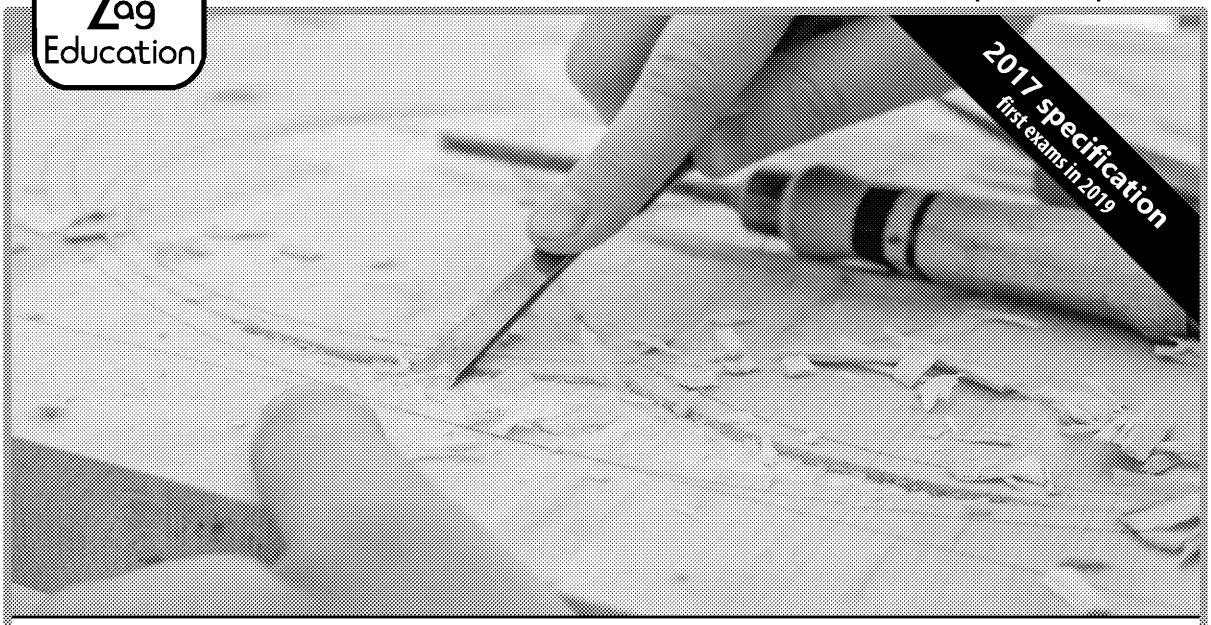
Zig Zag Education

DT

GCSE (9–1) | AQA | 8552



Practice Exam Papers

for GCSE (9–1) AQA DT

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POD 9807

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Teacher's Introduction

This resource consists of four brand-new, complete GCSE practice papers and mark schemes for AQA GCSE (9–1) Design and Technology (8552). The papers are closely aligned to the AQA sample assessment materials.

The four papers are accompanied by a specification coverage grid to show where and how each item is mapped against the specification. The whole specification has been covered across the four papers.

These papers will be a great resource for teachers as they prepare their students for public examinations. They can be marked using the comprehensive mark schemes, and feedback can be provided to help improve students' exam technique and diagnose their strengths and weaknesses.

Remember!

Always check the exam board website for new information, including changes to the specification and sample assessment material.

The papers assess the core technical principles, specialist technical principles and designing and making principles. Maths skills are also assessed throughout the resource.

These papers can be used in parts for homework, after specific topics have been taught, or they can be used in full for mock exams or for revision purposes.

The papers can be completed individually or in small groups. Students can then mark the papers themselves so that they can see how the mark schemes are applied and set out to further improve their own understanding of the exam itself.

The students' confidence will improve by completing these practice exam papers knowing that they will have been tested on every aspect of the specification.

April 2019

GCSE AQA Practice Paper Specification Coverage Grid

Specification point		Question Number			
		Paper 1	Paper 2	Paper 3	Paper 4
3.1.1 New and emerging technologies	Industry			1, 14.1	
	Enterprise	13, 14, 15	1		
	Sustainability			11	
	People		14	14.2	12
	Culture			8	
	Society				5
	Environment				6
	Production techniques and systems		2		
	How the critical evaluation of new and emerging technologies informs design decisions			12	
3.1.2 Energy generation and storage	Fossil fuels		3		3
	Nuclear power				14
	Renewable energy	1			13
	Energy storage systems, including batteries			2	
3.1.3 Developments in new materials	Modern materials	2			
	Smart materials	7	13	3	
	Composite materials		7	13	15
	Technical textiles		12		7
3.1.4 Systems approach to designing	Inputs	8		5	
	Processes			4	
	Outputs		6		
3.1.5 Mechanical devices	Different types of movement		8		2
	Changing magnitude and direction of force	3, 9, 10	11	6	8, 10
3.1.6.1 Material categories	Papers and boards		9	10	9
	Natural and manufactured timbers		4		1

Specification point		Question Number			
		Paper 1	Paper 2	Paper 3	Paper 4
3.2.4 Sources and origins	N/A		18		
3.2.5 Using and working with materials	Properties of materials	14		16	
	e modification of properties for specific purposes				17
	w to shape and form using cutting, abrasion and addition	17			
3.2.6 Stock forms, types and sizes	N/A	15			
3.2.7 Scales of production	[illegible]		15		18
3.2.8 Specialist techniques and processes	T[illegible]e of production aids	18			
	Tool[illegible]quipment and processes			15.1, 15.2	
	How [illegible]terials are cut, shaped and formed to a tolerance			17, 18	
	Com[illegible]ial processes		16		21
	Quali[illegible]ntrol				22
3.2.9 Surface treatments and finishes	N/A	1[illegible]			20.1, 20.2
3.3.1 Investigation, primary and secondary data	Use primar[illegible]d secondary data to understand client and/or user needs	20.1, 2[illegible] 21.1, 21[illegible] 21.3	25.2		23.1, 23.2, 26.1, 26.2
	How to writ[illegible]esign brief and produce a design and manufacturing specification				23.3
	Carry out inve[illegible]tions in order to identify problems and needs	22.2			
3.3.2 Environmental, social and economic challenge	N/A			22	26.4
3.3.3 The work of others	N/A		24.1, 24.2		
3.3.4 Design strategies	Generate imaginative and creative design ideas using a range of different design strategies		25.1		27
	Explore and develop their own ideas			23	
3.3.5 Communication of design ideas	N/A	23.1, 23.2 24	23.3		25.2
3.3.6 Prototype	N/A	19.1, 19.2			

GCSE
Design and Technology

Practice Paper 1

Name	

Time allowed: 2 hours

Materials required:
- Writing and drawing instruments
- A calculator

Instructions:
- Use black ink or black ballpoint pen. Use pencil only for drawing.
- Answer **ALL** the questions.

Information:
- The number of marks available for each question is shown in brackets.
- The maximum number of marks available for this paper is 100.
- There are 20 marks for Section A, 30 marks for Section B, and 50 marks for

SECTION A – Core Technical Principles

Questions **1–10** are multiple-choice questions. For multiple-choice questions, yo
you make a mistake, cross through the incorrect answer and shade the correct re

1 Which energy source is a form of renewable energy?

A Coal

B Oil

C Solar

D Gas

2 Which of the following materials is considered to be a modern materi

A Graphene

B Medium density fibreboard (MDF)

C Urea formaldehyde

D Spruce

3 Which mechanical device is an example of a class 1 lever?

A Tweezers

B Pliers

C Stapler

D Wheelbarrow

4 Which of the following is a ferrous metal?

A Zinc

B Copper

C Aluminium

D Iron

5 A material that will return to its original shape once a deforming force has which **one** of the properties given below?

A Toughness

B Elasticity

C Hardness

D Ductility

6 Which **one** of the following statements is tr[illegible]?

A Cotton is a synthetic [illegible]

B [illegible] a [illegible] fibre

C [illegible]ool is a natural fibre

D Polyester is a natural fibre

7 Thermochromic pigments react to which of the following?

A Pressure

B Stress

C Heat

D UV light

8 Figure 1 shows a circuit symbol.

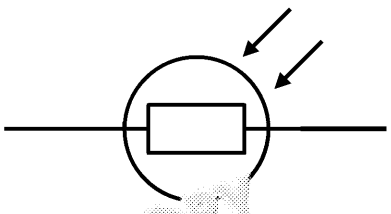

Figure 1

The circuit symbol [illegible] electronic component?

A [illegible]

B Pressure sensor

C Thermistor

D Light-dependent resistor (LDR)

9 Which type of follower will produce the least amount of friction between t

A Flat

B Point

C Roller

D Knife

10 Figure 2 shows a mechanical system.

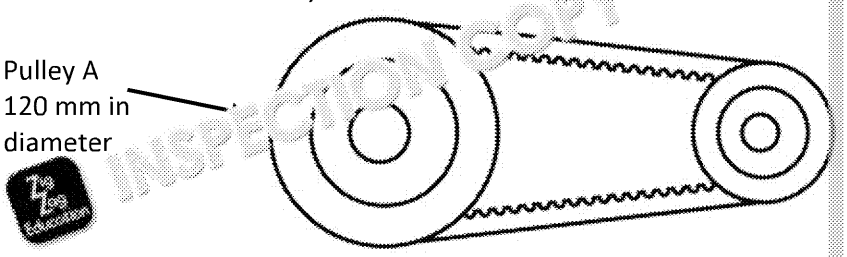

Figure 2

Analyse the mechanical system.
If pulley A rotates at 150 rpm, how fast will pulley B rotate?

A 3,000 rpm

B 200 rpm

C 150 rpm

D 90 rpm

11 State **two** properties of brass that make it suitable for use as a garden tap.

Property 1: .....

.....

Property 2: .....

.....

12 State **two** reasons why poly[illegible]ride (PVC) is used to coat electrical ca

1. .....

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2. .....

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13 . 1 Give **two** reasons why cooperatives are considered to be an effective

1. .....

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2. .....

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13 . 2 Explain why some consumers buy fair trade goods.

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.....

13 . 3 A company wants to raise funds for its new business by borrowing so
using crowdfunding to raise the rest.

It wants to raise £13.5 million in the ratio of 7:2 from the bank and cr

Calculate how much money the company needs to raise from crowdf

.....

.....

.....

.....

The following are examples of products made from materials whose properties w
the manufacturing process.

Product and material				
Soup carton manufactured from papers and boards	Lounge chair made from wood	Bangle made from metal	Patio chair made from polymers	Ki g fr

14 Choose **one** of the products shown in the t ble ab e.

Name **one** specific materia tha d be used to manufacture the produc

In th ei , se notes **and/or** sketches to explain the process of mod
of the ial before or during the manufacturing process.

Name of product selected: .....

Name of specific material: .....

15 Describe **two** different stock forms of materials.

Give examples in your answers.

1. .....

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2. .....

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16 . 1 Choose **one** product or component shown in **Figure 3** and describe **tw** to the selected product or component.

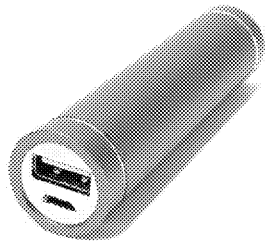
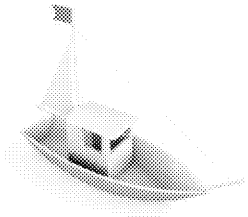
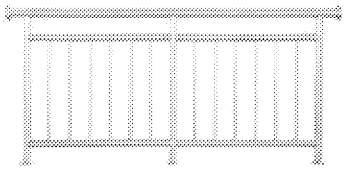
	
Aluminium power bank	Balsa wood model boat
	
Steel railings	Solid white board chocolate box

Figure 3

Name of product/component: .....

Ecological issue 1: .....

.....

.....

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Ecological issue 2: .....

