DESIGN AND TECHNOLOGY

Paper 0979/12
Product Design

Key messages

When listing additional points about the function of the product in response to **part (a)**, candidates should try to avoid the use of generic requirements that could apply to any product. The response must relate to a specific function relevant to the chosen design question. Care should be taken to avoid points already given in the question.
Full solutions to the design problem, drawn in response to **part (e),** should show all dimensions and construction details rather than manufacturing methods that might be used in the school workshop/studio.
The methods used to manufacture one **part** of the solution should be answered in **part (g).** Care should be taken to avoid duplicating or repeating this in both sections.
Candidates should avoid describing generic manufacturing methods, particularly where CAD and CAM methods form part of the answer. The response must relate to the description of the method used to make part of their final solution shown in **part (e).**

General comments

Most candidates responded well to the question of their choice and many showed that they were able to engage with the design problem and access the marks available in each section.

The A3 answer sheets are intended to help candidates follow the required design process and those who responded as and where required were able to successfully evidence their design and thinking skills.

Some candidates showed a high level of original thinking in their design work and used high quality drawing and sketching techniques to communicate their ideas.

Candidates are asked to indicate the question number they have chosen to answer, in the rubric box at the foot of each A3 answer sheet.

Centres are reminded that there is no requirement to include question papers when sending scripts to Cambridge.

Comments on specific questions

Section A

Question 1

This was the most popular question and the majority of candidates understood clearly the requirements of a portable unit for storing and displaying eight different types of vegetable.

(a) Many candidates scored high marks on this first question as they were able to identify additional important points relating to the function of the storage and display unit. Successful responses included: ease of access to vegetables; stable – cannot topple over; weatherproof; security aspects; easy to clean. General responses such as ‘easy to use’ or ‘durable’ can be awarded marks only where the specific reason for the requirement is given. Responses giving functions that are already stated in the question cannot be awarded marks.

(b) Most candidates were able to show two different methods to make the unit portable. Appropriate responses included: wheels; rollers; carrying handles; track systems.

(c) The majority of candidates presented three ideas that responded appropriately to the design problem and produced creative designs that showed a solution to the problem. Successful candidates used a range of communication techniques and enhanced their designs using shading, colour and annotation to show details and information on the function and features of their designs.

Candidates are advised to use all the space allocated to the answer for this part of the question so that they can show all information clearly.

(d) Many candidates were able to identify both positive and negative aspects of their designs in relation to the context of the question. This was often more successful when the candidate related their comments to the functional points described in their response to **part (a)**. Successful candidates included clear and valid reasons for their judgements rather than simple descriptions of each of their ideas. The majority of candidates selected one of their ideas to develop more fully. Successful candidates justified their reasons for the choice of idea by explaining what features of the design made it better than the others.

(e) The level of response to this question varied considerably. Most candidates were able to provide a response that showed their chosen solution to the problem using a sketch and notes. Successful candidates presented a clear, overall view of the solution using an appropriate drawing format and added details of construction in the form of additional sketches, diagrams and written annotations. Most candidates added overall dimensions to their responses, and many provided additional dimensions of other details.

(f) Most candidates were able to suggest two appropriate specific materials for their solution presented in **part (e)**. Many candidates were also able to provide valid reasons for their choice of material. Successful candidates gave specific properties of the materials that made them appropriate for use on their solution.

(g) The level of response to this question varied considerably. Most candidates were able to provide some description of a manufacturing method. Some candidates outlined methods that did not relate to any part of their chosen solution or described methods that were unsuitable. Successful candidates outlined an appropriate method for producing part of their solution using notes and sketches that included details of processes, equipment and tools used.

Question 2

This question, intended for those following the Graphic Products option, was answered by a significant number of candidates. The requirements of a lightweight countertop display to hold the items in the vegetable growing kit appeared to be understood and received well by candidates.

(a) The majority of candidates scored well on this question as they were able to identify additional important points relating to the function of the countertop display. Successful responses included: stability with the weight of the items attached; portability; visual appeal to children; robust construction; moisture resistance. Responses such as ‘safe to use’ can be awarded marks only where the specific reason for the requirement is given. Responses giving functions that are already stated in the question cannot be awarded marks.

(b) Most candidates were able to show two methods of attaching the items in the kit to card. Appropriate responses included: staples, shelves; adhesive tape; mastic putty adhesive (such as ‘blu tack)’; ‘Velcro’; wire ties; elastic bands.

