DESIGN AND TECHNOLOGY

Paper 0979/12
Product Design

Key messages

Candidates should be encouraged to plan the use of their time carefully so that they complete all parts of the question that they have chosen to answer. A small number of candidates did not complete **parts (f)** and **(g)** of their chosen question.

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

The benefits of using accurately measured drawings for **part (e)** needs to be carefully considered in terms of the time taken. Many candidates achieved high marks for this question using just freehand sketches and notes.

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

General comments

Question 1 was the most popular question. Very few candidates attempted **Question 3**.

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

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

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

Comments on specific questions

Question 1

(a) Most candidates managed to list four additional points about the function of the guitar stand that they considered to be important. Commonly seen answers related to stability, use of the stand during a performance or how it would be transported/stored after a performance. Candidates should be advised against repeating points that are given in the question or giving generic points, such as being safe, that might apply to almost any product.

(b) Most candidates used sketches and notes effectively to show two methods of preventing damage to a guitar whilst on the stand. Commonly seen answers involved the use of foam, rubber, fabric covers, shaped cases or the guitar having minimal contact with the stand. The standard of written and visual communication for this question was excellent.

(c) An impressive range of sketches with annotations was seen for this question. The most common solutions were based on a frame that the guitar leant against or a means of hanging the guitar from a stand. The strongest candidates added detailed annotations to their sketches and used a range

of presentation techniques, including exploded views. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. A very small number of candidates produced fewer than three ideas.

(d) The evaluation of ideas was often impressive with candidates able to clearly demonstrate a good understanding of the positive and negative features of their design proposals. Commonly seen answers referred to stability, ease of access, ease of manufacture or how much room the stand would take up on a stage. Many candidates used an area such as stability, as a positive feature in one design proposal and then a negative feature in another proposal. 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 and a variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and material lists. Colour was often used to add clarity to drawings. The most frequently seen drawing methods were exploded isometric sketches with annotations. This question specifically asked for construction details and important dimensions but in weaker responses these were often missing.

(f) Most candidates were able to name two specific materials that would be used in the construction of their design proposal and gave reasons for their choices. Commonly named materials included steel, stainless steel, acrylic and pine. Reasons for the choice of material often related to the strength, weight or appearance of the material. Candidates should be advised against giving generic names of materials such as wood, or generic reasons such as it being easy to work with, as these responses are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. Fabrication techniques including welding and joining solid timber were commonly seen methods of manufacture. Candidates that used acrylic often concentrated on cutting out the parts with a laser cutter and then the use of 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. Most candidates used a combination of sketches and notes to outline a method of manufacture.

Question 2

(a) Most candidates managed to list four additional points about the function of the display board that they considered to be important. Commonly seen answers related to the weight of the display board, how it would be moved in and out of the shop, how it would be assembled or the ability of the material to withstand the weather. Candidates should be advised against repeating points that are in the question, such as that the display board would be placed on a paved area or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes well to show two methods to promote musical instruments. Many candidates used large brightly coloured lettering or instrument images/shapes. Other methods involving the use of sound, and electronic displays and moving elements were seen. Many excellent responses were seen to this question.

(c) An impressive range of sketches with annotations were seen for this question and colour was generally used well. The annotations often revealed candidates' true understanding of how the design proposal would be constructed. A sketch of a development (net), with the joining method clearly shown often accompanied a three-dimensional (3D) sketch of the fully assembled display board. 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 or ideas that were similar.

(d) The evaluation of ideas was generally very impressive with candidates able to clearly demonstrate an understanding of the positive and negative features of their design proposals. Commonly seen answers focused on stability, how well the display board would attract customers or the cost of manufacturing. 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) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views and materials lists. Colour was generally used effectively, and many impressive answers were seen. Responses often included an isometric sketch and a development (net) with supporting annotation. The question specifically asked for construction details and important dimensions but in weaker responses these were often missing.

(f) Most candidates were able to name two specific materials that would be used in their design proposal and gave reasons for their choices. Foamboard, corrugated cardboard, Corriflute and acrylic were commonly seen materials. The reasons for the choice of the material often related to the working properties or suitability for outdoor use. Candidates should be advised against giving generic names of materials such as plastic, or generic reasons such as being easy to work with, as these are not awarded marks.