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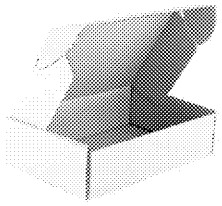
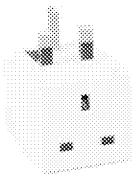
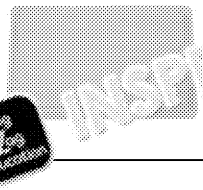
.....

16 . 2 Name **one** surface finish or treatment that could applied to the produ
chosen for question **16.1**.

In the box below, use notes **and/or** sketches to explain this process in

Name of surface finish or treatment: . . . . .

17 Choose **one** of the following and give **two** ways in which the material is sh
manufacture of the product.

		
Urea-formaldehyde – for use in electrical plug sockets	**Corrugated card** – for use in packaging product[illegible] during tran[illegible]ation	**St**
		
Beech – for use as a kitchen chopping board	**Wool** – for use as a pair of socks	**Pho** **bo** circ

Name of material/product .....

1. .....

.....

2. .....

.....

18 Manufacturers make use of templates, jigs and patterns where appropriate d

Examples include templates for marking out multiple items, drilling jigs an

Evaluate the use of templates, jigs and patterns during manufacture.

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..... *[You may continue*

The product below is a prototype of an electric tin opener for users with limited st

Specification:

- Mains power operated
- Wipe-clean smooth surface
- Can be used to open different sizes of tin
- Wide base area
- Ergonomically shaped

Evaluate the electric tin opener in terms of how it:

19 . 1 demonstrates innovation

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19 . 2 demonstrates suitability for the user

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19 . 3 consider ergonomics

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20 . 1 Explain what is meant by the term 'focus group' and why it is importa
consider focus groups.

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20 . 2 Name **two** other research methods that designers might use to carry o

Explain why each method is appropriate.

1. Name of research method: .....

   .....

   Explanation: .....

   .....

2. Name of research method: .....

   .....

   Explanation: .....

   .....

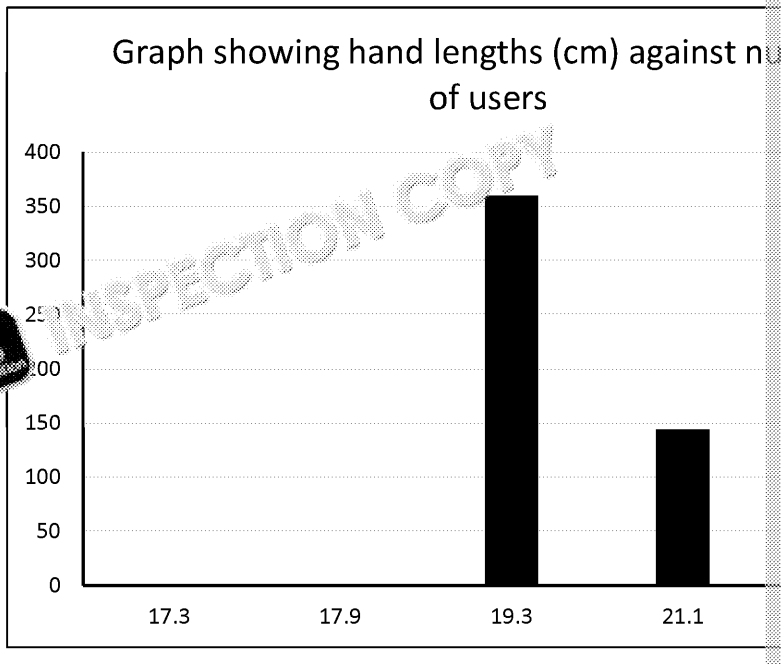
21 . 1 Y… have been asked to investigate the size of the electric tin opener s… more suitable for a wider range of users.

The data in the table below shows the hand length from a sample of 7…

Complete the table by calculating the missing number of potential ad…

Hand size (cm)	Number of potential users
17.3	
17.9	
19.3	360
21.1	144
21.9	36
Total	720

21 . 2 Using the information from the table in question 21.1, complete the b… the numbers of potential users.



21 . 3 Explain how the designer would use the information about hand leng
improving the design of the electric tin opener.

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22 . 1 Study the image and specifi[illegible] the electric tin opener shown at t

You have be[illegible]ke to develop the prototype to make it more appea

C[illegible]ur changes or additions to the original design specification, an
change/addition would make the electric tin opener suitable for a wi

You should not refer to the size or ergonomics of the electric tin oper

1. .....

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2. .....

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3. .....

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4. .....

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22 . 2 Explain why it is important for a designer to consider alterations to a d
this helps to ensure the interests of others are met.

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23 . 1 Name an appropriate visual, graphical technique designers might use t
design ideas to oth

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23 . 2 Explain why designers use different communication techniques to sh

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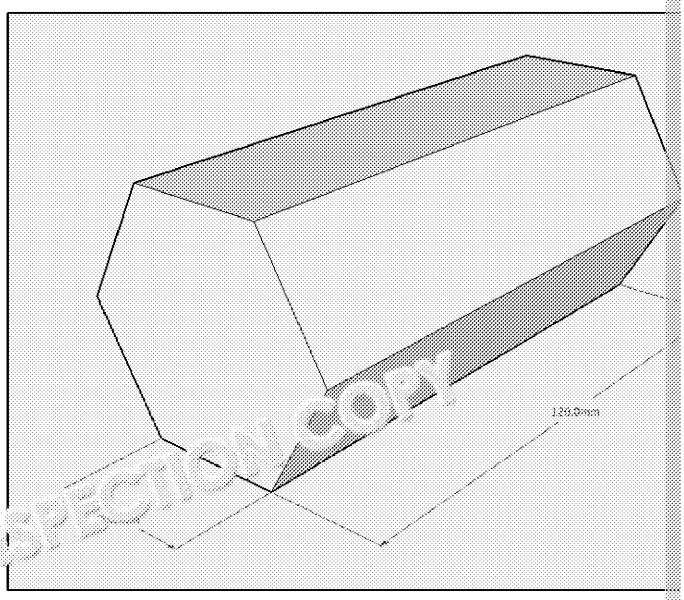
24 Below is a drawing of the packaging for a new chocolate bar.

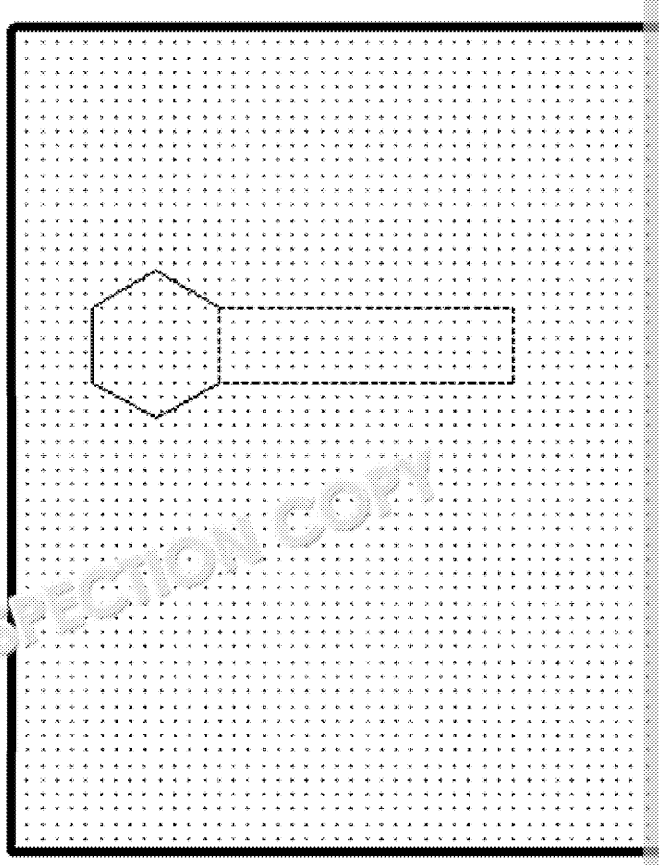


Complete the development for the packaging to a scale of 1:2.

One end has already been drawn for you.

Ignore all gluing tabs.

Mark with a dotted line where the development would be folded, as show



3 m

25 A full-sized prototype of the development is made up from several separat

The regular hexagon for the end is made up from six equilateral triangles. E
length of 30 mm.

The hexagon is cut from a piece of material measuring 60 mm × 60 mm.

Calculate how much waste material is left over once the hexagon has beer
material shown below. Give your answer in mm^2.

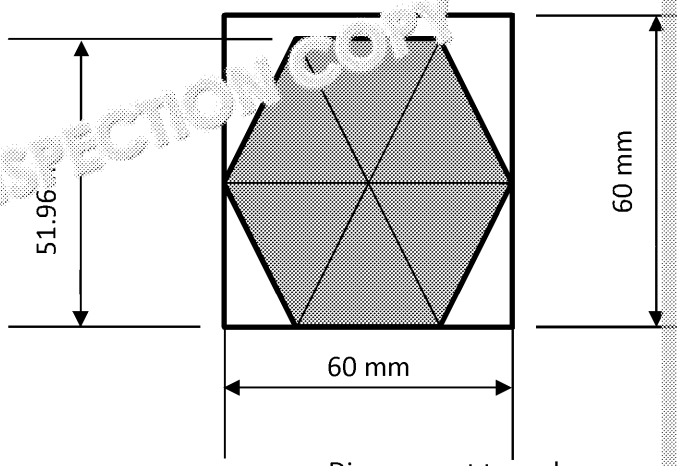


Diagram not to scale

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END OF QUESTIONS

Preview of Questions Ends Here

Mark Schemes

Practice Paper 1

SECTION A

Q.	Part	Marking guidance
1		**C** Solar
2		**A** Graphene
3		**B** Pliers
4		**D** Cast iron
5		El...
6		**C** Wool is a natural fibre
7		**C** Heat
8		**D** Light-dependent resistor (LDR)
9		**C** Roller
10		**B** 200 rpm
11		1 mark for each property correctly identified, up to a maximum of 2 m **Indicative content:** Properties of brass that make it suitable for a garden tap include: • resistant to corrosion • waterproof • good fluidity for casting to shape Accept any other valid response.
12		1 mark for each correct reason identified, up to a maximum of 2 mar **Indicative content:** • It is a good insulator of electri...ty • It is flexible • It will not cra... ...re with repeated bending • It is e... ...ed for identification purposes Ac... any other valid response.
13	1	1 mark for each correct reason identified, up to a maximum of 2 mar • They enable a group of people with the same business interests ... control over their business • They are a cost-effective way to sell and market goods and serv... • They protect the rights of their members • They ensure fair business terms and conditions apply to all me... Accept any other valid response.

13	2	1 mark for a valid reason. 2 marks for a valid and explained reason **or** two valid reasons given. **Indicative content:** • More money to the farmers (1 mark) • Consumers know that more of the money they have spent gets t farmer who grew the product (2 marks) • Better prices (1 mark) • Farmers and producers get a better price for their goods and se can pass on more wages to their workers to support families liv economically developed countries (2 marks) • Supports local workers (1 mark) • Buying fair trade goods means that goods have been produced b farmers/producers/plantations that meet certain environmenta economic conditions (2 marks) Award mark(s) for any other correct response.

13	3	2 × £1.5 million £13.5 / 9 = £1.5 or £1.5 million × 2 = £3 million

SECTION B

Q.	Part	Marking guidance
14		1 mark for correctly identifying an appropriate material (as per table Up to 4 marks for explaining the process of modifying the properties

Product	Material
Soup carton	Foil-lined board Laminated solid white b
Lounge chair	Oak Mahogany Beech Pine
Bangle	Copper Silver Gold Brass
Patio chair	HDPE ABS
Kitchen oven gloves	Cotton Polyester Cotton/polyester mix
Electronic product case	Aluminium

Award mark(s) for any other correct response.

3–4 marks	Complete explanation that is technically correct and sh knowledge and understanding of the methods employe modify the properties of the named material.
1–2 marks	A simple description with some correct elements. Show knowledge and understanding of the methods employe modify the properties of the named material.
0 marks	Nothing worthy of credit.

