Zig Zag Education

Design Technology A Level | AQA | 7552

2017 specification first exams in 2019

Practice Papers

for A Level AQA Product Design

Update v1.1 17 February 2022

zigzageducation.co.uk

POD 10380

Contents

Teacher's Introduction

This resource consists of four brand-new, complete sets of A Level Practice Papers and mark schemes for the AQA Design and Technology: Product Design (7552) specification. There are two sets of Practice Papers provided for Paper 1, and two sets of Practice Papers provided for Paper 2. The papers are closely aligned to the AQA sample assessment materials.

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

The four sets of papers are accompanied by a specification coverage grid to show where and how each question is mapped against the specification. The very large majority of the specification has been covered across the four sets of 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 to help diagnose the students' strengths and weaknesses.

The papers assess the technical principles and the designing and making principles. Maths skills are also assessed across both papers.

These papers can be used in parts for homework after specific areas of the specification 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.

Students' confidence will improve by completing these practice exam papers knowing that they will have been tested on content from across all major areas of the specification.

Update v1.1, 17 February 2022

- New questions added (Q15–17) to make Paper 1.1 total 80 marks
- Questions changed/replaced (mark schemes updated): 1.1 Q12, 1.2 Q3, 1.2 Q6, 2.2 Q4, 2.2 Q9
- Mark schemes corrected to better match the questions: 1.1 Q14, 1.2 Q5, 2.1 Q2, 2.1 Q3, 2.2 Q12
- Mark schemes made more comprehensive throughout.

April 2020

Paper 1: 3.1 Technical Principles

Subject Content	
3.1.1 Materials and their applications	Classification of materi
	Methods fo ati nd testing materials
3.1.2 Performa aracteristics of materials	P a acteristics of papers and boards
	mance characteristics of polymer based sheet and film
	Performance characteristics of woods
	Performance characteristics of metals
	Performance characteristics of polymers
	Elastomers
	Biodegradable polymers
	Composites
	Smart materials
	Modern materials
3.1.3 Enhancement of materials	Polymer enhancement
	Wood enhancement
	Metal enhancement
3.1.4 Forming, redistribution and addition processes	Paper and board forming processes
	Polymer processes
	Metal processes
	Wood ss
3.1.4.5 The use of adhesives and	hesi
	gs and fixtures
3.1.5 The use of nishes	Paper and board finishing
	Paper and board printing processes
	Polymer finishing
	Metal finishing
	Wood finishing

Subject Content	
3.1.6 Modern industrial and commercial practice	Scales of production
3.1.6.2 Efficient use of materials	Efficient use of materials
	The use of computer systems
	Sub-assembly
3.1.7 Digital control manufacture	Computer-aided design (CAD)
	Computer-aided manufacture (CAM)
	Virtual modelling
	Rapid prototyping processes
	Electronic data interchange
	Production, planning and control (PPC) networking
3.1.8 The requirements for product design and development	Product development and improvement
	Inclusive design
3.1.9 Health and safety	Safe working practices
	Safety in products and services to the customer
3.1.10 Protecting designs and intellectual property	Protecting designs and intellectual property
3.1.11 Design for manufacturing, maintenance, repair and disposal	Manufacture, repair, maintenance and disposal
	Ease of manufacture
	Disassembly
3.1.12 Feasibility studies	Feasibility studies
3.1.13 Enterprise and marketing in the development of products	Enterprise and marketing in the development of products
3.1.14 Design communication	Design communication

Paper 2: 3.2 Designing and Making Principles

Subject Content	
3.2.1 Design methods and processes	Iterative design process
3.2.2 Design theory	Design influences
	Design styles and movements
	Designers and their work
3.2.3 How technology and culture can impact on the work of designers	Social, economic influences
	Major developments in technology
	Social, moral and ethical issues
3.2.3.4 Product life cycle	Product life cycle
3.2.4 Design processes	The use of a design process
	Prototype development
	The iterative design process in industrial or commercial contexts
3.2.5 Critical analysis and evaluation	Testing and evaluating products in commercial products
	Use of third party feedback in the testing and evaluation process
3.2.6 Selecting appropriate tools, equipment and processes	Selecting appropriate tools, equipment and processes
3.2.7 Accuracy in design and manufacture	Accuracy in design and manufacture
3.2.8 Responsible design	Environmental issues
	Conservation of time and resources
3.2.9 Design for manufacture and project management	Planning accuracy and efficiency
	Quality assurance
	Quality control
3.2.10 National and international standards in product design	National and international standards in product design

A Level
Design and Technology Product Desi

Paper 1: Technical Principles

Set 1

Name	

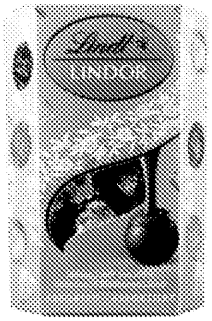
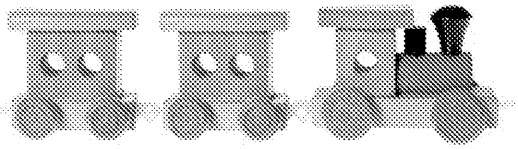
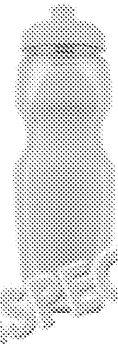
Time allowed: 2 hours and 30 minutes

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 120.