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal. The use of a laser cutter was commonly seen but the use of a line bender and fabrication methods were also seen. It was important that candidates included the correct names of tools and equipment to be used in the method of manufacture if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

Question 3

(a) Most candidates managed to list four additional points about the function of the music stand that they considered to be important. Commonly seen answers related to the construction, the needs of the performer or that the page turning action must not disturb the performance. Candidates should be advised against repeating points that are given in the question, for example that the stand must turn pages, or giving generic points that might apply to almost any product.

(b) Most candidates used sketches and notes effectively to show two methods which could be used to control the turning of a page of music. Many candidates showed a motor or hand turning device but some more ingenious methods involving the use of a fan or weights and pulleys were proposed. The quality of sketches and notes was usually sufficient to show the overall idea but often lacked sufficient detail to show the method of operation.

(c) An impressive range of sketches with annotations was seen for this question. Colour was generally used well. It was important that all ideas fully met the design requirements if candidates were to access the full range of marks. For example, in some cases candidates did not really consider how frequently the pages would need to be turned during a performance. A small number of candidates produced fewer than three ideas or ideas that were similar.

(d) The evaluation of ideas was generally very impressive with candidates able to clearly demonstrate an understanding of the positive and negative aspects of their design proposals. Many responses focused on the fact that the device might damage the sheet of music, become jammed during operation or how easy it would be for the performer to operate. It was important that candidates justified their evaluations rather than making broad statements, such as this is the best idea, if they were to access the full range of marks.

(e) A variety of methods were used to show the full solution to the design problem. These included orthographic drawings, exploded views, isometric views, circuit diagrams and materials lists. The question specifically asked for construction details and important dimensions but in weaker responses these were often only partly shown.

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

(g) Most candidates were able to identify and outline a method used to manufacture one part of their design proposal, with the use of vacuum forming and a laser cutter being the most common. It was important that candidates included the correct names of tools and equipment to be used in the method of manufacture if they were to access the full range of marks. Most candidates used a combination of sketches and notes to outline a method of manufacture.

DESIGN AND TECHNOLOGY

Paper 0979/02
Project

Key messages

- Some candidates could have improved the research section by adding personal comments about products being investigated. The analysis of existing products should lead to information and key points to take forward to the next stage of designing, what positive features could be included and what functions may not be necessary or could be improved upon.
- For Criterion 5, candidates must produce a sequence of stages of production to organise the making activity. Some candidates included excellent photographic evidence of the manufacture of the product but did not show evidence of a plan prior to making.
- Most candidates had clear photographic evidence of the testing of their product. The evaluation should have focused on the strengths and weaknesses of the product and proposals for improvement. Some candidates made comment, sometimes exclusively, on personal performance which was not required.

General comments

Centres provided all necessary paperwork with the samples for moderation.

The Individual Candidate Record Card information provided by teachers was very helpful in the moderation process.

Some of the work presented was of an exceptionally high quality. Creative and imaginative design ideas were proposed, and candidates used an integration of sketched ideas and modelling to clearly show their design decision making. Many candidates' development and application of ICT and CAD skills were strong and well executed.

Some candidates produced very similar research, design, and practical outcomes. Centres should allow scope for candidates to explore different possible design needs or design opportunities.

For new centres or teachers new to the specification, guidance for assessing coursework and other very useful support for 0445/02 can be found on the School Support Hub.

Comments on specific sections

Criterion 1: Identification of a need or opportunity with an analysis leading to a design brief

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

Criterion 2: Research into the design brief resulting in a specification

The research into the design brief should lead to information and key points to take forward to the designing stage. As well as researching the features of existing products, candidates should focus closely on the design challenge. For example, candidates designing storage units should research the range and sizes of items to be stored. Candidates should also be encouraged to gather relevant information such as ergonomic considerations.

Research into materials, tools and manufacturing methods should be appropriate to the design brief. Most of this information could support Criterion 4: Development of proposed solution

Criterion 3: Generation and exploration of design ideas

This section was generally assessed consistently and accurately. However, a number of centres were slightly lenient in awarding marks in the higher mark range. To gain a high mark for Criterion 3 candidates need to produce a wide range of ideas appropriate to the design problem. Candidates must show creativity and imagination and annotate ideas with reference to the specification. They should also clearly show design decision making and present work effectively and with clarity.

