DESIGN AND TECHNOLOGY

Paper 6043/12
Product Design

Key messages

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

Stronger candidates combined creativity and technical knowledge to produce excellent design proposals. Some weaker candidates produced design proposals that did not fully meet the design requirements.

Candidates should be encouraged to view the paper as a holistic design exercise, rather than several individual tasks. For example, the materials named in **Part (f)** and the method of manufacture outlined in **Part (g)**, must be evident in the solution proposed in **Part (e)**.

Candidates should be encouraged to plan the use of their time 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)**.

Candidates should be advised against spending a large amount of time producing highly detailed orthographic views for **Part (e)** and then having insufficient time to complete **Parts (f)** and **(g)**. Many candidates achieved high marks for **Part (e)** by using just freehand sketches and annotations.

General comments

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

Candidates should be advised that in **Part (d)** they must evaluate their design proposals, not simply describe them, or repeat the same evaluation point for all three ideas.

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 storage unit for toys that they considered to be important. Answers related to the safe use of the storage unit, how the toys would be stored in an organised manner, how easy it would be to access the toys or how the storage unit would be moved around the room. Candidates should be advised against repeating points that are given in the question, for example that the design must be based on a cartoon character, or giving generic points that might apply to almost any product.

(b) Most candidate used sketches and notes well to show two methods of attaching a lid or door to a storage unit. Answers involved the use of hinges, magnets, catches or grooves for sliding doors. The standard of written and visual communication for this question was often excellent but candidates needed to note that this question required sketches and notes. Full marks were not awarded for just sketches.

(c) An impressive range of sketches and notes was seen for this question. Many solutions were based on a fabricated wooden box or a moulded plastic shape. The strongest candidates added detailed annotations to their sketches and used a range of presentation techniques including freehand exploded views. Weaker candidates often presented three ideas that were similar in form and did not fully meet the design requirements. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. A small number of candidates produced fewer than three ideas.

(d) The evaluations of ideas were usually very detailed, with candidates able to clearly demonstrate a good understanding of the positive and negative features of their design proposals. Answers referred to the appeal of the design to children, ease of accessing the toys, ease of manufacture or how much room the storage unit would take up in a playroom. It was important that candidates justified their evaluations rather than making general statements, such as that it would work well, if they were to access the full range of marks.

(e) Responses to this question were usually very impressive, with a variety of methods used to show the full solution to the design problem. These methods included orthographic drawings, freehand exploded views and material lists. Colour was used appropriately to add clarity to drawings. This question specifically asked for construction details and important dimensions but, particularly in weaker responses, these were often missing. Candidates should be advised to consider if the information they have presented would be sufficient to allow 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 medium density fibreboard (MDF), acrylic and pine. Reasons for the choice of material often related to the aesthetic qualities of the material, the strength of the material or how easily it could be cut and joined. Candidates should be advised against giving generic names of materials, such as wood, as these responses are not awarded marks.

(g) Most candidates used a combination of sketches and notes to outline a method that could be used to manufacture one part of their design proposal. Fabrication techniques including the use of glue, screws and dowels were commonly seen methods of manufacture. Candidates that used plastics in their design proposals often described blow moulding or injection moulding processes. Candidates that chose acrylic often focused on the process of cutting out the parts with a laser cutter and then using a line bender to fold to shape. Many excellent responses were seen to this question, but it was important that candidates included the correct names of tools and equipment if they were to access the full range of marks.

DESIGN AND TECHNOLOGY

Project 6043/02
School Based Assessment

Key messages

- Candidates would benefit from a focus on both the design need and the needs of the intended users in detail before producing a clear design brief for Assessment Criterion 1.
- Candidates should ensure that the plan for making is produced before commencing manufacture. The plan can be updated if there are any changes required during making.
- Candidates should remember to provide annotated photographic evidence of the testing of the final product.

General comments

Centres continue to prepare candidates well for the Project.

Centres provided all the necessary paperwork with the samples.

The inclusion of Individual Candidate Record Cards was helpful in indicating why marks have been awarded.

Overall, work submitted was well structured and fully covered the assessment criteria. It would help candidates, teacher marking, and moderation if each section were clearly labelled against each of the assessment objectives.

Some of the work submitted was creative and innovative with many candidates producing exceptionally high-quality functional outcomes.