1. The table below gives **four** different products and the specific type of surface each product.

Product	Specific ty
 Cardboard chocolate box	Fo
 Mild steel stair railings	Po
 Beech children's pull-along toy	
 oplastic elastomer water bottle	S

Describe the way in which each specific surface finish has been used to enh
of each of the four products.

Cardboard chocolate box

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Mild steel stair railings

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Beech children's pull-along toy

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Thermoplastic elastomer water bottle

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2. Explain what is meant by the term 'composit[illegible]', and give an examp

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3. Smart materials such as thermochromic pigments change colour with heat.

Figure 1

Explain **one** advantage for an elderly user of the coffee mug shown, which c
poured into it.

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4.1. Explain the difference between mechanical properties and physical properti

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4.2. **Figure 2** shows a garden watering can that has been manufactured from hig

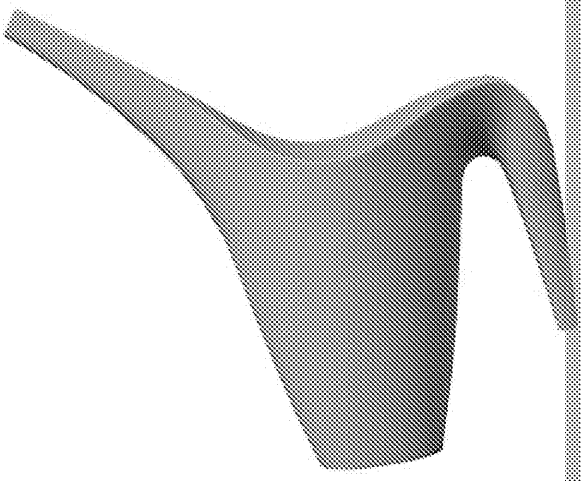

Figure 2

Give **one** mechanical property and **one** physical property of HDPE which ma
for the garden watering can.

For each property, state why the property is appropriate for the garden wat

Mechanical property

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Physica erty

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4.3. The HDPE garden watering can is manufactured using the injection process.

Describe, using notes and diagrams, the process of injection moulding the g

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Space for diagrams

5.1. **Figure 3** shows a pewter cast board game piece.

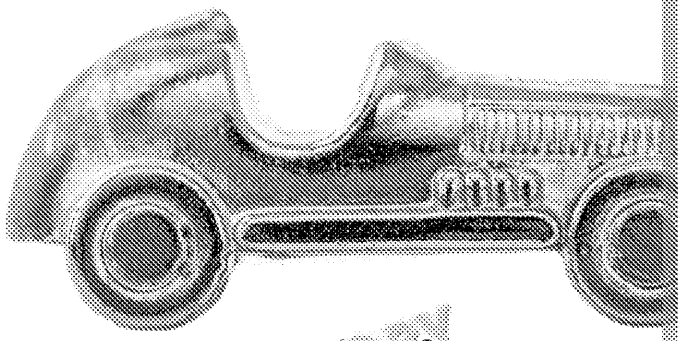

Figure 3

Give **two** properties of pewter.

1. .....

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2. .....

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5.2. Give **two** risks and **two** control measures associated with pewter casting in a

Risk 1

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Control measure 1

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Risk 2

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Control measure 2

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5.3. Pewter has a density of 7.26 g/cm^3.

The board game piece has a volume of 1.25 cm^3.

Calculate the mass of the board game piece using the formula: Density = Ma

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5.4. Pewter is an alloy made from [illegible] 7.75 % antimony and 0.25 % copper.

Calculat[illegible] n[illegible], antimony and copper required to make 25 kg of p

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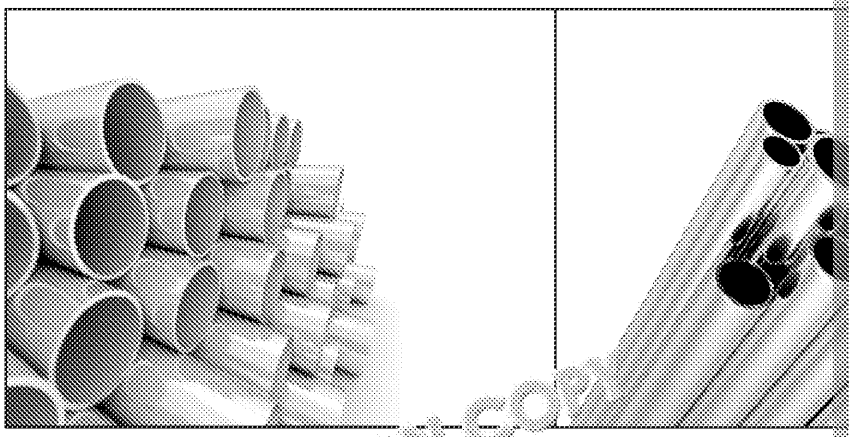
6. **Figure 4** shows two different types of plumbing pipe.