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

Criterion 4: Development of proposed solution

Most centres marked this section in line with the standard. However, some centres were lenient, awarding high marks when there was limited evidence of informed decision making about the final proposal, such as materials to be used and manufacturing methods and finishes in the samples presented.

2D and 3D card modelling can help to form decisions about proportions, functionality and aesthetics. Practical workshop experimentation can inform the suitability of materials and construction methods. Many candidates made good use of CAD to model developments.

Criterion 5: Planning for production

Most candidates produced a working drawing of their proposed solution, and most were fully detailed and dimensioned. Some of the CAD drawings presented did not include details such as dimensions.

Some candidates presented a photographic diary of the manufacture of their product but did not produce the required detailed, logical sequence of the stages of manufacture prior to making.

Criterion 6: Product realisation

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

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

Centres are reminded that marks allocated to making should reflect the overall complexity of the product, the level of skill demonstrated by the candidate, and the quality of the making of the final product.

Criterion 7: Testing and evaluation

Many candidates carried out appropriate testing, often including clients or product users, and were able to identify the strengths and weaknesses of their product. However, a significant number who completed this section produced comments against a brief list of initial specifications with limited explanation or justification of points made.

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

DESIGN AND TECHNOLOGY

Paper 0979/32
Resistant Materials

Key messages

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

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. It is essential that candidates attempt all parts of the question.

Comments on specific questions

Section A

Question 1

The majority of candidates identified at least one of the processes, steam bending and laminating, correctly.

Question 2

Many candidates drew a countersunk and clearance hole correctly. However, many sketches were not sufficiently clear or accurate to achieve the 2 marks available.

Question 3

The majority of candidates identified tempering correctly. Tempering is a process carried out to relieve stresses in metal.

Question 4

The steel rod would be chamfered so that the die could be positioned, ready to cut the screw thread. There were a few correct answers that referred directly to the end being chamfered and provided valuable notes to describe how this could be done, either by filing or the use of a centre lathe. Those candidates who described 'rounding off' the end of the steel rod also gained marks.

Question 5

Most candidates selected 'lasts for a fixed period of time' correctly.

Question 6

(a) Many candidates identified an appropriate plastic for the packaging. The most common answer was polyethylene and its variants.

(b) There were many excellent benefits for using plastic for food packaging, The most common answers related to it being lightweight, hygienic, transparent and that it did not react with food.

(c) The majority of candidates correctly stated that the use of plastics could harm the environment, for example, litter, landfill, non-biodegradable, and the fact that plastics are made from material of which there is a finite source.

Question 7

(a) Only a small minority of candidates could name the knock-down fitting.

(b) There were many unsuccessful attempts to show how the knock-down fitting could be used to join two sides of a cabinet. Many sketches lacked the clarity required to gain maximum marks.

Question 8

The majority of candidates gained at least 1 or 2 marks for stating advantages of the aluminium and canvas seat stool. The most common answers included that it was more comfortable, lightweight, easy to clean/open and close and more compact.

Question 9

(a) Most candidates were unable to name a router as the power tool used to cut out the rebate.

(b) The hand tools that could be used to cut out the rebate included the tenon or dovetail saw and a bevel-edge, firmer or mortise chisel. Many candidates could not name any of these hand tools.

Question 10

The majority of candidates gained marks for showing a recognisable base for the trophy and providing an important dimension. The weakest part of answers generally was showing how the trophy could be joined to the base. There were many answers that showed innovative grooves into which the trophy could slide and good use of an epoxy resin which would be excellent when joining wood to metal.

Section B

Question 11

(a) (i) The majority of candidates were unable to state one property of mild steel that made it suitable for the lantern lid. The most common properties included its ability to be shaped or that it was relatively cheap. Many candidates stated that it was heat resistant. This was irrelevant as the candle was made of plastic with an imitation flickering flame.

(ii) Many candidates stated appropriate finishes. The most common were paint, plastic coating and galvanising.

(b) (i) The majority of candidates recognised that model making was an effective method of finding out what was wrong with a design or that important sizes or dimensions could be checked before wasting valuable materials used to make the final product.

(ii) Some candidates provided benefits for using CAD for on-screen modelling that were no different to those for making a card model. There were many excellent answers with candidates stating correctly that CAD enabled ease and speed of editing, that no materials would be used and that design data could be transferred to CNC machines.