(c)

(d) See **Question 1 (c) – (g)**

(e)

(f)

(g)

Question 3

This question was answered by a small proportion of candidates. Candidates appeared to identify with the problem and were able to make use of their knowledge and experience of systems and control in a useful and interesting way.

(a) Most candidates who responded to this question were able to identify four additional important points relating to the function of the apple peeling machine and scored well. Successful responses included: safe to use; not damage the fruit; portable; adapt to different sizes of apple; easy to clean; hygienic to use.

(b) Most candidates were able to show two different methods of converting rotary motion into linear motion. Appropriate responses included: cam and follower, crank and slider, screw thread and follower, rack and pinion.

(c)

(d) See **Question 1 (c) – (g)**

(e)

(f)

(g)

DESIGN AND TECHNOLOGY

Paper 0979/22
Graphic Products

Key messages

The focus of this assessment is Graphic Products. Future candidates would benefit from practical activities based on the questions contained in this paper.

General comments

Candidates were required to complete all questions in *section A* (**A1**, **A2** and **A3**) and then go on to answer *either* **B4** *or* **B5** from ***section B***. Many candidates chose to answer **Question B4** rather than **B5**. A small number of candidates did not follow the rubric instruction and omitted parts of **Question A3** or answered all the questions.

There are areas of the syllabus where further improvements are needed. Candidates must be able to draw shapes with arcs touching other arcs/lines. Candidates must be able to draw solid shapes in isometric. The application of thick and thin line technique to solids to give 'realism' is an important technique in this subject area.

Comments on specific questions

Question A1

Winner badge

A pictorial image of a badge for 'winner' was given in the shape of a shield. The badge was shown with dimensions.

(a) Candidates were asked to complete the outer shape of the shield. The left side lower arc needed to be drawn R160 and the two upper arcs R60.

(b) Candidates were then required to complete the inner shapes. A semi-circle R50 was to be drawn centrally on a base line 110 from the bottom of the shield. By projecting lines either side of the bottom of the semi-circle, a half hexagon could be constructed 100 A/C.

Starting with circle of Ø80, a hexagon 80 A/C could be drawn and the inner shape completed with the equilateral triangle touching the corners of the inner hexagon.

(c) The missing letters (N and R) needed to be drawn to the same font shape and size inline and correctly positioned in the space provided.

Question A2

Trophy

Candidates were asked to assemble a trophy from four given shapes. The assembled trophy was to be drawn in isometric to a scale of 1:2.

Most candidates drew the two bases correctly assembled and centred upon each other. The triangular part 60 wide at the base needed to be shown centrally on the upper base and 160 tall.

The pentagon shape proved to be particularly difficult unless the candidate had 'crated' both this shape and the triangular shape. The thickness was generally shown 20 mm

Question A3

Making a stencil using CAD and CAM

Not all candidates attempted all parts of this compulsory question.

Candidates were asked to explain how CAD and CAM could be used to design and make the stencil for painting the letter 1. The question required the candidates to refer to the drawing of the shape using CAD, the selection of suitable material for the stencil (Card, thin plastic) and the use of a CAD machine (laser cutter, cutter plotter, STIKA, CAMM1 etc.) to cut out the stencil.

Question B4

This question was attempted by many candidates. Overall, candidates gained a wide range of marks for their answers.

(a) Candidates were asked to complete the planometric view of the podium to a scale of 1:20. The final drawing had to show three steps 30 wide, the middle step 30 high and five step top lines 40 long from the from the front face of the podium. The backboard was to be drawn 60 high above each step showing a board thickness of 5 mm.

(b) This part of the question asked the candidates to apply thick and thin line technique to the winner's cup. The principle is that where only one edge is seen producing the corner, a thick line is applied. All edges where two sides are seen producing the corner are left as thin lines.

(c) The base for the winner's cup was given in isometric. The candidates were asked to draw the base in two-point perspective on the VP's given. Many candidates realised that the base was a square making each side a mirror image. Not all candidates projected their edge lines to VP1 and VP2.

Question B5

Trophy cabinet

This question was attempted by a slightly smaller number of candidates.

Overall, candidates gained a wide range of marks for their answers.

A pictorial view and a plan and part side view in orthographic projection was given of a Trophy cabinet along with all the relevant dimensions.

(a) Many candidates attempted the completion of the two views of the cabinet. The source material showed a dimensioned pictorial view of the assembled cabinet and a completed plan. By projection, candidates could complete the side view and the front view. It was important that the candidate projected the given sizes correctly as the distance between the shelves could have a cumulative error affecting the overall size.

