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GCSE (9-1)

Examiners' report

DESIGN AND TECHNOLOGY

J310
For first teaching in 2017

J310/01 Summer 2019 series

Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates. The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report. A full copy of the question paper can be downloaded from OCR.

Paper 1 series overview

The paper consists of Section A (55 marks) and Section B (45 marks).

The paper performed slightly better than anticipated and was generally appropriate to all levels of ability. Most candidates attempted the majority of the questions. The paper was accessible by all candidates. There was no evidence to suggest that candidates did not have enough time to complete the questions.

There was a wide range or responses from the cohort which spanned the full ability range. Responses from the candidates were generally encouraging and demonstrated a good understanding of the technical aspects of designing, making and sustainability.

The quality of sketching and drawing on the isometric question, manufacturing processes question and bar chart questions was good on the whole. Most candidates used a ruler for the isometric and graphs.

The quality of written communication was extremely variable. There were five questions on the paper requiring a longer written response. The two extended response questions, Question 1(i)* and 6(d)* were the most well answered, followed by 3(d) and 5(a). Question 5(c) which allowed a written response and the use of notes and/or sketches was not answered well by the vast majority of candidates.

The mathematics questions were well answered on the whole. Many candidates had the relevant knowledge and understanding of the necessary calculations required. Often candidates missed crucial information which led to errors in their answers. By showing the working of calculations, some candidates were able to gain some marks for correct aspects of their work even when the final answer was incorrect.

The quality of handwriting across all papers showed a slight improvement over previous years although there were still some scripts where it was extremely difficult or impossible to make sense of some candidate responses.

Section A overview

Section A consists of Questions 1 to 3, that predominantly cover core knowledge and understanding of the principles of design and technology, through product analysis; demonstration of mathematical skills; core knowledge of design engineering and wider issues related to the principles of design and technology.

To do well in Section A candidates need to have a broad knowledge of the core principles across all material areas, but also be able to apply deeper understanding from their in-depth areas of learning.

Question 1 (a)(i)

1 **Fig. 1** shows images of an adjustable table lamp.

Fig. 1

(a) The lamp base is made from a hardwood.

(i) Name a hardwood.

..... **[1]**

This single mark question generally performed well.

Question 1 (a)(ii)

(ii) Give **two** characteristic properties of hardwood that make it suitable for the lamp base.

1 .....

.....

2 .....

.....

[2]

There were many good responses with the vast majority of candidates able to give one or two characteristic properties of hardwood.

Other candidates needed to ensure the properties given related to the suitability for the lamp base.

Question 1 (b)

(b) The design of the lamp is influenced by the fashion style of Scandinavian design.

Give **two** other factors that influence the design of products.

1 .....

.....

2 .....

.....

[2]

There were many good responses with the majority of candidates able to give credit worthy responses.

Some candidates gave responses relating to fashion and trends which were already given in the question.

Question 1 (c)

(c) The lamp base can be adjusted allowing different heights and angles to be achieved.

Explain **one** reason why this feature benefits the user.

.....

.....

.....

..... **[2]**

Some good responses from many candidates, though many responses were re-worded versions of the question and did not give sufficient explanation of the benefits to the user.

Question 1 (d)

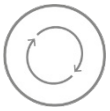
(d) The position of the lamp base is adjusted using the wing nut shown in **Fig. 1**.

The wing nut is made from stainless steel, a ferrous metal.

Give **one** characteristic property of ferrous metal that makes it suitable for this use.

..... **[1]**

There were many good responses with the majority of candidates able to give a characteristic property. Other candidates needed to ensure the property given related to the suitability for the lamp.

	**AfL**	When answering this type of question, candidates must consider the whole question in context. The context in this case is a wing nut for an adjustable lamp. The question is asking for a characteristic property of ferrous metal that makes it suitable for this **use**. The answer given must relate to the product in use. Ferrous metal has various characteristic properties such as ductile, malleable, good electrical conductor but none of these characteristics are reasons for its use on the lamp. Other characteristics such as its high strength and shiny appearance are the reasons it has been used on the lamp. When carrying out product analysis tasks in class, candidates should be encouraged to always question the context the product was designed for.

Question 1 (e)

(e) The lamp is assembled using standard components such as the bulb fitting and switch.

Explain **one** benefit to the manufacturer of using standard components when manufacturing the lamps.

.....

.....

.....

..... **[2]**

Generally candidates answered this well and showed some knowledge of the benefits to the manufacturer of using standard components. Other candidate responses focused on benefits to the consumer in relation to repairing a faulty product rather than to the manufacturer.

Question 1 (f)

(f) Many modern lamps use LED (light-emitting diode) bulbs.

Give **one** reason why an LED bulb is suitable for use in a consumer product.

..... **[1]**

This single mark question generally performed well.

Question 1 (g)

(g) The lamp shade is made from laminated cardboard.

Give **one** reason why laminated cardboard is a suitable material for the lamp shade.

..... **[1]**

Approximately half of candidate responses were worthy of credit.