See next page for indicative content.

Indicative content:
The following are not model answers but show some areas of the an
may be presented. Credit both the description and the diagrams pre

Soup carton	The paper and board are laminated and coated with w surface finishes to prevent liquids from escaping. The to be sealed to prevent air from getting in. Coatings n inert to prevent any reaction with the food.
Lounge chair	The timber needs to be cut to size before it is seasone Once dry it can be machined to the correct shape and Thin strips could also be cut to laminate over a forme mechanical strength.
Bangle	The bangle can be heat-treated t remove any stresse up due to work hardenin Different meta ls be alloyed to improve the m and ae c perties of the original materials.
c in	itive can be added to the raw material to improv n echanical properties such as compressive strength. UV stabilisers can be added to improve resistance to which stops the colour from fading in sunlight.
Kitchen oven gloves	The material can be stiffened and the thermal proper improved by the inclusion of wadding. Heat-resistant and fireproof coatings can applied to t the fabric.
Electronic product case	An aluminium case can be anodised or alloyed with o or elements to improve mechanical strength, such as hardness or aesthetic properties.

15		For each of the two descriptions, award up to 2 marks as follows:

2 marks	Full description showing both knowledge and under of the different forms of stock material. Student refe they are used.
1 mark	Limited description with some misconceptions relat different stock forms and the way in which they are
0 marks	Nothing worthy of credit.

Indicative content:
The candidate will draw upon their own experiences of different ma to answer the question. For each stock form given, the candidate sho describe how it is used.

The following are examples of answers, but any other examples mus credit where correct.

- Paper is supplied in sheet form (e.g. A4) which is easily fed i photocopiers for copying sho and lo production runs
- Paper is supplied in l s which is easily fed into printing n newspapers a
- MDF is supplied in large flat sheets which are easily cut / machi make flat-pack furniture
- Plexiply is available in large thin sheets which are easily formed laminations
- Aluminium is available as ingots which are easily fed into a furn melting so that the material can be cast in moulds
- Copper is available in thin wires that can be used for electrical and circuits
- Acrylic is available in sheet form and is easily bent / shaped on to make leaflet/POS holders
- Fibreglass matting is available on a roll so that it can be cut to s up with epoxy resin to make GRP canoes
- Wool is available as a ball or hank. Wool is a naturally spun fibr knitted to make products such as socks, jumpers and scarves.

16	1	For each issue described, award up to 2 marks as follows:

2 marks	Complete description linking both knowledge and unde of the ecological issues relating to the product or comp
1 mark	Simple description containing some errors and limited understanding of the ecological issues relating to the p component.
0 marks	Nothing worthy of credit.

Indicative content:

Product	Ecological issues
Aluminium power bank	• Damage caused to the landscape by the extractio bauxite, the mineral that pr vides aluminium • Energy-costly proce to x act aluminium from places a huge d ma d energy resources
Balsa wood model boat	• Defor due to excess logging to meet dem • Ex landscape causes soil erosion as a result weeping away soil since it is no longer protected
Ep SB lemory stick	• Extraction of crude oil and subsequent processin produce the resin • Very difficult to process and recycle, meaning th being disposed of in landfill
Steel railings	• Damage caused to landscape due to the extractio • Energy-rich process due to the temperatures inv production of the steel and subsequent pollution
Solid white board chocolate box	• Timber needs to be grown to produce the pulp r the board • The fibres need to be bleached and cleaned as th processed from the cut timber, resulting in the u chemicals that have to be disposed of safely
Cotton cap	• Cotton plants are reasonably quick-growing • Quite a simple process to deseed the plants, whi carded and spun without the use of toxic chemic • Cotton requires a lot of water to grow, harvest a When cotton is grown, lots of pesticides are used leach into water sources and be ecologically dan

Award marks for any other valid responses.
Responses must relate to ecological issues.

16	2	**1 mark** for correctly identifying an appropriate surface finish or trea Expected surface finishes or treatments include:

Aluminium power bank	Anodised
Balsa wood model boat	Paint/varnish
Epoxy resin USB memory stick	Screen-printed logo / pad pr
Steel railings	Galvanised / painted / powd
Solid white board chocolate box	Hot foil blocking / spot varn
Cotton cap	Embroidery

Award up to **4 marks** for explaining the process as follows:

4 marks	Comprehensive description of the application of a surfa treatment. Complete understanding of the process, wit diagram or good notes to explain the process.
3 marks	A partially complete descri[illegible]n of the application of a s finish or treatment. Si[illegible]pl[illegible]derstanding of the proces partially labe[illegible]gra[illegible]or sound notes to explain the
2 marks	A lim[illegible]l[illegible]ption with some inaccuracies and omiss [illegible]d understanding shown, either with a simple diag with some short notes to describe the process.
1 mark	A description of the process, missing many of the stage errors. Only a diagram or notes, not both, that does/do say anything about the process.
0 marks	Nothing worthy of credit.

Indicative content:
The following descriptions of possible processes are not exhaustive a points and steps can be used to gain maximum marks. Notes should b with labelled diagrams.

Aluminium power bank
The surface would be cleaned and degreased. It would be placed into frame and electrically charged. The solution has the opposite charge which means the particles in the solution are attracted to the produc solutions will result in different-coloured surface finishes.

Balsa wood model boat
The surface would be rubbed down and sealed because balsa wood i Varnish or paint would then be sprayed or brushed on and left to dry would be rubbed down with fine glasspaper between coats.

Epoxy resin case
Silk screen or pad printed. The product is held in a jig and the surface is picked up on the pad – which contains the text required – before be transferred to the surface of the product. Silk screen printing requires mask to expose the required text. Paint is applied to the screen and is s the frame, allowing the paint/ink to pass through the exposed area on

Steel railings
The surface is cleaned and degreased. A primer and undercoat are ap to dry between coats. A final coloured layer is [illegible]ayed on and left to sometimes being put in a oven to dry [illegible]der.

Solid white board chocolat[illegible]
Die/press/mould i[illegible]for the image to be highlighted on the box. The box [illegible]a jig and the foil film is laid over the top before [illegible]ed, which transfers the image to the box. The film stick [illegible]fa[illegible]and the waste is removed.

[illegible]otton cap
The cap is held in a frame and placed under the embroiderer machin style / font size / stitch pattern is selected. The frame moves backwa forwards as the needle stitches the image through the fabric.
Award marks for any other valid responses.
Responses must relate to the product and a relevant and appropriate s

If a student has named and described a surface finish or treatm relates to a different product from the answer they have given i different surface finish or treatment from the indicative conten should still be awarded.

17		1 mark for each way in which the material is shaped or formed durin manufacture of the given product. **Indicative content:** **Material and product** / **Way in which the material would be shaped or** Urea-formaldehyde plug socket: • Slug or preform produced of a known mass • The slug is heated and put under pressure in the m spreading out to fill the mould cavity and forming socket Corrugated card packaging: • Punched on a die to cut out the main shape • Creased and folded into a box/carton shape Stainless steel knives and forks: • A blank would be stamped out • A second press would be used to produce the fin while trimming it to shape and size Beech chopping board: • The tree is felled and the timber would be cut in ready to be seasoned • Secondary machining such as planing/sanding/ would be used to shape the board Wool socks: • The wool is carded and spun into long yarns • It is then knitted into the sock shape Photosensitive PCB: • The board will be photo etched to produce the c on the surface of the board • It will then be drilled and components will be so the board
18		**9–10 marks**: A fully coherent and logical evaluation containing seve and reflecting an excellent understanding of the use of jigs and patterns during manufacture. A justified conclu drawn to say why the use of templates, jigs and pattern appropriate during the manufacture of products. **7–8 marks**: A reasoned set of points covered demonstrating a good un of the use of templates, jigs and patterns during manufact conclusions are drawn as to why the use of templates, jigs patterns is appropriate during the manufacture of product **5–6 marks**: Answer reflects some understanding of the issues relat use of templates, jigs and patterns, including a range of some analysis/evaluation. Response lacks some cohere any conclusions drawn may lack substantiation. **3–4 marks**: Limited understanding of the issues and related discus Limited analysis and evaluation which lacks coherent t Limited conclusions with no supporting evidence. **1–2 marks**: One or two brief points given with limited explanation. shows very little understanding of the issues, with no t argument. Subjective comments only rather than evalu conclusions present. **0 marks**: Nothing worthy of credit. **Indicative content:** The following indicative content is intended to illustrate points that st make with regard to the examples given in the question, which would their understanding of why templates, jigs and patterns are used in th of products. Students may discuss some or all of these examples, or m examples in their answer. There is no requirement for students to d examples given. You should award marks for anything worthy of credi Templates • Easy/quick to draw around • Can be used to lay plan materials to reduce waste • No specialist skill required or training needed to be able to use • Easily stored and retrieved if used during batch production • Can be used to mark out seam allowances and points to drill an • May get worn around the edges as they are used repeatedly the will become smaller in size • Parts may get broken off Jigs • Set up on machines to ensure critical drilling of holes/pieces

		• Used to hold component parts in place for welding • Quick to lock parts together and easy to remove • Can be used to check sizes and alignment of parts • Bits might get stuck in the jig meaning parts no longer fitting in places, resulting in incorrect joints • May become accidentally welded together which means they will Patterns • Used to mark out textile patterns • Allow for lay planning for efficient use of materials • Used in foundries for casting metal products and can be used re • Easily generated from CAD software and cut on different CAM m • May get cut / bits cut off which means they will no longer be the size / shape • May get become creased or folded whi ld result in the wro being cut • Casting patterns may h e d ed which means the cast piec surface blemish t

SECTION C

19	**1, 2, 3**	Award marks for each of the three parts of the question as fol

3–4 marks	Well-described and justified comments, fully evaluated. B positive and negative factors are considered and a justifi conclusion is drawn.
1–2 marks	Limited points presented without any explanation. Lim analysis and evaluation with a focus on only the positiv negative factors.
0 marks	Nothing worthy of credit.

Allow positive and negative responses. Responses may include the fo
of answer.

Indicative content:

Demonstrates innovation	• Use of power to assist in the opening of tins • Removes the need for the user to turn any han levers to open the tin • Eliminates the need for the user to hold the ti reducing the risk of them cutting their hands • A motor is used to provide the turning motion
Demonstrates suitability for the user	• Safer to use as edges will be cleaner / less jigg one operation • Allows those with limited strength/mobility t have tinned foods • Hand-sized – can be held without too much di • Large switch/button at the top for easy operat
Considers ergonomics	• Sleek/rounded shape – easily fits into the han • Can be used by left- and right-handed users, b easier to use if you are right-handed because t will be moved down with your thumb • Smooth surface shape wi out any sharp edge • Curved internal e s t the shape of the ti

20	**1**	Award marks as follow

3–4 m	Re nse h ws a clear understanding of what a focus g g understanding of why it is important for designe consider focus groups, drawing upon relevant points to this, as per the indicative content below.
1–2 marks	Response shows basic knowledge of what a focus group understanding is limited without any points to illustrate groups are used.
0 marks	Nothing worthy of credit.

Indicative content:

A focus group is a group of potential users of products or services.

