DESIGN AND TECHNOLOGY

Paper 0445/11
Product Design 11

Key messages

A wide range of responses were seen to the questions. Higher level responses demonstrated a good understanding of the design context, a high degree of creativity and excellent technical knowledge. Weaker responses often demonstrated only limited understanding of the design context.

All candidates should be encouraged to thoroughly read their chosen question to ensure that they fully understand the requirements. For **Question 2**, some candidates designed a rack for vegetables rather than a shop display to encourage children to eat more vegetables.

In some responses the part questions appeared to be unconnected. For example, the materials named in **part (f)** and the manufacturing method described in **part (g)**, were not evident in the full solution proposed in **part (e)**. Candidates should be encouraged to view the paper as a holistic design exercise, rather than a series of individual questions.

General comments

Most candidates responded well to the given design situations and were able to select a question that fitted with the specialist option that they had studied.

Question 1 and **2** were popular questions, with only a small number of candidates opting for **Question 3**.

Freehand sketching, creativity and knowledge of materials and processes were strengths for many candidates.

Some candidates were unable to clearly express their thoughts in the written parts of the paper and may have benefitted from adopting a more structured approach. For example, in **part (d)** some candidates may have benefitted from using 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 device to allow someone to grow vegetables or herbs within a limited space that they considered to be important. Commonly seen responses referred to using a waterproof material, using a lightweight material so the device could easily be lifted into position on a wall, adding drainage holes, the device being strong enough to support the weight of the soil, stability, and allowing sunlight to reach the leaves of the plants. Candidates should be advised against repeating points that are given in the question 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 making woods and metals resistant to moisture. Commonly seen responses included varnish, paint, galvanising and plastic coating. In some responses a specific material, for example pine or mild steel sheet, was named even though it was not specifically asked for in the question. The sketches and notes were almost always of a standard that allowed the method to be clearly communicated.

(c) Freehand sketches, with annotations and colour, were commonly seen methods used to show design ideas. Many excellent responses were seen, with the design ideas being both suitable and clearly communicated. In weaker responses the design ideas did not always fully meet the requirements of the question with features, such as the method of attaching to a wall, unclear or not considered at all. 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 less than three design ideas and were awarded pro rata marks.

(d) The evaluations of the ideas were generally sound, with candidates able to clearly demonstrate an understanding of the positive and negative features of their design proposals. Commonly seen responses focussed on the main functions of the device, such as stability, strength or resistance to water.

It is important that candidates justify their evaluations, rather than making generic statements such as it will work well, if they are to access the full range of marks. Almost all candidates were able to choose one idea to develop further and give reasons for their choice.

(e) A variety of methods were used to show the full solution to the design problem. These included freehand orthographic drawings, exploded views, isometric views and materials lists. Commonly seen responses included troughs made from several pieces of wood fastened together or containers made from plastic mouldings. Stronger responses provided drawings with sufficient information for a skilled person to make the product. Weaker responses often did not include construction details or important dimensions.

All candidates should be advised against redrawing the design idea presented in **part (c)** and to focus on the construction details, dimensions and finishes.

(f) Most candidates were able to name two specific materials that would be used to make their design proposal and give reasons for their choices. Aluminium, acrylic and pine were commonly named materials, with reasons usually referring to the working properties or aesthetic qualities of the material. Candidates should be advised against giving generic names of materials such as wood, or generic reasons, such as easy to work with, as these are not awarded marks.

(g) Most candidates were able to outline a method that could be used to manufacture one part of their design. Marking out, cutting and joining pieces of material using hand production techniques was the most seen method of manufacture. Some candidates used Computer Aided Design (CAD) and Computer Aided Manufacture (CAM) to produce part of their design or commercial processes, such as injection moulding or vacuum forming. The most successful responses used a combination of sketches and notes to outline the method of manufacture.

If candidates are to access the full range of marks, it is important that the method is appropriate for part of the solution proposed in **(e)** and the correct names of tools and equipment are used. Generic names of tools, such as a cutter, are not awarded marks.

Question 2

(a) Most candidates were able to list four additional points about the function of a shop display to encourage children to eat more vegetables that thy considered to be important. Commonly seen answers referred to the visual appeal of the display, the information it would communicate through images and lettering, stability or the environment in which the display would be used.

Candidates should be advised against repeating points that are given in the question, for example the product will be flat-packed, or giving generic points, such as it must be safe, that might apply to almost any product.

(b) Most candidates used sketches and notes to good effect to show two methods of making a temporary joint from thin lightweight materials. The most seen responses were push together slot and tab joints, screw fastenings, Velcro and magnets. Some candidates incorrectly showed permanent joining methods, such as the use of an adhesive or welding. The sketches and notes were almost always of a standard that allowed the joining method to be clearly communicated.

To score maximum marks, candidates must use both sketches and notes to show each method. A small number of candidates used only sketches and were awarded a maximum of one mark for each method.

(c) Some impressive sketches with annotations were seen for this question. The most seen responses involved the use of folded and slotted together corrugated card or plastic sheet to produce a shop display. In some responses it was unclear how the surface graphics, giving information about the health benefits of eating more vegetables, were to be applied to the display stand.

Some candidates showed designs made from resistant materials, such as wood or acrylic, rather than lightweight materials. 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 less than three ideas and were awarded pro rata marks.

(d) The evaluations of the ideas were generally impressive, with candidates able to clearly demonstrate an understanding of the positive and negative features of their design proposals. Candidates often focussed on the stability of the display, how well it would attract children, how easy it would be to produce or how long it might last in a shop environment.

It is important that candidates justify their evaluations, rather than making generic statements such as it is strong, if they are to access the full range of marks. Almost all candidates were able to choose one idea to develop further and give reasons for their choice.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and materials lists. Colour was frequently used to give clarity to the drawings. Construction details were often clearly shown through a three-dimensional sketch and a development (net) with labels identifying the materials and joining methods.

This question specifically asks for important dimensions but, particularly in weaker responses, these were often omitted.

(f) Most candidates were able to name two specific materials that would be used to make their design proposal and give reasons for their choices. Commonly seen materials were corrugated cardboard, Corriflute (corrugated plastic sheet) and medium density fibreboard (MDF), with the reasons referring to the properties of the material, such as provides a smooth surface, available in a range of colours or easy to wipe clean.

Candidates should be advised against giving generic names of materials, such as plastic, or generic reasons, such as easy to work with, as these are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. Cutting out of thin sheet materials, either by hand or with the aid of CAD/CAM and joining with slotted joints or screw fasteners were commonly seen responses to this question. The most successful responses used a combination of sketches and notes to outline the method of manufacture. In a small number of responses candidates outlined manufacturing methods that were inappropriate for the material or solution proposed in **(e)**.

It is important that candidates include the correct names of the tools and equipment to be used in the method of manufacture if they are to access the full range of marks.

Question 3

(a) Only a small number of candidates selected this question. Most candidates that selected this question were able to list four additional points about the function of a device that would allow people with limited strength and mobility in their hands to safely peel the skin of vegetables that they considered to be important. Commonly seen answers related to the suitability of the materials, hygiene, stability, safety and ease of operation.

Candidates should be advised against repeating points that are given in the question, such as the device must hold different sizes and types of vegetables, or generic points that could apply to any product.

(b) Most candidates used sketches and notes to good effect to show two methods of removing the skin of a vegetable. Many candidates showed blades, rotating knives, or scrapers to remove the skin of a vegetable.

To score maximum marks, candidates must use both sketches and notes to show each method. A small number of candidates produced only sketches and were awarded a maximum of one mark for each method.

(c) Imaginative sketches with annotations were seen in response to this question, with many candidates clearly showing a device that had the potential to peel the skin from vegetables. It was, however, sometimes unclear how the design idea would work as the sketches only included labels, such as 'press this button' or 'this part rotates', rather than details of the actual mechanism.

It is important that all design proposals fully meet the design requirements if candidates are to access the full range of marks. A small number of candidates produced less than three ideas and were awarded pro rata marks.

(d) The evaluations of the ideas were generally well reasoned, with candidates able to clearly demonstrate an understanding of the positive and negative features of their design proposals. Points that focused on how easy it would be operate the device or how easy the vegetables would fit on to the device were commonly seen.

It is important that candidates explain their thoughts rather than making broad statements, such as it would not work well, if they are to access the full range of marks. Almost all candidates were able to choose one idea and give a reason for their choice.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and materials lists. Colour was frequently used to add clarity to the drawings. Most candidates included construction details for the individual parts of their design proposal but sometimes omitted to clearly show how these joined together to make the device.

This question specifically asks for important dimensions but, particularly in weaker responses, these were often missing.

(f) Most candidates were able to name two specific materials that would be used to make their design proposal and give reasons for their choices. Commonly seen materials were aluminium, acrylic and stainless steel with reasons for selection relating to the physical properties of the material or how easy it would be to clean.

Candidates should be advised against giving generic names of materials, such as metal, or generic reasons, such as easy to work with, as these are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design. Commonly seen answers included the use of a fabrication methods, injection moulding and the use of a laser cutter. The most successful candidates used a combination of sketches and notes to outline a 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 0445/12
Product Design 12

Key messages

A very good range of responses were seen to each of the design scenarios. Higher level responses demonstrated a very good understanding of the design context, a high degree of creativity and excellent technical knowledge. Weaker responses often demonstrated only limited understanding of the design context and elements of the design process.

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

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

Candidates should be encouraged to view the paper as a holistic design exercise. A small number of candidates built their design proposals around largely pre-prepared answers for **parts (a)**, **(f)** and **(g)** or produced responses to **parts (f)** and **(g)** that were not linked to the full solution shown in **part (e)**. Candidates should be encouraged to plan the use of their time wisely, so that they complete all parts of the question that they have chosen to answer. A small number of candidates did not complete **parts (f)** and **(g)** of their chosen question.

General comments

Question 1 and **Question 2** were the most popular questions. Very few candidates attempted **Question 3.** Creativity, knowledge of the properties of materials and understanding of processes were particularly well demonstrated through freehand sketching with annotations.

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

Comments on specific questions

Question 1

(a) Most candidates managed to list four additional points about the function of a table that could be used outdoors with the stacking stools that they considered to be important. Commonly seen answers referred to the stability of the table, the weight of the table, the need for the material to be weather resistant, how easy it would be to fold the table and how the dimensions of the table must match those of the stacking stools. Candidates should be advised against repeating points that are given in the question or giving generic points, such as it must be safe, 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 take up less space. Commonly seen answers involved the use of hinges, pivot joints, slot fixings, telescopic joints and magnets. The sketches and notes were almost always of a standard that allowed the method to be clearly communicated.

To score maximum marks, candidates must use both sketches and notes to show each method.

(c) An impressive range of sketches with annotations were seen in response to this question. The most common solutions involved aluminium legs, and a top made from plywood or laminated medium density fibreboard (MDF). Some more creative ideas involved connected parts that folded into a box for transportation or parts that fully separated and were then placed in a canvas bag for carrying. Stronger responses included detailed annotations and used a range of presentation techniques, including exploded views. 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.