Many candidate responses related to the laminated cardboard being heat or fire resistant and did not gain marks.

Question 1 (h)

(h) The lamp base is manufactured and sold in self-assembly form.

Explain why self-assembly products have become popular with consumers in recent years.

.....

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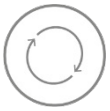
.....

..... **[3]**

Some excellent responses were given by some candidates relating to the ease of transportation, assembly and disassembly, storage and cheaper costs.

Other candidates focused on the benefits to the manufacturer rather than the consumer or gave responses focusing on the ability to modify the products to suit people's preferences.

	**AfL**	When answering this type of question, candidates must read the question carefully to ensure they are clear on who the question is focusing on. The question in this case is asking for benefits to the consumer (the user) not the manufacturer. The benefits to the consumer and the manufacturer will be different. The consumer benefits because it is easier to transport the item from the shop to their home (no delivery costs) and they do not have to pay for assembly costs. These are not benefits to the manufacturer. There may be some aspects that apply to both the manufacturer and

		consumer, such as; easier to store as they take up less space. In class, candidates should practice answering questions about products such as this, by looking at the benefits from the perspective of the consumer and other types of stakeholders.

Question 1 (i)

(i)* The choice of materials used in the lamp and its minimal design mean it is considered to be an example of a sustainable product.

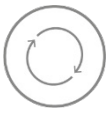
Discuss how designers can assess sustainability when designing and developing products.

To support your answer refer to examples that you are familiar with.

..... **[8]**

The majority of candidates accessed marks for this question. Most candidates showed some understanding of the principles of sustainability and could refer to the decisions designers face when designing and developing products.

Higher achieving candidates used evaluations of existing products to support their discussions. Some candidates referred to the 6Rs in their responses. A limited number were able to expand on these and link them to the design and development of products. Some candidate responses showed limited knowledge of what sustainability is and related their answer to prototyping and testing of a product or how products can be made to withstand sustained use over a long period of time.

	**AfL**	The question asks candidates to use examples they are familiar with to support their answer. When answering this type of question, candidates must try to draw on their areas of in-depth knowledge and apply this to a product they are familiar with that uses these materials. Ideally candidates should try to use examples of products not already used in the exam paper. In this question the candidate is given the lamp as an example of a product that could be considered to be sustainable. They are then asked to discuss how designers can assess the sustainability of products. A candidate with in-depth knowledge of fibres and fabrics could focus on products they are familiar with such as a knitted, woollen garment or fleece made from re-cycled plastic. They can draw on their knowledge of these materials and products to answer the question in more detail.

Exemplar 1

When designing a product the sustainability must be considered. This could include the amount of energy from fossil fuels needed to manufacture and transport the product as well as how easily it could be reused or recycled. The lamp base for example could be considered sustainable, as it uses small pieces of solid hardwood from which the fittings such as bolts can easily be removed, allowing the wood to be retained, reused, or cut down for use in man-made boards. On the other hand, hardwood is less sustainable than softwood due to the slow-growing nature of deciduous trees.

Designers can assess sustainability by carrying out a lifecycle analysis of the product, considering the environmental impacts from the raw materials to the transport to how it would be disposed of. Single use plastic products such as plastic carrier bags for example are very unsustainable, as they are made from crude oil, which is a finite resource, use a lot of energy and cannot be recycled.

Sustainability can also be assessed by evaluating whether products are able to biodegrade naturally. If they are able to it reduces the environmental impacts making the product more sustainable.

This is a good example of a well answered response. The candidate demonstrates good knowledge and understanding of sustainability, explaining various ways designers assess sustainability when designing and developing products.

There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and the lamp from the question is used as an example to effectively support the discussion, but they have also brought in another example when referring to a plastic carrier bag, demonstrating even more clarity in their understanding.

Question 2 (a) (i)

2 A manufacturer makes three different designs of fruit juice cartons from card.

(a) **Fig. 2.1** shows the side and front view of one carton.
Dimensions are given in millimetres (mm).

