DESIGN AND TECHNOLOGY

Paper 6043/12
Product Design

Key messages

- The structure of this syllabus means paper 6043/12 should contain only one question about Resistant Materials. In this instance, candidates had a choice of three questions because of an error in the production of the question paper. The additional two questions were about Graphic Products and System & Control.

  We want to reassure you we took all necessary action to make sure candidates were not disadvantaged by this error in the structure of the question paper. The examining panel reviewed the work of all candidates and the Principal Examiner found no evidence that any candidate had been disadvantaged by being presented with the question paper containing all three questions.

  Some candidates answered question 2 on Graphic Products, which was not within the scope of the syllabus. However, it was clear that candidates answering this question were able to use their combined knowledge from studying the Product Design and Resistant Materials topic areas to answer the question. They were able to evidence the skills being tested and offered an expected range of responses to the question answered. As this question should not have been on the question paper, we have not included it in the Examiner's comments in this report.

  No candidates answered question 3 on Systems & Control.

  A revised version of the question paper and mark scheme is published on the School Support Hub.

- Candidates should ensure they fully understand the context and requirements of the question so that their response reflects these requirements and any specification points they might add in answer to **Part (a)**.
- Candidates need to use specific terms when referring to design issues, materials, tools and manufacturing techniques.

General comments

Candidates were well prepared to respond to the design question and many showed that they could engage competently in the design problems set in the context of golf and its associated equipment. Some candidates showed a high level of originality in their design work.

The A3 answer sheets are intended to help candidates follow the required design process and those candidates who responded as required were able to successfully demonstrate their design and thinking skills. Candidates should avoid including information not required in response to a particular part of the design process.

Comments on specific questions

Question 1

Candidates understood the requirements of a mobile stand to display golf equipment clearly.

(a) Many candidates answered this starting point for the design process well as they were able to identify four additional functional points required of the stand. Successful responses included: easy

to see all equipment, stable because of long clubs, aspects of easy mobility, display of small individual items, suitable for outside display, reflect golf theme, attract attention.

(b) Most candidates were able to show two methods of making the stand mobile. Appropriate responses included: single or multiple wheel systems, sliding rails, trolley jacking system, straps and other carrying systems.

(c) The majority of candidates presented three ideas and showed that they were able to be quite creative in their response to the design problem. Successful candidates enhanced their drawings with colour or other forms of highlighting and added annotations to provide information on the nature and detail of each design idea. Candidates should be encouraged to use all the space allocated to the answer for this part of the question so that they can show all information clearly.

(d) Successful candidates identified both positive and negative aspects so that they could discriminate between all three of their design ideas in relation to the context of the question. This was often more effective where some of the comments related to the functional points raised earlier in their response to **(a)**. Stronger candidates included comments which showed valid judgements rather than just simple descriptions of each design idea. Most candidates gave their chosen design idea. However, justification was sometimes too vague to gain credit.

(e) Successful candidates selected a drawing format appropriate to the design and large enough to present it clearly and then added constructional detail in the form of sketched and written annotations. Candidates are reminded of the need to add overall and some detail dimensions for the award of maximum marks.

(f) Many excellent responses selected specific materials appropriate to the design presented in **(e)**. Reasons given for choice indicated that candidates had considered the structure of their design and were familiar with the strengths and weaknesses of a range of specific materials in this context. Only a small number of candidates used generic terms such as wood, metal and thermoplastic which could not be given credit.

(g) Candidates who gave outlines that described an appropriate step-by-step manufacturing method for one part of the design solution in **(e)**, including the specific tools used, answered this question well. Responses to this part needed to develop and to include detail beyond general marking out and preparation methods that could be applied to any product. The use of simple drawings in addition to written text was generally successful.

DESIGN AND TECHNOLOGY

Paper 6043/02
School Based Assessment

Key messages

- Centres are reminded that practical outcomes and three-dimensional prototype models should not be forwarded with the sample for moderation.
- Candidates should ensure that they produce a clear, coherent, and fluent presentation of their progress through the various sections of the design folio. They should ensure that all of the Assessment Criteria are considered.
- Candidates need to show reasoned decision making about the form, materials and construction, and of the final solution in Assessment Criterion 4.

General comments

Whilst most folders were concise and focused, some candidates included large amounts of generic information about materials, tools, finishes and manufacturing processes with very limited or no direct reference to the selected design challenge.

The majority of centres applied marks consistently and accurately. In some instances, candidates were awarded far too generous marks for some of the sections and placed above other candidates in the centre, with little or no evidence to support the marks awarded and their position in the rank order.

Centres should ensure that if more than one teacher is preparing candidates for this subject that they carefully standardise their marking to ensure an accurate rank order.

Comments on specific sections

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

This section was generally assessed accurately. The design opportunity and design brief were clearly presented by the majority of candidates. However, some candidates made limited or no reference to the needs and expectations of the selected user.

2. Research into the design brief resulting in a specification

Centres were slightly generous in assessing this section. Research needed to be more focused on the situation chosen and the specifications should state the main functions and qualities of the product. Many candidates did not access specific research directly related to their brief. For example, candidates designing storage units should research information about the range, number and sizes of items to be stored.