(c) (i) The majority of candidates named two marking out tools that could be used to mark out the development (net) on the mild steel sheet. The most common included a scriber, (steel) rule and some form of marker pen. Some candidates gave impressive answers showing their knowledge of engineers or marking blue.

(ii) Tinsnips would be used to cut out the mild steel sheet. Only a minority of candidates named this tool. There were many answers giving “metal scissors”.

(iii) Most candidates named an appropriate method of joining the flaps using heat. The most common answers included soldering, brazing and welding.

(iv) Although epoxy resin, (Araldite) was a common correct adhesive, there were many candidates who selected adhesives that would not be effective when joining metal, including PVA.

(d) This question was answered well by only a small minority of candidates. Many candidates did not read the question carefully and treated the development (net) of the lantern body as if it was made of metal. The question stated clearly that the lantern body was made from 5 mm thick acrylic. Those candidates who achieved good marks for this question described basic techniques involving the use of a strip heater or line bender to soften the plastic so that it could be shaped around a former and left to cool.

(e) The strongest answers showed some form of pin or peg inserted through both the lid and lantern body to secure the lid. There were many ideas that did not provide clear or accurate details relating to the constructions required.

(f) Many candidates achieved some marks for showing modifications to the lantern lid and the end of the support rod to suspend the lantern safely. However, 3 of the 6 marks were available for providing accurate and practical constructional detail. This was generally the weakest part of the question.

Question 12

(a) The most appropriate properties of beech are that it is hardwearing, close-grained and attractive. Very often candidates stated incorrect properties such as ‘easy to work’, ‘lightweight’ and gave vague answers such as ‘durable’ or ‘strong’.

(b) Most candidates stated two excellent safety considerations that would need to be included in the design of the pinball game.

(c) This question was answered well with many candidates naming an appropriate construction and some producing clear and accurate sketches of the chosen construction. There were many lap, dowel and finger (comb) joints.

(d) (i) Only a minority of candidates recognised the saw tooth or forstner drill bit. A common incorrect answer was a hole saw.

(ii) The majority of candidates incorrectly focussed on the purpose of the scrap wood being to protect the surface of the wood from bruising. There were some excellent answers from candidates who recognised that the purpose of the scrap wood was to protect the surface under the wood being drilled and/or that the scrap wood would prevent damage to the tip of the drill bit.

(e) The majority of candidates recognised that the base that fitted into a groove (method **B**) would be stronger. There were some excellent answers that stated that an adhesive (glue) was not required, that it improved the appearance and that it lifted the base off the ground.

(f) (i) Many candidates named two machine saws that could be used to cut out the curved shape from the 18 mm thick MDF base. The most common answers included a band saw, jig saw, router, laser cutter and scroll saw.

(ii) Many candidates were unable to demonstrate knowledge of the benefits of using PVA and a contact adhesive. PVA provides a strong bond and allows the joint to be adjusted before it sets. PVA does not create any toxic fumes and is safe to handle. The main benefit when using a contact adhesive is that it provides an immediate bond with no need to clamp the parts together.

(g) There were many very good answers to this question. However, many candidates did not show how the curved part would be fitted to the base of the pinball game. Many candidates recognised that the strip of beech would need to be steamed then bent and clamped around a former or mould.

(h) There were many good ideas showing how the pinball game could be supported at an angle. Many candidates used a hinge and some sort of leg that could be made to fold flat. Other good answers showed some sort of additional pivot with a pin or peg to allow the pinball game to fold flat. Often candidates did not address the part of the question that asked them to include details of materials and fittings.

Question 13

(a) (i) Most candidates stated a benefit of using plastics for parts of the toy lorry. The most common answers referred to the available variety of colours, that it was lightweight and easily shaped/moulded.

(ii) Candidates were less knowledgeable about benefits of using beech for parts of the toy lorry. The strongest answers referred to its close-grain, impact resistance and its attractive appearance.

(b) (i) Most candidates were able to provide at least one of the processes to be carried out when using CAM to produce the sides of the toy lorry. Some candidates described some of the processes involved in detail, demonstrating strong practical knowledge.