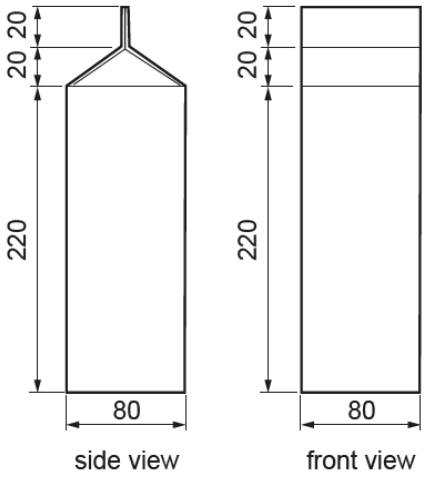
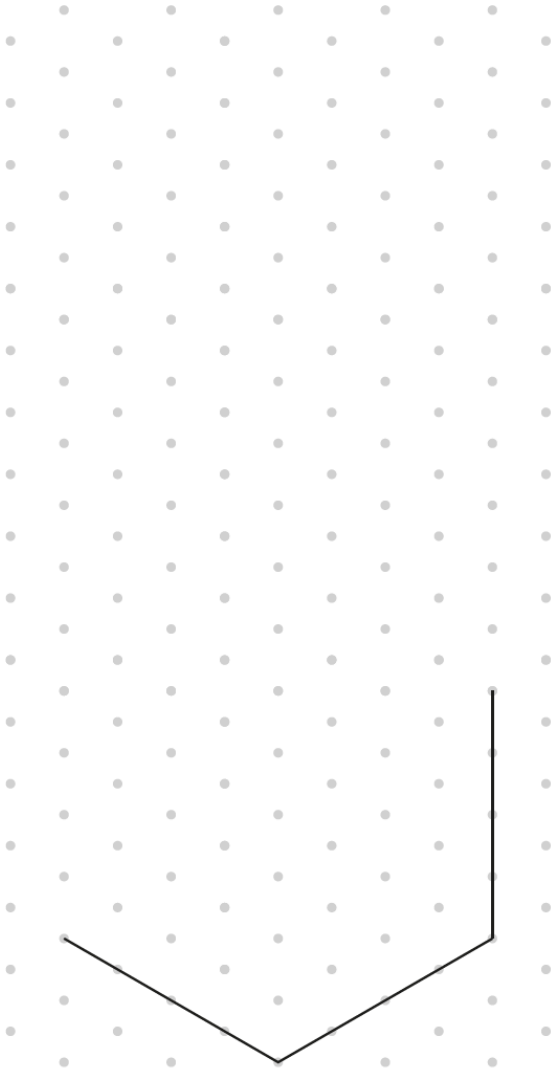


Fig. 2.1

(i) Complete the 3D isometric drawing of the carton in **Fig. 2.1** on the grid below.
The grid points are 10 mm apart. Use the scale 1:2.



[4]

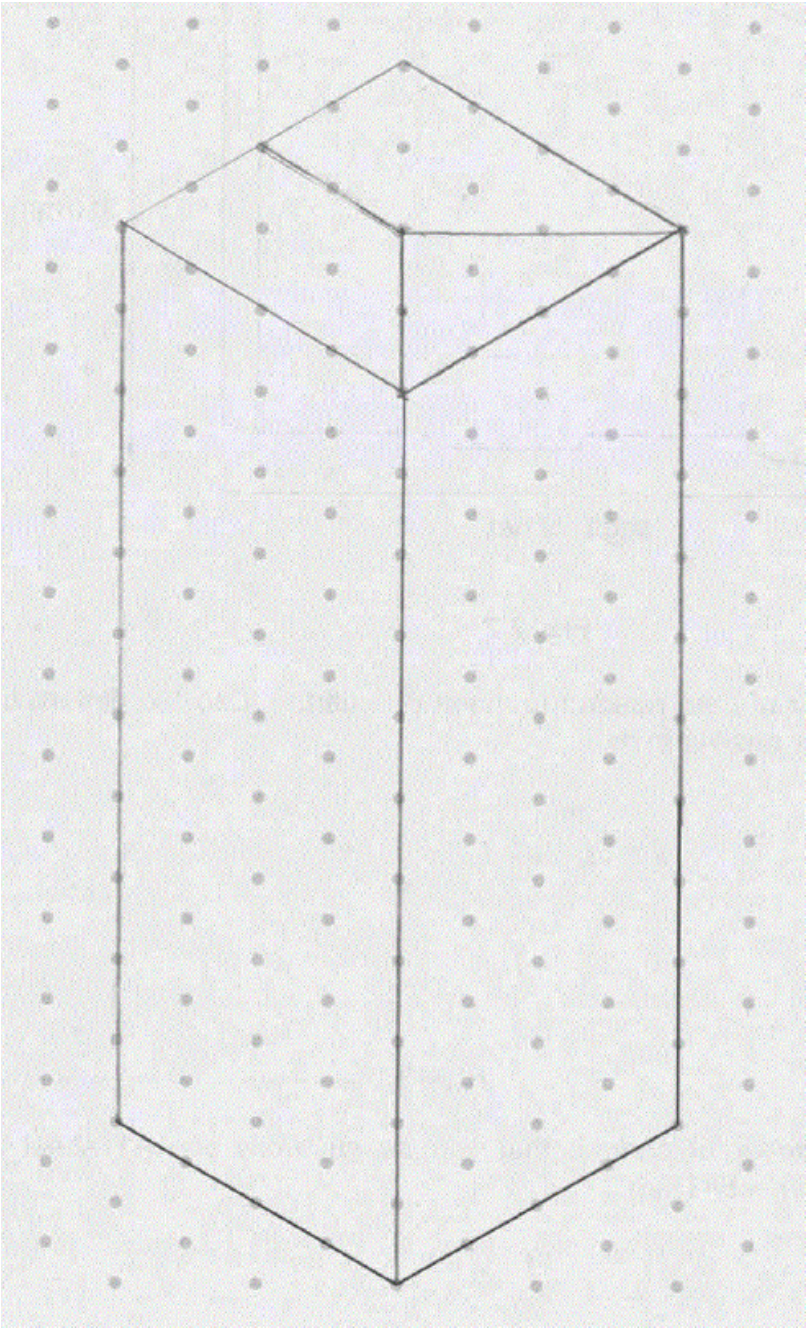
The majority of candidates were able to access marks with some very well drawn responses being seen.