PVC

Figure 4

Evalua su itability of the two different types of pipe for use in the cons

Your answer should make reference to:

- physical and working properties of the two materials
- manufacture
- disposal

7.1. **Figure 5** shows a 3D printed toy figure.

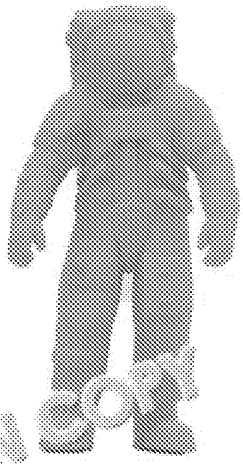


Figure 5

Explain **two** advantages for the designer in being able to 3D print the toy figure.

1. .....

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2. .....

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7.2. 3D printers allow you to control the layer height when printing.

The table below shows some information about the 3D printer's set-up options.

Layer height (mm)	Time	
0.06	9 hours 8 minutes	
0.15	3 hours	

Calculate the percentage of time saved to the nearest whole number if the layer height of 0.15 mm as opposed to a layer height of 0.06 mm.

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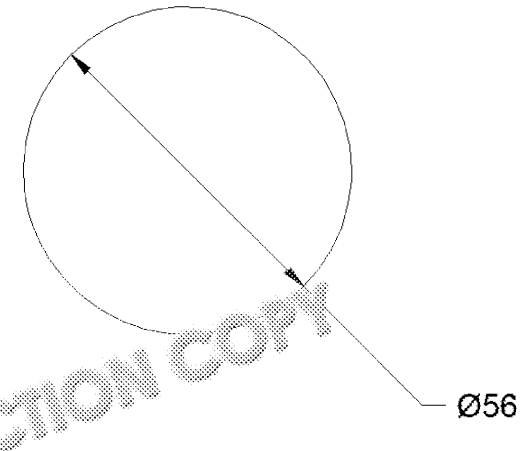
8.1. A manufacturer makes pool balls from an epoxy resin.

The diameter of each pool ball is shown below.



All dimensions are in mm.

Figure 6

Use π = 3.142

Using the formula $4\pi r^3/3$, calculate the volume of resin required to make each b
in cm^3 to two decimal places.

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8.2. Some of the pool balls are spray painted.
Allowing for 15 % waste for each ball painted, calculate how many complete
one litre of paint.

One litre of paint will cover 12 m^2

Surface area of a sphere is $4\pi r^2$

Use π = 3.142

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9. Explain how each of the following industrial manufacturing systems is used

Modular/cell production

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Just-in-time (JIT)

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Flexible manufacturing system (FMS)

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10. Explain **three** ways in which a designer can protect their work.

1. .....

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2. .....

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3. .....

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11. Explain **two** advantages and **two** disadvantages of using CAD compared to a

Advantages

1. .....

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2. .....

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Disadvantages

1. .....

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2. .....

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12.1. Some interchangeable screwdriver bits are shown in **Figure 7**, below.

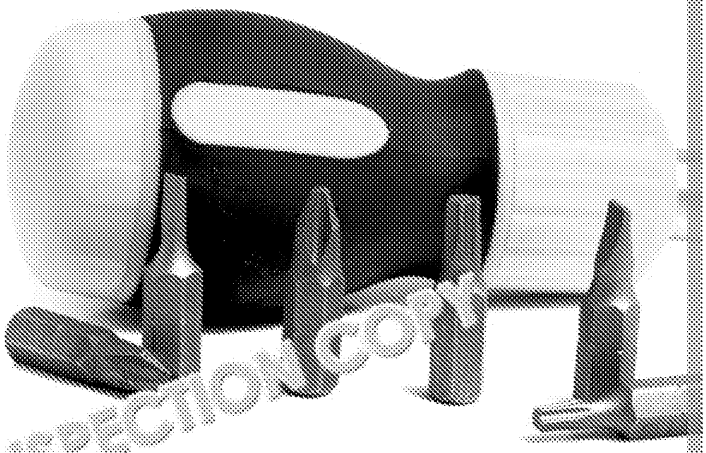

Figure 7

The screwdriver bits have been hardened and tempered.

Explain what is meant by the term 'hardening'.

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12.2. Give **five** stages of the hardening and tempering process. One of the stages

Stage 1 .....

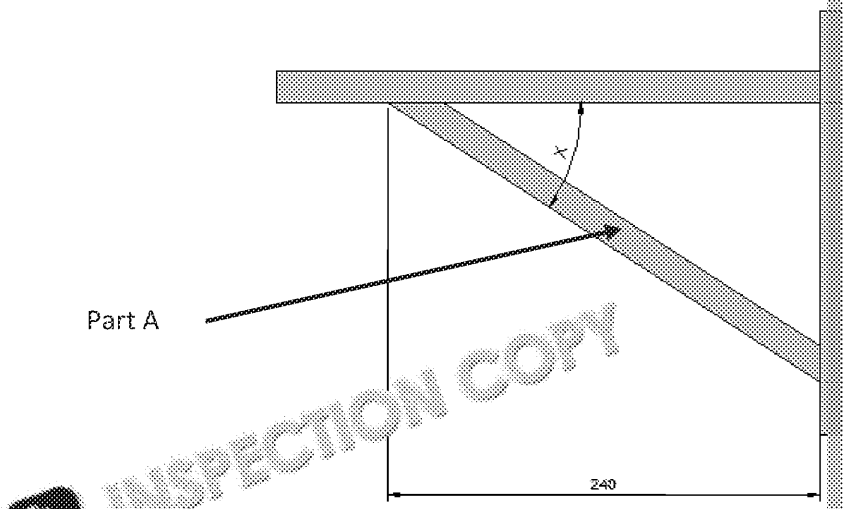
Stage 2 .....