(ii) Only stronger candidates gained full credit. Very few candidates knew how a contact adhesive would be applied to create a strong joint. Many candidates gained 1 mark for stating that the adhesive would be applied to both surfaces: the toy lorry sides and base. However, most answers then described how the joint would then be clamped. The main feature of a contact adhesive is that the adhesive applied to both surfaces is allowed to become touch dry and then stuck together. Hence the term contact or impact adhesive.

(c) (i) The majority of candidates understood that MDF was cheaper than solid wood, that it was easier to cut and shape and that it provided a smoother surface with the absence of grain.

(ii) Vacuum forming is an important process when manufacturing plastic products. Many candidates were unable to state two features of the mould used to vacuum form the tipper part of the toy lorry. The strongest answers related to a draft angle rounded corners and edges and no undercuts.

(iii) It was clear from the answers to this question those candidates who had first-hand practical experience of vacuum forming. There some excellent detailed stages described.

(d) There were some innovative designs showing how the tipper could be made to tip. The most common answers included the use of hinges or an additional pivot connected to both the base and underside of the tipper. Many candidates did not present their design ideas with sufficient clarity or accuracy. Annotations that could be used alongside sketches to explain the design idea were often difficult to read or simply missing.

(e) Some sort of axle was the starting point to answering this question followed by the fixing of the wheel to the axle. The wheel needed to rotate freely with the use of washers. Many candidates used some sort of rod for the axle and accurately showed that the hole to take the axle was slightly larger in diameter to provide the free rotation. The wheel needed to be secured to the axle or the side of the toy lorry. Many candidates correctly added a nut to the end of a screw or bolt or simply glued some sort of stopper to retain it.

DESIGN AND TECHNOLOGY

Paper 0979/42
Systems and Control

Key messages

- In both sections, candidates need to read the questions carefully before starting a response. This would avoid situations where an example is asked for in the question but not given in the response.
- Candidates should be advised to check that all required questions have been attempted. A question that is not attempted is guaranteed to get no marks.
- Questions requiring a 'State' or 'Give' answer will only require a short response. The 'Describe' or 'Explain' questions will require more detail, and responses should be given in sentences rather than as short notes. As a guideline one mark is awarded for each valid point, up to the total for the question.
- Use of general terms such as 'strong' or 'cheap' should be avoided unless they are justified by adding more information.

General comments

Questions in ***Section A*** were accessible to most candidates, with few questions not attempted. This reflected the fact that candidates had a good grounding in the key content area of the syllabus.

In ***Section B*** the mechanisms question was the most popular choice. The electronics question was the least popular.

A small number of candidates attempted more than one question in ***Section B***.

Calculations in all the ***Section B*** questions were answered well with the working provided as well as the answer.

Any questions answered in the additional space at the back of the question paper must be clearly marked with the question number.

Comments on specific questions

Section A

Question 1

(a) This question was answered well with all candidates gaining at least one of the three available marks. The majority correctly used durability as a property of steel. The important point for candidates to remember was that the properties given should have related to the axle stand. The photo of the stand showed that steel could be bent and welded, both of which were valid points. Those who gave 'strong' as a response did not gain a mark unless it was justified, for example 'strong in compression.'

(b) There were two marks available, one for the fact that it was a frame structure and one for the triangulation that was used to provide strength and stability. Both marks were awarded for a single point, well described.

(c) Sketches and notes were needed to describe the meaning of shear force. In many cases, opposing arrows were used to correctly show the result of this force in action and the example most often used was that of scissors. The second mark was for the two opposing forces meeting at a single contact point. With a gap between the forces, the result would be bending rather than shearing.

Question 2

(a) The reasons for reducing friction in a mechanism were well known. Most candidates were aware of the results of excessive friction in a mechanism.

(**b)** Lubrication and the use of bearings were the two ways of reducing friction that were commonly mentioned. A few candidates correctly stated that reducing the surface areas in contact or using materials such as nylon, with a low coefficient of friction would also have benefits.

Question 3

A variety of valid benefits for being able to disassemble a product were given in responses. The ability to repair or reuse parts from a product was a frequent response, as was the extra room provided for storage and transport when the product was disassembled.

Question 4

(a) The types of motion were well known and most candidates gained a mark for recognising oscillating movement in the clock pendulum.

(b) Rotary motion was the answer required for the clock hands. Anything resembling rotary was accepted but candidates should be made aware of the standard term for this type of motion.