Many candidates were able to draw the two vertical sides of the carton in isometric, and to the correct size.

A much smaller proportion of candidates were able to correctly complete the top of the carton and gain full marks.

A significant number of candidates did not attempt the question.

Exemplar 2



This is an example of a typical response to this question. The candidate has drawn the two sides of the carton to the correct height and in isometric but has not been able to complete the top section correctly.

Question 2 (a) (ii)

The carton is made from one piece of card using the development (net) shown in **Fig. 2.2**. An allowance of 15 mm for glue tabs is shown shaded in grey.

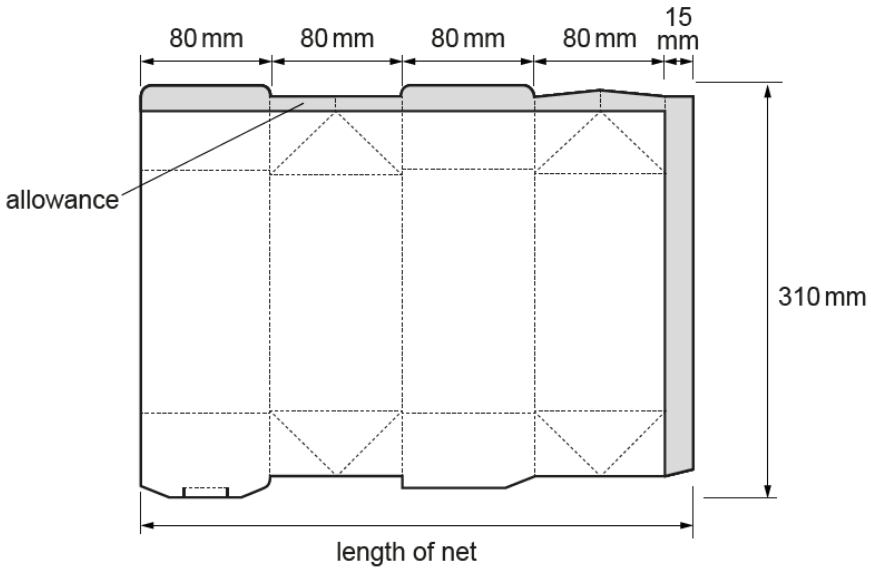


Fig. 2.2

(ii) Calculate the area of card needed to make one carton. Use the dimensions shown in **Fig. 2.2**. Give your answer in mm^2.

Area = ... mm^2 **[2]**

The majority of candidate responses were correct and given both marks.

Some candidates did not include the 15mm allowance in their calculations but were given credit for showing the correct parts of the formula (length x width) in their working.

Question 2 (a) (iii)

(iii) Calculate the number of cartons that can be cut from one A1 sheet of card with dimensions 594 mm × 841 mm.

Number of cartons = ... **[1]**

A small proportion of candidates were able to give a correct answer.

The majority of candidate responses were incorrect.

The most common incorrect response was 4.

Many candidates worked out the area of the A1 sheet of card by multiplying the length and width (841 x 594 = 499,554mm^2).

They then divided this by the area of the carton

499,554 divided by 103,850 = 4.81

Question 2 (a) (iv)

(iv) Give **one** benefit to the manufacturer of making this carton from a single material.

.....

..... **[1]**

Approximately half of candidates gave a credit worthy response to this question.

Many candidate responses stated that it was cheaper or easier but gave insufficient qualification to be given the mark.

Question 2 (b) (i)

(b) **Fig. 2.3** shows another fruit juice carton that is made by the manufacturer.

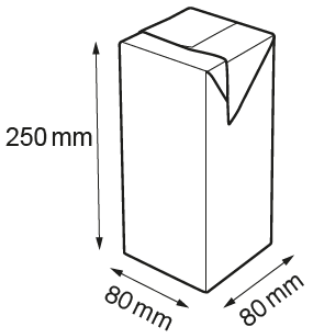


Fig. 2.3

(i) Calculate the volume of fruit juice the carton in **Fig. 2.3** could contain. Give your answer in cm^3.

Volume = ... cm^3 **[2]**

This question was answered well by the majority of candidates.

Many achieved a single mark for using the correct calculation, but giving their answer in mm^2 instead of cm^2.

Question 2 (b) (ii)

(ii) This design of carton is manufactured in two sizes to hold either 1.5 litres or 2 litres of fruit juice.

Given that 1 ml (millilitre) equals 1 cm^3, state if the carton shown in **Fig. 2.3** would hold 1.5 or 2 litres of fruit juice.

.....