(d) The evaluations of ideas were generally very impressive with candidates able to clearly demonstrate a good understanding of the positive and negative features of their design proposals. Commonly seen answers referred to the weight of the table, the stability of the table, ease of assembly or how easy it would be for the users to sit at the table and eat.

It is important that candidates justify their evaluations, rather than making generic statements such as it is strong, if they are to access the full range of marks. Almost all candidates were able to choose one idea to develop further and give reasons for their choice.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and material lists. Colour, enlarged drawings of details and annotations were commonly used to add clarity to drawings.

Higher achieving responses provided sufficient detail for a skilled person to make the product. In weaker responses construction details and important dimensions were often missing.

(f) Most candidates were able to name two specific materials that would be used in the construction of their design proposal and gave reasons for their choices. Commonly named materials included aluminium, plywood and MDF. The reasons for the choice of material often referred to the weight, strength or structural stability of the material.

Candidates should be advised against giving generic names of materials such as metal, or generic reasons such as being easy to work with, as these responses are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. Fabrication techniques, including welding and joining the parts using nuts and bolts, were commonly seen methods of manufacture. Most candidates used a combination of sketches and notes to outline a method of manufacture.

Many excellent responses were seen to this question, but it is important that all candidates include the correct names of tools and equipment if they are to access the full range of marks. Weaker responses often did not outline a method that could be used to manufacture a part of their solution but a stage in the making process, such as drilling a hole.

Question 2

(a Most candidates managed to list four additional points about the function of a container that a child could use to collect shells that that they considered to be important. Commonly seen answers referred to the appeal of the container to a child, the container must be light enough for a child to carry, the capacity of the container, the material must be water resistant or the need to add holes to the container for drainage or ventilation. Candidates should be advised against repeating points that are in the question, for example it must have a handle for carrying, 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 joining thin sheet material. Commonly seen answers included adhesives, magnets, Velcro, double sided tape, rivets, slot fixings and screw fasteners. Many excellent responses were seen to this question, with the sketches and notes clearly communicating the method.

To score maximum marks, candidates must use both sketches and notes to show each method.

(c) An impressive range of sketches with annotations were seen for this question and colour was generally used to good effect. The annotations often revealed the candidate's true understanding of how the design proposal would function and be constructed. Many candidates chose to use lightweight materials, such as thin plastic sheet, for their holder but some used resistant materials, such as plywood or pine.

Only a few candidates fully addressed the design requirement for the container to be made from a single piece of thin sheet material. 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.

(d) The evaluations of ideas were generally well reasoned, with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Commonly seen answers focused on the weight of the container, how many shells could be stored, how easy it would be for a child to put in and take out shells, or how suitable the container would be for use on a beach. It is important that candidates explain their evaluation points rather than making general statements, such as that it would work well, if they are to access the full range of marks.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views and isometric views. Colour was generally used effectively to show the material or surface finish. Many responses included an isometric sketch and a development (net) with supporting annotations.

Higher achieving responses provided sufficient detail for a skilled person to make the product. In weaker responses construction details and important dimensions were often missing.

(f) Most candidates were able to name two specific materials that would be used to make their design proposal and gave reasons for their choices. Cardboard, PVC and polypropylene were commonly named thin sheet materials. The main reasons for choosing these materials were often linked to the method of manufacture, range of colours available or how resistant the material would be to water. Some candidates named woods, such as pine, or metals, such as aluminium, and gave appropriate reasons for their choice.

Candidates should be advised against giving generic names of materials such as plastic, or generic reasons such as being easy to work with, as these are not awarded marks.

(g) Most candidates were able to outline a method that would be used to manufacture one part of their design proposal. Descriptions of how to cut out and assemble developments (nets) by hand or with the aid of computer numerically controlled (CNC) machines were commonly seen. Some candidates also described how a container could be made by cutting out and joining wooden parts. Most candidates used a combination of sketches and notes to outline a 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.

Question 3

(a) Only a small number of candidates selected this question. Most candidates that did answer this question managed to list four additional points about the function of a device that would that add sound to outdoor play equipment that they considered to be important. Commonly seen answers referred to the appeal of the device to children, ease of operation or ability to withstand different weather conditions. Candidates should be advised against repeating points that are given in the question, for example that the device would be activated by movement or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes effectively to show two ways of using movement to produce a sound. Many candidates showed ways that were based upon pulling a rope to ring a bell, turning a handle to generate an electrical current that sounded a buzzer, stamping on a spring-loaded device to ring a bell or air being forced through a narrow opening. The quality of sketches and notes were usually sufficient to show the way of producing sound.

To score maximum marks, candidates must use both sketches and notes to show each method.

(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 responses did not fully consider how the movement of the child would make a sound. Colour was generally used to good effect to enhance the sketches by showing the material or surface finish.

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 ideas that used additional power sources such as a battery, fewer than three ideas or ideas that were similar in form and function.

(d) The evaluations of ideas were generally soundly reasoned with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Many responses focused on the fact that the device might not always work effectively if used by different age children, how well it would appeal to children or how easily it would be to attach the device to the outdoor play equipment. It is important that candidates justify their evaluations rather than making broad statements, such as that it meets all the specification points, if they are to access the full range of marks.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and materials lists. Candidates should consider giving more details about the operating mechanism to help determine if the device would function as intended.

Stronger responses provided drawings with sufficient information for a skilled person to make the product. Weaker responses often did not include construction details or important dimensions.

(f) Most candidates were able to name two specific materials that would be used to make their design proposal and gave reasons for their choices. The most common materials named were acrylic, pine and aluminium, with the reasons relating to the appearance of the material or ease of forming the material. Candidates should be advised against giving the 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 were able to outline a method that could be used to manufacture one part of their design proposal. The most seen manufacturing methods were hand fabrication techniques, injection moulding and cutting out the parts of the device with a laser cutter. Most candidates used a combination of sketches and notes to outline a method of manufacture.

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.

DESIGN AND TECHNOLOGY

Paper 0445/13
Product Design

Key messages

Candidates should be encouraged to thoroughly read their chosen question to ensure that they fully meet all the design requirements and do not repeat points given in the question in their answers to **part (a)**.

All candidates should be carefully briefed on the requirements of each part of the paper. For example, in **part (e)** marks are specifically allocated for construction details and important dimensions.

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

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

General comments

Most candidates responded well to the given design situations and were able to select a question that fitted with the specialist option that they had studied.

Question 1 and **2** were the most popular questions. Very few candidates attempted **Question 3**. Creativity, knowledge of materials and understanding of processes were particularly well demonstrated through freehand sketching with annotations.

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

Comments on specific questions

Question 1

(a) Most candidates were able to list four additional points about the function of a product for nesting birds that they considered to be important. Commonly seen answers referred to the birds must be safe from predators, the materials must be weatherproof, the materials must be finished with a non-toxic paint, ease of cleaning, the product must be stable, and the product must withstand the weight of the birds.

Candidates should be advised against repeating points that are given in the question or giving generic points, such as lightweight, that might apply to almost any product.

(b) Most candidates used sketches and notes to good effect to show two methods of joining sheet materials that did not require the use of adhesives or tools. Commonly seen answers included slotted joints, magnets, Velcro, push fittings and wing nuts. A small number of candidates incorrectly showed the use of an adhesive as the joining method or the use of nails or screws, that would clearly require the use of tools. The standard of written and visual communication for this question was usually of a very high standard.

Candidates should be reminded that the question asks for sketches and notes and, therefore, just sketches will not be awarded full marks.

(c) A good range of sketches with annotations was seen for this question. 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 product to be flat-packed and assembled without the use of tools. 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 less than three design ideas and were awarded pro rata marks.

(d) The evaluations of ideas were generally sound, with candidates able to demonstrate a good understanding of the positive and negative features of their design proposals. Commonly seen responses referred to how easy it would be for the birds to access the nesting area, how easy it would be to fasten the product to a tree, how well the product would withstand different weather conditions or whether the design would attract birds.

It is important that candidates justify their evaluations, rather than making generic statements such as it will work well, if they are to access the full range of marks. Almost all candidates were able to choose one idea to develop further and give reasons for their choice.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, freehand exploded views, freehand isometric views, and material lists. Colour was usually used to add clarity to the drawings. Stronger responses provided sufficient information for a skilled third-party to make the product. 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 give reasons for their choices. Commonly named resistant materials included pine, plywood and acrylic. Reasons for the choice of material included relatively inexpensive, available in large sheets, can be varnished to make it waterproof, available in a wide range of colours and transparent so the birds can be viewed.

Candidates should be advised against giving generic names of materials, such as wood, or consumables such as an adhesive, 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 included the use of hand tools to mark out, cut out, shape and join parts together. Some candidates used Computer Aided Design (CAD) and Computer Aided Manufacture (CAM) to produce the parts of their design that then slotted together.

If candidates are to access the full range of marks, it is important that the method is appropriate for part of the solution proposed in **(e)** and the correct names of tools and equipment are used. Generic names of tools, such as a cutter, are not awarded marks.

Question 2

(a) Most candidates were able to list four additional points about the function of a greetings card based on the theme of birds that they considered to be important. Commonly seen answers referred to the use of colour, images or fonts, the cost of producing the card, information to be include on the card, providing sufficient space for the user to write a message or how long the card would need to last.

Candidates should be advised against repeating points that are given in the question, for example the card must be based on the theme of birds, or giving generic points, such as it must be lightweight, that might apply to almost any product.

(b) Most candidates used sketches and notes to good effect to show two methods of creating movement using mechanisms made from card. Commonly seen responses included vee folds, floating layers, pull mechanisms and rotating parts. Whilst the standard of sketching was usually very good, it was not always clear how the actual mechanism would work because comprehensive notes of explanation were not added.

To score maximum marks, candidates must use both sketches and notes to show each method.

(c) A good range of sketches with annotations was seen for this question, with colour generally used to good effect to show the surface graphics. Commonly seen design proposals included pop-up cards with a bird image as the moving feature, various sliding mechanisms that made an image of a bird move or rotating discs that revealed images of birds through openings in the front of the card. The annotations often revealed candidates true understanding of how the mechanism would function. 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 features of their design proposals. Commonly seen responses focused on how appealing the card would be, the reliability of the mechanism, how expensive it would be to produce and if the materials could be recycled. Many candidates seemed aware that there would only be a limited amount of money that customers would be prepared to pay for a greetings card.

It is important that candidates justify their evaluations, rather than making generic statements such as it must be safe, if they are to access the full range of marks. Almost all candidates were able to choose one idea to develop further and give reasons for their choice.

(e) Some good responses were seen to this question, with a variety of methods used to show the full solution to the design problem. These included orthographic drawings, freehand sketches, developments (nets) and materials lists. Colour was generally used to good effect to show the material and surface graphics. Many responses included an exploded three-dimensional (3D) sketch of the fully assembled card and then developments (nets) of each part that was required to make the greetings card.