Question 5

The question clearly asked for examples of the use of computers in stock control. Those who described any other uses such as CAD or CAM were not awarded marks.

Question 6

Most candidates gained the mark for knowing the function of an electrical switch in connecting or disconnecting components from a circuit.

Question 7

(a) Although many candidates were able to use the correct names for each of the switches, there were several who used colloquial terms such as flick switch for the toggle switch.

The reed switch was generally identified correctly but a few candidates thought that it was a fuse. The toggle switch was sometimes identified as an SPDT switch, which was accepted.

(b) Operation of a reed switch using a magnet was correctly described in most cases. Those candidates who just put magnet gained a single mark, but those who noted that the magnet opened or closed the contacts gained the second mark. Use of an electromagnet was also allowed but this is not the usual choice.

Question 8

Knowledge of the two methods of connecting components was common. Knowing which method was series and which was parallel proved a problem for a few candidates.

Section B

Question 9

(a) (i) Most candidates were able to give three valid forces that could affect stability of the chair.

(ii) Only a few candidates correctly interpreted the term lamination. In many cases it was understood to be a means of protecting the timber rather than a constructional technique. Several candidates recognised that it could be beneficial in producing a bend or curve in the top rail.

(b) (i) Accuracy was the most commonly recurring benefit given for CAM production, with just a few candidates taking it a stage further to say that repeatability was also a feature of CAM production.

(ii) Most responses to this question focused on the lower cost of hand production for one-off production. Those who said that it was faster did not gain a mark unless it was justified. This is because once set up, CAM production will be faster but for prototypes hand methods will be faster.

(iii) Specific knowledge of adhesive properties was not strong. Most candidates will have used adhesives on wood and they should have tried to make use of their own experience when putting a response together. Strength in tension and not leaving marks on the wood could have been used in the responses but they were very rarely given.

(c) (i) Sketches were generally limited in quality, but the notes with them clarified the differences between beams, struts and ties. Candidates found it easier to give the difference between struts and ties but had difficulty in giving a clear description of a beam as a structural member.

(ii) Most candidates gained at least one of the two available marks. Warping or termite damage were the most common answers. Knots, shakes and splits were not often seen in the responses.

(iii) Reading the question carefully was key to gaining marks on this question. An example of a composite material was asked for, but rarely given in the response. Most candidates knew what a composite material was but very few could accurately explain the improvements over the parent materials. Reference back to an example would have helped here.

(d) (i) Almost all candidates could identify the counterbalance weight in the workshop joist.

(ii) In general, this calculation was well done. Candidates knew the formula to apply and found the correct answer. Some candidates gained partial credit for the working, showing the benefit of always including the working in a calculation question. Those who then went on to make an error in the final answer, only got the single mark for the earlier working.

(iii) The term Factor of Safety was not widely understood with many responses describing PPE measures that would be taken. It was expected that reference to the breaking strain of the lift cable would be made or labelling that should be applied to inform a user of the safe working load.

Question 10

(a) (i) The question asked for one different benefit for each of the three methods of transmitting motion from one shaft to another. Although there are features that could be applied to more than one method, such as non-slipping, using the same feature twice or even three times did not answer the question. A few candidates gained the mark for the vee belt benefit by saying that it allows limited slip which could prevent damage to other areas of the mechanism. The vee belt was also the only method that does not require lubrication.

With the spur gears the benefit most often given was that the ratio can easily be adjusted.

The chain drive was recognised to have a long service life, the chain itself lasting far longer than a vee belt.

(ii) Some candidates highlighted more than one area of the chain. Careful reading of the question would have revealed that it was a single area required.

(iii) Stronger candidates recognised that the joining link is held tight by the tension in the chain. This led to positive comments about the security of the method and the fact that the chain can easily be removed for cleaning or replacement.

(iv) The advantage of a toothed belt was generally seen to be in reducing slipping. In fact, with this method no slipping will be experienced. A few responses noted that two pulleys of the same size will remain in the same relative position.

(b) There were very few responses that used recognised methods of adjusting spur gears to mesh correctly. For one of the gears movement is required, and either a straight slot or a gear mounted on a quadrant was the expected answer. In a few cases candidates suggested using an idler gear to take up any slack. However, this would still require a method of adjusting the position of one of the gears, by use of a slot or quadrant.