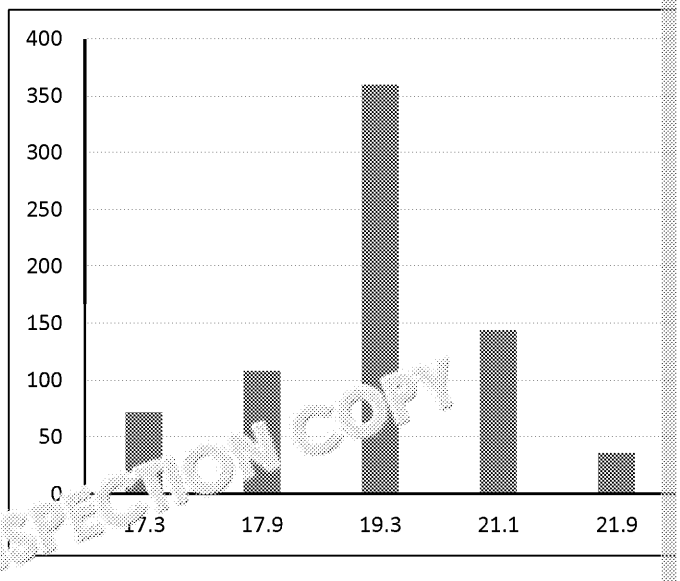
Designers need to consider focus groups in order to:

- test products or services
- provide feedback, views and opinions of products or services
- determine whether consumers would buy or use the products

20	2	**Award 1 mark for each valid method, up to a maximum of 2 mar** **Award 1 mark for each reason up to a maximum of 2 marks.** Indicative content is given below but the list is not exhaustive. Award any other valid responses. **Method** / **Reason** Telephone interviews – Able to contact lots of people quick over the country without having to Human measurements – So that products fit users exactly Product testing – So that they can see how users inte products in terms of size / ease of
21	1	1 mark for correct answers. 17.3 – 10% user × 9 – 2 × 36 = 72 users or 20%/2 = 144/2 = 72 17.9 – 15 5% = 3 × 36 = 108 users

Hand size (cm)	Number of potential users	Total (%)
17.3	**72**	10
17.9	**108**	15
19.3	360	50
21.1	144	20
21.9	36	5
Total	720	

21	2	1 mark for each correct bar drawn on the bar chart. If calculations are incorrect in question 21.1, errors can be carried o should be given here for presenting data correctly.



21	3	Marks awarded as follows: **3 marks**: Explanation is correct and demonstrates a clear unders… together with a thorough explanation of how the inform… would be used when improving the design. Considerati… not just to hand length but also to finger length and pot… areas. **2 marks**: Explanation is correct and demonstrates some underst… there is little linking of how the information would be u… improve the design; likely to focus solely on hand lengt… **1 mark**: Explanation is correct, demonstrating a basic understa… explanation of how the information would be used. **0 marks**: Nothing worthy of credit. **Indicative content:** • They would be able to make sure the tin opener is not too big to… around the handles with one hand • They would ensure that the button on the top is not too far away… with the thumb • They could consider integrating some form of grip shape / textu… the body to make it easier to hold • They would be able to ensure that there is enough clearance aro… to be able to get your hand out once the tin has been opened Award marks for any other valid responses.
22	1	**1 mark for each change or addition to the specification.** **1 mark for an explanation of why the change/addition is import…** **Indicative content:** • The product could be coloured to fit in with different kitchen co… styles, e.g. someone with existing red kitchen gadgets and appli… be more inclined to buy the tin opener if it were red rather than… • It could incorporate a textured grip area to make the product sa… user • A small LED light could be incorporated to help show where the… placed (the exact location is on the underside of the overhangin… could be a bit dark to see) • The button on the top could have a textured surface, making it l… the user's hand will slip when operating the gadget, especially i… hands are wet • A magnetic arm to hold the lid once it has been cut from the tin… doesn't drop off and pose a risk to the user of cutting their hand… • Make it battery operated rather than mains operated so that it c… anywhere in the kitchen / does not need to be near a plug • Feet on the bottom to lift it off the work surface in case there are any… spillages that could find their way into the product / cause dam… internal electronics Award marks for any other valid points.

22	2	

3 marks	Clear understanding of the need for a designer to consi alterations to a design brief, including a detailed under how this helps to deliver a successful outcome.
2 marks	Some understanding of the need for a designer to consi alterations to a design brief, with limited understandin this helps with the success of the outcome.
1 mark	Basic understanding of the need to consider alteration brief but without any understanding as to how this con the outcome.
0 marks	Nothing worthy of credit.

Indicative content:

- They run the risk of designing a product that will not work
- The final product may not sell if they do not listen to feedback a changes to the brief is suggested
- They may not get any more work from the company/client they the do not listen to the comments/suggestions made
- They attach little value to any consumer feedback as a result of testing

Award marks for any other valid responses.

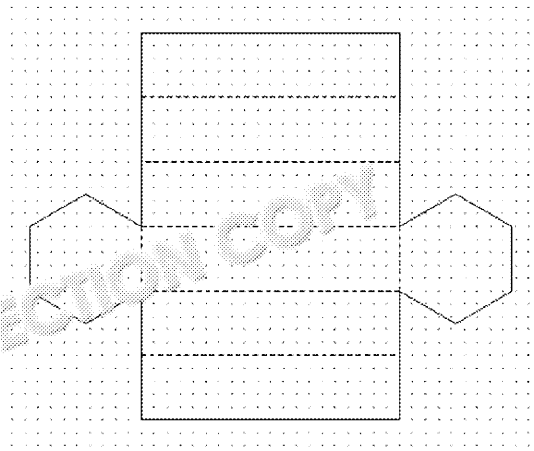
23	1	1 mark for an appropriate answer. **Indicative content:** • Isometric • Perspective • Orthographic • Exploded views Accept any other valid response.

23	2	

3 marks	Excellent understanding of why designers use different communication techniques to show their design ideas t
2 marks	Some explanation of why designers use different comm techniques to show their design ideas to others.
1 mark	Limited explanation of why designers use different con techniques to show their design ideas to others.
0 marks	Nothing worthy of credit.

Indicative content:

- 3D drawings are used to show potential customers what the pr look like
- Formal orthographic drawings are used to show production en big component parts and how components might fit together
- Parts lists / exploded drawings are used to produce costings fo and materials
- Schematic drawings are used to show circuit design
- Scaled drawings are used when products are too big to be draw
- Computer drawings / models are used to test and simulate wor conditions, such as wind or stress loading

24		1 mark for correct scale. 1 mark for second hexagonal end. 1 mark for the five additional sides. 1 mark for the dotted lines along the long rectangular folds. 1 mark for the dotted line where the hexagonal end meets the rectan There are several different solutions to this development. 
25		1 mark for calculating the height of the triangle 1 mark for working out the area of one triangle 1 mark for working out the area of six triangles (the hexagon) 1 mark for calculating the waste area Calculation: H = 51.96/2 = 25.98 $A_{triangle}$ = 1/2 × 30 × 25.98 = 389.7 mm² $A_{hexigon}$ = 389.7 × 6 = 2338.2 mm² A_{waste}= 60 x 60 = 3,600 mm² – 2,338.2 = 1,261.8 mm²

Practice Paper 2

SECTION A

Q.	Part	Marking guidance
1		**B** Virtual marketing
2		**A** The design of new products using specialist software
3		**D** Coal
4		**C** Plywood
5		**C** Hardness
6		**A** Buzzer
7		[illegible]lass reinforced polymer (GRP)
8		**B** Reciprocating motion
9		**C** Foil-lined board
10		**A** Elastane
11		MA = Load/Effort = 450/150 3 or 3:1
12		1 mark for each correct reason given, up to a maximum of 2 marks. **Indicative content:** • Gore-tex® is waterproof, keeping the wearer warm and dry, bu small water-based droplets to 'evaporate' through the membran • Kevlar® has very high tensile strength yet is hard-wearing, flexi lightweight which makes it very effective for use in body armou vests • Conductive fabrics allow an electrical signal to pass through the allowing them to be used with LEDs and in-built headphones • Fire-resistant fabrics have been developed to withstand high temperatures and combustion when exposed to a naked flame • Microfibres and microencapsulation are very thin and are capabl trapping liquids or having scents and vapours trapped inside th are released when they are rubbed or heated making them usefu off body odour in sports clothes Accept any other valid response.
13		2 marks for a valid explan[illegible] the term 'smart materials' 1 mark for naming a correct and appropriate smart material. **Indicative content:** • A smart material is one which reacts and responds to an externa or input such as UV light, pressure, moisture, stress, pH [2 mark • A material that changes in response to a change in the local envi [1 mark] **Smart materials:** • Shape-memory alloys (SMAs) • Thermochromic pigments • Photochromic pigments • Quantum tunnelling composites Award marks for any other correct response.

14		2 marks for a valid explanation of why it is important to consider the the elderly. 1 mark for a correct and appropriate example of a product. **Indicative content:** • New products and designs should look to be inclusive wherever so that the elderly are not left out or discriminated against beca their age / issues such as mobility or strength • Some elderly people have very specific needs, e.g. those with mo issues who require specific products and devices to help them n keep active / mobile so as not to cause associated/related issues **Products:** • Stairlifts • Walking frames • Tin openers Award marks for any other correct response.

SECTION B

Q.	Part	Marking guidance
15		ac. process explained, award up to 3 marks as follows:

3 marks	Complete explanation showing a thorough understandin production method.
2 marks	Detailed explanation linking both knowledge and understanding of the production method.
1 mark	Simple explanation containing some errors and limited understanding of the production method.
0 marks	Nothing worthy of credit.

Indicative content:

Batch production

- Products are produced on a production line which enables identi products to be made to the same size/fit
- Workers are semi-skilled and flexible because batches might be qu number, i.e. workers need to be able to adapt to the product/tasks
- Sometimes pre-made parts are brought in from other companies only small quantities might be required and it is not worth the co making them themselves / the company does not have the skills machinery to be able to do so
- Often batches can be made quickly in response to consumer/mark
- Production lines can be changed quickly in response to consume
- Jigs and fixtures are often used to ensure the accurate positioning assembly of components, thereby ensuring all the products are th

Mass production

- This type of production can run 24/7
- In general, unit costs are lower due to high volume output
- Machines are set up to work non-stop; therefore, there is little do terms of not having machines running / products being manufact
- Volumes are high since there is a predet. ed number of prod ordered / high volume to be pro. d
- It requires a high initial inv. ne. n machinery/tooling
- Workers general. ir. the skill since machines are fully/se automatic. it just a case of topping up materials/oil
- Skil. ans are required to service complex/automated m
- T. needs to be checked at specific times to ensure that prod made are of the correct size / avoid tool wear

Continuous production

- Products are produced continuously to produce stock items to be
- Factory will operate 24/7 without any downtime during manufac
- Machines and tooling are set up and dedicated to the product/co being manufactured
- Mainly low-skilled workers who keep the materials topped-up, b skilled technicians to service and maintain machines
- Takes place on a production line which enables identical product made to the same size/fit
- Highly automated machines set up for single task/operation

16

Check the table below.

Product mark:
1 mark for correctly matched product to process.

Reason:
A reason clarified (detailed process description) = 2 marks
A simple description = 1 mark

No repeated products.