The question specifically asked for construction details and important dimensions but, particularly in the weaker responses, these were often missing or only partially added.

(f) Most candidates were able to name two specific materials that would be used in their design proposal and give reasons for their choices. Card, paper and polypropylene sheet were commonly named materials, with reasons often referring to specific properties of the material, such as easy to cut and fold or images and text can easily be printed on the surface.

Candidates should be advised against giving generic names of materials, such as plastic, 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 the use of a craft knife, safety rule and cutting mat were commonly seen but some candidates focussed on the use of a laser cutter.

Many excellent responses were seen to this question, but it is important that all candidates include the correct names of tools and equipment if they are to access the full range of marks. Weaker responses often did not outline a method that could be used to manufacture a part of their solution but a stage in the making process, such as fastening two parts together with double sided tape.

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 an automated device that would allow customers to fill paper bags with bird seed that they considered to be important. Commonly seen answers referred to the reliability of the mechanism, how it would cope with different size seeds, ease of operation, stability of the device, how accurate it would be or how the paper bag would be held in position.

Candidates should be advised against repeating points that are given in the question, for example the device must release a measured amount of seed, as these responses are not awarded marks.

(b) Most candidates used sketches and notes to show two methods of releasing a measured amount of seed. Many responses showed a mechanical device, for example a rotating part that opened to allow a measured amount of seed to drop into the paper bag. A small number of candidates

showed systems that were based upon an electric motor or a hand operated scoop. Whilst some good responses were seen to this question, it was unclear exactly how many of them would work.

To score maximum marks, candidates must use both sketches and notes to show each 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. In most design proposals the path of the seed could clearly be seen but the operation of mechanism that measured the amount of seed to be dispensed was less clear. It is important that all ideas fully meet the design requirements if candidates are to access the full range of marks. For example, some candidates did not fully appreciate an automated device was required and concentrated on showing the external views of the product rather than the mechanism for measuring and releasing the seed into a paper bag. A small number of candidates produced fewer than three ideas or three ideas that were similar.

(d) The evaluations of ideas were generally good, 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 system, ease of operation or cost of manufacture.

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 were able to choose one idea to develop further and give reasons for 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, exploded freehand sketches, orthographic views, annotations, and materials lists. Higher achieving responses provided sufficient detail for a skilled person to make the device. In weaker responses construction details and important dimensions were often missing.

(f) Most candidates were able to name two specific materials that would be used in their design proposal and give reasons for their choices. The most common materials named were acrylic, stainless steel and aluminium, with the reasons often relating to strength of the material, how easy it would be to clean or its appearance.

Candidates should be advised against giving generic names of materials such as metal, 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 manufacturing one part of their design proposal. Commonly seen responses included marking out, cutting, drilling and joining materials with rivets, nuts and bolts or adhesives. Some responses showed the use of computer numerically controlled (CNC) machines to cut out parts or the manufacture of parts using injection moulding. Most candidates used a combination of sketches and notes to outline a method of manufacture.

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.

DESIGN AND TECHNOLOGY

Paper 0445/02
School Based Assessment

Key messages

- Marks should not be awarded on the candidate Assessment Summary Form when there is no evidence in the candidate's folder. Exceptional circumstances should be reported to CIE and recorded on the Individual candidate record card. Clear photographic evidence is required for both the key manufacturing stages of the product and the testing of the product.
- Models are used by many candidates to help to visualize size, shape, and proportions of the design proposal. Candidates should then go on to use trialling where appropriate to test aspects of the proposed solution and specify details of form, materials and construction/production methods.
- Whilst most work is clear and well presented, some folios were not easy to follow; a more structured approach following the assessment criteria is recommended.

General comments

Most work submitted was clear, structured and well-presented and candidates had addressed the assessment criteria in a concise and appropriate manner.

Some project work was challenging to follow; candidates should ensure that their folios align more accurately with the assessment criteria. Presenting work in sequence can aid clear communication.

All centres submitted coursework folders with the appropriate accompanying paperwork. When submitting a sample from a large entry, centres are reminded to try to include work with marks covering the full range of marks awarded.

The Individual candidate record cards have been helpful for Moderators to see where centres have awarded marks.

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

Comments on specific questions

Question 1

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

This section was generally assessed accurately with candidates giving clear details of the design needs and the needs of the user. Some design briefs were very short and lacking detail. The design brief could include details such as who the product is for, why it is needed, and the desired end result of the project.

Question 2

Research into the Design Brief resulting in a Specification

Most centres assessed this section accurately and consistently. Candidates are advised to apply more focus on the design brief. It is important that candidates obtain and analyse information which will guide their designing in later sections. This will include essential information such as the details and dimensions of items to be stored or fitted into the product, and details relating to the intended location for the product.

As well as researching the particular features of existing products and gathering information and data such as ergonomic or environmental factors, candidates are also expected to collect information directly relating to the user and the user's needs for the product.

Specifications were generally more detailed and justified, giving a clear framework and reference point for the design work that follows.

Question 3

Generation and exploration of Design Ideas

Some of the design work presented was of a very high quality, with well presented, well annotated and imaginative proposals.

Marking was generally lenient in this section. To achieve the higher mark ranges, candidates would benefit from generating a wider range of significantly different design possibilities before choosing to develop one of them. They should explore and evaluate each idea in detail, and include material possibilities, aesthetic considerations, experimentation with proportions etc. before going onto the next concept.

Question 4

Development of Proposed Solution

Some centres marked this section leniently. Most candidates made good use of models to help visualise their product and assist in the decision making relating to proportions and functions. Many candidates went on to use simple trialling to work out suitable construction materials and finishes. Candidates should aim to explain why specific materials and constructional methods had been selected or gave details of where appropriate, the number of components and their sizes required.

Question 5

Planning for Production

This section was generally assessed accurately. Most candidates produced clear and fully dimensioned working drawings and fully detailed planning for manufacture showing an effective order for the sequence of operations. Some higher scoring work seen included full details of tools, processes, health and safety considerations, cutting lists, specific materials and finishes to be applied.

Plans must be produced prior to manufacture.

Question 6

Product Realisation

Centres are generally accurate when awarding marks in this section. There were many outstanding products made to a very high standard with candidates demonstrating precision and accuracy in the production of a well-functioning outcome.

It is important that all candidates include a detailed photographic log of their making process.

Centres are reminded that the candidates should have ownership of their coursework – including the manufacture of the product. Any external help outside of usual teacher/technical assistance must be acknowledged, and the marks adjusted accordingly.

Question 7

Testing and Evaluation

Most candidates had clear photographic evidence of the testing of their product and evaluated its performance accordingly. Many evaluated the product against the original specification. The quality of the original specification can influence the range and scope of the evaluation of the final outcome.

Candidates are reminded that to achieve the higher mark ranges, after testing, they are required to draw meaningful conclusions leading to proposals for further development. Proposals should be in the form of sketches and notes.

DESIGN AND TECHNOLOGY

Paper 0445/31
Resistant Materials 31

Key messages

- Candidates are encouraged to carefully read each question before attempting to answer, focusing on the key elements to maximize their performance. The marks allocation and space provided for each question offer clear guidance on what is required.
- Candidates should enhance their knowledge and understanding of the practical processes and techniques involved in working with resistant materials such as wood, metal, and plastic. This includes the ability to match specific tools and equipment to their purposes.
- Improving drawing skills is also essential. Candidates should aim to produce clear and accurate sketches when responding to questions that instruct: "Use sketches and notes to…". Accompanying notes should clarify and support the sketches, rather than stating the obvious.

General comments

Section A

In this section candidates need an all-round knowledge and understanding to answer all questions successfully in this section. Many candidates can improve on their understanding of the processes, tools and equipment required to demonstrate foundational knowledge.

Section B

This section 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 to access all the marks available.

Comments on specific questions

Section A

Question 1

Only a few candidates stated all three items of information on the label on the box of screws: diameter, length and type of head respectively. Many candidates achieved two of the three marks available.

Question 2

Many candidates named three natural sources of energy. The most common answers included wind, sun, (solar), water, (hydroelectric power) and geothermal.

Question 3

Only a few candidates were familiar with the term ‘groove’ when related to wood and drew a groove correctly. A groove is a channel cut along the edge or on the face of a piece of wood.

Question 4

Most candidates were able to identify one or two design features of the mobile phone stand. The most common features included the lip to prevent the phone from sliding off, the wide stable base and the holes in the back of the stand that would provide space for a charging cable.

Question 5

Three specific items of information were required to show how a batch of identical sign holders could be produced using thin mild steel sheet. The items included the use of some sort of former, the method of force, i.e. use of a hammer or mallet to bend the metal, and a sketch to show how the metal and former would be held securely while the bending took place. Many candidates gained at least one mark but only a few were able to provide all the necessary details.

Question 6

Very few candidates recognised the 'sand casting' process that would use a split pattern to produce an aluminium hacksaw handle.

Question 7

(a) and (b) Correct answers naming the process used on the copper dish or its purpose were extremely rare. 'Planishing' is a process used to induce hardness into the copper to prevent distortion and to give the copper an attractive appearance.

Question 8

Some candidates gained one mark for giving the name 'Nickel' while others gained one mark for giving the name 'Titanium'. Only a few candidates achieved both marks.

Question 9

Only a few candidates demonstrated an understanding of the question. The two lengths of softwood had already been glued together, so any strengthening needed to focus on the joint. The best answers illustrated creative solutions, such as using wooden corner blocks secured with adhesive and nails or screws, or metal brackets screwed to the two pieces of softwood. These responses showed an appreciation for effective reinforcement techniques.

Candidates are reminded to read the questions carefully.

Question 10

Many candidates recognised that one main benefit of an integral lid was that it would not get lost or that it made it easier to open and close. General comments relating to keeping food fresh were not a specific benefit of an integral lid.

Section B

Question 11

(a) Many candidates provided relevant questions that the D&T candidates could ask the catering staff when designing the condiment holder. The best answers related to the size, type and number of condiment holders required, their location and the budget set aside for their manufacture.

(b) (i) The main reasons for making the condiment holder out of softwood rather than hardwood are that softwood is generally cheaper and more readily available. Many candidates gave incorrect answers such as softwoods are easier to work or that they were more attractive.

(ii) Most candidates named MDF or plywood correctly for the 5 mm thick base of the condiment holder. The use of hardboard was also a good choice of manufactured board.

(c) Many candidates achieved at least one mark for this question. The best answers, showing how the shape of the condiment holder could be achieved, included the following features: use of an

appropriate saw, for example, coping, Hegner or scroll; the use of files to smooth the sawn edges and glasspaper to produce a final finish.

(d) This question required candidates to sketch and name a suitable method of joining the partition to the end of the condiment holder. Some candidates did produce a sketch of a suitable method and gained at least one mark but denied themselves a mark by not naming the method.