Stage 3 Clean the surface

Stage 4 .....

Stage 5 .....

13.1. **Figure 8** shows a wooden shelf bracket.



Drawing not to scale

All dimensions are in mm.

Figure 8

Calculate the length of the timber required to make part A.

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13.2. Calculate the angle of the cut to make shown as the angle marked X.

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14. **Figure 9** shows a 'virtual assistant' that is connected to the Internet.

Figure 9

Discuss how this type of product is considered to be an example of 'inclusive

15. Give **three** ways in which production, planning and control (PPC) networking

1. .....

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2. .....

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3. .....

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16. Give a specific example of a product which could be manufactured using ea
aided manufacturing processes.

Laser c

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Routing

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Plotter cutting

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17. Describe the process of forming a polymer product using rotational mouldin

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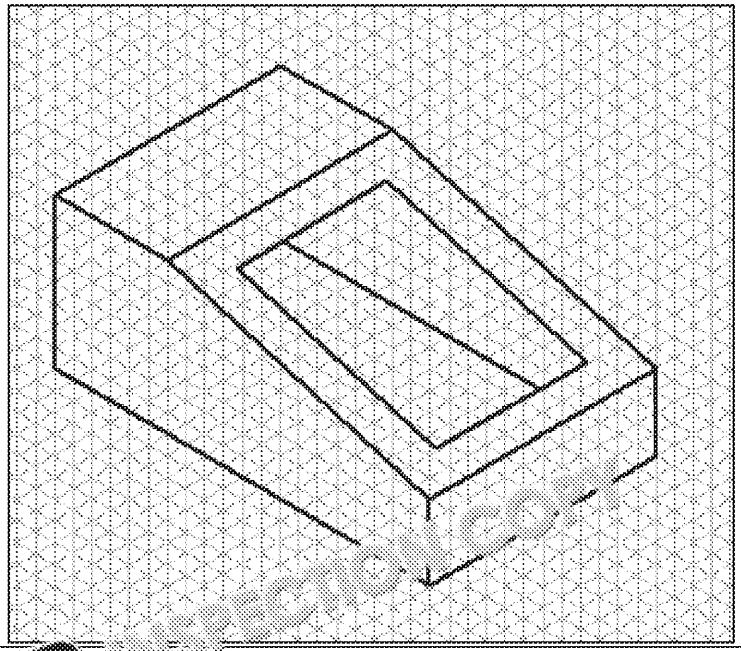
END OF QUESTIONS

Preview of Questions Ends Here

Set 2

Qu.	Marking guidance
1	1 mark for each correct application **Foam board** • Model making • Presentation board / flats • Backing boards for photographs **Low-density polythene sheet** • Wrapping • Packaging • Carrier bags **Plastazote foam** • Protective packaging • Swimming buoyancy aids • Foam/yoga mats • Supportive medical products / collars and splints **Fluted polypropylene sheet** • Signs / estate agent signs • Storage / box construction You should accept any other valid response.
2	1 mark for a specific industrial test from: • Rockwell test • Brinell test • Vickers pyramid test 2 marks for a correct explanation of one of the industrial tests named above 1 mark for a basic explanation of one of the industrial tests named above **Rockwell test** A preload is applied to the test piece which is just enough to mark and break surface. A further load is then applied for a predetermined period before be The distance between the two depths is measured; the smaller the indent, t material. **Brinell test** A hardened steel ball is pressed into the surface of the material. The diamet is measured and a formula is used to calculate the hardness of the material diameter of the indent. **Vickers pyramid test** For very hard tests, a diamond is pressed into the material and the size of the in with a microscope. The smaller the indent, the harder the material.

Qu.	Marking guidance
3	1 mark for a correct material enhancement 2 marks for a correct explanation of the material enhancement **Wooden fence panel** • Timber preservation, such as pressure treated / tanalisation • Timber is stacked, allowing for airflow, then placed in a vacuum chamb vessel. Air is removed and the chamber is flooded with preservative so based). Pressure is used to force the treatment deep into the wood. Ex pumped out. Timber is removed from the chamber and allowed to dry **Polymer patio chair** • UV stabilisers disperse the light energy, wh s to ensure the molecul less affected by UV radiation (less r pt in chains and resultant brittler • At the moulding stage, add e put into the polymer mix to add c the polymer from being d ed when subjected to UV light • The polym en enhanced by the addition of pigments to ad nd **countersink bit** • Hardening and tempering • The bit will be hardened and tempered by heating it to a specific temperatu it rapidly and then reheating it to remove the brittleness caused because of
4	1 mark for correct scaled length 1 mark for correct scaled width 1 mark for correct scaled height 1 mark for correct scaled height of the front profile 1 mark for the correct scale and placement of the window 1 mark for the line shown inside the box once the window is in place 
5	f tailed explanation relating to the use of spreadsheets when y studies 1 rk for a basic explanation • Spreadsheets can be used to assess the overall costs of production/ma including the costs for lighting, rent, rates and salaries, so that a judgen made as to the overall costs • Spreadsheets can be used to calculate the costs of materials and manu such as the injection moulding tools / cycle times, so that manufacturin calculated to assess the overall costs to compare against potential sale You should accept any other valid response.

