DESIGN AND TECHNOLOGY

Paper 6043/12
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 6043/02
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, a few 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.

Most marking was generally accurate and consistently applied.

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.

More comments on the reports from centres and moderators would be useful in the future.

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 result of the project.

Question 2

Research into the Design Brief resulting in a Specification

Marking for this section was generally lenient. Most candidates produced detailed evidence of the analysis of existing products although some comments were only descriptive. The analysis of existing products should lead to information and key points to take forward to the next stage of designing. This also includes details the candidates want to include further and what they want to avoid taking forward. Candidates should apply a greater focus to key information required to support their designing.

Question 3

Generation and exploration of Design Ideas

Marking was generally slightly lenient in this section. To achieve the higher mark ranges, candidates would benefit from generating a wider range of conceptually 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.

Candidates would also benefit from using appropriate design techniques throughout that are supported by annotations which explore technical aspects of each idea, including consideration of possible materials and constructions.

Question 4

Development of Proposed Solution

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

There were many good designs 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 6043/32
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.