The most common constructions included mortise and tenon, dowel and housing joints.

(e) Only a few candidates achieved maximum marks for this question. Some candidates were unfamiliar with the term 'jig'. The jig needed to show a length of softwood held securely, a mark showing 200 mm, a saw cut or clear position for the saw blade and the method of holding the jig itself securely while the softwood was sawn.

(f) (i) Only a few candidates were able to show the rail horizontally in a vice or up against a bench stop, flat on a work bench.

(ii) Only a few candidates named a smoothing plane or jack plane as the type of plane that could be used to produce the chamfer along the length of the rail.

(g) (i) Only a few candidates named a specific type of nail that could be used to join the rails to the ends of the condiment holder. Knowledge of fittings and fixings is a basic joining method with which candidates should be familiar. 'Made-up' names such as 'flat head nail' and 'countersink nail' were not rewarded. The most appropriate type of nail included a panel pin, round wire nail and an oval (brad) nail.

(ii) Very few candidates could name a pin punch or nail punch as the appropriate tool that could be used to sink the head of the nail below the surface of the wood.

(h) Many candidates did not address this question correctly. Candidates were asked to describe how the D&T candidates could evaluate the design of the condiment holders.

Most candidates gave their own evaluation of the design shown in Fig. 11.1 rather than a description of how the evaluation of the design could be carried out. Good answers included asking the catering staff to trial the holders and give feedback and for the candidates to observe the holders being used and to check the final outcome against their original specification.

Question 12

(a) Candidates were required to select two properties that applied to acrylic from the five statements given in the question. The two properties were 'impact resistant' and 'can be self-finished'. Most candidates provided at least one correct statement.

(b) (i) Most candidates were unable to provide three processes that needed to be carried out in order to produce a high-quality finish to the edges of the acrylic strip. Many candidates recognised that filing would be important or that the edges would be polished. Important stages, including the use of wet and dry), silicon carbide paper was often missing. The use of glasspaper, (sandpaper to most candidates), should be used on wood and not an acrylic.

(ii) Most candidates recognised that to bend the 500 mm length of acrylic would require heat of some sort. The only method was to heat it in an oven. Many candidates described the use of a strip heater or hot air gun which would not be successful. This did not prevent candidates from achieving three out of the four marks available for showing the use of a former, the acrylic draped around it and held securely in position while the material cooled.

(c) (i) Only a few candidates named dividers as the tool used to mark out the circular shape on the sheet of 5 mm thick acrylic.

(ii) Most candidates did name an appropriate saw that could be used to cut out the circular shape. The most common saws included the coping, Hegner and band saws.

(d) The best precautions taken to prevent the acrylic sheet from being damaged while it was drilled included clamping the sheet securely with a sacrificial board placed underneath. Many candidates

showed the acrylic clamped without the sacrificial board. Some candidates gained one mark for the use of masking tape to cover the area being drilled and some candidates suggested drilling a pilot hole.

(e) Comprehensive descriptions of how CAM, (Computer Aided Manufacture), could be used to produce the numbers on the clock face were very rare. Some candidates did describe how the data from the CAD, (Computer Aided Design), file could be transferred to a CNC machine, (often a laser cutter), which would produce the numbers. Some candidates gave information relating to CAD which was irrelevant.

(f) Generally, candidates demonstrated a good understanding of the vacuum forming process. However, many candidates did not provide stages that would continue from the first stage given: 'Turn the heater on'**.** Many answers referred to clamping the plastic sheet which was already done and shown in Fig. 12.3. Other answers referred to placing he mould on the platen, which was already in position, shown in Fig. 12.3. Both these stages would have been carried out before turning the heater on.

(g) Only a few candidates successfully showed practical methods of joining the clock face to the two acrylic rods. The clarity of the sketches and notes could be improved to help determine how many of the proposed solutions would function as needed.

Question 13

(a) Most candidates identified two hardwoods, beech and oak, from the list given.

(b) (i) A few candidates named both the sliding bevel and the mitre square as two tools that could be used to mark out the mitres on the sides of the photo frame.

(ii) Most candidates gained one mark for naming an appropriate saw that could be used to remove most of the waste. Many candidates described how files or glasspaper could be used to make the sawn edges flat. Use of these items would not produce surfaces that were flat enough to make a successful mitre joint. The best answers, from a few candidates, described how the sawn ends could be made flat by using a disk sander. Those candidates who described the use of a mitre box and saw to complete the whole process gained maximum marks.

(c) (i) Most candidates were unfamiliar with string cramps. Strips of wood or corner blocks inserted between the string around the frame would tighten the string and therefore hold the joints together. Only a small group of candidates achieved maximum two marks.

(ii) Most of the methods of strengthening the mitre joint shown were impractical. The best answers showed additional thin wood glued onto the 'face' of the joint or inserted into the corner of the joint. The use of nails and screws would not be practical.

(d) (i) Many candidates recognised two basic marking out tools, a scriber and an engineer's try square used to mark out the mild steel bar.

(ii) There were three main stages involved when cutting out the recesses in the mild teel bar used for the legs of the photo stand. First, the metal would be held securely in a vice, the recesses would be cut using a hacksaw and a file would be used to remove the remaining waste. One mark was awarded for describing how all four recesses could be cut out accurately. Some candidates showed the four pieces being marked out together or being sawn together.

(e) Brazing is a basic method by which steel can be joined together. There are several important stages when brazing, involving the use of various items of equipment and materials with which candidates should be familiar. This question asked candidates to state the purpose of four items. Emery cloth is used to clean the metal. Flux is used to keep the join clean and to prevent oxidisation when heated. A blowtorch is used to heat the metal and brazing rod is the material that is heated and melted to form the joint.

Many candidates gained one or two marks but only a few achieved maximum four marks.

(f) Only a few candidates showed a practical method by which the stand could be made more stable. The best methods included a base onto which the legs could be joined or two feet added to the existing legs.

DESIGN AND TECHNOLOGY

Paper 0445/32
Resistant Materials 32

Key messages

- Candidates are encouraged to carefully read each question before attempting to answer, focusing on the key elements to maximize their performance. The marks allocation and space provided for each question offer clear guidance on what is required.
- Candidates should enhance their knowledge and understanding of the practical processes and techniques involved in working with resistant materials such as wood, metal, and plastic. This includes the ability to match specific tools and equipment to their purposes.
- Improving drawing skills is also essential. Candidates should aim to produce clear and accurate sketches when responding to questions that instruct: "Use sketches and notes to...". Accompanying notes should clarify and support the sketches, rather than stating the obvious.

General comments

Section A

In this section candidates need an all-round knowledge and understanding to answer all questions successfully in this section. Many candidates demonstrated 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 to access all the marks available.

Comments on specific questions

Section A

Question 1

Most candidates provided at least one benefit of using CFRP for aircraft parts. The most common answers included ‘lightweight’ and ‘durable’.

Question 2

(a) Only a very small number of candidates named copper as the metal used to make the plumbing pipes.

(b) Only a very small number of candidates named soft soldering or soldering as the method of joining the metal pipes together. Most incorrect answers stated ‘welding’ or ‘brazing’.

Question 3

Many candidates gained some reward for showing how the tenon could be prevented from being pulled out of the mortise. The best answers showed some form of wedge, dowel or pin through the tenon and straight against the upright part. Other good answers showed nails or screws through the edges of the upright part. Answers stating the use of an adhesive only gained one mark.

Question 4

Very few candidates gave suitable finishes for all three products. The most common correctly named finish was that the wheelbarrow body could be painted or galvanised. There were very few answers stating that the silver pendant could be self-finished or that it could be polished and even fewer answers stating that the brass tap could be electroplated.

Question 5

Most candidates gained one or two marks for showing how the curved shape could be produced in the acrylic sheet. Marks were awarded for heating the acrylic, the use of a former around which the sheet could be shaped and a method of holding the acrylic in place while it cooled. Most candidates did not provide details of the last of the last stage.

Question 6

Many candidates achieved at least one or two marks for describing how the steam chest could be used to steam bend wood. The labels around the drawing of the steam chest were both a guide and a clue as to how the process worked.

Question 7

Only a small minority of candidates recognised that to make a saw cut marked out at 45º in the steel tube would require the tube to be positioned in the vice so that the saw cut could be made vertically.

Question 8

Most candidates were unable to explain what was meant by the term 'glass reinforced plastic'. Most answers referred vaguely to a mixture of glass and plastic. There were some excellent explanations stating that glass fibres or strands of glass were soaked in polyester resin.

Question 9

(a) Many candidates named Low Density Polyethylene (polythene) correctly. Some candidates simply repeated the question by stating LDPE.

(b) Most candidates stated two ways by which supermarkets could reduce environmental waste produced by the use of plastic shopping bags. The best answers included the use of alternative material such as paper, the use of recycling bins in store as well as campaigns to encourage customers to reuse existing bags.

Question 10

Many candidates recognised that the fabricated stool would use more materials and increase the time taken to manufacture the stool. However, only a minority of candidates went on to state that the increased time would result in increased labour costs that would be passed on to customers.

Section B

Question 11

(a) Many candidates gave 'durable' and 'attractive' as benefits of using hardwood for the tablet stand. Some answers, including 'cheap' and 'easy to work' were not applicable to hardwoods.

(b) (i) Most candidates named at least one tool that could be used to mark out the sides of the base for the tablet stand. Pencil and marking knife are the only tools that should be used to make a mark on the surface of the wood. Other tools, such as a steel rule and a try square could be used with a pencil and marking knife.

(ii) Many candidates named the tenon or dovetail (tenon) saw to be used with a bench hook. Some candidates named a 'hacksaw' which is used to cut metal, not wood.

(c) Many candidates did not understand the term 'jig' which appears in the section: 'Joining and assembly', in the syllabus. There were some excellent designs for a jig. The most basic jig was a template with two holes drilled that could be placed on the ends of each side. For maximum marks, the template would have a side and an end added to become a jig that could be positioned positively on the ends of the hardwood.

(d) Many candidates gave the name 'try square' that could be used to check that the sides of the frame were clamped squarely and gained one mark. For a second mark the try square had to be shown in position on the inside of the frame. Many candidates showed incorrectly, the try square on the outside of the frame. Only a few candidates provided a second method: to measure the diagonal distances from inside corner to corner with a steel rule or straight edge on which the distances could be marked.

(e) (i) Many candidates completed the drawing of the butt hinge. Many candidates achieved at least one of the three marks available. Marks were awarded for showing a second 'leaf', the central 'knuckle' and either two or three equally spaced holes in each leaf.

(ii) A minority of candidates named an alternative to the butt hinge. The most common correct type of hinge was a piano hinge. A flush hinge and back flap hinge were also suitable alternative hinges to the butt hinge.

(f) There were some good design solutions showing how the platform could be tilted and locked at three different angles. Many candidates missed full marks due to their choice of materials and construction details.