Product	Process	Suitability of manufacturing proce[ss for] product
Aluminium bike frame	Welding	• Welding melts the materials at a 'lo[cal] point; when the new parent materia[l is] added, it simply fuses together and solidifies just like the original mater[ial] • Welding creates a strong joint whic[h] bike frame will need
Silk scarf	Batik	• The silk can take a wax mask before colours are painted onto the surface silk which will absorb the colour • Colours can be applied to the scarf
Circuit board	Soldering	• Components are placed through the [...] board and the legs meet copper pad[s] joint between the copper pad and component leg is heated with a sold[ering] iron, and solder is put onto the heat[ed ...] which melts to form a joint • A soldering iron is used to melt sold[er to] make a joint
Curved wooden kitchen spatula	Laminatio n	• Thin strips/layers of wood/flexiply [a...] coated with glue. They are held in a f[...] (cut to the required shape) which is [...] a vice while the glue dries/ sets –usu[ally] about 24 hours. Once dry, the strips [...] stuck in the required shape. • Strips of wood are glued and held in a [...]
Circular wooden fruit bowl	Turning	• A wooden blank is screwed to a face[plate] and then mounted on a wood lathe. A chisel/gouge is held against the rota[ting] wooden plank to remove the waste [and] shape the profile / hollow out the m[iddle of] the bowl. • A wood lathe is used to spin the wo[od ...] is cut with a chisel
A4 folded leaflet	Creasing	• A creasing machine is used to creas[e ...] printed leaflet in the correct place s[o it] can be easily folded without causing damage, leaving a sharp fold • A creasing machine folds the leaflet [...] has been printed
T-shirt	Screen printing	• A mask is produced on a mesh whic[h ...] over the T-shirt before ink is laid on [the] mesh and moved across it with a squ[eegee] pushing ink through the mesh to cre[ate the] desired image. Several screens can b[e used] with different-coloured inks to mak[e] multicoloured images. • A screen is made and ink is pressed through it to create an image

G clamp	Casting	• A pattern is made of the required s which is then packed in sand in a cope/drag before being removed t a cavity. Molten metal is poured in a runner and left to cool before the broken open to leave a solid shape • Molten metal is poured into a cavit form a shape
Fizzy drinks bottle	Blow moulding	• A parison is formed and lowered d an open mould which clamps shut around the preform. Compressed a blown into the preform, forcing the polymer cool against the mo form a bottle. Air is blown into a soft plastic tube mould
Chocolate box	Vacuum forming	• A mould is made of the required sh polymer sheet is clamped down, he and softened before the air below is removed, forcing the soft polyme down over the mould. • A sheet of softened plastic is sucke over a mould
Breakfast cereal box	Die cutting	• A die is made which matches the sh the box to be cut out. The outside s blade, and any folds or creases are with a V-shaped blade so as to mak the box where it will be folded. • A die is made to cut out the shape box with a sharp blade

17		1 mark for calculating how much has been used. 1 mark for working out how much is left. Calculation: 5/8 × 240 = 150 cm used 240 – 150 = 90 cm left over ECF to be applied if the first part is wrong but the second sum is corre

18		1 mark for each appropriate answer. **Indicative content:** • grass • trees • rice • oil • wool • silk • metal ores • bauxite Accept any other valid responses.

19		2 marks for an explanation. 1 mark for an example of a product which relates to the chosen force o

2 marks	Complete explanation linking both knowledge and under of the force or stress.
1 mark	Simple explanation containing some errors and limited understanding of the force or stress.
0 marks	Nothing worthy of credit.

Indicative content:
Tension
The ability of a material to withstand being pulled apart / stretched w subjected to an external force.

Lifting ropes / tow bar

Compression
The abilit[illegible] to withstand being squashed due to external f[illegible] subjected to external forces.

[illegible] jaws / concrete foundations / chair leg

Bending
The ability of a material to withstand deflection as a result of point/un loading when supported by one/two end(s)/point(s) without breaking
Springboard / diving board / aircraft wings / bridges

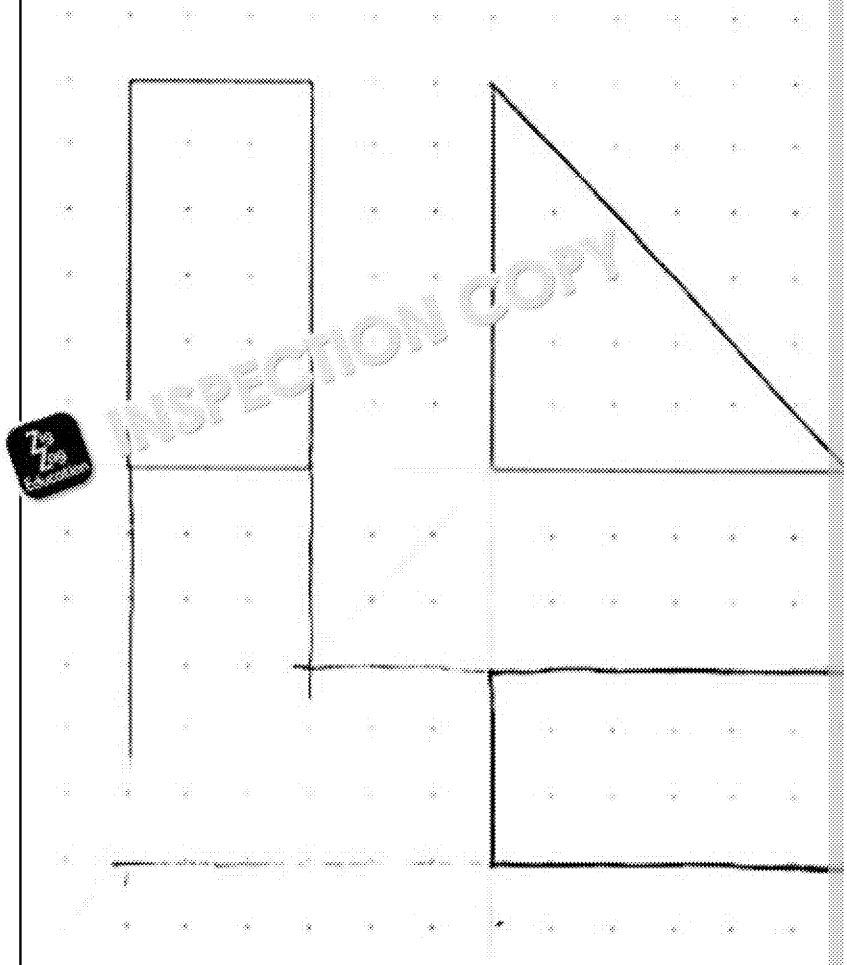
Accept any other valid responses.

20	**1**	1 mark for each social factor in relation to the selection of materials an components. 1 mark for explanation of why it is important. **Indicative content:** • It is important to know where the materials come from / account source/origin of the materials to show provenance in relation to t materials coming from a sustainable source / being recycled mate • All materials have some kind of carbon footprint; therefore, know materials have come from / how far materials have travelled is in in terms of being able to say that the materials are environmentall • Working conditions of the staff who make the products / work fo company are important in that they should be paid a fair wage an factories and environments that are safe • Health and safety standards should be applied and maintained so working in factories are safe and work with machines that are saf • Companies operate local schemes to supp[illegible]cal charities and fou which support local causes / peop[illegible]who [illegible]ay be working for them • Companies should be com[illegible]ed to [illegible]nvesting in staff training and development, mea[illegible]he staff will feel more valued / learn new develop wi[illegible]he company rd [illegible]ks for any other valid points.

SECTION C

21	1	Award marks as follows: **3–4 marks**: Response shows a clear understanding of the suitability sandwich box for the sandwich shop, drawing upon rel points to illustrate this, as per the indicative content be **1–2 marks**: Response shows a basic understanding of the suitabilit sandwich box for the sandwich shop but is limited with points to illustrate this. **0 marks**: Nothing worthy of credit. **Indicative content:** • It is supplied flat-pack which means it can be stored flat before us meaning it does not take up lots of spac • It can be customised with sticker to close the box / seal the box o sandwich has been plac le, thereby acting as a form of adve • Once made, two b e can be stacked together to form a square, r the prod p less space on the shelf / in the fridge; theref s can be put on display
21	2	rd marks as follows: **3–4 marks**: Response shows a clear understanding of the suitability sandwich box for the consumer, drawing upon relevant p illustrate this, as per the indicative content below. **1–2 marks**: Response shows a basic understanding of the suitability sandwich box for the consumer but is limited without an to illustrate this. **0 marks**: Nothing worthy of credit. **Indicative content:** • The size of the see-through window allows the consumer to see w of sandwich is inside, thereby allowing them to make a choice abo type of sandwich to buy • The box is in an easy to hold / grab shape which makes it less like sandwich will be dropped • It helps to protect the sandwich from getting damaged / prevent contents falling/spilling out during transportation
21	3	Award marks as follows: **3–4 marks**: Response shows a clear understanding of the suitability sandwich box for the recycling centre drawing upon rele points to illustrate this, as per the indicative content belo **1–2 marks**: Response shows a basic understanding of the suitability sandwich box for the recycling centre, but is limited with points to illustrate this. **0 marks**: Nothing worthy of credit. **Indicative content:** • It can be easily squashed/compressed so it takes up less space du subsequent transportation to factories for processing • The biodegradable window needs to be separated from the solid w board because biodegradable polymers should not / cannot be re this adds to the cost of recycling • Plain white solid board can be sold on for processing so that it ca turned into other forms of paper-based materials

22		2 marks for each explanation for each of the two availability factors. **2 marks** – Complete explanation linking both knowledge and unders of the issues that relate to the relevant availability factor. **1 mark** – Simple explanation containing some errors and limited understanding of the issues that relate to the relevant av factor. **0 marks** – Nothing worthy of credit. **Indicative content:** **Cost** • If the cost of the raw material is too high, it makes the overall cos packaging too expensive • The cost of the packaging will be bui th overall cost of the s meaning that the customer ul in tel ds up paying the price of packaging **Availabili** If c material is not widely available, the price will increase supply/demand issues; therefore, the packaging will go up in pric cost being passed onto the consumer • Other materials would need to be considered/sourced for the pac which might be more expensive / damaging to the environment / increasing demand/pressure on natural resources Accept any other valid responses.
23	**1**	1 mark for calculating the waste from one triangle. 1 mark for calculating the total waste from two triangles. 1 mark for calculating the waste from the rectangular strip. 1 mark for calculating the total waste from one window. 1 mark for calculating the total waste from 1,000 windows. Calculation: $50 \times 50 \times ½ = 1{,}250\ mm^2$ $1{,}250 \times 2 = 2{,}500\ mm^2$ $120 - 115 = 5\ mm$ $5 \times 100 = 500\ mm^2$ $2{,}500 + 500 = 3{,}000\ mm^2$ $3{,}000 \times 1{,}000 = 3{,}000{,}000\ mm^2$
23	**2**	1 mark for calculating the t erial per window 1 mark for showing t 1 mark for c er la on: $12 \times 10 = 120\ cm^2$ Percentage waste = $30/120 \times 100$ $0.25 \times 100 = 25\%$ Apply ECF if the 30 is carried over as an incorrect answer from 23.1.

23	**3**	1 mark for the correct diagonal on the front view. 1 mark for the correct length on the plan view. 1 mark for the correct width on the plan view. 1 mark for the correct position of the plan below the front view. 

23	**4**	3 marks for a detailed explanation of why materials or components are manufactured to a tolerance. 2 marks for a simple explanation of why materials or components are manufactured to a tolerance. 1 mark for a valid simple point made without any specific mention of t • Tools/dies that are used to cut materials will wear with repeated therefore, the windows will get small ow ver, with a tolerance allowance they will be slightly o ers. , meaning they will still f opening • There may be s all ons in the size of the window which wi cut to herefore, there is an allowance for an overlap n error The size of the supplied material may fluctuate; therefore, an allo the overall size will compensate for this Accept any other correct responses.

24	1	1 mark for naming a specific product produced by the company that w on the paper by the candidate (from the list below): • Alessi • Apple • Braun • Dyson • Gap • Primark • Under Armour • Zara Examples of products: • Specific types or forms of clothing • Shavers • Hairdryers • Curling tongs • Mobile [illegible] • L[illegible] • Co[illegible]puters • Lemon squeezers • Air blades • Hoovers (Dyson cleaning devices)

24	2	

5–6 marks	A fully coherent and logical discussion which contains se points, reflecting an excellent understanding of how the the company has evolved over time in response to the ch needs and wants of its clients, and an evaluation with a ju conclusion drawn to say how.
3–4 marks	A reasoned set of points covered which reflects a good understanding of the issues relating to how the work of t company has evolved over time in response to the chang needs and wants of its clients, and an evaluation with an appropriate conclusion given.
1–2 marks	Answer reflects some understanding of the issues relatin the work of the company has evolved over time in respo the changing needs and wants of its clients. Limited conc with no supporting evidence.
0 marks	Nothing worthy of credit.