(b) A pictorial view of two glass doors was given. Candidates were required to render the doors so that they looked like curved glass. Shading that indicated a curve was needed in the convention for glass.

(c) Candidates were asked to complete the sectional view of the handle when fitted into the hole in the glass door. An exploded view of the arrangement was given, so that candidates would recognise the position of washers and the nut.

(i) The handle was to be drawn to the given size and have its body hatched to indicate a section (this is the only part that is hatched, as the other components are left open).

(ii) The felt washer needed to be drawn 3 thick and 54O/D with the inner hole in line with the existing hole in the glass.

(iii) The metal washer needed to be drawn 3 thick and 36O/D with the inner hole in line with the existing hole in the glass. Depending on the orientation of the nut, this was to be drawn $\frac{30}{35}$ wide and 15 thick.

DESIGN AND TECHNOLOGY

Paper 0979/32
Resistant Materials

Key messages

Candidates need to read the questions carefully before attempting to answer. Candidates 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 required to 'work' the resistant materials, wood, metal and plastic. Currently many candidates name tools or describe processes that are not suitable for specific materials.
Candidates need to improve their communication 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.
In order to achieve good marks for ***Section A***, candidates need to develop a wide knowledge and understanding of materials, tools and processes used when working with wood, metal and plastic.

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 always has a number of questions with large mark allocations requiring a combination of clear and accurate sketches supported by detailed written notes. The Key messages above are particularly relevant.

Comments on specific questions

Section A

Question 1

The majority of candidates described at least one specification point for the pedal bin. The best answers included being easy to clean, the lid closing automatically when the pedal is released and the size and durability of the pedal.

Question 2

Most candidates were able to state at least one of the manufacturing processes; laminating or steam bending for the wooden chair legs being the most common correct answer. Candidates needed to improve their knowledge for this question as only the minority of candidates named all three correctly.

Question 3

(a) The reason for using a marking knife was to cut through the veneer in order to prevent the fibres from splitting. The majority of answers stated that lines marked with a knife rather than a pencil were more visible, or that they were more permanent and did not get rubbed off.

(b) The majority of candidates understood the purpose of the 10 mm waste. The best answers referred to the need to leave a small amount of wood that could be removed later to achieve the required length. Other correct answers related to increased accuracy and the avoidance of errors.

Question 4

Some candidates needed to improve their knowledge for this question. Candidates should 'show knowledge of available market forms, types and sizes'. Very few candidates could provide the names of the three standard metal sections. There were many variations given by candidates that could not be awarded marks.

Question 5

The majority of candidates provided a recognised drawing of a finger joint. There were many excellent drawings showing an odd number of 'fingers' and end grain which emphasised the nature of the construction. Candidates were able to gain one or two marks for partially correct answers.

Question 6

The majority of candidates named two composite materials.

Question 7

Candidates needed to improve their knowledge for this question as very few could name the two centre lathe processes. In terms of 'shaping' metal, knowledge of at least basic operations carried out using the centre lathe is important.

Question 8

(a) Some candidates needed to improve their knowledge for this question. Many candidates named a sash cramp correctly although some did confuse this with a 'G' cramp and other variations which were not correct.

(b) The majority of candidates recognised that the purpose of the scrap wood was to prevent damage to the chopping board and to provide more even pressure along its length.

Question 9

There were many good properties of stainless steel given. The most common properties included its resistance to corrosion, attractive appearance and easy to clean. Some candidates needed to improve their understanding for this question as there were many misconceptions: stainless steel is not lightweight or easy to bend, and a high melting point was not relevant to the use of stainless steel for a toast rack.

Question 10

To answer this question successfully depended to a large extent on an ability to draw ideas clearly. There were many good, practical solutions. The best design solutions concentrated on relatively 'close-up' drawings of some form of hook and eye, or two interlocking pieces of metal or plastic. Many candidates drew views of the complete chair which made it difficult to understand the 'interlocking' details. Added written notes are valuable and can help to explain ideas.

Section B

Question 11

(a)(i) and (ii) The vast majority of candidates were able to name a suitable manufactured board and non-ferrous metal for the clock shape. The most common materials were MDF and plywood and aluminium and brass respectively.

(b) (i) Many candidates understood that it was necessary to clamp the board down to prevent it from snagging and spinning (the possibility of personal injury) and to ensure an accurate hole was drilled.