..... **[1]**

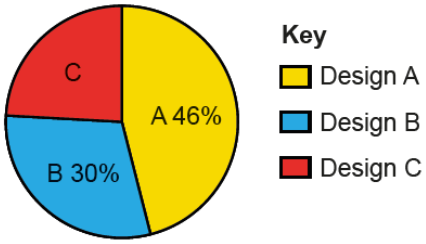
Many candidates worked out the volume and gave the correct answer.

Some candidates misunderstood the question and gave 2 litres as this was bigger than 1.6 litres or answered with a 'yes' or 'no' response.

Question 2 (c) (i)

(c) The carton manufacturer asked 150 people to vote for their favourite fruit juice carton.

The results are shown on the pie chart below:



(i) Calculate the number of people who voted for Design A.

Number of people = ... **[1]**

The majority of candidates responded with the correct answer by multiplying the percentage by 1.5.

Question 2 (c) (ii)

(ii) Thirty-six people voted for Design C.
Calculate the percentage of people who voted for Design C.

Percentage = ... **[1]**

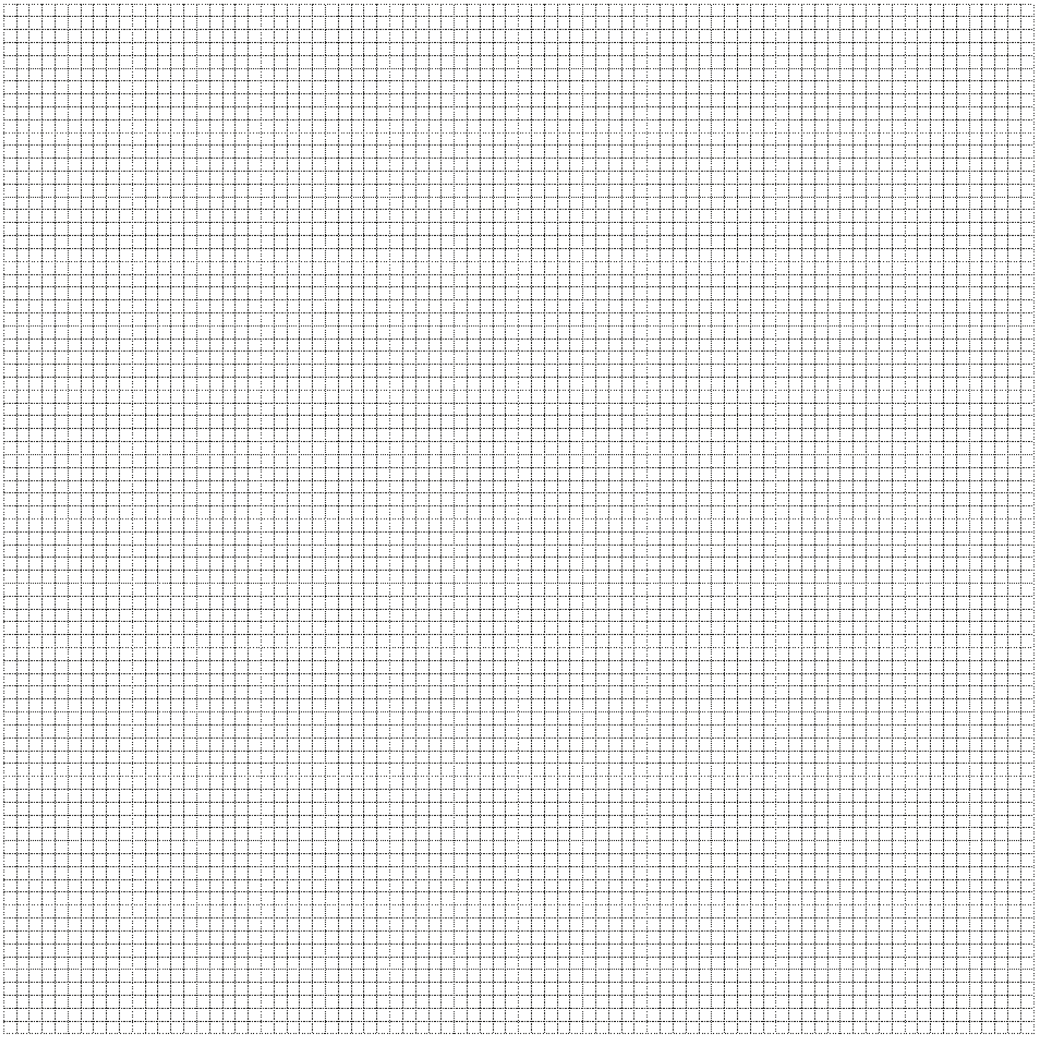
The majority of candidates responded with the correct answer.

Question 2 (d)

(d) The table below shows the sales figures for 500 fruit juice cartons.

Carton design	Number of sales
A	76
B	180
C	244

Draw a bar chart on the grid below to show the data given in the table. Label your axes.



[3]

The majority of candidates achieved full marks on this question.

Other candidates achieved one or two marks for drawing an appropriate scale and the bars to the correct heights.

Some candidates did not label the x or y axis and lost marks.

Question 3 (a)

3 **Fig. 3** shows a voice-controlled device that can play music, set alarms, control smart home devices, and provide information and news.