Qu.	Marking guidance

Marks	Description
9–12	An excellent evaluation demonstrating a high level of analy comparison of the two different types of modelling techni consideration of their suitability and use for the context.
5–8	A good evaluation demonstrating a sound degree of analys comparison of the two different types of modelling techni consideration of their suitability and use for the context.
1–4	A basic response with some comparison of the two differe modelling technique. The response is a description rather of or attempt at an evaluation.
0	No rewardable content.

Indicative content:

CAD model:

- The ... be edited to show different colours and textures
- ...ar be drawn as many different components, some of which might h ...evious models, so they can be adapted for a new model
- Component parts can be sent to a 3D printer so that physical parts can made/held/tested/evaluated
- Models can be subjected to various stress/strain tests
- Files can be worked on by a designer anywhere in the world, providing access to a computer/tablet
- Models can be animated / simulation tested so that they can undergo r tests to gauge any potential failures / weak spots
- CAD files can be hacked / lost in hardware failure
- CAD requires a great deal of time to learn and investment in hardware, needs upgrades

Wind tunnel:

- There is a positive correlation between wind tunnel testing of a car and performance
- Flow instability issues can be seen on a full-sized car
- Mechanical faults / issues may come to light, such as failure of compon structural failure
- Large-scale physical testing requires full-sized/expensive prototypes to manufactured, which costs a lot of money by comparison
- Large testing facilities are required, which would be expensive to set up being outsourced
- Any changes / developments of the car need to be made physically, wh lot of time and skill (given the size and nature of the product)
- Surface finish needs to be very good since any ...h surfaces would ha consequences for the airflow over the ...de
- Airflow smoke patterns need t... a...sed by a human in terms of th patterns/turbulence they ...ea...
- Photograph... ...s to be taken to be able to make comparisons r being ... ...e stored digitally (as in the CAD model)

6

Qu.		Marking guidance

Marks	Description
5–6	An accurate and complete diagram is included with a co description of the process. The diagram and the descrip correct and accurate, and use appropriate technical lang good knowledge and understanding of the process of us adhesive.
3–4	An attempt to provide a diagram and description has be some connections between the two. Diagrams are parti and the description provides some detail.
1–2	Diagrams and descriptions are i plete and lacking in few links between the
0	Nothing worthy of re it or an incorrect process.

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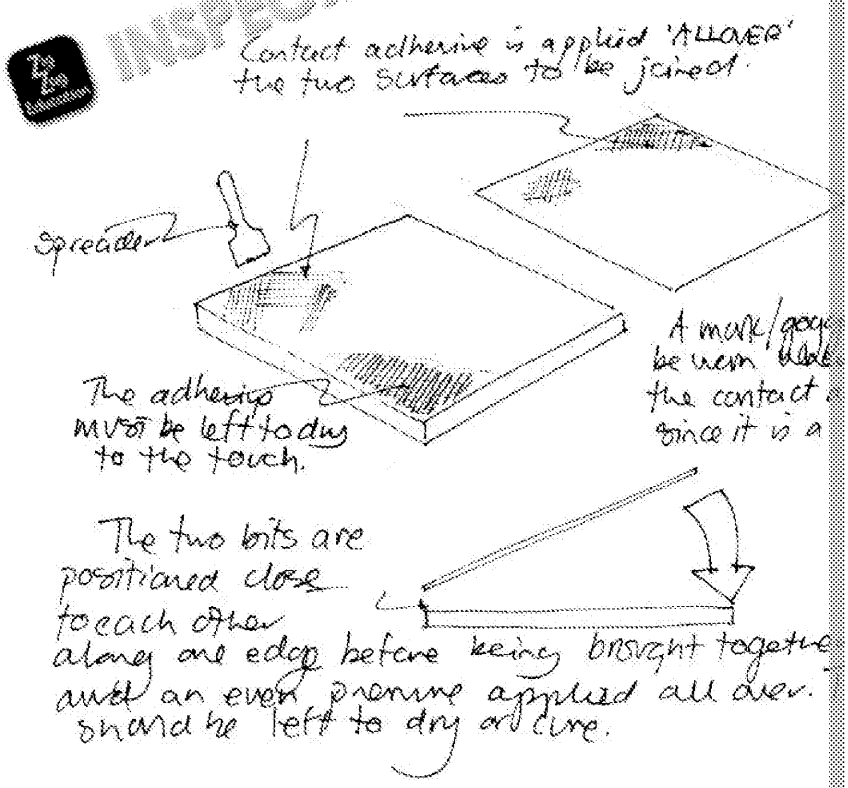

Indicative content:

The diagram must represent the correct process of, and knowledge and an u of, the process of using contact adhesive to join the tw material types, and reference to the list of points below.