Some candidates focused on architectural model making and there were a number of excellent folders presented. When choosing 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. They need to focus on designing the model, making the model, and evaluating the success of the model, not the building itself.

Centres are reminded that if after internal moderation a different total mark is inserted on the Coursework Assessment Summary Form, it is helpful to Moderators if it is made clear on the form where any changes in marks to particular assessment criteria have been made.

Comments on specific questions

Question 1

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

Candidates need to consider both the design need and the needs of the intended users in detail before producing a clear design brief for Assessment Criterion 1. It is helpful if candidates cover the 5W's. Who is the product designed for? What are the main functions of the product? Why is the product important? Where will the product be used? When will the product be used? This type of approach and other similar methods can help to provide the start of a clear structure for the rest of the design and make challenge.

Question 2

Research into the design brief resulting in a specification

Whilst most candidates focused on the situation chosen, a significant number of candidates produced extensive detail of a wide range of materials, finishes and tools used for designing and making. Candidates should only include information relevant to the situation and explain the research that they have found in more detail and its suitability for the product being designed and made. They should make final conclusions from their investigations by explaining what they have found out and what they intend to take forward. This will help to produce a detailed specification for the product to be designed. Materials, processes and finishes could be included in the design section, Assessment Criterion 3, and when making decisions about the form, materials, and construction of the final solution in Assessment Criterion 4.

The use of investigating existing products was generally informative. The analysis of existing products should lead to information and key points to take forward to the next stage of designing, for example, what features to include and what features to avoid. Candidates should also gather other relevant information and data such as ergonomic or environmental factors and the type, size and shape of items to be used with the product. Many candidates selected storage of a particular item for their design brief but very few researched the types and sizes of items to be stored.

Question 3

Generation and exploration of design ideas

There were a number of outstanding examples of well-presented work showing a natural progression of design and development. However, some centres were lenient in the marking of this section, particularly the award of marks in the highest mark range. To achieve the higher mark range, candidates should produce a wide range of imaginative solutions which are conceptually different. Ideas should be developed and clarified with reference to the specification.

Candidates should use appropriate drawing techniques and present work clearly. Annotations should explore the technical aspects of each idea and include consideration of possible materials and constructions.

Candidates ought to use the specification points to evaluate proposals and explain why one design is better than another. Candidates would benefit from exploring material and constructional possibilities, aesthetic considerations, and experimentation with proportions before going onto the next concept. Reasoning and justification are important in deciding upon a proposal to develop further.

Question 4

Development of proposed solution

Many candidates produced clear evidence of the testing and trialling about form, appropriate materials, constructions and finishes. Candidates use of 3D models was helpful to visualise the size, shape and proportions of the design proposal.

Some candidates did not make their design decision-making clear. A significant number made limited or no clarification of the technical specifications of the product to be manufactured, such as functions, dimensions and constructional details. Practical workshop experimentation can inform the suitability of materials and construction methods.

Question 5

Planning for production

Most candidates produced detailed and comprehensive plans for making, clearly showing a full sequence of stages required to manufacture their product. A significant number used a photographic diary of making as their plan which is not acceptable. Planning for production must be done before commencing manufacture. In many cases, the candidate may divert from the original plan when making and can record any such changes onto the original plan.

Working drawings were generally accurate and detailed. A significant number of candidates did not include all the dimensions necessary to be able to make the product.

Question 6

Product realisation

Assessment was generally accurate and consistent in this section. Some marks awarded in the higher mark range tended to be slightly generous. 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.

Centres are reminded that photographic evidence must be included in the folder. Marks should not be awarded if there is no evidence submitted. Some of the practical work produced was of a very high standard.

Question 7

Testing and evaluation

This section was marked slightly leniently by some centres. It is important that candidates include photographic evidence of the testing of the product in its intended environment if possible. Tick lists are inappropriate when evaluating against the specification. Justified evaluative comment is required to give detail of how the final product performed against the specification.

After testing, candidates should clearly explain the strengths and weaknesses of the product and propose modifications. Modifications are best presented in the form of sketches and notes.

Some candidates had evidence of third-party testing and feedback which helped to identify strengths and weaknesses of their product.