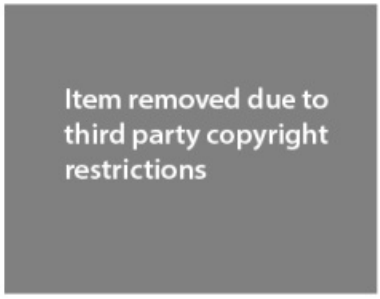


Fig. 3

(a) The device uses a number of inputs and outputs to function.

Complete the table below with the missing inputs or outputs and electronic components.

Function	Input or Output	Electronic component
Turn the device on.	.....	.....
Provides sound to play music.	.....	.....
Illuminates to show when the device is switched on.	.....	LED
Listens to the human voice.	.....	Microphone

[6]

Most candidates correctly responded to the input/output part of the table and named both components correctly.

Some candidates gave 'button' as an answer and lost a mark. Very well answered on the whole.

Question 3 (b)

(b) Most modern electronic devices use programmable microcontrollers.

Explain what a microcontroller does.

.....

.....

.....

..... **[2]**

A small proportion of candidates showed a clear understanding of microcontrollers and were able to give detailed explanations of how they work.

Other candidates gained 1 mark for giving reference to them performing functions or inputs /outputs.

Many candidate responses focused on how the voice controlled device in the previous question (Q3 (a)) worked rather than a microcontroller and did not answer the question sufficiently to achieve credit.

Question 3 (c)

(c) New and emerging technologies are enhancing the function of many consumer products.

Give **one** example of a new and emerging technology and state how it is used to enhance the function of a product.

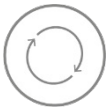
.....

.....

..... **[2]**

The majority of candidates were able to give an example of a new and emerging technology with virtual reality, biometrics, nanotechnology and wireless technology being some of the most popular responses.

Fewer candidates were able to state how the technology enhanced the function of the product.

	**AfL**	When considering new and emerging technologies, candidates should draw on their areas of in-depth knowledge and try to use examples within this area. For example, a candidate with specialist knowledge of metals should have knowledge of technologies such as shape memory alloys and their applications. A candidate with in-depth knowledge of polymers should be aware of technologies such as polymorph and conductive polymers and their uses.

Question 3 (d)

(d) Advances in 3D printing mean a range of materials can be 3D printed.

Discuss the impact that 3D printing is having on traditional manufacturing.

Use examples to support your discussion.

..... **[6]**

There were a small number of excellent candidate responses that demonstrated a thorough understanding of the use and benefits of 3D printing in industry and described a range of commercial uses and examples.

Many candidates focused on their experience of 3D printing in schools and its use for producing prototypes. Understanding of how companies were expanding its usefulness into many aspects of manufacturing was not evident in most responses.

The majority of candidate responses focused upon negative aspects such as the loss of jobs or skilled professionals in tradition manufacturing due to the increased use of 3D printers.

Exemplar 3

3D printing is a quick process of manufacturing things on batch orders and it is starting to replace traditional manufacturing because it is more efficient and very consistent. Since it is computered by a program, this means that all objects that are 3D printed will be the same. Errors are less likely to occur than traditional manufacturing.

However, 3D printing has replaced many jobs since it has been created because 3D printing is reliable and is cheaper to maintain than to pay the salary of many workers from the perspective of the leaders of a company. However, it has also created more jobs for programmers to create these programs and to run them. As ~~technology~~ the development of technology increases, the number of workers needed will decrease.

This is a typical example of common responses from candidates to this question. Although the candidate briefly mentions the increased efficiency and consistency achieved by the used of 3D printing, the candidate focuses primarily on the loss of jobs in traditional manufacturing due to the introduction of 3D printers.

Section B overview

Section B consists of Question 4 covering core and Questions 5 and 6 covering in-depth knowledge and understanding.

Question 4 ensures a balanced coverage of core knowledge and understanding across the paper and gives candidates and fresh opportunity to answer more accessible questions.

Questions 5 and 6 focus on a specific product. Candidates must choose one product from the insert and answer both of the questions in relation to this product.

To do well in Section B candidates must have an in-depth knowledge and understanding of at least one specific material category (Papers and boards; timbers; metals; polymers; fibres and fabrics; design engineering). Those with deeper knowledge and understanding of more than one of these categories will have more choice in the product they can respond with, but **must** stay with the same product for the remainder of the questions.

Question 4 (a) (i)

For **all** questions in Section B you **must** refer to the **Insert** which contains images and information about toys you could find in a children's nursery.

4 Refer to **page 8** of the Insert.

(a) The Lego® bricks in **Images A** and **B** were originally designed in the 1930s and are still a popular children's toy today.

(i) The bricks are made from a thermo polymer.

Give **two** reasons why a thermo polymer is a suitable material for the bricks.

1 .....

.....

2 .....

.....

[2]

There were many good responses with the vast majority of candidates able to give one or two reasons why a thermo polymer is suitable for Lego bricks.

The majority of answers related to it being difficult to break and easily mouldable.