Some candidates made detailed analysis of existing products and extracted useful information. Many candidates briefly described the products with no identification of key features that would help when designing.

Many candidates did not research key areas such as anthropometric data and specific details such as the sizes of objects to be kept in storage units. There was evidence of questionnaires in a number of folders but only a few candidates made conclusions from the responses.

Many specifications were fully detailed, but others were very brief and generic. Specification points needed to be detailed and justified to direct the design stages and to provide a check when evaluating.

3. Generation and exploration of design ideas

Design work presented was generally good with some examples of very high-quality presentation. However, a number of centres were too generous in their assessment in this section. The Cambridge International School Support Hub has examples of assessed coursework that would help when gauging the marks to be awarded.

Most candidates produced a small range of different discreet design ideas. To access the higher mark ranges candidates needed to explore a wider range, with some creative proposals and should have evaluated ideas in more detail before going on to the next concept.

Candidates needed to make reference to the specifications to make it clear why ideas had been selected for further development.

4. Development of proposed solution

Many candidates used models well to visualise the size, shape and proportions of the design proposal. However, candidates then needed to carry out appropriate trialling and experimentation in order to make informed decisions about the materials, construction possibilities and finishes for the product they wished to make.

5. Planning for production

This section was generally assessed accurately by most centres. Most candidates produced a dimensioned working drawing, with many including a cutting list.

Not all candidates produced a detailed, logical sequence of the stages of manufacture. Some were very brief and lacked sufficient information to manufacture the product.

6. Product realisation

Where possible candidates fully completed the manufacture of a practical outcome and there were many good quality manufactured products presented.

Candidates used clear photographic evidence during the key stages of manufacture of the product to emphasise particular features and the quality of making.

7. Testing and evaluation

Where possible candidates carried out a test of their product and produced a brief evaluation. Some candidates produced an outline of evaluation against the original specifications, but many specifications were insufficiently detailed for this to be helpful.

Not all candidates had photographic evidence to show the product in use when testing. After testing, candidates needed to identify the strengths and weaknesses of the product, and to use sketches and notes to suggest proposals for further improvement or development.

DESIGN AND TECHNOLOGY

Paper 6043/32
Resistant Materials

Key messages

- Candidates need to read the questions carefully before attempting to answer. Candidates should 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 show their knowledge and understanding of the practical processes required to work the resistant materials, wood, metal and plastic. Many candidates named tools or described processes that were totally unsuitable for specific materials.
- Candidates should provide clearly drawn sketches when attempting questions that begin with the statement: *Use sketches and notes to....* In addition, notes should enhance and make what they have drawn clearer and not simply state the obvious.

General comments

Section A

Many candidates needed to further develop the all-round knowledge and understanding required to answer all questions in this section.

Section B

This section had a number of questions with large mark allocations requiring a combination of clear and accurate sketches supported by detailed written notes. Many candidates needed to improve on their knowledge and skills to demonstrate an understanding of how to work the materials.

Comments on specific questions

Section A

Question 1

The majority of candidates achieved at least partial credit for naming the parts of the fastening device.

Question 2

Most candidates were unable to provide stages used when brazing the pegs to the mild steel base.

Question 3

The majority of candidates showed how the mortise and tenon joint could be strengthened. Many answers included the use of nails, screws or bolts inserted into the side of the joint. The strongest answers showed one or two dowels glued into the side of the joint.

Question 4

Many candidates gained at least partial credit for demonstrating a basic understanding of anthropometrics by relating the data to the height of people or to leg length.

Question 5

(a) The majority of candidates gave an accurate explanation of the term.

(b) Many candidates named stainless steel and brass as alloys.

Question 6

(a) Many candidates described how the brace increased stability, rigidity and provided greater support. Answers referring to the strength of the gate were too vague.

(b) Only a minority of candidates recognised the tee hinge that would be used with the gate.

Question 7

Most candidates gained at least partial credit for explaining the environmental impact of plastic products. Many answers referred to the non-biodegradable factor and difficulty in recycling features resulting in landfill, litter and pollution.

Question 8

Many candidates did not provide sufficient detail to support a basic drawing showing some sort of stand or support to enable the photo frame to become freestanding. Most candidates did not recognise that the 3 mm thick hardboard could not take screws. Often parts were stuck rather than glued with a named adhesive.

Question 9

(a) and (b) Most candidates could not name a die and a tap required to cut threads on a rod and inside a hole.

Question 10

Many candidates recognised that a joint made using the glue gun would set quickly. Many also recognised that there was a danger of injury from burns when using the glue gun and that the joints would not be as strong as PVA.

Section B

Question 11

(a) Many candidates were able to name specific materials for the parts of the balance. However, some candidates named materials that did not belong to the correct group; for example, naming a softwood such as pine for a hardwood and a ferrous metal such as steel for a non-ferrous metal.

(b) Many candidates produced well-drawn joints that could be used to join the support to the base of the balance. The most common included butt, half-lapped and finger joints.