DESIGN AND TECHNOLOGY

Paper 6043/32
Resistant Materials

Key messages

- Candidates need to read the questions carefully before attempting to answer and should try to focus on the key elements of each question. The marks allocation given to each question and the space provided to answer the question provides candidates with a clear indication of what is required.
- Candidates need to improve their knowledge and understanding of the practical processes and techniques required to work the resistant materials, wood, metal and plastic. In order to achieve this, candidates need to be able to match tools and equipment to specific purposes.
- Candidates need to improve their drawing skills. They must try to provide clearly drawn sketches when attempting questions that begin with the statement: *Use sketches and notes to....* In addition, notes should enhance and make 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. Many candidates demonstrated at least 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

(a) The majority of candidates identified either aluminium or stainless steel correctly.

(b) Only a minority of candidates identified an appropriate plastic for the swimming pool steps. The most common correct materials were polypropylene, ABS and HDPE.

Question 2

(a) Only stronger candidates were able to give a benefit of using a contact adhesive. Most answers referred vaguely to its strength, while the best answer was that it dried on impact or contact.

(b) There were many misconceptions about drawbacks when using a contact adhesive. Many answers referred to the adhesive not being waterproof. Stronger candidates described how the instant bond meant that there was no room for minor adjustment or how difficult it was to remove excess adhesive.

Question 3

There were many good benefits given for using card to make a model of the adjustable lamp. Some candidates described how testing and adjustments could be made or that it prevented the wastage of materials later.

Question 4

Very few candidates selected all three materials correctly**.** Many candidates were able to select only one or two from those listed. Identification of materials as ferrous or non-ferrous metals or as thermoplastic or thermosetting plastics is basic subject knowledge.

Question 5

Many candidates described a use for the digital micrometer. The majority of candidates recognised that it was a measuring device and many were able to state that one of its primary uses was to measure thin sheet material or the diameter of rod or tube.

Question 6

(a) Many candidates provided benefits of blister packaging. Stronger responses included the see-through feature, the protection it gave to the product or that it could be manufactured easily.

(b) There were many good answers describing environmental problems caused by blister packaging. Most answers referred to the plastic being non-biodegradable, that it could be thrown away and described the subsequent problems including litter and landfill. Other excellent answers included the fact that plastics are made from oil which is a finite resource.

Question 7

Only stronger candidates produced a drilling jig that would locate on at least two sides of the hardwood. The most common design, which was awarded one mark, was a template showing two holes drilled that could be placed on top of the hardwood.

Question 8

Methods of joining different materials is essential basic knowledge required when designing and making products. Only a minority of candidates stated correct methods for joining the materials listed in the question.

Question 9

Most candidates gained at least one mark for showing some sort of runner or guide on which the drawer could slide. The strongest answers showed an additional support below the desktop and the use of pre-manufactured runners. There was a large space provided for candidates to show their designs but many candidates needed to improve on their drawing skills as sketches were very small and difficult to understand.

Question 10

Most candidates identified geothermal as the renewable energy resource from the list provided. However, many candidates selected coal, natural gas or crude oil as renewable energy resources.

Section B

Question 11

(a) Most candidates gained at least one of the three available marks for completing the cross-halving joint. Clear and accurate sketches are essential when answering this type of question.

(b) Most candidates named and sketched an appropriate construction, but only a minority achieved maximum marks. The most common constructions named and sketched were a mortise and tenon joint or a dowel joint. The butt joint was not considered appropriate. Stronger answers showed the leg and rail in the correct orientation and drawn in good proportion.

(c) (i) The majority of candidates named two machine saws correctly. The most common saws named included a circular or table saw, jig saw, scroll saw or band saw.

(ii) Most candidates selected faceplate turning as the correct method of woodturning used to produce the tabletop.

(iii) Most candidates could not provide checks to be carried out after setting up the hardwood on the woodturning lathe. The most common correct answers stated that the hardwood should be rotated by hand to ensure it was clear of the lathe, that the tools should be sharp or that the speed of the lathe was set correctly.

(d) (i) There were many good answers stating advantages of using the palm sander rather than a cork block and glasspaper. Most advantages provided included speed, ease of use and a more even finish.

(ii) Most candidates explained that a clear finish would allow the hardwood surface to be seen and enjoyed. There were some excellent descriptions relating to the natural beauty of the grain that would be hidden if an opaque finish was applied.

(iii) Many candidates named two clear finishes that could be applied. The most common finishes included varnish, sealer, lacquer and wax. Oil, without a specific type stated, was not accepted.