Indicative content:

- Clothing has changed to incorporate new and emerging technolog
embedding smart fibres into clothing, and microencapsulation in
- Some mobile phones use fingerprint technology to recognise user
allowing them access to be able to make calls / access apps
- The development of battery technology and miniaturisation has e
electronic products to become smaller, e.g. mobile phones / Appl
- The development of processing power has enabled mobile phones
increased processing / storage capacity as users download more a
store music / pictures on their phones
- Fashion chains respond to trends / seasons / cultural influences /
shows in terms of updating their clothing ranges
Form versus function is often reflected/challenged in new housel
products, resulting in products that are more modern/stylish
- Some companies have embraced / responded to consumer pressu
awareness to ensure that materials and products are ethically sou
- Consumer awareness of fair trade products and the working cond
the workers who make the products/garments
- Increasing awareness of 'green' miles in terms of carbon footprin
to the movement/transportation of goods around the world, mea
more goods are being manufactured closer to home

25	1		

5–6 marks	A fully coherent and logical description which contains points relating to a design strategy and how it is used to generate creative and imaginative design ideas.
3–4 marks	A set of points given which describes a design strategy and makes some links to how it is used to generate creative imaginative design ideas.
1–2 marks	An answer that reflects some understanding of the design strategy without any links to how it is used to generate and imaginative design ideas.
0 marks	Nothing worthy of credit.

Indicative content:

Collaboration

- Designers work with other designers to share and gather ideas or to and work on problems together
- Designers are able to bounce ideas off each other with a view to improve the design solution
- Designers can work at home and can share ideas online via a digital whiteboard / digital platform

User-centred design

- This focuses on working to fulfil the wants and needs of the user
- The client remains at the heart of the process and is fully consulted th
- Interviews and questionnaires are often used to capture the users' wants
- Continued research and surveys are used to monitor the performance product (once it has been in use) as it helps to improve future design

A systems approach

- Systems design tends to be used when designing electronic/mechan computer-based products
- Blocks are used to represent stages/processes/decisions, such as input/output and control stages
- Systems blocks can be designed in insolation and modelled individu before being connected to each other to make a whole system

25	2		

5–6 marks	A fully coherent and logical discussion about how designers gather and use primary and secondary research data to understand client and user needs.
3–4 marks	Several points made which describe how designers gather use primary and secondary research data to understand and user needs.
1–2 marks	An answer that reflects some understanding of how designers gather and use primary and secondary research data to understand client and user needs.
0 marks	Nothing worthy of credit.

Indicative content:

- Primary data can be collected by interviewing consumers / using questionnaires / consulting focus groups / looking at existing products / carrying out research into materials / taking measurements
- Primary research is first-hand information and is very often closely to specific user groups and their needs, and to existing product and establish what works well and what could be improved
- Primary data often relates to a very specific design problem or task
- Secondary research is often based on a much wider audience / resp
- Secondary research can be gathered from indirect sources such as textbooks, journals, newspapers and web pages
- Government statistics / company information / official data are all secondary research
- Secondary research provides a much wider range of information a from a bigger cross section

Practice Paper 3

SECTION A

Q.	Part	Marking guidance
1		**D** High cost of buying and installing equipment
2		**D** 6
3		**B** Shape-memory alloy
4		**B** Decision
5		**C** Thermistor
6		**A** Eccentric
7		**A** Acrylic
8		**C** Tube
9		**B** Copper
10		**A** Isometric
11		1 mark for each correct finite resource given, up to a maximum of 2 marks. • Coal • Oil • Gas
12		1 mark for each correct reason given, up to a maximum of 2 marks. **Indicative content:** • It makes consumers buy new products which keeps money coming in and maximises profit • They can keep staff employed in the manufacture of new products • They make use of new materials / improved technology to make more powerful products to keep customers loyal Accept any other valid response.
13		2 marks for a valid explanation of the term 'composite'. **Indicative content:** • A composite is a mixture of two or more materials, often with some kind of matting or fibre which is mixed with some kind of adhesive / binding agent to make a new/improved material [2 marks] • A mixture of two or more materials [1 mark] Award marks for any other correct response.
14	1	2 marks for a valid explanation of how new and emerging technologies are having an impact on buildings and the places people work. **Indicative content:** • More flexible use of building space / office space / hot desking to meet the need to increase staff flexibility and performance, and to help reduce office costs • Smaller factories due to just-in-time deliveries and products being shipped as soon as they have been manufactured • Larger warehouse spaces / taller buildings because robots put away items, e.g. to fulfil orders for Amazon; robots can move higher/faster than humans, thereby reducing the likelihood of health-and-safety-related issues • Greater use of robots and AGVs to move goods and products around warehouses has reduced the need for drivers / forklift drivers Award marks for any other correct response.

14	2	1 mark for working out 12.5% as a decimal. 1 mark for working out how many staff will lose their jobs. Calculation: 12.5/100 = 0.125 0.125 × 240 = 30 ECF to be applied if the first part is wrong but the second sum is corr

SECTION B

Q.	Part	Marking guidance
15	1	Award up to 3 marks as follows: **3 marks** — Complete explanation of 'wasting', showing a thorough understanding of the term. **2 marks** — Detailed explanation of 'wasting', linking both knowledge understanding of the term. **1 mark** — Simple explanation of 'wasting', containing some errors showing only limited understanding of the term. **0 marks** — Nothing worthy of credit Wasting is a process that produces waste such as sawdust, metal filings slithers of paper and card, metal legs for components, bits of thread forms of unusable material generated as a result of cutting bits off or sanding/abrading a material.
15	2	**5–6 marks** — Comprehensive description of the wasting process. Com understanding with a labelled diagram and good notes to the process. Tools and equipment are labelled accurately **3–4 marks** — A partially complete description of the wasting process understanding with a partially labelled diagram or sou to explain the process. Tools and equipment are labelled some accuracy. **1–2 marks** — A limited description with some inaccuracies and omiss Limited understanding shown with either a simple diag some short notes to describe the process. Tools and eq are drawn but not named or labelled. **0 marks** — Nothing worthy of credit. See next page for indicative content.

Process	Description of the process
Die cutting	• A die is used to cut paper or card to a predeterm shape, often an outline of a net. A blade will cut material out of a sheet / stock form. Other tools are used at the same time to cut perforations or crease the material for folding.
Turning	Metal • The work piece is held in a chuck which is drive motor. As the work rotates, tools that are held i post are moved to cut across the face of the me parallel to it, to reduce the external diameter. O processes such as taper turning, parting, knurli drilling and boring could also be described/sho Wood • The work piece is held on a faceplate or betwee The work is rotated by a motor but the tools are hand and moved while resting on a tool post. Ext and internal shapes can be cut with a variety of t addition, finishing can be done while the work is mounted on the lathe by applying a varnish, wax

Milling	•	The work is held in a clamp or machine vice wh bolted to the bed of the machine. The work is m three axes past a rotating cutter. Grooves and s be cut depending on the type of cutter used. A l is often used to aid the cutting and to help remo waste material.
Drilling	•	The work is held in a machine vice or clamped t bed of the machine. Different types of drill bit c used (twist, flat, countersink, hole saws) to cut or 'blind' holes. A piece of scrap wood is placed underneath the work to protect the drill bit and of the machine. The guard must be closed to sto bits coming off that could h t the user. The dept can be used to drill l les.
Cutting and shearing	•	Scissors, sh ar an notines can all be used t cut/s terials. Cutting is used to separate s from stock lengths to make them the ze ready to be joined to other parts/products. lines and curves can both be achieved, although guillotines can only cut straight lines.

16

Check the table below.

Product mark:
1 mark for correctly matched product to process.

Reason:
A reason clarified (detailed process description) = 2 marks
A simple description = 1 mark

Product	Property	Suitability of material for the appl
Breakfast cereal box	Rigid	• Once printed, it has an excellent su printing on; it is easily creased for and will hold its shape
Outside garden bench	Durable/ hard/ tough	• It is waterproof / weather resistan means it will resist any water from / damp conditions outside • As people sit down on it, it will with any abrasive wear from clothes/jea as they move on the bench • It is tough which means it will with any knocks and bumps from lawnmowers/toys
Fizzy drinks can	Malleable / corrosion resistant	• The can needs to be deep drawn in movement so the material needs t to stretch without tearing/ripping would result in a leaky can) • It will not rust / react with the fizz inside eans the drink stay ar p re / will not be contaminate
Electrical plug socket	Electrical insu	It will not conduct electricity becau an insulator, i.e. you will not get an shock when you turn the switch on
So	Thermal insulator	• It will trap air between the fibres, t keeping your feet warm
ath	Plasticity/ waterproof	• When it is heated, it becomes soft/p therefore, it can be formed into the required to make the bath • It will not absorb any water; therefo will retain the water inside and not
School tie	Crease resistant	• It will not crease when put inside a s bag; therefore, it will stay looking go /presentable / retain a smart appea
Kitchen chopping board	Hard/tough	• When a knife is used to cut/chop fo will not mark/score the wood, mea board will last a long time

Fruit juice carton	Waterproof	•	Due to its many layers, it provides a waterproof barrier; therefore, it wi any juice from leaking through it
Solder	Low melting point	•	It can be heated with a soldering ir low temperature, meaning it can fl make a joint between the circuit bo the electronic component

17		1 mark for calculating the maximum length. 1 mark for calculating the minimum length. Calculation: 780 + 1.5 = 781.5 780 – 1.5 = 778.5

18		1 mark for each appropriate answer. **Indicative content:** • Offset lithography • Die cutting • Routing • Milling • Turning • Injection moulding • Vacuum forming • Blow moulding • Extrusion • Weaving • Dying • Staining Accept any other valid responses.

19		

3 marks	Complete description of a process linking both knowled understanding of how it impacts the material's ability t stresses.
2 marks	A basic description of a process linking both knowledge understanding of how it impacts the material's ability t stresses.
1 mark	A limited description containing some errors with only limited understanding of the process used to improve t material's ability to resist stresses.
0 marks	Nothing worthy of credit.

Indicative content:
Lamination
Thin layers of plyw[illegible]rs/flexiply are glued together and squ former un[illegible]nes to form a new shape that is stiffer / more r [illegible]ng more weight.

[illegible]ding
Metals/papers/boards/polymers can be bent and deformed to make shapes / can be hollowed out / creased to increase stiffness/rigidity they can stand up / can support more weight / will have increased r to torsion and bending stresses.

Webbing/interfacing
Webbing can be stuck/ironed/sewn between layers of fabric so that collars become stiffer / iron better, thereby improving the overall ap

Accept any other valid responses.

20	**1**	Award up to 2 marks for each 'R' mentioned **Indicative content:** **Refuse** • Do you really need to use the product or make the journey? • If you refuse to use or buy the product, you will be saving 100% not using a plastic bag from a supermarket **Rethink** • Can you source materials/services locally or use different mate • Can different modes of transport be used by delivery companie • Can communications be made electronically, saving transport c **Reduce** • The size of the product / th n mb f parts / the thickness of • Use different materi / modern materials which are lighter/stron • Redu nsumption by fitting smart motion sensors in tory **use** • Upcycle products/materials to use in different applications • Glass bottles can be used repeatedly in comparison to plastic bo which are generally single use • Websites such as 'Freecycle' can be used to source materials or away materials • Repurposing of old furniture with new paint/finishes can exten of a product **Repair** • Some products, such as Dyson cleaners, have been designed for repair • May be cheaper to repair products than to replace them • Some products are sold sealed, which prevents people from fixi meaning they must be thrown away • Electronic goods often contain complex circuits which are too s complex to be repaired and, therefore, must be replaced **Recycle** • Can sometimes be difficult to separate materials, thereby increa cost of recycling • Limited market for recycled materials • Recycling prevents lots of materials being sent to landfill unnec • Legislation (WEEE Directive) has been introduced to cover the and disposal of electrical goods • Reduces the impact of / demand for new/virgin materials, whic the environmental impact on finite res s Award marks for any othe