Question 4 (a) (ii)

(ii) Give **one** reason why Lego® remains a popular toy.

.....

..... **[1]**

This single mark question generally performed well.

Question 4 (b) (i)

(b) The teddy bear in **Image C** is made from cotton which is a natural fibre.

(i) Give **two** reasons why natural fibre is a suitable material for the teddy bear.

1 .....

.....

2 .....

.....

[2]

Many good responses with the vast majority of candidates able to give one or two reasons why natural fibre is a suitable material for the teddy bear.

Other candidates gave responses that were not related to a teddy bear such as sustainability, environmental issues or non-toxicity which did not gain credit.

Question 4 (b) (ii)

(ii) The teddy bear is a Fairtrade® product.

Explain why consumers choose products with a Fairtrade® symbol.

.....

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.....

.....

.....

..... **[3]**

The majority of candidate responses showed understanding of what fairtrade products are and were able to give responses relating to the exploitation of workers through unfair pay or poor working conditions.

A much smaller proportion of candidates were able to clearly explain the reasons why consumers choose to buy fairtrade products such as social pressure, trends, moral conscience or feelings of wellbeing or 'giving back'.

Question 5 (a)

5 (a) Lifecycle assessment is a process of evaluating the impact of a product on the environment throughout its lifecycle.

Study and use the images and technical information about your chosen product given on the Insert.

Explain the lifecycle of your chosen product and its impact on the environment.

Your explanation **must** include:

- the main material used and its source
- energy used in the different stages of the lifecycle
- the disposal and recycling of the product.

..... **[9]**

The majority of candidates demonstrated an understanding of the lifecycle of products and many explained some elements of their chosen product's lifecycle in detail.

Many responses focused heavily on the first stages of the product's life from extraction and processing of the raw materials and then the end stages of its life describing the disposal or recycling of the product in detail.

There was little description of the manufacturing processes used to turn raw materials into products or the other stages in the products lifecycle.

Many candidate responses stated that energy was used during the stages of the lifecycle but did not give sufficient detail of how this impacted on the environment to achieve marks in the higher level mark bands.

Question 5 (b)

(b) Having considered your product's lifecycle, describe **two** ways that your product's effect on the environment could be minimised.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

Some excellent responses were given by some candidates with clear descriptions that related to their chosen product. Reducing materials, using alternative materials and recycling materials were the most popular answers.

Other candidate responses described methods that were un-related to their chosen product or did not give a clear enough description of how the method would minimise or reduce environmental impact to gain the second mark.

Question 5 (c)

(c) Refer to the Insert which identifies the **main part** of your chosen product.

For the **main part** of the product:

- Describe the manufacturing process or processes that could be used to make it in quantities of 5000 or more. Use sketches and notes to support your answer.

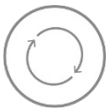
[9]

There were a small number of excellent responses to this question where candidates used notes and sketches to give detailed descriptions of how the main part of their chosen product would be manufactured in quantity.

The majority of candidate responses described processes that would be used when making the product in small numbers in a school workshop environment. Whilst many of these were detailed and clear, they had little or no reference to any quantity production techniques such as jigs, templates etc. and were unable to achieve marks in the higher mark bands.

