrical. Many candidates were able to construct the rectangular centre section but drew the two side parts incorrectly. Many candidates drew one side incorrectly but were able to reproduce the other side as a mirror image. The best responses drew one side to the dimensions given then used this to project lines over to the other side to help ensure sizes on both sides were the same.

Question B5

Security light

(a) Candidates were required to complete the orthographic views of the security light to a scale of 1:4. This question was well answered by most candidates. Many candidates completed the front view correctly by projecting down the width of the light from the plan above and using the sizes on the given isometric view. Some candidates projected the side view to the right instead of the left and lost marks. Other candidates did not project lines across from the front view resulting in a side view different to the front. Many candidates projected the depth of the light too far because they did not use the plan view as a guide. The candidates who carefully studied the isometric view, read the necessary dimensions and drew accurately from the given start points achieved the best results.

(b) On this question, candidates were required to complete the estimated one-point perspective of the security light package using the given start points and vanishing point. Many candidates projected some of the lines to the vanishing point but omitted the sloped edge on the backboard section. Most candidates completed the shape of the bottom sections correctly and achieved most of the marks. Some candidates drew the package in isometric instead of perspective but still achieved some of the marks. Many candidates drew the sloping edges of the backboard out of proportion and lost marks. The best responses projected lines from all corners and edges of the package to the vanishing point, then linked these using the existing edges as a guide.

(c) This question required candidates to sketch a design for a symbol that showed the security light must not be placed in a recycling bin. Candidates were expected to show a recycling bin and a cross or prohibited type of symbol to show this was not to be placed in it. The best responses were where candidates drew neat and simple sketches that conveyed the message clearly and without the use of words. Some candidates drew sketches related to lights or safety. Other candidates used words to convey the message rather than a symbol and lost marks.

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(e) This question required knowledge of flowcharts and symbols used in them. Candidates were required to complete the missing parts of the flowchart by adding the missing information in the second decision box, the feedback loops and the missing time in the wait / delay box. Many candidates completed all three parts correctly and achieved full marks. Most candidates were able to add 2 minutes into the wait/delay box and achieve one mark. Many candidates did not write a question in the decision box and lost marks. Other candidates missed off the feedback loops and/or YES and NO labels and also lost marks.

DESIGN AND TECHNOLOGY

Paper 0445/53
Graphic Products 53

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

The standard of work was the same as that of the previous year.

The drawing of planometric views and sectional views are areas where many candidates could improve on. Questions requiring knowledge of CAD/CAM were answered better than in previous years.

Comments on specific questions

Section A

Question A1

Wooden blocks

Candidates were asked to complete full-size drawings of the four wooden blocks to the dimensions given.

(a) Candidates were required to complete the full-size drawing of the equilateral triangle. Most candidates drew the equilateral triangle to the correct height and width and achieved both marks. Some candidates drew an isosceles triangle with two equal sides but not equal to the base.

(b) Candidates were required to draw the 40×40 square. Most candidates drew the square correctly and achieved both marks. Some candidates drew the square too large.

(c) Candidates were required to draw the ellipse to the Major and Minor axis sizes given. There are a few different methods that can be used to complete this task and all methods are acceptable. Whichever method is used, the candidate is required to plot a series of points and then use these to draw arcs using a pair of compasses or join them carefully using freehand to construct a smooth evenly curved ellipse.

Very few candidates achieved full marks on this question. Many candidates made some attempt at drawing an ellipse shape by sketching freehand and achieved at least one mark. Fewer candidates marked out the Major and Minor axis' correctly and gained further marks. Some candidates used an appropriate method and plotted a few points on the ellipse, but the number of points was insufficient to draw the whole of the ellipse correctly. The best responses used the concentric circle method and plotted more than eight points which allowed the ellipse shape to be to drawn in. A significant number of candidates used a trammel to plot clear points at close intervals to show the shape of the ellipse clearly. However, very few of these attached the trammel to the paper to show this. Where a trammel is used, centres are required to attach this to the paper.

(d) Candidates were required to draw the hexagon to the correct size. Many candidates drew the hexagon correctly and gained all three marks. Some candidates drew the hexagon to 60 across faces instead of across corners resulting in a hexagon that was regular but too big.

Question A2

Shape sorter toy

This question required candidates to complete the full-size isometric view of the shape sorter toy.

(a) This part of the question required candidates to add the 90 mm × 90 mm cube to the isometric view. Many candidates drew the cube to the correct size and in isometric and achieved all three marks. Some candidates drew the first side to the incorrect size resulting a cube of an incorrect size or a cuboid. Candidates were not double penalised and marks were awarded providing the subsequent side and the top were drawn correctly to the candidates solution.

(b) On this part of the question, candidates were required to add the 10 mm thick base to the drawing. Many candidates drew the left hand side correctly and added the two back edges in isometric. Some candidates drew the left side to the correct thickness but the wrong length.

(c) This part of the question required candidates to add the 10 mm thickness to the triangular hole. Many candidates drew the bottom face correctly but drew the side to the wrong thickness and the corner line at the wrong angle.

Question A3

Rendering of the wooden block

This question required candidates to render the hexagonal wooden block in a primary colour. Many candidates rendered the block in a primary colour and showing different tones on each side. The best responses shaded the top surface the lightest and the three sides in different tones darker than the top surface neatly and evenly. Many candidates rendered the block with wood grain to look like wood and lost marks. Some candidates rendered the block in grey pencil or a non-primary colour and lost marks.