(ii) The techniques involved in cutting out the shape and smoothing the edges are very basic: three specific processes: saw, file and glasspaper. While some candidates did achieve maximum marks for clearly presented sketches and notes using appropriate tools, many candidates gained only one or two marks for this question. Often incorrectly named tools were given and many candidates went straight from a saw to glasspaper without the use of a file. Some candidates used a tenon saw to cut out the curved shape.

(c) Many candidates provided accurate details showing variations of a mortise and tenon joint held together permanently with an adhesive, often PVA. Some candidates needed to improve their understanding for this question as they did not recognise that the manufactured board was only 5 mm thick making it impractical for it to be nailed, screwed or dowelled.

(d) Many candidates understood that applying paint by means of spraying resulted in a more even coat of paint, free from brush strokes and done more quickly than by hand.

(e) Candidates needed to develop their knowledge for this question. There were three items to address when making the legs from non-ferrous metal and joining them permanently to the clock shape: cutting the metal to shape, bending the legs and then joining them.

The techniques shown and the tools used needed to be appropriate. For example, it would be very difficult to cut 1.5 mm thick non-ferrous metal using a hacksaw; a more successful method would be to use a guillotine or tin snips.

When bending to shape some candidates used a line bender used to soften plastic while others heated the metal using a blowtorch. The non-ferrous metal required only the use of a former and vice and a mallet. Heat was not needed.

Many candidates used welding to join the metal, which was not appropriate. Some candidates used nuts and bolts which would not provide a permanent joint. The best answers soldered the joint or used rivets or epoxy resin adhesive.

(f) Many candidates gained at least one mark for stating that self-finishing meant that no finish is applied to the metal. For a second mark candidates needed to add that no ‘extra’ finish was required or that the surface could be buffed and polished or that the material had properties that meant it did not require an additional finish.

(g) Candidates needed to develop their knowledge and understanding of CAD/CAM. The best answers gave some details relating to the the use of software to design the numbers, the design being transferred to a named CNC machine and the setting up of material and tool parameters.

(h) There were some good answers describing ways by which designers make products appealing and exciting for young children: the most common involving texture, interaction, sound and lights. Some candidates stated shape and colour that were provided in the question.

Question 12

(a) There were many good answers giving sound reasons for using acrylic for the storage unit. The most common included an ability to be bent to shape easily, attractive appearance and inherent colour.

(b) Many candidates achieved at least two marks for this question. To cut the slots the following stages were necessary: drill a hole into which the blade of a coping or scroll saw could be inserted, saw out the majority of the waste, remove the waste up to the line or edge of the slot and finish using wet and dry (silicon carbide) paper and/or polishing mop and compound.

Some candidates needed to improve their knowledge and understanding for this question as they did not drill access holes for a saw. Some used a jig saw on acrylic, others a tenon saw or a very sharp knife to cut out the slots. Sand or glass paper was often used instead of wet and dry. Some used a laser cutter even though the question did state ‘cut out by hand’.

(c) Candidates needed to improve their knowledge and understanding of the basic operations involved in producing the slots by means of a CNC machine. The best answers included the following details: a named CNC machine, for example laser cutter, miller, router, engraver, the design

drawing sent/transferred to a CNC machine, the setting up of the acrylic work piece and the setting of machine parameters.

(d) Most candidates showed how the acrylic could be bent using a strip heater or line bender and the use of a former to achieve the required shape. Many candidates did not achieve the third mark because they omitted to describe how the shape would be retained while the acrylic cooled.

(e) (i) Most candidates gained one mark for showing the acrylic strip clamped using a 'G' cramp. For a second mark some sacrificial material should have been used to distribute pressure evenly and protect the surface of the acrylic.

(ii) Few candidates mentioned that acrylic cement would be an irritant to the skin. Most stated that gloves would be used to protect the hands. However, a significant number did state that the reason for wearing a face mask was to protect from toxic fumes.

(f) Candidates needed to improve their knowledge and understanding for this question about laminating veneers with only a minority of candidates demonstrating any practical knowledge of laminating. The best answers showed the five layers glued together, the use of male and female formers and some form of clamping. Some candidates used a single former in conjunction with a vacuum bag.

(g) The majority of candidates described an evaluation whereby the items would be placed in the storage unit and their accessibility tested or by comparing the final product against the original specification. Other excellent methods included asking the client's opinion or giving out a questionnaire and analysing the feedback.

(h) Most candidates understood that with developments in technology items such as a tablet, phone or remote control were household items that needed to be stored carefully and accessibly.