(g) (i) Most candidates appeared to have difficulty in describing the ergonomic features of the tablet stand.

The best answers referred to the adjustment of the platform to different viewing angles which would provide comfortable positions for users of different heights or seated positions.

(ii) Many candidates stated that hardwoods are generally long lasting and therefore sustainable. This answer was given one mark. Candidates needed to go further by describing how hardwood trees could be replaced by planting new trees, making the material sustainable. Many candidates confused the term biodegradable material with sustainability.

Question 12

(a) Tested candidates' knowledge and understanding of some basic metalworking processes. The overall performance was very poor.

(i) Only a few candidates recognised that that the purpose of a centre punch was to provide an indentation into which the drill could sit without it moving out of position.

(ii) Some candidates did give the reason for a pilot hole: that it would provide a guide for a larger diameter drill that would follow.

(iii) Many candidates confused saws used for cutting wood with those used to cut metal; for example, naming incorrectly a tenon saw (used to cut wood), rather than a hacksaw.

(iv) Very few candidates named tin snips as a tool that could be used to cut out curved shapes in thin metal sheet.

(v) Good answers from a minority of candidates included a half round, round or rat tail file as a specific type of file that could be used to make the curved shape smooth.

(b) When describing how the sheet metal legs could be bent to shape, candidates needed to show some type of former around which the metal could be shaped, a method of holding the work piece securely and the method of force, i.e. a mallet or hammer. One mark was awarded for the clarity and accuracy of both written notes and sketches.

(c) (i) Most candidates achieved at least one mark for giving additional ways in which the CAD drawing could be modified. The most common answers referred to sizing, the application of colour or texture and the ability to produce a three-dimensional image.

(ii) Benefits relating to Computer Aided Manufacture (CAM) were less convincing. However, many candidates did achieve one or two marks for answers including speed and accuracy.

(d) There were six marks available for candidates to show how a bracket could be attached to the back of the coat hook so that the coat hook could be fixed to two screws in the wall. Several candidates did not include a practical design of the bracket or a method of attachment. Additionally, the clarity of some sketches and notes was limited, making them hard to interpret.

(e) (i) Most candidates were unable to provide an alternative finish for the mild steel coat hook. The best answers included plastic dip coating or galvanising.

(ii) Only a few candidates achieved two marks for describing how the surfaces of the mild steel could be prepared to take an applied finish. The most common awarded mark was for stating that the surface would be cleaned, but very few answers included the use of wet and dry (silicon carbide) paper or emery cloth.

(f) Many candidates stated one advantage of using aluminium rather than mild steel for the coat hook. The most common answers stated that it was corrosion resistant, that it was easier to work or that it could be self-finished.

Question 13

(a) (i) Most of candidates named a suitable hardwood for the sides of the box.

(ii) Most candidates named either MDF or plywood as a suitable manufactured board for the lid of the case.

(b) Candidates provided many variations of what a half lap should look like but only a minority of these were accurately drawn.

(c) (i) Only a few candidates provided clear and accurate sketches of a practical mould. There were some good designs showing a mould that could be used to vacuum form the lift-out tray. The most accurate designs showed the mould as the reverse of the tray mounted on a base.

(ii) Only a few candidates identified MDF as the most suitable material from which to make the mould.

(d) (i) Many candidates achieved marks for some parts of this question. To gain maximum marks candidates needed to show, through sketches and notes, a method of cutting out the shape of the palette, the use of files and/or wet and dry (silicon carbide) paper and the use of a drill to drill the Ø40 hole. There were some very good sketches showing stages clearly, but very often the sketches were difficult to understand, and relevant annotations were missing.

(ii) Many candidates gained one mark for showing the acrylic sheet clamped securely but did not show a sacrificial board underneath the sheet that would prevent the acrylic from splitting or cracking.

(iii) There were some innovative ideas showing how the palette could be stored inside the lid of the case. Good ideas included the use of clips screwed to the inside of the lid that could be turned to secure or release the palette. The use of Velcro, magnets and a type of harness were also imaginative solutions.

(e) Most candidates gained at least one mark for showing some sort of handle. However, additional details such as a named appropriate material and a method of attaching the handle to the case were missing.

(f) Many candidates showed the correct positions of the two parts of the toggle catch. Some candidates drew them in upside down positions and some candidates did not align the two parts vertically.

DESIGN AND TECHNOLOGY

Paper 0445/33
Resistant Materials 33

Key messages

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General comments

Section A

In this section candidates need an all-round knowledge and understanding to answer all questions successfully in this section. Many candidates can improve on their understanding of the processes, tools and equipment required to demonstrate foundational knowledge.

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This section 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 to access all the marks available.

Comments on specific questions

Section A

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Many candidates named three natural sources of energy. The most common answers included wind, sun, (solar), water, (hydroelectric power) and geothermal.

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Section B

Question 11

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(b) (i) The main reasons for making the condiment holder out of softwood rather than hardwood are that softwood is generally cheaper and more readily available. Many candidates gave incorrect answers such as softwoods are easier to work or that they were more attractive.

(ii) Most candidates named MDF or plywood correctly for the 5 mm thick base of the condiment holder. The use of hardboard was also a good choice of manufactured board.

(c) Many candidates achieved at least one mark for this question. The best answers, showing how the shape of the condiment holder could be achieved, included the following features: use of an

appropriate saw, for example, coping, Hegner or scroll; the use of files to smooth the sawn edges and glasspaper to produce a final finish.

(d) This question required candidates to sketch and name a suitable method of joining the partition to the end of the condiment holder. Some candidates did produce a sketch of a suitable method and gained at least one mark but denied themselves a mark by not naming the method.

The most common constructions included mortise and tenon, dowel and housing joints.

(e) Only a few candidates achieved maximum marks for this question. Some candidates were unfamiliar with the term 'jig'. The jig needed to show a length of softwood held securely, a mark showing 200 mm, a saw cut or clear position for the saw blade and the method of holding the jig itself securely while the softwood was sawn.

(f) (i) Only a few candidates were able to show the rail horizontally in a vice or up against a bench stop, flat on a work bench.

(ii) Only a few candidates named a smoothing plane or jack plane as the type of plane that could be used to produce the chamfer along the length of the rail.

(g) (i) Only a few candidates named a specific type of nail that could be used to join the rails to the ends of the condiment holder. Knowledge of fittings and fixings is a basic joining method with which candidates should be familiar. 'Made-up' names such as 'flat head nail' and 'countersink nail' were not rewarded. The most appropriate type of nail included a panel pin, round wire nail and an oval (brad) nail.

(ii) Very few candidates could name a pin punch or nail punch as the appropriate tool that could be used to sink the head of the nail below the surface of the wood.

(h) Many candidates did not address this question correctly. Candidates were asked to describe how the D&T candidates could evaluate the design of the condiment holders.

Most candidates gave their own evaluation of the design shown in Fig. 11.1 rather than a description of how the evaluation of the design could be carried out. Good answers included asking the catering staff to trial the holders and give feedback and for the candidates to observe the holders being used and to check the final outcome against their original specification.

Question 12

(a) Candidates were required to select two properties that applied to acrylic from the five statements given in the question. The two properties were 'impact resistant' and 'can be self-finished'. Most candidates provided at least one correct statement.

(b) (i) Most candidates were unable to provide three processes that needed to be carried out in order to produce a high-quality finish to the edges of the acrylic strip. Many candidates recognised that filing would be important or that the edges would be polished. Important stages, including the use of wet and dry), silicon carbide paper was often missing. The use of glasspaper, (sandpaper to most candidates), should be used on wood and not an acrylic.

(ii) Most candidates recognised that to bend the 500 mm length of acrylic would require heat of some sort. The only method was to heat it in an oven. Many candidates described the use of a strip heater or hot air gun which would not be successful. This did not prevent candidates from achieving three out of the four marks available for showing the use of a former, the acrylic draped around it and held securely in position while the material cooled.

(c) (i) Only a few candidates named dividers as the tool used to mark out the circular shape on the sheet of 5 mm thick acrylic.

(ii) Most candidates did name an appropriate saw that could be used to cut out the circular shape. The most common saws included the coping, Hegner and band saws.

(d) The best precautions taken to prevent the acrylic sheet from being damaged while it was drilled included clamping the sheet securely with a sacrificial board placed underneath. Many candidates

showed the acrylic clamped without the sacrificial board. Some candidates gained one mark for the use of masking tape to cover the area being drilled and some candidates suggested drilling a pilot hole.

(e) Comprehensive descriptions of how CAM, (Computer Aided Manufacture), could be used to produce the numbers on the clock face were very rare. Some candidates did describe how the data from the CAD, (Computer Aided Design), file could be transferred to a CNC machine, (often a laser cutter), which would produce the numbers. Some candidates gave information relating to CAD which was irrelevant.

(f) Generally, candidates demonstrated a good understanding of the vacuum forming process. However, many candidates did not provide stages that would continue from the first stage given: 'Turn the heater on'**.** Many answers referred to clamping the plastic sheet which was already done and shown in Fig. 12.3. Other answers referred to placing he mould on the platen, which was already in position, shown in Fig. 12.3. Both these stages would have been carried out before turning the heater on.

(g) Only a few candidates successfully showed practical methods of joining the clock face to the two acrylic rods. The clarity of the sketches and notes could be improved to help determine how many of the proposed solutions would function as needed.

Question 13

(a) Most candidates identified two hardwoods, beech and oak, from the list given.

(b) (i) A few candidates named both the sliding bevel and the mitre square as two tools that could be used to mark out the mitres on the sides of the photo frame.

(ii) Most candidates gained one mark for naming an appropriate saw that could be used to remove most of the waste. Many candidates described how files or glasspaper could be used to make the sawn edges flat. Use of these items would not produce surfaces that were flat enough to make a successful mitre joint. The best answers, from a few candidates, described how the sawn ends could be made flat by using a disk sander. Those candidates who described the use of a mitre box and saw to complete the whole process gained maximum marks.

(c) (i) Most candidates were unfamiliar with string cramps. Strips of wood or corner blocks inserted between the string around the frame would tighten the string and therefore hold the joints together. Only a small group of candidates achieved maximum two marks.

(ii) Most of the methods of strengthening the mitre joint shown were impractical. The best answers showed additional thin wood glued onto the 'face' of the joint or inserted into the corner of the joint. The use of nails and screws would not be practical.

(d) (i) Many candidates recognised two basic marking out tools, a scriber and an engineer's try square used to mark out the mild steel bar.

(ii) There were three main stages involved when cutting out the recesses in the mild teel bar used for the legs of the photo stand. First, the metal would be held securely in a vice, the recesses would be cut using a hacksaw and a file would be used to remove the remaining waste. One mark was awarded for describing how all four recesses could be cut out accurately. Some candidates showed the four pieces being marked out together or being sawn together.