Section B

Question B4

Shape sorter toy package.

(a) Candidates were required to complete the planometric view of the card package for the shape sorter toy to a scale of 1:2 using the information given on the development (net). Only a few candidates achieved high marks. Most candidates were able to construct the top face of the package correctly. Some candidates were able to draw the package to the correct height and with the correct base width but did not draw the angled side sections correctly. Very few candidates drew the left-hand side with a vertical lower section 20 mm high and the top part slightly sloping up to the top face. Many candidates drew the package as a straightforward cuboid and lost a significant proportion of the marks. The best responses drew the top face to the correct size then found the mid-point of the 90 mm side and projected a line down 50mm long to locate the mid-point of the base edge. They then drew lines at 45° either side of this to a length off 55 mm each side to construct the bottom edge of the package and worked upwards from this to plot the vertical section before joining to the corners of the top face.

(b) (i) This question required the candidate to show knowledge of thin sheet plastics by naming a suitable thin sheet plastic for the clear window. The plastic sheet would need to be creased and folded easily to fit into the package. Many candidates gave a suitable response such as acetate. Many other candidates gave plastics which would not be able to be folded or creased such as acrylic.

(ii) This question required the candidate to show knowledge of adhesives by naming one suitable adhesive that could be used to attach the clear plastic window to the package. Many candidates named adhesives which were unsuitable such as PVA glue. Some candidate responses gave adhesive tape such as double-sided tape which was awarded marks as it would work.

(iii) This question required the candidate to show, using sketches and notes, how the clear plastic window could be fixed to the package. Candidates were expected to show how the thin plastic sheet would be cut to size and identify that it must be larger than the aperture in the card development (net). They were then expected to show where the adhesive would be applied and used to fix the plastic sheet in place. Many candidates showed a glue gun or tape being used to stick the thin plastic to the card and achieved a mark. The quality of sketching from most candidates was good and most achieved a mark for their clear communication. The best responses showed the clear plastic sheet cut larger than the aperture and adhesive applied to the inside of the development (net) around the edge of the aperture before fixing the clear plastic sheet in place.

(c) On this question candidates were required to show their sketching ability and use knowledge of the product's intended audience to produce a more suitable lettering style for the package. Most candidates produced bubble style lettering and achieved both marks. Some candidates produced words other than SHAPE and lost marks.

(d) This question required the candidate to complete the estimated one-point perspective view of the shape sorter toy package. Candidates were required to construct the rectangular shaped front lower face of the package by projecting horizontal lines across from the given start points to a suitable length. They were then expected to draw lines from the top left corner of the rectangle to the vanishing point and horizontally from the given start points to construct the central rectangular section of the bracket, then use the information given to construct the left-hand side of the bracket around the given circular hole. Once completed, candidates were expected to mirror the left side onto the right-hand side so that the bracket was symmetrical. Many candidates were able to construct the rectangular centre section but drew the two side parts incorrectly. Many candidates drew one side incorrectly but were able to reproduce the other side as a mirror image. The best responses drew one side to the dimensions given then used this to project lines over to the other side to help ensure sizes on both sides were the same.

Question B5

Toy trolley

(a) Candidates were required to complete the orthographic views of the toy trolley to a scale of 1:10. This question was well answered by most candidates. Many candidates completed the front view correctly by projecting horizontal lines from the side view to construct the top and bottom of the wheels and handrail sides, then adding thickness. Many candidates completed the side view by projecting lines across from the front view and down from the plan. Some candidates drew the plan view to an incorrect width or length. Other candidates drew the handrail sections too long or omitted them altogether. The candidates who applied the dimensions from the isometric view and projected lines accurately were able to achieve higher marks.

(b) On this question, candidates were required to complete the sectional view through the axle of the trolley to a scale of 1:5. There were only a few strong responses to this question. Many candidates were able to mirror and complete the given sides and middle of the trolley. Some candidates were able to add the wheels and axle correctly. Very few candidates were able to draw in the holes for the axle to pass through. Many responses added the hatching correctly which was pleasing to see.

(c) (i) This question required candidates to show knowledge of computers by describing how a computer could be used to source and capture an image of a teddy bear. Many candidates were able to give a way of sourcing an image such as using the internet, but responses could be improved by describing how the image would be downloaded from the internet or saved.

(ii) This question required knowledge of computer software and how it can be used to manipulate and alter images on screen. Candidates were required to state two ways that the image could be altered using the computer. Many candidates correctly identified two ways and were awarded the marks. Some candidates stated the names of image editing software such as Photoshop or Corel draw and did not gain the marks.

(d) On this question candidates were required to complete the exploded isometric view of the trolley front by adding the rectangular front piece of the toy trolley to the drawing. Candidates were expected to use the given positions of the fixing holes as start points, to ensure the position in relation to the teddy bear image was correct. Many candidates drew the front in the correct position

and to the correct length, height and thickness achieving all 5 marks. Some candidates drew the front to the correct size but in the wrong position. Others drew the thickness incorrectly and lost marks. The best responses used the given corner of the front or holes as a start point and projected lines from there at the correct 30° angles to construct the required isometric shape.