- Appropriate and correct use / ack ledg ient of PPE / local extracti
- Both surfaces cleaned re on dust and dirt / degreased / abrade
- Both surfaces m be ed with the contact adhesive
- The ad s l to dry to the touch
- e separate pieces are brought together along one edge and pres he metal sheet as it is rolled over and pressed down into contact wi timber
- Pressure is applied evenly to bring together the two pieces, which bond on contact
- Left to cure / adhesive is left to bond fully / any excess adhesive can be removed with spirit-based cleaner

Qu.		Marking guidance
7	2	**Mathematical calculation** Correct calculation Conversion of units at the start or the end Correct calculation of area of whole cylinder 3.142 × 1.2 × 0.5 = 1.8852 m^2 Correct calculation of percentage of cylinder 60 / 360 = 1 / 6 or 0.166 Correct calculation of surface area of the segment, allowing for ECF 1.8852 m^2 × 1/6 = 0.3142 m^2 Correct calculation of total area for both surfaces since the adhesive must be applied to both surfaces 0.3142 m^2 × 2 = 0.6284 m^2
7	3	**Mathematical calculation** Correct [illegible] [illegible]6284 = 2.5 / X Correct transposition of formula X = (0.6284 × 2.5) / 10 Correct calculation X = (0.6284 × 2.5) / 10 = 0.1571 Correct conversion of units into ml 0.1571 = 157.1 ml
8		2 marks for each correct explanation of the benefits of using the screen prin to a maximum of 6 marks 1 mark for a basic response, up to a maximum of 3 marks **Indicative content:** • The process requires very little technical equipment and can be carried ou screens; this means that it is not an expensive process to set up • You can print on a variety of substrates/materials which can be soft / fl papers and boards; this makes it a very versatile process • Screens are quite straightforward to produce with basic images being c so that they fit into the mesh screens so that the paint can be squeeze mesh • Different screens can be used with different masks to create different-c layers for quite complex printing • Enables the printing of specialist inks, e.g. glow-in-the-dark, for limited • Process can be viable for one-offs, batches and long production runs • Quick set-up compared to plate-making alternatives – lithography, flex You should accept any other valid response

Qu.	Marking guidance
9	**Marks** / **Description** **5–6**: An excellent evaluation demonstrating a high level of an comparison of the two different types of timber, with de reference to the physical and working properties in relat in the construction of new houses. Detailed consideratio suitability and use within the context. **3–4**: A good evaluation demonstrating a sound degree of ana comparison of the two different types of timber, with de reference to the physical and working properties in relat in the construction of new hous[illegible]ome consideration suitability and use with[illegible]te[illegible]. **1–2**: A basic response with some comparison of the two differ used, with some reference to their characteristics. The r[illegible] **0**: No rewardable content. **Indicative content:** Oak: • Oak is a hardwood and is very hard, tough and durable, making it an ap of material for floorboards and stair treads • Oak takes a long time to grow and is relatively expensive compared to makes it too costly to use for general construction such as stud walls / • Oak has an attractive colour and grain and can be used for doors / skirting bo • Oak can be used for kitchen fittings / cupboards / worktops Pine: • Pine is quick-growing and is, therefore, relatively cheap compared to p cost-effective for general construction such as floor joists / roof trusses • Pine can grow relatively fast / provide long lengths, which means it can without having to be joined / creating weak spots • Pine contains a lot of knots which leak resin / fall out, making the mate / difficult to paint
10	**Marks** / **Description** **5–6**: An excellent demonstration of knowledge showing a hig analysis in relation to the manufacture, maintenance an bicycle in its design and manufacture. **3–4**: A good demonstration of knowledge showing a good lev in relation to the manufacture, maintenance and repair in its design and manufacture. **1–2**: A basic response showing a limited level of analysis in re manufacture, maintenance and repair of the bicycle in i and manufacture. **0**: No rewardable content. **Indicative content:** • The bike is [illegible] several component parts which could be bought [illegible]rer making all the individual parts • [illegible]e frame is likely to have been welded together using mild steel or alum • [illegible]e frame would have been held in a jig while being welded so that the held in the correct place • The tyres of the bike can be replaced if they are worn out/away • Punctures can be repaired to prolong the life of the inner tube • Brake blocks can be replaced as they get worn away due to friction • The chain is easily maintained with oil and lubricants • The handle bars / saddle can be raised higher as a younger owner grows

<table>
<tr><th>Qu.</th><th>Marking guidance</th></tr>
<tr><td>11</td><td>
<table>
<tr><th>Marks</th><th>Description</th></tr>
<tr><td>5–6</td><td>An excellent understanding of the legislation that desi
manufacturers must comply with to ensure that prod
sold to consumers.</td></tr>
<tr><td>3–4</td><td>A good understanding of the legislation that designers
manufacturers must comply with to ensure that prod
sold to consumers.</td></tr>
<tr><td>1–2</td><td>A basic understanding of the legislation that designers
manufacturers must comply with to ensure that prod
sold to consumers.</td></tr>
<tr><td>0</td><td>No rewardable cont</td></tr>
</table>
Note that standards aren't [illegible] compulsory and may instead be codes of