Question 13

(a) Most candidates achieved at least three or four marks for showing how the shape could be marked out and cut using a tenon saw, scroll or band saw. The curved edge could be shaped on a sander or by a combination of planing and filing. Some candidates had an over-dependence on the use of glasspaper. Technical accuracy, including correctly named tools and equipment was also rewarded.

(b) The majority of candidates gave two features of the ride-on toy that made it suitable for use by young children. Common correct answers included the stability of having four wheels, the back support to the seat and the rounded edges and corners.

(c) (i) The majority of candidates thought that turning the wood without removing the corners would result in damage to the lathe rather than to the wood.

(ii) Candidates needed to improve their knowledge for this question in order to name woodturning tools or items of equipment used to make the wheels on a lathe. Glasspaper, more commonly named 'sandpaper' was the main correct answer.

(iii) Candidates needed to improve their knowledge for this question as they did not understand why plywood would be a better material than hardwood for the wheels. Common misconceptions about plywood included: easier to work, lighter in weight and cheaper. The few best answers focused on the stability of plywood and its construction that makes it less likely to split compared to hardwood which has a grain structure.

(d) (i) There were some excellent jigs designed by only a minority of candidates. Some candidates needed to improve their knowledge for this question as they did not understand the basic design features required of a drilling jig. One type of design included a centre or hole into which a drill would locate and location for the sides of the jig so that it fitted over or around the area to be drilled. The question required candidates to name the material for the jig. Jigs of this type needed to be made from a hardwearing material; namely metal.

A second type of jig involved the use of a 'cradle' into which the whole of **part B** would 'sit' on the drilling machine table. With this design wood-based materials were acceptable.

(ii) Candidates needed to improve their knowledge for this question. Fitting a wheel onto an axle and allowing it to rotate required three features: a method of free rotation, a method of retaining the wheel on the axle and the use of a washer to prevent the wheel from rubbing against the side of the ride-on toy.

Some candidates provided rotation by drilling a hole in the wheel slightly larger than the 8 mm diameter axle and retained the wheel on the axle by means of some sort of 'stopper' or cap fitted over the end of the axle. Very often the quality of sketches did not show the details clearly enough to gain credit.

(e) (i) The majority of candidates named injection or blow moulding as the process that could produce the plastic wheels.

(ii) The majority of candidates named welding, brazing or soldering as a method of joining lengths of steel tube permanently.

(iii) Most candidates named paint correctly as a finish for the steel frame but found it more difficult to provide a second suitable finish. Alternatives included electroplated and dip-coated plastic finishes.

DESIGN AND TECHNOLOGY

Paper 0979/42
Systems and Control

Key messages

- Candidates should be reminded that they are required to read all instructions carefully.
- Candidates should be reminded that they are required to answer every question in ***Section A*** but only one question in ***Section B***. There were several instances where all three ***Section B*** questions had been attempted.
- Candidates should be reminded that clear, legible writing and annotation to sketches are vital for an answer to be awarded marks.
- If a question requires sketches and notes for the answer both should be used in the response.
- All responses should appear in the space allocated for that response. If there is not enough room the response can be continued on additional sheets attached to the booklet. If additional sheets are used the question and part number must appear clearly next to the response.
- In questions that require either a single answer or a set number of answers it is important that candidates do not enter additional answers. This will result in the examiner not being able to give credit to a correct response because an incorrect one has also been offered. E.g. tables requiring ticks (✓) or items to be circled to identify the answer should not have more than the required number of ticks or circles.
  Any errors can be corrected by crossing through the ones that are incorrect.
- If a comparison is required, for example, in a question asking for advantages, the response should reflect this and provide reference to the items being compared.
  Explanation should be given in sentences rather than as short notes.
- In calculation questions units should be applied to the answer wherever it is appropriate.
  Any working should always be shown as it is possible to gain marks from this even if the final answer is incorrect.

General comments

The questions in ***Section A*** proved accessible to the majority of candidates with very few instances of questions with no response offered. Clear answers were seen in the majority of cases and there was evidence that each area of the syllabus had been covered.

In ***Section B*** the structures question was once again the most popular; the number of candidates choosing the electronics question was slightly greater than in 2018.

It is important that candidates read each question carefully before starting their response.

As noted in the key messages there was an increase shown in those attempting all three questions. In almost all these cases time would have been better spent concentrating on a single question.
Where sketches were required as part of the response, they were generally clear and good use had been made of the available space.