(c) (i) Two reasons were required for using a cover on the drive components of a pillar drill. In several cases only one of the reasons given was valid. Prevention of dust and particles entering the mechanism is an example of a response that was not accepted. A good clue to one reason was the labelling of the cut-off switch. This should have led to the safety reasons for having a cover. Those who stated that the cover would avoid any damage to the user in the case a of a belt breaking gained a mark.

(ii) The calculation of the motor speed was answered well, with more candidates getting the correct velocity ratio than arriving at the correct drive speed. This illustrated the importance of showing all working, with two marks available for the intermediate stages in the calculation.

(iii) There were a few incorrect answers, giving either second or third order for the order of lever used. Most candidates recognised the arrangement as a first order lever.

(iv) This part was answered well, with most candidates realising that a longer lever would increase the effectiveness. The alternate method, reducing the distance between fulcrum and load was not often seen.

(d) Benefits of a worm gear were well known and most candidates gained at least one of the available marks for giving a valid benefit. The large reduction ratio possible and the inability to slip backwards were the responses seen most often.

(e) Knowledge of the standard mechanisms was generally very good. Answers for the conversion from rotary to linear movement were usually correct. For rotary to reciprocating movement the majority of candidates picked at least one correct mechanism. Very few chose to use the compound pulley from the given terms.

Question 11

(a) (i) Most answers for this part were correct in identifying the heat sensing transducer as a thermistor.

(ii) As with the calculations in the other two ***Section B*** questions those who included the working were able to gain partial credit even if the final result was incorrect. Reading the resistance value from the table was usually accurately carried out. Failing to substitute this value correctly into the formula was a common error.

(iii) There were only a few responses that showed understanding of the voltage requirements of a logic system. The fluctuating value from the potential divider could easily be less than the lower threshold of the logic system. Any candidates who mentioned that the voltage was not stable were given credit.

(iv) Either a voltage comparator or a transistor switch would be suitable for taking the output from the potential divider and turning it into a usable logic signal. Precise details for these circuits were not required for full marks but an understandable circuit diagram was needed.

(b) Knowledge of the NAND gate truth table was needed to answer this question. Several fully correct answers were seen, and marks could be awarded to candidates correctly completing individual columns in the table.

(c) (i) The two marks available were for it being identified as a NAND gate IC and the fact that there were four gates on the IC. The ideal answer would be ‘Quad NAND IC.’

(ii) If the connections were added in the order INPUTS – PROCESS – OUTPUT the solution was made easier. Candidates sometimes made errors in not connecting inputs of the gates together where NOT gates were needed.

The gates to be used in the solution were decided by candidates. When answering a question like this it is better to go for the obvious solution, for example using the two gates on the left for the inputs and then either the top or bottom gate on the right to complete the process and provide an output.

(iii) Very few candidates knew that the capacitor was there to prevent any voltage spikes giving false logic readings. There were a few candidates who gained one of the marks for stating that the low value capacitor would store and release charge.

(d) (i) Of the two components in the output circuit, the diode was correctly identified in more cases than the relay.

(ii) Reasons for using a relay in an output circuit did not appear to be fully understood but some candidates mentioned isolation of the low and high voltage circuits, which gained one of the available marks.

(iii) A power connection to the relay Common terminal was added to the correct position in a minority of cases.

The connections to the motor from the relay Normally Open terminal and from 0 V were more often shown correctly.

DESIGN AND TECHNOLOGY

Paper 0979/52
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 with a focus on drawing accurately using instruments.

General comments

Candidates were required to complete all questions in ***Section A*** (**A1**, **A2** and **A3**) and then go on to answer either question **B4** or **B5** from ***Section B***. An equal number of candidates chose to answer **Questions B4** and **B5**. A small number of candidates did not follow the instructions and answered all questions.

There are areas of the syllabus where some candidates did not perform well. With the increased use of computers in graphic design and graphic products, candidates need to be aware of CAD/CAM equipment, how it is used and the advantages of it. The drawing of 3D shapes, sectional views and the correct use of hidden detail are areas where many candidates did not perform well.

Comments on specific questions

Section A

Question A1

(a) Candidates were required to draw the circle to the sizes given and on the correct centre lines. Many candidates drew the circle on the centre lines but some drew the circle with an incorrect diameter.