(e) Brazing is a basic method by which steel can be joined together. There are several important stages when brazing, involving the use of various items of equipment and materials with which candidates should be familiar. This question asked candidates to state the purpose of four items. Emery cloth is used to clean the metal. Flux is used to keep the join clean and to prevent oxidisation when heated. A blowtorch is used to heat the metal and brazing rod is the material that is heated and melted to form the joint.

Many candidates gained one or two marks but only a few achieved maximum four marks.

(f) Only a few candidates showed a practical method by which the stand could be made more stable. The best methods included a base onto which the legs could be joined or two feet added to the existing legs.

DESIGN AND TECHNOLOGY

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Systems and Control

Key messages

- Candidates should be reminded that all responses should appear in the space allowed for that response. If further space is needed one of the blank pages can be used but the relevant question number should be included in the extra material.
- Very few instances of more than one question from ***Section B*** being attempted repeat information that is given in the question.
- In question requiring an explanation or description more than one mark can be gained for a single point by giving full depth to the point being made.

General comments

***Section* A** questions were accessible to candidates, and detailed responses were observed. The questions covering electronics content were mostly answered confidently, indicating thorough preparation by individual centres.

In ***Section B*** the question based on structures was again by far the most popular. Although the electronics question was the least popular marks gained for this question were higher than those answering the other two questions.

Comments on specific questions

Section A

Question 1

(a) This question was accessible to candidates with many gaining all of the available marks. Errors were confined to lower achieving candidates transposing the first two words required, 'nails' and 'triangulation'. Almost all gained the mark for placing the word 'rigid' in the final space. Candidates are reminded to read the questions carefully before answering.

(b) The force indicated by the arrow at the top of the framework was compression. This would have been transmitted down the verticals on either side of the frame. 'Bending' was not allowed as the part of the building surrounding the frame would spread the load evenly across the top of the frame.

Question 2

(a) Almost all higher achieving candidates were able to give an example of a composite material, concrete was the example most frequently used. Other composites such as GRP and carbon fibre were acceptable.

(b) At least one valid benefit of using composites was given by the majority of candidates. A second applicable benefit was not given by many of the lower achieving candidates. Any examples that mentioned cost did not gain a mark.

Question 3

Environmental benefits for products that can be disassembled were not clearly laid out in some cases. Those candidates who mentioned the potential for repair of the product gained the mark. The ability to store and transport large items was another valid point frequently used.

Question 4

(a) The two marks for the description were obtained either by using two distinct point or by fully describing a single point. Most candidates gained the marks for two separate points. Reduction of friction can be achieved by ensuring that mating parts in a mechanism move freely against each other. The method given by almost all candidates was to use lubrication. Use of named bearing types or suggesting a material with a low coefficient of friction such as nylon was enough to gain a mark. A third method was to reduce the area of the surfaces in contact.

(b) Knowledge of levers was generally very good with examples seen of small sketches being used to show the relative position of effort, load and fulcrum.

(c) Almost all candidates were able to name the two other types of motion, linear and rotary.

Question 5

The most popular reason given for using spur gears was that there can be no slippage so they are a positive method of transferring motion. A number of other reasons related to speed or direction of motion were found. The only reasons not accepted were economic ones, which were often found as a single word answer, 'cheaper' or 'easier' with no comparison offered.

Question 6

The two effects of using the spur gears shown were that the driven gear would rotate faster than the drive gear and that direction of rotation would be reversed. The resulting torque reduction in the driven gear was also accepted. Higher achieving candidates answered the question correctly, while several lower achieving candidates lost marks by not stating the end effect. For example, stating that the drive gear has more teeth was insufficient without mentioning the effect on speed reduction. The effect of speed reduction was needed for the mark to be awarded.

Question 7

Knowledge of electronic components and their symbols was very good, with many candidates gaining all four marks. Candidates should be advised to use a ruler to draw lines in this type of question.

Question 8

The classification of switch terminals was not widely known; the common terminal was frequently identified as 'control' and the normally open terminal as 'not open'.

Section B

Question 9

(a) (i) The illustration gave a number of possibilities for each of the type of structure. The one that caused most problem was the shell structure. In most cases the candidate had picked the car in front of the house. What was key to gaining the mark was to specify the car body rather than the complete item. A high number of candidates had identified the scaffolding as an example of a frame structure, alternatives were the ladder or window and door frames. The building or house was correctly identified as a mass structure in most cases.

(ii) Prevention of movement in the scaffolding was largely down to triangulation from the diagonal poles. Small details such as square base plates at the foot of each of the main vertical poles and use of strong joints at the junction of each of the poles could also be seen.

(iii) The wooden boards supporting the scaffold at the top of the roof were used to spread the load evenly across the roof tiles. Only higher achieving candidates gained the mark for recognising this feature.

(iv) There were several visible safety features that could be seen in the construction of the scaffolding. The area around the top walkway included boards on edge to prevent items falling, and flat boards to provide a safe standing area. The safety gates giving access to the work areas were noted in a number of responses. The question asked for a description of the features; in cases where a single word had been used the mark was not awarded.

(b) (i) This question caused problems for a high proportion of candidates. The key to the answer was the position of the crack, right next to the vertical support. This should have been identified as shear but it many cases the answer given was a description of what was happening, such as 'pulling' or 'stretching' rather than a force being named.

(ii) The force acting on the beam should have been shown as an upward supporting force applied by the vertical pillar with a downward force at the point where the beam was unsupported. Responses from candidates indicated that they were not familiar with the way that shear forces interact to cause cracking.

(iii) This part was answered considerably better than the preceding two parts. There was clear understanding of how small cracks in concrete can allow water in, which will eventually cause more widespread cracking. The resulting possibility that the structure could collapse was widely recognised.

(iv) The illustration for this question showed two individual beams being supported by the three vertical columns. The load from each beam was the total weight of the beam divided by 2. A common error was to assume that it was a single beam with the load divided by 3, this gave an incorrect load on the central support. Calculation of the area of the central support was carried out accurately by a full range of candidates. The final part of the calculation was to divide the force in Newtons acting on the central support by the cross sectional area of the support. The correct units, Nm^2, were required in the answer for the fourth mark. The final answer should have appeared as 32700 Nm2. This question was a good example of where inclusion of the working meant that individual marks could be awarded even where the final answer was incorrect.

(c) (i) Candidates who used both sketches and notes generally did better than those who had relied solely on sketches. For a single mark to be awarded struts had to be shown at each end of the shelf, for the second mark suitable proportions should have been used for the struts.

(ii) This part again used a shelf, this time supported by ties. Many candidates were not aware of the difference between a strut and a tie and consequently failed to gain marks. A beneficial approach to both **parts (i)** and **(ii)** would have been to first draw the shelf with a wall or vertical surface against the back of the shelf. The labelled strut or tie could then be added to the sketch. Examples from higher level candidates also included notes explaining the forces that were being resisted and the fixing methods used.

(iii) Details were given of three different sections of material that could be used for supporting the shelf. In most cases ***section B*** was chosen as the most appropriate support and details were given of the fixing method. The most frequently shown position of the support was providing triangulation at the front of the shelf. Very few candidates showed the support on edge under the back of the shelf, which would have provided adequate support without impeding access to the front of the shelf.

Question 10

(a) (i) This first part of the question was generally answered accurately, with the ratchet and pawl being identified correctly in most cases. Any errors were due to confusion with other mechanisms such as the crank and slider or labelling the pawl as the ratchet and vice versa.

(ii) In this part there were slightly fewer candidates gaining all of the available marks for describing how the mechanism controls rotation. Higher level candidates accurately described the locking action of the pawl, which prevented the shaft from rotating backwards. Other comments on the movement of the pawl such as using gravity to drop onto the ratchet were rarely seen. In most cases the single direction of rotation of the shaft was correctly noted.

(iii) A high proportion of responses identified the purpose of the tapered square hole on the handle correctly. The response most frequently seen was that the handle could be fitted and removed easily and it was always a tight fit onto the shaft.

(iv) In almost all responses the concept of mechanical advantage was accurately explained. Responses form higher achieving candidates often included the formula for calculating mechanical advantage.

(v) This part of the question was challenging for many candidates. Some recognized the need to extend part of the handle but increased the length of the handle section instead of the distance between the center of the handle and the center of the shaft. Few candidates identified that reducing friction between the handgrip and the user's hand would increase efficiency.

(b) (i) Lower achieving candidates gained the mark for noting the increased stability of using four mounting holes but very few gained the second mark for recognising the slots as part of the system for adjusting the drive belt for the circular saw.

(ii) In several responses candidates had drawn a spring loaded jockey wheel as the tensioning method. In reality this method would work but introduced complexity when the slots in the motor mounting could also provide tension to the belt. Sketches and annotation were clear and accurate in most cases.

(iii) Calculation of the rotational speed of the saw blade was accurately completed, with clear illustration of the working shown, leading to a final answer of 3965 rpm.

(iv) Knowledge of the factors around frictional losses was good with production of heat and sound frequently featuring in responses. The fact that a vee belt can slip on the pulleys was also widely recognised.

(v) The purpose of the cover on the lubricating hole was recognised by the majority of higher achieving candidates as being a method of excluding dirt or sawdust from the motor.

(c) (i) The fact that a plain bearing contains no moving parts was generally recognised by the full range of candidates. No responses recognised that the material used for a plain bearing is normally softer than the shaft supported by the bearing to allow any small particles to embed in the bearing rather than damaging the shaft.

(ii) This part proved difficult in many cases. A number of responses noted that both radial and axial loads can be supported; a few higher level responses recognised that the bearing was adjustable. It was possible to gain 2 marks from a full explanation of a single point and this occurred with the best responses.

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(a) (i) Comparison of the two possible designs revealed that one had tracks and pads that were much larger than the other. This would make soldering of components easier and reduce the risk of damage to the tracks during manufacture.

(ii) The dangers of using ferric chloride in the photoetch process were widely recognised. Understanding of precautions needed to minimize the risk was generally good with ‘spill kits’ being mentioned as well as the use of protective equipment such as gloves.

(b) (i) The signal shown in the given graphs was a single pulse, meaning that it was a monostable signal; only the best candidates recognised this.

(ii) In almost all cases the trigger pin signal was accurately described in terms of the time of a change occurring and the nature of the change in terms of voltage level.

(iii) Calculation of the resistor value was successfully completed by the full range of candidates answering the question. This question was another instance of where showing all of the working could gain marks even if there was an error in the final answer, which was 27.27 kΩ or 27272.72 Ω.

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(iii) The numbering of pins in a dual in line IC was well known with no errors being seen.

(iv) The low voltage input connections to the transistor were accurately completed by the majority of candidates. Errors occurred in the connection of the relay coil and in the wiring of the higher voltage circuit to the heater. There was confusion between the normally open and normally closed switch connections and in some cases the +24 V supply was not connected to the common terminal.