Comments on specific questions

Section A

Question 1

(a) The majority of candidates were able to name two computer-controlled machines used in manufacturing.

(b) This was generally answered well with a range of benefits for CAM being given. There were a small number of instances where the abbreviation 'CAM' had been mistaken for a cam mechanism. Candidates should be reminded that where there are several parts within a single question there will not be a sudden switch of focus within the question.

Question 2

(a) This question was answered well in the majority of cases. Candidates should be reminded that use of a ruler is beneficial where straight lines are being used to join two points.

(b) The majority of candidates made the correct connection to the switch terminals. Those who had not gained full marks had generally made the correct connection to the common terminal and then used the NC terminal.

(c) Candidates needed to improve on their knowledge for this question. The answer should have referred to the motor not being able to run with the door open. In a number of cases the answer referred to the contents of the tumble drier not being allowed to fall out.

Question 3

(a) The majority of candidates recognised the body of the drier as being a shell structure.

(b) Candidates who gained marks for this part had generally used a corrugated approach to make the flat steel more rigid, very few had added depressions in the surface. Some candidates needed to improve on their knowledge for this question as those who were not awarded credit had in many cases shown a piece of steel folded in two to increase the thickness of the steel.

Question 4

This question was well answered, clear practical reasons for using gears were generally given.

Question 5

Some candidates needed to improve on their knowledge for this question as methods of securing a spur gear to a shaft were not known to a number of candidates.

The stronger responses showed keyways or splines as an effective solution, with many being extremely well drawn and annotated. In some cases, a permanent method such as welding was used; this also gained the marks. Candidates who had chosen to use an adhesive did not gain marks.

Question 6

The conversions of motion in the two examples were well known to the majority of candidates. Errors came mainly in the cam and follower with 'reciprocating' not being used for the follower.

Question 7

(a) The respective benefits of soldering and the terminal block were generally well known, and the two techniques were recognised as being permanent and temporary electrical joints.

(b) The purpose of plastic covering on the connecting wires was widely identified as electrical insulation. Candidates should be reminded to be specific in their response; just stating 'insulation' could be seen as referring to thermal insulation. Those who had referred to the dangers of electrocution were awarded the mark, although this is not a serious possibility in low voltage circuits. Some candidates needed to improve on their knowledge for this question as they had not noted that the insulation could also be used to identify the function of the connection.

Section B

Question 8

(a) (i) This part question was answered well in the majority of cases. Candidates who were not awarded marks had added multiple ticks to the grid. As noted in the Key Messages it is important that any misplaced ticks are crossed through.

(ii) Candidates needed to improve their knowledge for this question as a number of candidates had difficulty in defining a natural defect. Any defect that occurred whilst the tree was growing was allowable. This includes insect attack.

(b) (i) This part question was answered well. Good knowledge of structure types was demonstrated.

(ii) The strengthening methods used in the frame structure were correctly identified in most cases. Some candidates needed to improve on their approach to this type of question as there was sometimes a tendency to write down all the strengthening methods that they know, rather than restricting their response to the methods asked for.

(c) (i) Many excellent answers to this question were seen. Some candidates needed to improve on their knowledge for this question as they were unsure as to the nature of different types of load. Some candidates needed to improve on their approach to this type of question as it asked for examples and a number of candidates did not provide any examples.

(ii) Stronger candidates showed a good understanding of the link between the information provided on the safety label and how the manufacturer had arrived at a safe working load by building in a Factor of Safety.

(iii) Some candidates needed to improve on their knowledge for this question as there were a few difficulties seen in the responses to the calculation. In some cases, the formula used was correct and the working was also correct, but the reactions had been attributed in reverse order, the correct numerical value for $\mathbf{R_2}$ being attributed to $\mathbf{R_1}$. In cases like this only one mark was lost.

(iv) This question required knowledge of the formula used to calculate stress. The very general description offered by a small proportion of candidates was not enough for the marks to be awarded. In most cases the formula was accurately quoted, gaining both marks.

(d) This question was a good example of where sketches and notes were both needed. Tension and compression were generally described accurately but shear and torsion provided more of a challenge. The use of arrows as a symbol of the force direction was a reliable way of picking up the marks.

Question 9

(a) (i) Many candidates attempting this question were able to give a valid advantage for using a vee belt.

(ii) A number of different tensioning methods were seen in the responses with most relying on a spring- loaded idler pulley or jockey wheel to provide some tension to the belt. Sketches in the majority of cases were very clear and detailed.