(b) Candidates were required to draw the regular hexagon to the sizes given. Many candidates drew irregular hexagons with different side lengths and angles.

(c) Candidates were required to draw the octagon to the sizes given. Many candidates drew irregular octagons with different side lengths and angles.

(d) Candidates were required to draw the two isosceles triangles to the correct size and in correct positions. Many candidates drew isosceles triangles but not to the correct size or did not get them in the correct position.

(e) Candidates were required to complete the ACTIVE title by adding the missing letters C and E in a consistent format to the given text. Many candidates completed this to a high standard and achieved both marks. However, some drew the lettering to the incorrect size or thickness which did not match the existing style.

To achieve higher marks in this question, candidates needed to ensure they knew how to construct basic geometric shapes using the correct methods. They should also have made sure they drew accurately to the dimensions given.

Question A2

(a) Candidates were required to draw the plan view of the drinks bottle by projecting the widths of the cap, neck and bottle from the front view. Hidden detail for the bottle neck was required. Many

candidates were able to draw the outer bottle circle and lid circle to the correct diameter but very few candidates were able to add the neck detail correctly.

(b) Candidates were required to draw the label on the side view by projecting horizontal lines from the front view. The vast majority of candidates completed this successfully.

Question A3

(a) Candidates were required to draw the full-size development (net) including the 20 mm overlap. Many candidates projected the label horizontally but did not make the label the correct length (232 mm). Many drew both ends of the label the same length rather than making one side 20 mm longer.

(b) Candidates were required to identify the 20 mm long area the glue would be applied to. Many candidates did not achieve full marks on this question as they identified two areas (one each end). This would mean one of the glue areas was on the incorrect side of the development (net).

Section B

Question B4

(a) Candidates were required to complete the parts list of the point-of-sale display unit by drawing the individual parts to a scale of 1:10. Most candidates were able to draw the base of the unit to the correct size. Many candidates drew the front and side pieces to the correct overall dimensions but drew the cut-outs incorrectly.

(b) (i) Candidates were asked to name a suitable type of thin plastic for the point-of-sale display insert. There was a wide range of responses. Candidates who named a rigid plastic that is available in sheet form were awarded the mark.

(ii) This question asked candidates to state a suitable piece of CAM equipment that could be used to cut out the insert from the thin plastic sheet. A range of responses was seen but many candidates did not achieve the mark. It appeared that many candidates had very limited knowledge of the use of CAD/CAM.

(iii) Candidates were required to describe a method of bending the plastic sheet to shape. Many candidates described the use of a vacuum former which would be unsuitable due to the holes in the plastic. Candidates who described heating the plastic to soften it and the use of a former to achieve the correct shape achieved full marks.

(c) Candidates were asked to complete the one point perspective view of the point-of-sale display to a scale of 1:5. Many candidates drew the backboard to the correct height and successfully projected lines to the vanishing point but did not draw the display to the correct width. Many candidates did not include the inner detail of the point-of-sale display or drew the base lines incorrectly projected.

Question B5

(a) Candidates were required to complete the isometric view of the bottle package a scale of 1:3. Many candidates were able to draw the two vertical sides correctly but did not draw the sloping sides of the package correctly sloping in two directions. Many candidates drew the handle in the centre of the package but to an incorrect height and length. Candidates who correctly read the orthographic views and worked from the given corner achieved the best results.

(b) (i) This question required candidates to describe how a computer could be used to capture an image of a recycling symbol. For the two marks available, candidates were expected to describe how they would find, get or create the symbol, then capture, download or copy it so it could be used on the package.

(ii) Candidates were asked to explain a benefit of using a computer to capture and store images. A range of different answers was seen. The best responses described benefits associated with the storage, transferral and ease of access compared to paper documents.

(c) This question asked candidates to complete a sectional view through the recycling bin. Candidates were required to show knowledge of sectional drawing and hatching. Many candidates drew isometric views or plan views of the recycling bin. Some candidates drew a sectional view but with the base missing.

(d) Candidates were required to render the model of the recycling bin to look more realistic. Candidates were expected to apply tonal shading to the sides and top of the bin and show shadow or darker tone to the inside faces. Many candidates made the bin look like Styrofoam by adding textural rendering. Many candidates added colour to the bin but showed no difference in tone. The quality of shading was good on the whole, but some candidates' application of colour was uneven and untidy.