(e) Only a small minority of candidates showed the shrinkage plate in the correct position and orientation screwed to the top of the rail.

(f) Many candidates achieved some marks for showing a shelf in the correct position but few achieved maximum marks. However, the majority of candidates did not take note of the important dimensions in the drawing showing that the shelf was Ø390 and the gap or space into which the shelf would fit was 400 mm. Most answers showed some sort of cut-out or recess into the legs into which the shelf could fit. Unfortunately, this would not work as the gap was too great. There were some excellent answers showing the use of wooden blocks or brackets joined to the legs on which the shelf would sit.

Question 12

(a) (i) Most candidates recognised that over time the card would become worn and distorted and therefore would not provide accurate making out.

(ii) The majority of candidates correctly named a scriber, chinagraph pencil, felt tip marker (or similar) to mark around the templates.

(b) Most candidates understood that to remove the waste acrylic they would need to drill a hole through which the detached blade of an appropriate saw could be threaded. The waste could then be removed. The most common correctly named saws included coping, jig, Hegner and scroll.

(c) Many candidates named at least one correct type of file that could be used to smooth the sawn edges produced in **(b)**. There are specific types of files, for example, half round, round or rat tail, flat and hand. However, many candidates simply stated the shape of the file that could be used rather than the actual specific type.

(d) Only a small minority of candidates showed a method of batch producing the book stands. One method was to tape two pieces of acrylic together and cut as one piece. Another method involved the use of CNC machines.

(e) (i) The majority of candidates named a suitable non-ferrous metal for the book stand. Aluminium and brass were common correct answers.

(ii) Many candidates correctly selected malleability as the term to describe the ability of a metal to be shaped without breaking.

(iii) Many candidates achieved some marks for some parts of this question. Only a small minority achieved the maximum five marks. To bend a single length of Ø5 non-ferrous metal required the metal to be heated to soften it so that it could be bent to shape. A bending jig or former would be

required as well as a method of force used to actually bend the metal. In addition to this, candidates needed to name the tools and equipment used to carry out the process.

(iv) Only a minority of candidates could name the process, annealing, by which the metal would become softer.

(v) Most candidates provided benefits for using a clear lacquer finish on the non-ferrous metal. The most common choices included having an attractive finish, preventing corrosion and being easier to clean.

(f) Only stronger candidates answered this correctly. Candidates were asked to describe one good design feature for each book stand. Some good answers for the acrylic stand included being adjustable to take different size books and that it could be taken apart for storage. For the metal stand, answers included making good use of minimal material, having an attractive metal finish and being stackable.

Question 13

(a) The majority of candidates named some of the four materials correctly. Most named an appropriate hardwood and manufactured board correctly. Fewer candidates named an appropriate non-ferrous metal and even fewer named an appropriate plastic for the football players.

(b) (i) Most candidates named the mitre joint shown as the joint at the corner of the football game.

(ii) A very small minority of candidates achieved two marks for this question. Very few candidates knew how to strengthen the mitre joint. Some excellent answers showed additional wooden blocks inside the corner or an angled bracket. A corrugated metal fastener was also an excellent method.

(c) The majority of candidates did not relate their answers to settings that should be made to the power router, such as setting the depth stop to the required depth or the fence to the required width.

(d) Only the strongest candidates answered this correctly. Many potentially good answers involved the construction of some sort of box but lacked constructional detail including how the box would be fitted to the game cabinet. Many candidates did not address the last part of the question requiring details of materials, fittings and constructions used.

(e) (i) Most candidates selected injection moulding as the correct method of manufacture of the players.

(ii) A minority of candidates correctly named epoxy resin or Araldite as a suitable adhesive to join the players to the metal rods.

(f) (i) Only stronger candidates showed a secure knowledge of heating the acrylic, (use of a line bender or strip heater) and bending the acrylic, (use of a former) to produce the shape of the slider.

(ii) It was evident from answers to this question, that many candidates needed to be more aware of the practical applications of CAD/CAM. There were some relevant processes given, including “data transferred to CNC machine”, “position acrylic on bed of CNC machine” and “set tool parameters”.

(g) Many candidates achieved one mark for showing how the table football game could be protected when the rods were pushed and pulled. Few candidates achieved maximum marks. The most common methods involved the use of rubber or similar impact resistant materials added to either the rods or to the game cabinet itself.