Indicative
• ec legislation is in place to protect the consumer
• signers must ensure that their products meet specific standards befo
sold on the high street
• The Consumer Protection Act (1987) is designed to safeguard consume
that do not reach a satisfactory level of safety, and to give consumers r
buying goods and services
• The Trade Descriptions Act (1968) is in place to stop traders and sellers
false or misleading statements about products, or from supplying good
false statement
• The Consumer Rights Act (2015) introduced legislation to include digita
products, and made provision to cover/protect the consumer in terms
dispute resolution
• The Consumer Rights Act (2015) replaced several safeguards such as th
Act (1979) and Supply of Goods and Services Act (1982)
• The BSI sets standards that designers and manufacturers have to comp
ensure that products are safe for use, e.g. being a specific size
• The BSI Kitemark is awarded to products as a sign of quality, and is easi
and highly regarded
• The Lion Mark is a symbol used to identify that toys have met a minimu
standards; it was developed by the British Toy & Hobby Association
</td></tr>
<tr><td>12</td><td>2 marks for each correct explanation of how EDI is used for marketing purpo
maximum of 4 marks
1 mark for each basic response, up to a maximum of 2 marks

Indicative content:
• Tracking parts throughout production as part of l manufacture
• Identifying parts in storage as part of a K sys em
• Recording sales, which updates and triggers reordering
• Recording sales, which m es and marketing teams of buying tre

You should ac ny other valid response.</td></tr>
</table>

<table>
<tr><th>Qu.</th><th>Marking guidance</th></tr>
<tr><td>13</td><td>2 marks for a correct explanation of the concept of global marketing, up to a
marks
1 mark for a basic response, up to a maximum of 1 mark

Indicative content:
• Global marketing is the process of promoting a product or service worl
bigger/wider/international markets
• Different marketing strategies need to be employed to avoid any cultur
countries, or to avoid marketing products in countries where there is n
• Global marketing is most successful by those who develop products wit
appeal, e.g. food, cars, mobile communicatio y ems and electrical g
• Global marketing has benefited from e xi sion of the Internet and
provision across the world

You should acce e valid response.</td></tr>
<tr><td>14</td><td><table><tr><th>rk</th><th>Description</th></tr><tr><td>5–6</td><td>An excellent understanding of the different ways in which a
designed to allow for more efficient manufacture.</td></tr><tr><td>3–4</td><td>A good understanding of the different ways in which a produ
designed to allow for more efficient manufacture.</td></tr><tr><td>1–2</td><td>A basic understanding of the different ways in which a produ
designed to allow for more efficient manufacture.</td></tr><tr><td>0</td><td>No rewardable content.</td></tr></table>
Indicative content:
• Manufacturers make use of subsystems when designing and making pr
any faulty items are easily tracked / located / taken out of circulation /
• Standard-sized components / component parts can be used to avoid u
in making specific parts
• Injection moulded parts can have inserts moulded directly into them t
machining / can be used to avoid machining components from solid bl
• Self-finishing materials such as polymers reduce the need for expensive
consuming finishing processes
• Greater use is being made of adhesives rather than costly fixings / mec
which can get lost / fall out because of vibrations
• Wall thickness can be reduced, thereby saving materials/cost by introd
to improve stiffness
• Material utilisation – additional material employed only where require
simulation analysis, e.g. CFRP cycle frames
• Snap fittings speed up assembly times</td></tr>
<tr><td>15</td><td>1 mark for each correct definition

One-off
A unique product for an ind l

Batch prod
nu ure of a group of products of a known quantity made simultan

Unit production system (UPS)
A system which is essentially used to move an overhead transportation syste
manually or electronically, used extensively in the textiles industry to reduce
times a product/material is handled

Quick response manufacturing (QRM)
A manufacturing system that results in the shortest time possible in respons
being received to its being completed</td></tr>
</table>

<table>
<tr><th>Qu.</th><th colspan="2">Marking guidance</th></tr>
<tr><td>16</td><td colspan="2">
<table>
<tr><th>Marks</th><th>Description</th></tr>
<tr><td>3</td><td>A detailed understanding and explanation of how jigs and fix to aid the manufacture of products.</td></tr>
<tr><td>2</td><td>A good understanding of how jigs and fixtures are used to ai manufacture of products.</td></tr>
<tr><td>1</td><td>A limited understanding of how jigs and fixtures are used to manufacture of products.</td></tr>
<tr><td>0</td><td>No creditworthy points, or an incorrect explanation.</td></tr>
</table>
Indicative content:
• A jig is used to hold the work and he[illegible] tools used during the m process. As such, a jig holds th[illegible]m[illegible]ents being worked on / assem that each product i[illegible]identical to the one before and the next might be us[illegible] that holes are drilled in the correct place with[illegible] mar[illegible] for pieces being welded together.
• [illegible]g used to hold pieces of work in place to be drilled without the ne [illegible]ere the holes need to be drilled
• A jig is a device used to hold materials in place during manufacture
• Jigs may guide the tooling or the work through the tooling (band saw ji
• Jigs can aid the accuracy of manually operated tools
• Jigs have set-up times and tooling costs that can generally only be reco increased scales of production, e.g. batches
• Fixtures enable complex forms to be secured when operating CNC mac
• Fixtures are clamping devices that secure parts but don't guide tooling
</td></tr>
<tr><td>17</td><td>1</td><td>1 mark for a forming process Fixtures are clamping devices that secure p guide tooling.
1 mark for a product that has been manufactured using the process named

