DESIGN AND TECHNOLOGY

Paper 6043/12
Product Design

Key messages

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

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

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

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

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

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

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

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

General comments

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

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

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

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

Comments on specific questions

Question 1

(a) Most candidates were able to list four additional points about the function of a countertop storage unit to hold and display fresh fruit that they considered to be important. Most candidates developed their points into short sentences, rather than giving just a one-word answer. Commonly seen

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

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

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

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

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

(f) Most candidates were able to name two specific materials that would be used in the construction of their design proposal and gave reasons for their choices. Commonly named materials included pine, acrylic and aluminium. The reasons for the choice of material often referred to the aesthetic qualities, working properties or structural strength of the material. Candidates should be advised against giving generic names of materials, such as plastic, as these responses are not awarded marks.

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

Question 2

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

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

(c) An impressive range of sketches with annotations were seen for this question, with colour used to good effect to show the materials and surface graphics. Many candidates correctly chose to use lightweight graphic materials, such as corrugated card or polypropylene sheet, for their display. Almost all the design ideas clearly linked to fresh fruit, for example a board in the shape of a pear with a friendly face to appeal to children, but for some, the interactive element was either omitted or unclear. It is important that all design ideas fully meet the design requirements if candidates are to access the full range of marks. A small number of candidates produced fewer than three ideas or three ideas that were very similar.

(d) The evaluations of ideas were generally very impressive with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Commonly seen answers focused on how the children would use the display, how easy it would be to manufacture, its suitability for use with children or whether it could be recycled after use. It is important that candidates justify their evaluations rather than making general statements, such as that it would work well, if they are to access the full range of marks. Almost all candidates chose one of their ideas, usually by giving the number of the idea, and justified their choice of idea for development.

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

(f) Most candidates were able to name two specific materials that would be used in the construction of their design proposal and gave reasons for their choices. Corrugated cardboard and Corriflute (corrugated sheet plastic) were commonly named materials. The main reasons for choosing these materials were often linked to the method of manufacture, such as cutting or joining, structural strength of the material or how easy it would be to recycle the material after use. Candidates should be advised against giving the generic names of materials, such as plastic, or generic reasons for choosing the material.

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

Question 3

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

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

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

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

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

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

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

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

DESIGN AND TECHNOLOGY

Paper 6043/02
School Based Assessment

Key messages

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

General comments

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

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

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

Guidance for assessing coursework and other very useful support for 6043/02 can be found on the teachers support hub.

Comments on specific sections

Question 1

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

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

Question 2

Research into the Design Brief resulting in a Specification

The research into the design brief should lead to information and key points to take forward to the designing stage. Most candidates generally researched the features of existing products well and gathered useful information. Some candidates would benefit from focusing closely on the design challenge. For example,

candidates designing storage units should research the range and sizes of items to be stored. Candidates should also be encouraged to gather relevant information such as ergonomic considerations.

Research on materials, tools and manufacturing methods should be appropriate to the design brief. Most of this information could support Assessment Criterion 4: Development of Proposed Solution.

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

Question 3

Generation and exploration of Design Ideas

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

To gain a high mark in Assessment Criterion 3 candidates need to produce a wide range of ideas appropriate to the design problem. Candidates must show creativity and imagination and annotate ideas with reference to the specification. They should also clearly show design evaluation and decision making and present work effectively and with clarity.

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

Question 4

Development of Proposed Solution

Most centres mark this section in line with the awarding body standard. Some centres are lenient in their assessment, awarding high marks when there is limited evidence of informed decision making about the final proposal such as materials to be used and manufacturing methods and finishes in the samples presented.

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

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

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

Question 5

Planning for Production

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

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

Question 6

Product Realisation

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

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

Centres are reminded that marks allocated to making should reflect the overall complexity of the product, the level of skill demonstrated by the candidate, and the quality of the making of the final product.
Some folders had very limited or no evidence of the final product. Centres are reminded that there must be clear evidence of work produced for marks to be awarded.

Question 7

Testing and Evaluation

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

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

DESIGN AND TECHNOLOGY

Paper 6043/32
Resistant Materials

Key messages

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

General comments

Section A

In this section candidates need an all-round knowledge and understanding in order to answer all questions successfully in this section. Candidates need to improve on demonstrating a basic understanding of the processes, tools and equipment required.

Section B

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

Comments on specific questions

Section A

Question 1

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

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Question 2

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

Question 3

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

Question 4

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

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

Question 5

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

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

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

Question 6

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

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

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

Question 7

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

Question 8

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

Question 9

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

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

Question 10

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

Section B

Question 11

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

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

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

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

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

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

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

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

The most common issues included climate, theft and vandalism.

Question 12

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

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

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

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

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

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

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

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

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

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

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

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

Question 13

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

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

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

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

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

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

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

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

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

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

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