(b) (i) The majority of answers seen reflected clear knowledge of how the velocity ratio is calculated in a pulley system.

(ii) Around half of the candidates recognised why there are energy losses in a pulley system. The stronger responses then went on to describe the form of the losses.

(iii) Knowledge of bearing types was generally good, with most choosing to use a ball bearing race.

(c) (i) Some candidates needed to improve their knowledge for this question. In most cases the position of the fulcrum and effort were correctly identified but the load was frequently shown as being somewhere along the length of the cylinders, in no definite position.

(ii) A number of candidates concluded that the mechanism would not operate if a fixed joint was used. Some candidates needed to further improve their knowledge for this question as they could not clearly describe the reason for the mechanism being unable to operate.

(iii) Many candidates needed to improve their knowledge for this question. In many cases 'linear motion' was stated, rather than the reciprocating motion that actually takes place.

(iv) Knowledge of the principle of a crank and slider mechanism was generally good. In a number of cases the sketches could have been further improved to fully describe how the mechanism works.

(d) (i) The name of the roller follower was generally well known and the majority of candidates answering the question gained the mark.

(ii) A common error with this part was to use the 13.25 mm dimension as the lift caused by the cam without deducting the 10 mm of the base circle radius.

(iii) Some candidates needed to develop their understanding for this question as the 180° of dwell during the rotation of the cam had been ignored, or the given starting position had not been used.

(iv) Some candidates needed to develop their understanding for this question. The offset follower causes the follower to rotate, evening out the wear on the follower. Any understanding of the dual movement of the follower gained the marks.

Question 10

(a) (i) Some candidates needed to improve their knowledge for this question. The switch and motor symbols used in this part were generally identified correctly. The fuse symbol was frequently mistaken for a resistor.

(ii) The direction of conventional current flow was correctly indicated in most cases.

(iii) Nearly all answers had correctly given ampere or amp as the unit of current.

(b) (i) A high proportion of answers identified temperature as the physical property being sensed.

(ii) The first part of the description was to note that the voltage is divided by resistors in series, most answers gained the mark for this. The second mark available was for noting that the voltage is divided in the same proportion as the resistor values. This mark was only gained by the stronger candidates.

(iii) This calculation required a straightforward substitution into the given formula. Candidates who got the first part correct generally went on to complete the calculation accurately. It should be noted that not writing down the working for the calculation incurs no penalty for those who get the answer correct. If an incorrect answer is given with no working shown it results in no marks being awarded.

(iv) Some candidates needed to improve their knowledge for this question. In many cases the voltmeter symbol was correctly drawn but it had been connected to the wrong part of the circuit.

(v) There were a number of allowable answers for this part, many candidates realised that tolerance in the resistors used or inaccurate setting of the variable resistor would cause a faulty reading.

(vi) This part required the available voltage to be divided equally. The stronger responses chose a suitable value, greater than 1 kΩ and applied it to both resistors used. The arrangement of the resistors was generally correct, and a connection had been made to the inverting terminal of the Op Amp.

(c) **(i)** Calculation of the time constant was completed accurately in the majority of cases.

(ii) Most candidates gained the mark for showing a rising voltage. The second mark was for showing the curve flattening out as the capacitor nears full charge; very few marks were awarded for this.

(iii) Many candidates needed to develop their knowledge of the working of a bipolar transistor. There was some evidence that candidates knew the theoretical switching point of the transistor, but few responses went on to mention the current flow in the collector emitter circuit.

(d) Knowledge of the benefits of programmable ICs was evident in many cases and there were a number of valid benefits to choose from.

DESIGN AND TECHNOLOGY

Paper 0979/05
Project

Key messages

- Ensure that the problem selected will enable the candidate to access all the assessment criteria. Candidates must create a 'product' that can be properly tested and evaluated in the environment it is intended for. Where possible, identify a client or user who can help provide information when researching, comment on design ideas and help to test and evaluate the final product.
- Use a reasonable size font and make full use of each page. Candidates should focus on quality rather than quantity.
- Candidates should be encouraged to explore more innovative and creative design opportunities.

General comments

Work submitted was generally well packaged and folders appropriately bound. Centres are reminded that practical outcomes and three-dimensional prototype models should not be forwarded with the sample for moderation.

Some projects were very innovative, and many candidates produced high quality, functional outcomes.

A concise and detailed folder, making the best use of each page is recommended. Work needs to be structured, focused and presented clearly as additional embellishment carries no marks.