SECTION C

21	**1**	Award marks as follows: **3–4 marks**: Response shows a clear understanding of the suitability flat-pack desk for the consumer, drawing upon relevan to illustrate this, as per the indicative content below. **1–2 marks**: Response shows a basic understanding of the suitability flat-pack desk for the consumer, but is limited, without points to illustrate this. **0 marks**: Nothing worthy of credit. **Indicative content:** • Generally cheaper products due to no manufacturing costs invo assembly, making the product more affordable • Easier for the customer to transport the product home in their c visited the store to buy it so no delivery costs/charges • Sense of satisfaction when you build the product yourself at ho • Can be built in a particular room / moved around in parts befor built / easy to take apart and move from house to house
21	**2**	Award marks as follows: **3–4 marks**: Response shows a clear understanding of the suitability flat-pack desk for the retail store, drawing upon relevan to illustrate this, as per the indicative content below. **1–2 marks**: Response shows a basic understanding of the suitability flat-pack desk for the retail store, but is limited, withou points to illustrate this. **0 marks**: Nothing worthy of credit. **Indicative content:** • Can stack them high in the warehouse as they take up less spac room than assembled stock; therefore, more can be held / price reduced • Able to sell at a lower price, thereby encouraging consumers to makes them more appealing as they feel they can afford the pro increases turnover/profits
21	**3**	Award marks as follows: **3–4 marks**: Response shows a clear understanding of the suitability flat-pack desk for the transportation company, drawing relevant points to illustrate this, as per the indicative c below. **1–2 marks**: Response shows a basic understanding of the suitability flat-pack desk for the transportation company, but is li without any points to illustrate thi **0 marks**: Nothing worthy of credit **Indicative content:** • Smaller in size than a fully assembled product means they are eas in keeping with them being flat-packed in a self-contained cardboar should stack them on a pallet which means many can be moved trip on a trolley / moved in a truck

22		2 marks for each explanation for each of the two availability factors. **2 marks** – Complete explanation linking both knowledge and understanding of issues that relate to the relevant availability factor. **1 mark** – Simple explanation containing some errors and demonstrates only limited understanding of issues that relate to the relevant availability factor. **0 marks** – Nothing worthy of credit. **Indicative content:** **Environmental** • It is made from manufactured/man-made boards as opposed to natural timbers, meaning the natural timber supplies will last longer • It is flat-packed which means it has a smaller volume; therefore easier to transport/move between sites, reducing overall cost of the product • China is a long way away; therefore, large carbon footprint involved in shipping/transport **Social** • Greater well-being / feeling of self-satisfaction from being able to build/assemble the product yourself • Able to move the desk from one house to another in a car because you can disassemble it / reduce the volume, thereby reducing the need to leave it behind or throw it away • Buying the desk from a local maker supports business in your area as opposed to worldwide stores **Economic** • Cheaper to purchase due to assembling the product yourself rather than paying for someone to build it in a factory • Cheaper product overall due to materials used (manufactured/man-made boards rather than natural timber) Accept any other valid responses.

23	**1**	1 mark for calculating the cost of the desktop. 1 mark for calculating the length of the end panels. 1 mark for calculating the width of the rear panel. 1 mark for calculating the area of the drawer unit panel. 0.9 × 14 = £12.60 0.54/0.6 = 0.9 0.45/1.5 = 0.3 0.5 × 0.6 = 0.3

23	**2**	1 mark for calculating the total area used from previous table (apply FT) 1 mark for calculating the area of the board. 1 mark for correct answer. Calculation: 0.9 + 0.54 + 0.84 + 0.45 + 0.6 = 3.33 m^2 3 × 1.6 = 4.8 m^2 4.8 – 3.33 = 1.47 m^2

23	**3**	1 mark for calculating the volume of the box. 1 mark for calculating the volume of 100 boxes. 1 mark for calculating the cost of transporting the boxes. 1 mark for calculating the total price inc. VAT. 1.5 × 0.9 × 0/296 = 0.3996 0.3996 × 100 = 39.96 39.96 × 12 = £479.52 £479.92 × 1.2 = £575.424 Rounded up = £576.00 *or* 1.5 × 0.9 × 0/296 = 0.3996 or 0.4 m^3 100 × 0.4 = 40 m^3 40 × 12 = £480.00 £480 × 1.2 = £576.00

24

5–6 marks	A fully coherent and logical discussion which contains s… points reflecting an excellent understanding of how the … technique is used to explore and develop ideas.
3–4 marks	A reasoned set of points covered which reflects a good understanding of the issues relating to how the design technique is used to explore and develop ideas.
1–2 marks	Answer reflects some understanding of the issues relati… how the work of the company has evolved over time in response to how the design technique is used to explore… develop ideas.
0 marks	Nothing worthy of credit.

Sketching

- Sketching can take many forms: 2D/3D/freehand and some CA… programs allow you to sketch direct on a tablet
- 3D sketching in isometric/perspective is used to communicate i… quickly to clients/customers to show ideas for products / conce… / cars / external envelopes of buildings / internal spaces
- Sketches can be coloured to show texture
- Sketching can also be used to show sectional views to designers/engineers so that they can see how things fit togethe… exploded views to show how products are assembled
- Fashion sketches are used to show how fabrics would flow / dr… move as the wearer moves
- Systems / schematic diagrams are used to show engineers/pro… how the product needs to work/function / how electromechani… systems interact
- Working drawings in the form of dimensioned drawings / assem… drawings what size parts/components should be and how they fi…

Modelling

- Modelling can be carried out by computers to simulate stress/st… virtual wind tunnels can be used for testing aerodynamics
- Circuit modelling can take place on a computer or physically wi… components on a breadboard
- Computer modelling can also take place using Excel/spreadshe… model mathematical calculations / time / manufacturing sched…
- Models can be generated through CAD on screen and can be out… printers to produce physical models / digital models can be em…
- Models can be made from blue foam / MDF / calico to test shap…
- Models can be full-sized (such as a hairdryer) or made to scale (… housing estate / a car)
- Modelling allows products to be tested by being held/evaluated … putting the idea into full production

Accept any other correct responses

24 | **1**

1 mark for naming a specific marking-out tool.

- Steel rule
- Tape measure
- Try square / mitre square
- Engineer's square
- Odd-leg calipers
- Marking/cutting/mortise gauge
- Centre punch
- Scriber
- Tailor's chalk
- Marker pens
- Tracing wheel
- Dividers
- Sliding bevel
- Rotary cutting wheel

24 | **2**

2 marks	Complete explanation linking both knowledge and understanding of how the marking-out tool is used to m with precision and accuracy.
1 mark	Simple explanation containing some errors and demon only limited understanding of how the marking-out too to mark out with precision and accuracy.
0 marks	Nothing worthy of credit.

Indicative content:
- Make sure the tool is held firmly against the edge when using a square or marking-out gauge
- Mark out up against the edge
- Press firmly with the chalk / rotary cutter to ensure the pattern marked out
- Follow the pattern closely
- Take careful measurements from zero each time

24 | **3**

5–6 marks	A fully coherent and logical evaluation which contains s points and reflects an excellent understanding of the di techniques that can be used to ensure materials are ma to minimise waste. A justified conclusion is drawn.
3–4 marks	A reasoned set of points which reflects a good understa the different techniques that can be used to ensure mat are marked out to minimise waste. Response includes a evaluation, and an appropriate conclusion is given.
1–2 marks	An answer that reflects some understanding of the issu relating to the different techniques that can be used to materials are marked out to minimise waste. Limited conclusions with no supporting evidence.
0 marks	Nothing worthy of credit.

Indicative content:
- Any method aiming to minimise waste should start with good pl
- Working out the best way could involve the use of paper patterns/templates to lay plan, ensuring that space between co parts is kept to a minimum
- Computers can also be used for lay planning
- It is important, especially when using fabrics, to ensure that the cloth is taken into consideration when lay planning so that the be matched
- Any cutting out should start in a corner at the edge rather than out from the middle of the sheet / fabric roll
- The size of the material is also an important consideration to en efficient use is being made of standard-sized sheets/boards / ro (such as A3/4)
- Component parts can be nested to ensure that there is the mini space between parts
- Tessellating parts can help to minimise waste by rotating/turnin parts so that they fit even closer together

25		2 marks for each explanation. **2 marks** – Detailed explanation linking both knowledge and understanding of the reasons why surface finishes an treatments are applied to materials. **1 mark** – Simple explanation containing some errors and demonstrating only limited understanding of the reas surface finishes and treatments are applied to materi **0 marks** – Nothing worthy of credit. **Indicative content:** **Functional** • Provides protection from/against the w er/elements makin material more durable / waterpr / eat er resistant / less p insect/fungal attack • Provides protecti ga t igh temperatures / electricity • It will mak e m t rial surface harder/tougher, making it mo resi to ear/abrasion/indentation • make the material surface more hygienic / easier to clean **Aesthetic** • The surface of the material can be coloured with dyes/paints/s • Different surface finishes can be applied to give the surface mor shine/gloss/sheen • Surface decorations can be applied in the form of sequins/embellishments/applique

Practice Paper 4

SECTION A

Q.	Part	Marking guidance
1		**C** Balsa
2		**A** Rotation
3		**D** Solar
4		**A** Ductility
5		**C** Assistive technology
6		**A** Burni[illegible]
7		[illegible]evlar®
8		**B** Rack and pinion
9		**A** Corrugated card
10		**C** V
11		1 mark for each correct element. • Iron • Carbon
12		2 marks for a valid explanation of the way in which technology push i[s] develop new products. **Indicative content:** • As a result of new scientific discoveries, designers and engineers a[pply] technology to new products – even though there is no specific nee[d] market for the new product – in the hope that consumers will wa[nt] • Technology is progressing at a rapid pace in terms of new materi[als] technologies, which are combined to produce new products tha[t] designed to last very long – upgrades can then be developed/so[ld] technology progresses. Award marks for any other correct response.
13		2 marks for a valid explanation of how energy is generated from biom[ass] **Indicative content:** • Biomass is a general term applied to the burning of solid biofuel[s] [crop]s and waste from farms in the form of oil and starch-b[ased] crops) to produce heat. Award marks for any other correct response.

14		2 marks for a valid disadvantage of nuclear energy. **Indicative content:** • The cost of building a nuclear power station is very expensive a consumes a great deal of materials/resources which impacts on environment in terms of the use of finite resources • Radioactive waste from the power station is very dangerous and buried and stored correctly so that it does not leak and contami surrounding ground/environment • Waste remains radioactive for a very long time – sometimes mil years – which means it must be stored/contained safely to redu of any harm to life / the environment Award marks for any other correct respo
15		1 mark for working out the ra 1 mark for worki out h much concrete is required. Calcu 3 = 4 which means each part is 20/4 = 5 kg 3 × 5 = 15 kg ECF to be applied if the first part is wrong but the second sum is corr

SECTION B

Q.	Part	Marking guidance
16		Award up to 3 marks as follows: **3 marks** – Complete explanation showing a thorough understandi each term. **2 marks** – Detailed explanation linking both knowledge and understanding of each term. **1 mark** – Simple explanation containing some errors and showin limited understanding of each term. **0 marks** – Nothing worthy of credit. **Deforestation** Deforestation is caused by burning / cutting down / chopping down woodland areas / cleansing land to grow crops or to harvest the timb As a result of this, natural habitats are being destroyed / lost for wild soil erosion takes place as the topsoil/nu s/are washed away can also give rise to flooding. **Carbon footprint** Carbon an ses are produced during the manufacture and an of goods/products/components. The amount of CO_2 g ring the various stages is known as the carbon footprint. Some co w calculate their carbon footprint for each product/service and pu their products/websites. **Product miles** A product is a combination of materials and components which have brought together to produce a product. The miles the materials and components travel, along with any final delivery miles, combine to g for total 'product miles'. This forms part of the LCA.