DESIGN AND TECHNOLOGY

Paper 0445/42
Systems and Control

Key messages

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General comments

***Section* A** questions were accessible to candidates, and detailed responses were observed. The questions covering electronics content were mostly answered confidently, indicating thorough preparation by individual centres.

In ***Section B*** the question based on structures was again by far the most popular. Although the electronics question was the least popular marks gained for this question were higher than those answering the other two questions.

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DESIGN AND TECHNOLOGY

Paper 0445/43
Systems and Control

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

DESIGN AND 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***. 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.

There are certain areas of the syllabus where candidates can improve further. Many candidates would benefit from additional practice in drawing planometric and orthographic views. Enhancing skills in modelling with graphic materials, textural rendering, and the use of thick and thin line drawing techniques will also contribute to better performance in future assessments.

Comments on specific questions

Section A

Question A1

Cycle lane sign

Candidates were asked to complete the full size drawing of the cycle lane sign.

(a) Candidates were required to complete the drawing of the cycle frame by adding the two equilateral triangles and the front forks. Many candidates drew the horizontal base line of the left hand triangle too long resulting in the position of the back wheel being incorrect. Many others drew the top horizontal line of the right hand triangle too high or at an incorrect angle.

(b) Candidates were required to draw the wheels of the cycle to the sizes given and in the correct position. Most candidates drew the wheels with the correct centre position but too small. Some candidates drew the wheels freehand instead of using a pair of compasses.

(c) Candidates were required to draw the seat of the cycle by constructing a right angled triangle. The vast majority of candidates did this correctly and achieved both marks on this question. Some candidates drew a triangle with all angles less than 90º and only achieved some or none of the marks.

(d) Candidates were required to complete the rectangle shape below the cycle wheels in a central position. Many candidates completed this correctly and achieved both marks. Many candidates drew the rectangle to the correct size but in the wrong position. The best responses measured 85 mm to the left and right of the vertical centre line to ensure the correct width and position of the rectangle before completing the height.

(e) Candidates were required to complete the outline of the sign by constructing the two half octagons on each side of the sign. Very few candidates drew the sign outline correctly. Many candidates

drew the sign to the correct height but incorrect width. Many candidates drew the 45º diagonal sides of the sign too small or at the wrong angle.

Question A2

Cycle lane sign backboard

This question required candidates to show knowledge of exploded views and planometric drawing by completing the exploded planometric view of the cycle lane sign and backboard to a scale of 1:2.

Many candidates completed the two vertical edges of the rectangular backboard and gained some of the marks. Fewer candidates were able to draw the top face of the rectangular sign backboard to the correct size or in the correct position.

Question A3

(a) (i) This question required candidates to show knowledge of thin sheet plastic and name a suitable rigid thin sheet plastic that could be used to make the sign. Many candidates named a suitable rigid sheet plastic and gained the mark. Some candidates named non rigid sheet plastics such as acetate or vinyl which are not suitable and did not gain the marks.

(ii) This part of the question required candidates to name a suitable method of printing the design onto the thin sheet plastic sheet. Many candidates named processes such as laser cutting or 3D printing which were not suitable. The best responses named a suitable method for printing onto plastic.

(b) On this question candidates were required to sketch a modification to the given image of the cycle to inform people that cycling is not allowed. Candidates were expected to draw an outline around the sign with a diagonal line or lines across the sign to show it is not allowed. Most candidates drew a cross or line of some description and gained at least one mark. The best responses added some thickness to the outside shape and cross and used instruments such as a ruler and compass to construct the shapes accurately.

Question B4

Isometric view of the cycle stand.

(a) Candidates were required to complete the isometric view of the cycle stand to a scale of 1:5 using the information given on the orthographic views. Many candidates were able to complete the front upright of the stand and achieve the first two marks although many drew this to an incorrect length. Fewer candidates drew the projecting side feet correctly, but many drew the rear triangular support correctly by projecting the existing one at 30º. Many candidates drew the rear support correct to their solution. Candidates who drew the front feet were also mostly able to project these correctly to the back. Only a very small number of candidates drew the left-hand side triangular support correctly. The best responses used a 30º set square to draw the vertical and 30º angle lines to construct the shapes of the individual parts.

(b) This question required candidates to show knowledge of modelling scales, techniques and materials.

(i) This part of the question required candidates to show knowledge of scales used in modelling and drawing. Many candidates stated 1:2 and gained the mark. Some candidates stated the correct numbers but the wrong way around (2:1) or stated an incorrect scale such as 1:5 or 1:20.

(ii) This part of the question required the candidate to show knowledge of tools and equipment used to model products in graphic materials. Many candidates named knives such as craft knives and Stanley knives or saws such as hacksaws which are suitable for the cutting of Styrofoam and gained this mark. Many candidates gave hot glue or solvent based glues such as superglue which are unsuitable as they melt the foam. Trade names of adhesives were given by some candidates as many trade names such as ‘Gorilla glue’ make a variety of adhesives which are not all suitable. The best responses gave a suitable non-solvent based adhesive such as PVA glue.

(iii) On this part of the question candidates were required explain a benefit of making a model of the design. Most candidates stated that a model allows the designer to ‘see’ how the design will look.

Fewer candidates then explained that this allows any errors or mistakes to be identified and corrected prior to making the real product.

(c) This question required candidates to complete the development (net) of the cycle stand design to a scale of 1:4 using the given start point and information on the isometric view. Most candidates were able to complete the partly drawn left rectangular side. Many candidates drew the radius of the vertical sections incorrectly. Most candidates constructed the central section correctly and mirrored the left-hand side faces. Many candidates used the incorrect line convention for the fold lines and lost marks.

Question B5

Cycle light

(a) Candidates were required to complete the full-size orthographic views of the cycle light using the given isometric view and part completed side view. Only a few candidates who attempted this question achieved high marks. Candidates were expected to use the dimensions on the isometric view to construct the outline of the side view including the semi-circular section before adding the vertical corner edge lines in the appropriate positions and adding the side view of the circular top button. Many candidates drew the semi-circular section correctly but the rest of the side view to an incorrect height. Many candidates drew some of the vertical lines in the correct positions but omitted the top button.

Many candidates drew the semi-circular lens section of the plan view but drew the width incorrectly and the thinner rear section to the incorrect length. Many also drew the corners of the sloping sections in the wrong position in relation to the side view. To complete the front view candidates were expected to project lines from the plan and side views to construct the outer shape and hidden detail of the thinner section. While some candidates included these, others need to include the hidden detail or draw it to the correct line convention.

(b) On this question candidates were required to render the cycle lens to look like clear plastic. Many candidates showed some understanding of the technique and added some blue shading. Fewer candidates used any variations in tone or added any type of reflection lines to the lens.

(c) On this question candidates were required to apply thick and thin line technique to the mould for the vacuum formed cycle light package. Many candidates showed some understanding of the technique and drew the outer edges of the base thick with thin inner lines. Many other candidates drew the left and right vertical lines of the main section thick with the inner lines thin. Fewer candidates added thick and thin line to the top face of the mould correctly. Many candidates could improve the clarity of their responses by making a more noticeable distinction between thick and thin lines, which would help in clearly identifying the lines intended to be thick or thin. The best responses used clear thick lines drawn with a ruler.

(d) On this question candidates were required to complete the one-point perspective view of the mould using the given vanishing point and start lines. Candidates were expected to project lines from the corners of the given front faces of the mould to the vanishing point, before adding the vertical back edges followed by the horizontal back edges. Many candidates projected lines and drew the sides correctly but drew the vertical back edge of the base in an unsuitable position. Many candidates omitted the vertical edge of the curved section. The best responses projected the relevant lines to the vanishing point and added the horizontal and vertical back edges in appropriate positions.

DESIGN AND 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***. 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.

There are certain areas of the syllabus where candidates can improve further. Many candidates would benefit from additional practice in drawing planometric and orthographic views. Enhancing skills in modelling with graphic materials, textural rendering, and the use of thick and thin line drawing techniques will also contribute to better performance in future assessments.

Comments on specific questions

Section A

Question A1

Cycle lane sign

Candidates were asked to complete the full size drawing of the cycle lane sign.

(a) Candidates were required to complete the drawing of the cycle frame by adding the two equilateral triangles and the front forks. Many candidates drew the horizontal base line of the left hand triangle too long resulting in the position of the back wheel being incorrect. Many others drew the top horizontal line of the right hand triangle too high or at an incorrect angle.

(b) Candidates were required to draw the wheels of the cycle to the sizes given and in the correct position. Most candidates drew the wheels with the correct centre position but too small. Some candidates drew the wheels freehand instead of using a pair of compasses.

(c) Candidates were required to draw the seat of the cycle by constructing a right angled triangle. The vast majority of candidates did this correctly and achieved both marks on this question. Some candidates drew a triangle with all angles less than 90º and only achieved some or none of the marks.

(d) Candidates were required to complete the rectangle shape below the cycle wheels in a central position. Many candidates completed this correctly and achieved both marks. Many candidates drew the rectangle to the correct size but in the wrong position. The best responses measured 85 mm to the left and right of the vertical centre line to ensure the correct width and position of the rectangle before completing the height.

(e) Candidates were required to complete the outline of the sign by constructing the two half octagons on each side of the sign. Very few candidates drew the sign outline correctly. Many candidates

drew the sign to the correct height but incorrect width. Many candidates drew the 45º diagonal sides of the sign too small or at the wrong angle.

Question A2

Cycle lane sign backboard

This question required candidates to show knowledge of exploded views and planometric drawing by completing the exploded planometric view of the cycle lane sign and backboard to a scale of 1:2.

Many candidates completed the two vertical edges of the rectangular backboard and gained some of the marks. Fewer candidates were able to draw the top face of the rectangular sign backboard to the correct size or in the correct position.

Question A3

(a) (i) This question required candidates to show knowledge of thin sheet plastic and name a suitable rigid thin sheet plastic that could be used to make the sign. Many candidates named a suitable rigid sheet plastic and gained the mark. Some candidates named non rigid sheet plastics such as acetate or vinyl which are not suitable and did not gain the marks.

(ii) This part of the question required candidates to name a suitable method of printing the design onto the thin sheet plastic sheet. Many candidates named processes such as laser cutting or 3D printing which were not suitable. The best responses named a suitable method for printing onto plastic.

(b) On this question candidates were required to sketch a modification to the given image of the cycle to inform people that cycling is not allowed. Candidates were expected to draw an outline around the sign with a diagonal line or lines across the sign to show it is not allowed. Most candidates drew a cross or line of some description and gained at least one mark. The best responses added some thickness to the outside shape and cross and used instruments such as a ruler and compass to construct the shapes accurately.

Question B4

Isometric view of the cycle stand.