Marks were applied accurately and consistently by the majority of centres. There were occasions where standardisation had been carried out, marks awarded adjusted, and only the total mark changed on the Coursework Assessment Summary Form. If marks are changed, please indicate in the Assessment Criterion where adjustment has occurred.

For new centres, or teachers new to the subject, guidance for assessing coursework and other very useful support for 0979 can be found on the teachers support hub.

https://schoolsupporthub.cambridgeinternational.org

Comments on specific sections

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

Some centres were generally lenient in awarding marks in this section. Some candidates produced a brief statement of design intention with limited or no reference to the design or user/s needs and were incorrectly awarded marks in the middle and higher mark range. To access the higher mark range, candidates must analyse the need in detail and consider the requirements of possible users.

The design opportunity and design brief tended to be communicated well. Candidates would benefit from looking at the needs and expectations of the selected user group in more detail.

2. Research into the Design Brief resulting in a Specification

Marks awarded for this section were generally in line with Cambridge standards. Some centres tended to be slightly lenient. Research needs to be more focused on the situation chosen and specifications should state the main functions and qualities of the product. Some candidates did not access specific research directly related to their brief. For example, candidates designing storage units should find information about the range and sizes of items to be stored.

Many candidates analyse existing products as part of their research. To access the higher mark range, candidates need to draw out details that will help them when designing. Candidates should highlight the particular design strengths and weaknesses and use this information when generating a specification and when designing. Candidates should make reference to specific ergonomic or anthropometric requirements. Some candidates used existing products as their only source of information in this section and this alone cannot access full marks.

Specifications were mostly clear and justified. To access the higher mark range, candidates need to produce more detailed and specific specifications. By explaining the design criteria in more detail, candidates show a greater understanding and can access a higher level of attainment.

The stronger candidates focused on key, relevant information which helped to support the design. Some candidates needed to make conclusions about the information/data that they collected relevant to the item being designed. This was particularly evident with questionnaires. Candidates should be encouraged to include more personal observation and analysis when researching.

3. Generation and exploration of Design Ideas

Some of the design work presented was very good; well-presented, innovative and creative. Many candidates produced a good integration of models with sketched ideas and design possibilities, showing a natural progression of design and development.

Some centres assessed this section slightly leniently. To access the higher mark range, a wide range of different, well-annotated possibilities is required. Ideas should be evaluated on their suitability for further development and should make reference to the specification.

Many candidates produced a range of different design ideas. To access the higher mark range, candidates needed to be more imaginative and creative when designing. Exploring and evaluating each idea in more detail, including material possibilities, aesthetic considerations and experimentation with proportions etc. before going onto the next concept, would enable them to access more marks.

Candidates needed to improve on their evaluation and specification checks as they needed more detail. Candidates must make it clear why ideas had been selected for further development.

4. Development of Proposed Solution

Some centres were slightly generous in their awarding of marks for this section. Some candidates had very limited evidence of the development of ideas in their folders.

An increasing number of candidates produced a card model of their chosen idea, but most did not go on to work out the most suitable materials and methods of construction. Many candidates made very good use of three – dimensional modelling and CAD modelling to help to visualise the size, shape and proportions of the design proposal.

Candidates should explain why specific materials, possible joining methods and finishes have been selected for their final solution.

5. Planning for Production

Most candidates produced detailed, dimensioned working drawings. CAD is being increasingly used to very good effect in the generation of working drawings although some candidates using 3-D representational CAD drawings did not include dimensional detail.

To achieve the highest mark ranges, drawings should include all details necessary such as key dimensions, additional fixtures used, for example, hinges and screws, and finishes applied.

Most candidates produced a logical sequence of the stages of manufacture, including detailed cutting lists and approximate time allocations in their detailed plan for production. Some flow charts needed more detail such as more about the information required to manufacture the product.

6. Product Realisation

Most candidates fully complete the manufacture of a practical outcome and there were many examples of high-quality manufactured products presented.

Many candidates made excellent use of photographic evidence during the key stages of manufacture of the product to emphasise particular features and the quality of making.

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.

7. Testing and Evaluation

Most centres assessed this section accurately, some were too lenient.

Most candidates tested their products against their original specification. Many went on to identify strengths and weaknesses. To improve on their responses further, candidates needed to use sketches and notes to suggest proposals for further development. To access more marks, candidates also needed to test the product for its intended use and make more detailed comment about the quality of manufacture or performance against the specification.

Photographic evidence of testing should be included in this section. Many candidates had clients/users identified who were able to test and evaluate the final product.