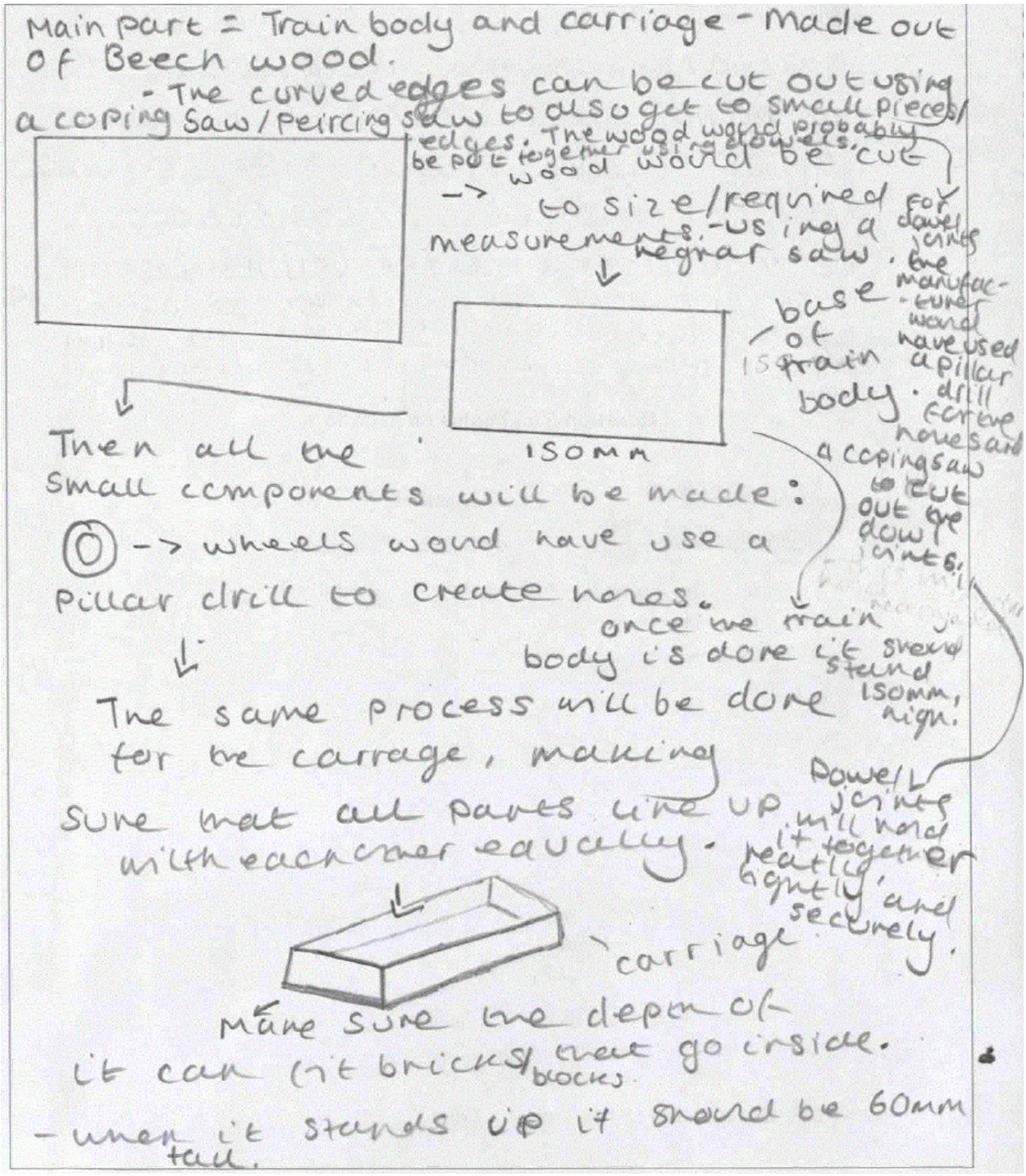
Some candidates made reference to production lines or commercial manufacturing methods but did not describe how these could be applied to the manufacture of their chosen product.

Many candidates did not focus just on the main part of the chosen product as stated in the question and gave multiple brief descriptions of the various different parts.

	**AfL**	Manufacturing methods and scales of production for each material area are covered in depth in each respective section of the Design and Technology textbook. Educational visits to local manufacturing companies are a good way of giving candidates first-hand experience of manufacturing a product. Numerous online videos are also a good source of learning where this is not possible.

	**Misconception**	Questions in this section of the paper can touch on any making/manufacturing method, stage or scale of production. Candidates are required to know and understand the methods used for making prototypes or manufacturing products at different scales of production along with the processes used for larger scales of production. This in-depth knowledge should then be applied to the context of the product in the question. Candidates should not just rely on their experience of making prototypes in their NEA.

Exemplar 4



This is a good example of a typical response to Question 5c. The candidate has given a reasonably detailed response explaining how the product could be manufactured in a school workshop as a one off production.

The response makes no reference to quantity production or methods that could be used when producing more than one item.

Question 6 (a)

6 You should use **the same** product you chose for Question 5 to answer this question.

(a) Identify **one** working or physical property of a material/component used in your chosen product and state why this makes it suitable for use in the product.

.....

.....

.....

..... **[2]**

Some candidates were able to identify a working property of a material or component used in their chosen product that made it suitable for use.

Many candidates focused on an aspect of manufacturing or features of the actual product such as size and shape and why this made them safe for use by a child rather than properties of the material or component.

Strength was the most common property identified across all material areas.

Question 6 (b)

(b) When designing the toys, the needs and views of the primary users and wider stakeholders would have been considered.

When the primary user is a young child, identify **two** stakeholders that should also have been considered when designing the toys.

1 .....

2 .....

[2]

Most candidates were able to identify one stakeholder.

Many identified two and achieved both marks.

Parents and retailers were the most common correct answers.

Question 6 (c)

(c) The structural integrity of products designed for children is important to ensure safety and reliability.

Explain how your chosen product is designed to withstand the forces and stresses of use by children.

.....

.....

.....

.....

.....

..... **[3]**

Some candidate responses showed a clear understanding of structural integrity and how products are designed with this in mind.

Many candidate responses were repeated answers of question 6 (a) or focused on the strength or durability of their chosen material rather than the design.

Question 6 (d)

(d)* Discuss why ergonomics are important in the design of children's products.

Use examples to support your answer.

..... **[8]**

Some candidates did not respond to this question. The majority of candidates that did respond to this question were able to access the marks available.

The majority of candidate responses focused primarily on anthropometrics and sizes of different parts of their chosen product in relation to the child.

Other responses demonstrated a broader knowledge of ergonomics and discussed aspects such as the visual appearance, texture and comfort of the product whilst in use.

High achieving candidates used a range of examples that they had experience of to support and substantiate their answers.

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Q1, Fig. 1

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