(a) Candidates were required to complete the isometric view of the cycle stand to a scale of 1:5 using the information given on the orthographic views. Many candidates were able to complete the front upright of the stand and achieve the first two marks although many drew this to an incorrect length. Fewer candidates drew the projecting side feet correctly, but many drew the rear triangular support correctly by projecting the existing one at 30º. Many candidates drew the rear support correct to their solution. Candidates who drew the front feet were also mostly able to project these correctly to the back. Only a very small number of candidates drew the left-hand side triangular support correctly. The best responses used a 30º set square to draw the vertical and 30º angle lines to construct the shapes of the individual parts.

(b) This question required candidates to show knowledge of modelling scales, techniques and materials.

(i) This part of the question required candidates to show knowledge of scales used in modelling and drawing. Many candidates stated 1:2 and gained the mark. Some candidates stated the correct numbers but the wrong way around (2:1) or stated an incorrect scale such as 1:5 or 1:20.

(ii) This part of the question required the candidate to show knowledge of tools and equipment used to model products in graphic materials. Many candidates named knives such as craft knives and Stanley knives or saws such as hacksaws which are suitable for the cutting of Styrofoam and gained this mark. Many candidates gave hot glue or solvent based glues such as superglue which are unsuitable as they melt the foam. Trade names of adhesives were given by some candidates as many trade names such as ‘Gorilla glue’ make a variety of adhesives which are not all suitable. The best responses gave a suitable non-solvent based adhesive such as PVA glue.

(iii) On this part of the question candidates were required explain a benefit of making a model of the design. Most candidates stated that a model allows the designer to ‘see’ how the design will look.

Fewer candidates then explained that this allows any errors or mistakes to be identified and corrected prior to making the real product.

(c) This question required candidates to complete the development (net) of the cycle stand design to a scale of 1:4 using the given start point and information on the isometric view. Most candidates were able to complete the partly drawn left rectangular side. Many candidates drew the radius of the vertical sections incorrectly. Most candidates constructed the central section correctly and mirrored the left-hand side faces. Many candidates used the incorrect line convention for the fold lines and lost marks.

Question B5

Cycle light

(a) Candidates were required to complete the full-size orthographic views of the cycle light using the given isometric view and part completed side view. Only a few candidates who attempted this question achieved high marks. Candidates were expected to use the dimensions on the isometric view to construct the outline of the side view including the semi-circular section before adding the vertical corner edge lines in the appropriate positions and adding the side view of the circular top button. Many candidates drew the semi-circular section correctly but the rest of the side view to an incorrect height. Many candidates drew some of the vertical lines in the correct positions but omitted the top button.

Many candidates drew the semi-circular lens section of the plan view but drew the width incorrectly and the thinner rear section to the incorrect length. Many also drew the corners of the sloping sections in the wrong position in relation to the side view. To complete the front view candidates were expected to project lines from the plan and side views to construct the outer shape and hidden detail of the thinner section. While some candidates included these, others need to include the hidden detail or draw it to the correct line convention.

(b) On this question candidates were required to render the cycle lens to look like clear plastic. Many candidates showed some understanding of the technique and added some blue shading. Fewer candidates used any variations in tone or added any type of reflection lines to the lens.

(c) On this question candidates were required to apply thick and thin line technique to the mould for the vacuum formed cycle light package. Many candidates showed some understanding of the technique and drew the outer edges of the base thick with thin inner lines. Many other candidates drew the left and right vertical lines of the main section thick with the inner lines thin. Fewer candidates added thick and thin line to the top face of the mould correctly. Many candidates could improve the clarity of their responses by making a more noticeable distinction between thick and thin lines, which would help in clearly identifying the lines intended to be thick or thin. The best responses used clear thick lines drawn with a ruler.

(d) On this question candidates were required to complete the one-point perspective view of the mould using the given vanishing point and start lines. Candidates were expected to project lines from the corners of the given front faces of the mould to the vanishing point, before adding the vertical back edges followed by the horizontal back edges. Many candidates projected lines and drew the sides correctly but drew the vertical back edge of the base in an unsuitable position. Many candidates omitted the vertical edge of the curved section. The best responses projected the relevant lines to the vanishing point and added the horizontal and vertical back edges in appropriate positions.

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

Certain areas of the syllabus, such as the drawing of two-point perspective views, sectional views, and the construction of ellipses, showed lower performance among candidates, indicating a need for further improvement. Questions requiring knowledge of CAD/CAM and modelling in graphic materials also require improvement.

Comments on specific questions

Section A

Question A1

Internet café logo

Candidates were asked to complete the full-size drawing of the internet café logo.

(a) Candidates were required to complete the drawing of the cup and saucer. Candidates were expected to add the base line and radius to the saucer before drawing the rectangular shape of the cup above. Candidates were then expected to construct the two semi-circles of the handle using the given centre point. Many candidates drew the horizontal base line of the saucer but drew the radius incorrectly. Most candidates drew the rectangle of the cup and constructed the two semi-circles correctly but needed to add the four horizontal lines to connect these to the cup. Many candidates scored all five marks on this question.

(b) Candidates were required to draw the two missing Wi-Fi arcs to the sizes given. Many candidates drew arcs of the correct radius but with the incorrect centre point. Most candidates drew the end lines of the arcs to the correct 45º angle.

(c) Candidates were required to draw the circle Ø190 using the given centre point. Most candidates did this correctly and achieved the mark.

(d) Candidates were required to construct the outer pentagon using the given baseline as a start point. Many candidates did not draw the pentagon correctly. Many candidates drew a symmetrical pentagon but not regular in shape.

(e) Candidates were required to complete the C@FE lettering in a style consistent with the given letter E. Candidates were expected to construct the letters using the information and sizes of the letter E projecting lines across to ensure consistency. Many candidates drew both letters and added some thickness. Very few candidates drew the letter C to the correct size. Some candidates drew the

letter F correctly. Many candidates drew the letters freehand. Responses that used the sizes of the existing letter E to construct the letters C and F using drawing instruments were more accurate.

Question A2

Coffee cup top ellipse

This question required candidates to construct an ellipse with Major Axis 150 and Minor Axis 78 on the given centre lines.

Many candidates did not attempt this question or drew a freehand ellipse to an incorrect size and shape. Some candidates constructed the Major and Minor Axis' and plotted a few points but drew the ellipse incorrectly. Responses that plotted more than 8 points using an appropriate technique and joined these with a smooth curve using instruments or accurate freehand drawing scored more marks.

Question A3

(a) This part of the question required candidates to show knowledge of Computer Aided Manufacturing (CAM) by naming one piece of CAM equipment that could be used to produce the batch of acrylic coffee cup coasters. Many candidates named a suitable item of equipment such as a laser cutter. Many candidates gave 3D printer or vinyl cutter as their answer.

(b) This part of the question required candidates to state one property of acrylic that makes it suitable for the coffee cup coaster. Many candidates gave a suitable property such as waterproof, heat resistant etc. The vast majority of candidates achieved the mark.

Question B4

Development (net) of the menu holder.

(a) Candidates were required to complete the development (net) of the menu holder to a scale of 1:2 using the information given on the front and back isometric views. Many candidates were able to complete the centre section and semi-circular top edge and achieve the first two marks. Many candidates also drew the top side pieces on both sides correctly. Fewer candidates drew the lower parts of the menu holder correctly. Many drew the curved side faces to the correct size but with an incorrect radius. Many drew the two front feet but missed off the section projecting from the rear of the stand. Only a very small number of candidates drew the fold lines to the correct convention.

(b) This question required candidates to show knowledge of modelling in thin card and making using thin sheet plastic.

(i) This part of the question required candidates to show knowledge of tools and equipment used to model products in thin card. Many candidates named a pencil or ruler to mark out the development (net) and a suitable knife such as a craft knife or Stanley knife or scissors to cut out the development (net). Fewer candidates were able to name a suitable scoring tool.

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(ii) This part of the question required the candidate to show knowledge of thin sheet plastics and how they can be bent and formed into shape. Candidates were expected to describe a suitable method of heating the plastic and then the use of a former to ensure the plastic was held correctly whilst cooling down. Many candidates described how the development (net) would be made from thin card rather than sheet plastic and did not gain any marks. Some candidates described the plastic being heated and bent to shape but did not mention the use of any type of mould or former.

(c) This question required candidates to complete the estimated two-point perspective view of the menu holder using the given start point and two vanishing points. Many candidates constructed the rectangular base correctly by projecting lines from the two vanishing points through the two given corners of the base and achieved the first two marks. Only a few candidates were able to construct the end section correctly but drew it to their own solution and gained some of the marks. Many candidates drew the two rectangular cuboid sections incorrectly or did not draw them at all. Only a few candidates achieved all eight marks on this question. The best responses projected lines from both vanishing points through the relevant existing parts of the menu holder to construct the missing end correctly.

Question B5

Café chair

(a) Candidates were required to complete the full-size orthographic views of the chair using the given isometric view and part completed front and plan views. Candidates were expected to use the dimensions on the isometric view to construct the back section of the chair on the front view before adding the side view and detail to the plan. Many candidates drew the back section and arms of the chair to the incorrect height. Many candidates drew the lower section of the chair on the side view correctly but drew the arm of the chair to the incorrect radius. Most candidates added the back of the chair to their own solution but with the incorrect thickness. Many candidates drew the back and arms of the chair correctly on to the plan although many did not add any detail, losing the last two marks.

(b) (i) On this question candidates were required to apply thick and thin line technique to the condiment holder. Many candidates showed some understanding of the technique and drew the outer edges of the base and upstand thick with thin inner lines. Many other candidates drew the diagonal centre divider correctly. Fewer candidates added thick and thin line to the curved front edges of the two circular indents correctly. Many candidates could improve the clarity of their responses by making a more noticeable distinction between thick and thin lines, which would help in clearly identifying the lines intended to be thick or thin. The best responses used clear thick lines drawn with a ruler. Many candidates shaded the condiment holder instead of adding thick and thin line technique.

(ii) On this question candidates were required to render the condiment container to look like stainless steel. Many candidates showed little understanding of the technique and added some grey shading only. Fewer candidates showed some understanding of the technique and showed some variation in tone to emphasise the light reflection or cylindrical shape. Very few candidates applied the technique correctly and achieved all three marks.

(c) On this question candidates were required to complete the sectional view of the condiment holder base using the given vanishing point and information on the isometric view. Many candidates did not attempt this question. Many candidates drew the outline of the base correctly but drew the indented sections to incorrect sizes or in the wrong positions. Very few candidates achieved full marks on this question. The best responses completed the outline of the base correctly before adding the circular indents and centre slot to the sizes given before adding hatching.

(d) Candidates were required to state the meaning of the symbol shown. Very few candidates correctly identified the symbol. ‘Dangerous’, ‘do not touch’ and ‘corrosive’ were among the most common incorrect answers.

(e) Candidates were required to state one benefit other than being quicker of using CAD/CAM to produce the lettering on the condiment holder. Many candidates stated answers relating to it being quick or taking little time and did not achieve the mark. Many candidates gave correct answers such as the improved accuracy and consistency of CAD/CAM.