17		Check the table below. **Product mark:** 1 mark for correctly identified product. **Reason:** An explanation clarified = 2 marks A simple explanation = 1 mark

Material	Explanation of how the material can be mod
Papers and boards	• They can be coated to make them waterproof so they can be used to hold liquids without leaking / allowing liquid to seep through, e.g. for products fruit juice cartons
Timbers	• Once a tree has been felled / cut down it needs to the wet water/moisture removed by a process as seasoning. This means that the timber will be dimensionally stable and can, therefore, be used warm houses for furniture / skirting boards / do frames without it drying out even more and split
Metals	• When a material such as copper is pressed/defor into a shape, it becomes work hardened and mo difficult to shape. It must be annealed, a process involves heating the metal to release the internal stresses in the material so that it becomes malle once again, allowing further deformation to take
Polymers	• Additives introduced during various manufactu processes, such as when injection-moulding pat They have UV stabilisers added to help reduce t degradation caused by sunlight, which has a ten make the colour fade.
Fabrics	• Garments can have fire-retardant coatings appli them to reduce the risk of combustion in high-ri environments, e.g. the protective suits worn by firefighters and racing car drivers
Systems	• Electronic product cases can be anodised to imp their aesthetic appearance, but this also increas surface hardness of the outer casing, making it t and more durable

18		1 mark for working out the percentage. 1 mark for rounding to the nearest whole per cent. Calculation: 175 – 150 / 150 * 100 = 16.6% Rounded to nearest whole per cent = 17% ECF to be applied if the first part is wrong but the second sum is corr
19		2 marks for a valid explanation of what is meant by the term torsion. **Indicative content:** • Torsional forces occur as result of materials/components being to rotational/twisting forces caused by the opposite ends of a shaft/axle/component rotating in different directions or at diffe speeds / carrying different loads. Car axles/driveshafts and spe propeller shafts will all be subjected to torsional forces. Award marks for any other correct response.

20	**1**	2 marks for a valid functional reason for applying a surface treatmen finish or treatment. **Indicative content:** • Provides protection from/against the weather/elements makin material more durable / waterproof / weather resistant / less p insect/fungal attack • Provides protection against high temperatures / electricity • It will make the material surface harder/tougher, making it mo resistant to wear/abrasion/indentation • It will make the material surface more hygienic / easier to clea Award marks for any other correct response.
20	**2**	2 marks for a valid aesthetic rea on for ying a surface finish or t **Indicative cont :** • The e material can be coloured with dyes/paints/s surface finishes can be applied to give the surface mo shine/gloss/sheen Surface decorations can be applied in the form of sequins/embellishments/applique Award marks for any other correct response.
21	**1**	1 mark for naming a specific process. • Cutting papers and boards • Scoring • Perforating • Drilling • Laminating • Milling • Vacuum forming • Blow moulding • Piping • Soldering • Creasing • Folding • Sawing • Planning • Turning • Casting • Injection moulding • Sewing • Pleating Accept any other valid response.
21	**2**	1 mark for stating a specific product relating to the process given in previous part of the question. • Chocolate box • Cereal box • Fruit bowl • Bike frame • Railing • Curtain • Soft toy • Sh y • K • Greetings card • Furniture • Stair spindle • Machine vice • Handbag • Pillow • Bath • Plug socket Accept any other valid response.

22

7–8 marks	A reasoned set of points which reflect an excellent understanding of the issues relating to quality control c including measurable and quantitative systems for che products during the manufacturing process.
5–6 marks	Answer which reflects a good level of understanding of issues relating to quality control checks, including mea and quantitative systems for checking products during manufacturing process.
3–4 marks	A basic level of understanding of the issues relating to control checks, including measurable and quantitative for checking products during the manufacturing proce
1–2 marks	One or two brief points given, with limited understand issues relating to quality control checks, including mea and quantitative systems for checking products during manufacturing process.
0 marks	Nothing worthy of credit.

Product	Quality control checks
Fizzy drinks can	• A go-no gauge would be used to check the internal/external dimensions of the can • A micrometer would be used to check the wall t of the can • X-rays could be used to check for any cracks or h fractures in the can • Depth gauge used to check the draw/depth of th
Button-up shirt	• Checks would be made against the original samp ensure dimensions are correct • Stitch quality and strength would be checked wi form of tensometer • The pattern and lay of the check pattern would b against a chart / original standard garment • Jigs/templates would be used to check the posit size of buttonholes / position of buttons/pocket of cuffs • Tension/abrasion tests on different batches of f coming into the factory
Wooden pizza board	• The surface texture would be checked to ensure no rough grain / aren't any splinters that could issues • Go-no gauge used to check the size of the handle • Density check on the quality of the timber comi from different trees / batches of timber
Colour hardback book	• Registration marks would be on the printed pag ensure that pages/sheets line up before printing/cropping • Overall page size would be checked • Stitching ratio to ensure pages do not come o [illegible] / fall out
Laptop	• Quality / circuit flow of boards / soldering / functionality / connectivity of other parts such a screen/keyboard/CPU • Battery charger / battery storage • Trackpad works / sensitivity test
Patio chair	• Colour swatch would be used to ensure that the of the chair matches the requirements against a piece • Dimensional accuracy would be tested with jigs • Visual inspection for flow marks / characteristic the moulding process • Dimensional checks of hand sizes

23	1	Award marks as follows:

3–4 marks	Response shows a clear understanding of how anthropometric data would be used in the design of t bike.
1–2 marks	Response shows a basic understanding of how anthropometric data would be used in the design of t bike.
0 marks	Nothing worthy of credit.

Indicative content:

- Data would be collected/gathered from books/tables/websites the target market age range
- Key dimensions/areas would be the size of the frame of the bik relation to the user
- The seat would need to be adjustable and data would be used to the minimum and maximum height required for the age range
- The angle the rider sits at to be able to reach the handlebars is a consideration
- The adjustability of the height of the handlebars would be work using key data

23	2	Award marks as follows:

3–4 marks	Response shows a clear understanding of how ergonom would be used in the design of the child's bike.
1–2 marks	Response shows a basic understanding of how ergonom would be used in the design of the child's bike.
0 marks	Nothing worthy of credit.

Indicative content:

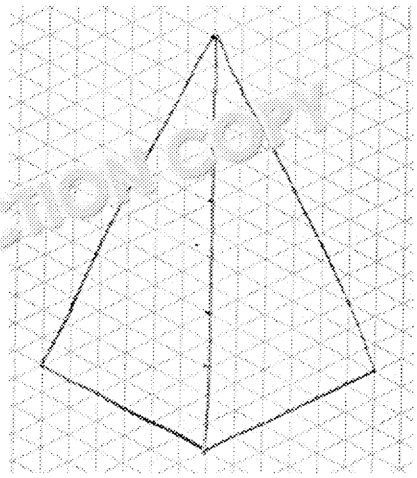
- Ergonomics is to do with how the children/users interact with t
- The saddle needs to be comfortable to sit on since children mig riding / playing on the bike
- The size and shape of the grip/handlebars are important – the h must be comfortable to hold safely without slipping, but the rid still be able to grab the brake levers while holding on to the grip

23	3	Award marks as follows:

5–6 marks	Response shows an excellent understanding of how the designer would use a design brief when considering th and wants of the client and the interrelationship betwe design brief and the product.
3–4 marks	Response shows a good understanding of how the desi would use a design brief when considering the needs a of the client, and shows some understanding of the rela between the design brief and the product.
1–2 marks	Response shows a minimal understanding of how the de would use a design brief when considering the needs a the client but no evidence of the relationship betwee design brief and the product.
0 marks	Nothing worthy of credit.

Indicative content:

- The design brief is a simple statement of the task/problem to b by the designer
- It will clearly set out the client/user needs/wants, often in com with a set of constraints such as timescale and budget
- It is a statement that should be continually referred to, ensurin design addresses the client/user needs/wants
- The designer would need to consider the TMG / age-specific requirements of the product in terms of dimensions/size of the

		whether the size can be adjusted within a set of limits so that th saddle/handlebars can be adjusted as the child grows • Specification points such as colour/style/aesthetics will fall out design brief • Considerations such as ability to repair/maintain the bike woul feature in the brief • At key stages the design proposals would be put back alongside to see how well / if they fit the criteria set out
24		2 marks for a valid explanation of how each marking-out method is u **Indicative content:** **Template** • A template is used to ensure the accurate repeated marking out identical components a... • A template can be used / drawn around time and time again whi that all parts will be identical A Jig is used to ensure individual parts are held in the exact plac being able to move when being joined/fixed by screwing/welding/brazing
25	**1**	1 mark for the conversion of units at the start or end. 1 mark for calculating the area of one triangle. 1 mark for calculating the area of four triangles. 1 mark for calculating the area of the square base. 1 mark for calculating the total area. ½ × b × h = ½ × 30 × 60 = 9 cm² 4 × 9 = 36 cm² 3 × 3 = 9 cm² 36 = 9 = 45 cm²
25	**2**	1 mark for correct width. 1 mark for correct depth. 1 mark for correct height taken from the centre of the base square. 1 mark for the two diagonals. 
26	**1**	1 mark for correct calculation. 475 – 345 = 130 mm

26	**2**	1 mark for correct transposition. 1 mark for correct % calculation. 1 mark for correct rounding. 73 – 49 / 49 = 0.489 0.489 × 100 = 48.9% Rounded to 49%

26	**3**	1 mark for correct ratio calculation. 1 mark for correct calculation of quantities. 13 + 7 = 20 10/20 = 0.5 0.5 × 13 = 6.5 kg

26	**4**	

3 marks	A complete explanation of the need for fair trade and its benefits and implication.
2 marks	A basic explanation of the need for fair trade and its wi benefits and implication.
1 mark	A limited explanation of the need for fair trade and its w benefits and implication.
0 marks	Nothing worthy of credit.

Indicative content:

- Fair trade ensures that better prices / working conditions / tra for farmers/workers are in place to support and develop their businesses/communities so that they have better control over t businesses/communities / are able to improve the environmen which they live/work

27		

5–6 marks	A fully coherent and logical discussion which contains linked points in relation to iterative design.
3–4 marks	A reasoned discussion which contains some linked po relation to iterative design.
1–2 marks	Some discussion which contains only limited points i relation to iterative design.
0 marks	Nothing worthy of credit.

Indicative content:

- Iterative design centres around the continual process of genera testing them, evaluating and refining them
- It is a flexible way of designing in that s es/notes/models a produced and evaluated/tested for being refined and impro
- Products are continually improved and refined such as Dyson c and many Apple products which show small incremental changes/improvements/iterations as new versions of the same p are developed and released

28

3–4 marks	Response shows a clear understanding of the need for t preparation of the surface of the material before applyi surface finish, as per the indicative content below.
1–2 marks	Response shows a basic understanding of the need for t preparation of the surface of the material before applyi surface finish, as per the indicative content below.
0 marks	Nothing worthy of credit.

Indicative content:
Preparation:

- Timber surfaces need to be sanded and dust-free
- White spirit / meth used to degrease metal surfaces, and edges deburred
- Paper surfaces need to be dry
- Surfaces need to be even
- Textile surfaces need to be ironed/pressed / flat before being embroidered / screen printed
- Glass surfaces need to be dust-free before any paints / vinyl transfers are applied
- Electrical tracks / pads / circuit boards need to be cleaned/deg any surface oxides must be removed to ensure a good flow of so

3–4 marks	Response shows a clear understanding of the process o applying a surface finish to a material, as per the indica content below.
1–2 marks	Response shows a basic understanding of the process o applying a surface finish to a material, as per the indica content below.
0 marks	Nothing worthy of credit.

Application:

- Varnish/paint/stain/lacquer can be applied with a brush or spr
- Surfaces can become rough after a 'wet' treatment has been app needs to be taken back with fine wire wool before a topcoat / s is applied
- Some paints/materials require a primer/undercoat to be applie topcoat is applied
- Wax is applied with a rag before being polished / buffed up
- Metals can be dip coated / powder coated in a special spray are means the paint/powder is attracted to the electrically charged component before it is baked in an oven for the surface finish t
- Many papers can be printed on using a variety of processes such laser printing / lithography / gravure / screen printing
- Vinyl cuts on a plotter/cutter are transferred to the surface usin tack transfer tape
- Fabrics can be embroidered using CNC machines or by the freeh movement of the piece (free style embroidery)
- Batik involves the use of wax to mask off areas before dyes are a
- Embellishments can be sewn onto garments, e.g. in the form of s

Preview of Answers Ends Here