Forming process
• Bending
• Creasing
• Vacuum forming
• Blow moulding (domes on a vacuum forming machine such as those to a kiosk cover)
• Calendaring
• Forging
• Rolling
• Laminating – polymers, timbers, papers and metals
• Steam bending
• Press forming
• Spinning / cupping / drawing
• Forging
• Steam bending

A[illegible]ar[illegible]n that would have been manufactured by one of the proces</td></tr>
</table>

Qu.		Marking guidance
17	2	2 marks for a correct and accurate explanation of the forming process named in 1 mark for a simple statement about the forming process Accept accurate explanations as to why the process named is appropriate, c materials in relation to the product. **Exemplar response** Laminated chair leg – given that thin layers of timber can be glued together shapes, complex shapes or forms can be achieved through careful laminatio used over and over again to make identical legs; however, it is a slow proces quite labour-intensive and the laminates need to b clamped under pres adhesive to cure. You should accept any oth r response.
18		**Mathematical cal** ct version of units t calculation of the waste from the mortise 1 × 2.5 = 7.5 cm^3 Correct calculation of the waste from the tenon (3 × 5 × 2.5) = 37.5 cm^3 – the mortise Alternative method (((5 × 1) + (1 × 1)) × 2) × 2.5 = 30 cm^3 Calculation of total waste from tenon if using the first of the two methods above 37.5 cm^3 – 7.5 cm^3= 30 cm^3 Calculation of total waste overall 30 cm^3 + 7.5 cm^3 = 37.5 cm^3
19		2 marks for a correct explanation of the reason for using neoprene for the h maximum of 4 marks 1 mark for a basic response, up to a maximum of 2 marks **Indicative content:** • Neoprene has an elastic quality, which means that it has some 'give' w squeezed to hold it tightly by the user so that they can lift the dumb-be • Neoprene has a rubberised texture which improves the surface texture easier to grip and hold the dumb-bells, reducing the risk of dropping th • Neoprene is non-toxic and the surface is able to be cleaned (which is u handling scenarios) You should accept any other valid response.
20		2 marks for a correct explanation of the re for sing biodegradable poly supermarket carrier bags, up to a m u 4 marks 1 mark for a basic respons aximum of 2 marks 4 m rks c given when a response refers to both raw materials and e e content: • The use of biodegradable polymers will reduce the demand for oil – a f which means that the current reserves will last longer • Biodegradable polymers will naturally break down in the soil / compost bi result in fewer traditional plastic bags being dumped / left to pollute the s • Fewer bags will be sent to landfill (where they take very many years to the soil) You should accept any other valid response.

Qu.	Marking guidance

Marks	Description
7–9	An excellent discussion demonstrating a high level of analy comparison of the two different types of manufacturing, w reference to CAM and traditional manufacturing methods. consideration of their suitability and use within the contex
4–6	A good discussion demonstrating a sound degree of analys comparison of the two different types of manufacturing, w reference to CAM and traditional manufacturing methods. consideration of their suitability and use within the contex
1–3	A basic response with some comp[illegible]n of the two differe manufacturing, with spec[illegible]nce to CAM and traditio manufacturing me[illegible]ds. Detailed consideration of their s use with[illegible]o[illegible]xt.
0	[illegible]ant/[illegible]e content.

21

[illegible]ve [illegible]ntent:

[illegible]

- CAM machines can be linked directly to CAD packages so that designs c quite easily
- CAM can run repeatedly without the need for breaks / stops / having t working conditions
- CAM machines have automatic tool changing heads so that a multitude tools can be swapped in and out of the cutting head
- CAM machines have multiple axes, which means complex shapes / 3D s profiles can be machined
- CAM machines of this complexity would be very expensive to purchase
- Cutting fluids will be present in both traditional and automated milling enclosed and shielded CAM machinery does reduce risks of clashes and harming an operator
- Less about running machines repeatedly for a batch of 15 and more ab of speeds and feeds – to achieve desired accuracy and surface finish

Traditional manufacturing methods:

- Great skill and training is required to be able to machine components o this shape
- They would take a great deal of time to cut, and may take several days up tools and changing cutters
- The parts may be cut in stages to reduce the number of tool changes, b the setting and repositioning of components may result in inaccuracies being introduced
- The use of cutting fluids may present health and safety issues for the w with a CAM machine it would be totally enclosed, reducing any potenti risk to the worker

Preview of Answers Ends Here