(c) (i) Most candidates showed how they would cut out the slots using unconventional methods. The simplest method involved making vertical saw cuts using a tenon saw with the bulk of waste wood removed by means of a chisel. Many candidates used a coping saw to make straight cuts and filed down the remaining wood.

(ii) Similarly, many methods describing how the ends could be rounded relied greatly on the use (or misuse) of glasspaper and files when all that was required was to saw off most of the waste then finish on the sanding disc.

(d) (i) To answer this question, candidates were required to demonstrate a very basic understanding of metalworking techniques. Many candidates needed to improve on their knowledge and skills for this question, as overall performance was weak. The metal rod should have been measured using a steel rule and the length marked on the rod using a scriber. The rod would then have been secured in a vice to allow it to be sawn to length using a hacksaw. Many candidates were able to name at least one appropriate metalworking tool.

(ii) Many candidates were able to provide only one advantage of using a non-ferrous metal rather than a ferrous metal for the weights. The most common advantages included the attractive appearance and resistance to corrosion. Some candidates incorrectly stated that non-ferrous metals were lighter in weight and were cheaper.

(iii) The majority of candidates could not name the two basic centre lathe operations.

(iv) There were some good modifications drawn showing how the weights could be picked up more easily by young children. The strongest answers included some sort of machined shape allowing fingers to grip more effectively and a knurled surface that could be carried out on a centre lathe. However, many candidates provided sketches that did not show the modification clearly enough to gain credit.

(e) (i) This question required a knowledge of the features of a former or mould used when vacuum forming. To ensure that the wooden former shown in Fig. 11.6 could be used to produce the plastic pans, the only features candidates needed to show were a draft angle on the sides and rounded edges. Generally, this question was not answered well.

(ii) Many candidates understood that when heating plastic to vacuum form, if the plastic was not hot enough it would not be able to form the shape. If the plastic was too hot it could be come too thin, stretch and tear apart.

Question 12

(a) The best reasons for using MDF rather than hardwood for the dominoes included lower cost, it was easier to work and was more stable. Many candidates provided at least one reason.

(b) Most candidates sketched and named an appropriate joint for the corner of the domino box. The most common included finger and mitre joints with many half-lapped joints. Credit was awarded for accuracy of the drawings, good proportion and orientation.

(c) Very few candidates achieved maximum marks for this question. The method to fit the base inside the box with no edges visible on the outside was to use a groove, rebate or to apply some thin beads. Many candidates provided methods that were clearly visible on the outside of the box and were awarded no marks.

(d) (i) Some candidates provided drawings of excellent sawing jigs. The existing bench hook was to be modified. Some candidates ignored this and produced new jigs and little credit could be awarded.

(ii) Many candidates did not know how to square the sawn ends of the dominoes. There was an over-dependence on the use of files and glasspaper, neither of which could produce a square end. The strongest answers included the use of a smoothing, jack or block plane with the MDF supported low in a vice or showed the end of the MDF pushed against the sanding disc.

(e) Most candidates could not describe how CAM could be used to produce the dots onto the dominoes. First-hand, practical experience of CAD/CAM is to be encouraged but where this is not possible candidates must acquire at least a basic understanding of these important activities.

(f) (i) Many candidates provided one advantage of using plastic from which to make the dominoes rather than MDF. The strongest answers referred to the smooth finish, its durability and that it was easier to clean.

(ii) Many candidates correctly named injection moulding as the industrial process used to manufacture the plastic dominoes. Many gave good reasons including the repetitive accuracy and speed of the process. Those candidates who named an inappropriate process were awarded credit for reasons that were still valid.

Question 13

(a) Most candidates gave at least one property of hardwood that made it suitable for the plant holder. The most common were toughness, durability, attractiveness and resistance to moisture.

(b) There were some good answers to this question. However, some candidates did not make an accurate sketch of a dowel joint.

(c) (i) Only a minority of candidates named an appropriate type of drill that could be used to make a Ø15 hole. Twist drills were not considered appropriate and the best choices of forstner, saw tooth and flat bits were rarely stated.

(ii) Most candidates understood the purpose of the scrap wood underneath the work piece. Stronger candidates mentioned to avoid splitting, to protect the surface below, to prevent damage to the drill bit and to produce a clean hole.

(d) (i) The majority of candidates named at least one correct marking out tool. Answers included steel rule, scriber, try square and centre punch. Felt tip/marker pens were not appropriate.

(ii) To bend the mild steel to shape, candidates needed to show the strip held in a vice or clamped securely, the use of some sort of former and also needed to include the method of force used to shape the metal, usually a hammer or mallet. Many candidates gained at least partial credit for this question.

(iii) The majority of candidates gave two good reasons for painting the mild steel. The most common reasons included to improve the appearance and to prevent corrosion.

(e) Very few candidates understood the term sustainable. The majority of answers referred to the lifetime of the product rather than to why hardwood is sustainable. Hardwood can be replaced by planting new trees. Hardwood can be reused to make manufactured boards.

(f) There were many different design proposals showing how the plant holder could be made freestanding at a height of 500 mm above the ground. Many candidates did not produce clear enough sketches to communicate their ideas. In many cases candidates did not address the last part of the question that stated ‘Include details of materials, constructions, fittings and fixings’.