

**GCSE
DESIGN AND TECHNOLOGY
8552/W**

Unit 1 Written Paper

Mark scheme

June 2020

Version: 1.0 Final



Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

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Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Glossary for maths

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

[a, b]	Accept values between a and b inclusive.
For π	Accept values in the range [3.14, 3.142]
Their	Accept an answer from the candidate if it has been inaccurately calculated but is subsequently used in a further stage of the question.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Qu	Part	Marking Guidance	Total marks	AO
1		A Biomass	1 mark	AO4
2		B To have a short lifespan	1 mark	AO4
3		C To switch equipment on or off	1 mark	AO4
4		B Photochromic pigment	1 mark	AO4
5		D Woven fabric	1 mark	AO4
6		A Due to improvements in new materials	1 mark	AO4
7		A An increased use of robotics has led to a reduction in manual jobs	1 mark	AO4
8		D Turbine	1 mark	AO4
9		D Pulley	1 mark	AO4
10		A Can be drawn into a long length	1 mark	AO4

Qu	Part	Marking Guidance	Total marks	AO						
11	1	<p>Name one alloy.</p> <p>1 mark for a correct specific named alloy.</p> <p>Indicative content:</p> <p>Brass Bronze Duralumin Pewter Steel (accept any specifically named steel eg die steel (tool steel), high speed steel (HSS), stainless steel)</p> <p>Accept all other valid responses.</p>	1 mark	AO4						
11	2	<p>Explain why metals are alloyed.</p> <table border="1" data-bbox="320 974 1217 1193"> <tr> <td data-bbox="320 974 509 1090">2 marks</td> <td data-bbox="509 974 1217 1090">Two correct simple points of explanation or one point explained in detail possible using a specific example of use.</td> </tr> <tr> <td data-bbox="320 1090 509 1142">1 mark</td> <td data-bbox="509 1090 1217 1142">One correct simple point of explanation.</td> </tr> <tr> <td data-bbox="320 1142 509 1193">0 marks</td> <td data-bbox="509 1142 1217 1193">No attempt or nothing worthy of credit.</td> </tr> </table> <p>Indicative content:</p> <ul style="list-style-type: none"> • Where a mixture of at least 2 metals are combined to give enhanced properties • To produce a tough corrosion resistant material eg stainless steel • Titanium can be alloyed with other metals like aluminium and vanadium for increased strength, better corrosion resistance and easier workability • Alloying metals can improve working properties and improve aesthetics <p>Possible reference to examples of use to enhance explanation:</p> <ul style="list-style-type: none"> • Stainless steel – cutlery to make hard wearing and corrosion resistant • Brass – copper and zinc for brass musical instruments due to workability into different forms and profiles <p>Accept all other valid responses.</p>	2 marks	Two correct simple points of explanation or one point explained in detail possible using a specific example of use.	1 mark	One correct simple point of explanation.	0 marks	No attempt or nothing worthy of credit.	2 marks	AO4
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Qu	Part	Marking Guidance	Total marks	AO								
12	1	<p>Composite materials such as foil and polymer lined boards are used in food and drink packaging.</p> <p>Give one advantage and one disadvantage of using composite materials for packaging.</p> <p>1 mark for one correct advantage and one correct disadvantage.</p> <p>Indicative content:</p> <p>Advantages:</p> <ul style="list-style-type: none"> • Improve resistance to water absorption • Improve insulation properties • Improve ability to preserve contents • Improve strength and stability of the container <p>Disadvantages:</p> <ul style="list-style-type: none"> • Not always recycled by some local collection services hence may be incinerated or end up in land fill • Do not degrade easily if littered • Difficult to separate different materials from each other for recycling at the end of a containers life <p>Accept all other valid responses.</p>	2 marks	AO4								
12	2	<p>Table 1 shows the number of food and drink containers successfully recycled by a manufacturer in 2010 and 2017.</p> <p>What is the percentage increase in recycling of composite food and drink containers between 2010 and 2017?</p> <table border="1" data-bbox="320 1529 1217 1731"> <tr> <td data-bbox="320 1529 507 1615">1 mark</td> <td data-bbox="507 1529 1217 1615">For recognising a 14 billion tonne increase in containers recycled ie 46-32 billion tonnes</td> </tr> <tr> <td data-bbox="320 1615 507 1731">1 mark</td> <td data-bbox="507 1615 1217 1731"> $14 \div 32 \times 100 = 43.75\%$ Accept 43.8% </td> </tr> </table> <p>Alternative method</p> <table border="1" data-bbox="320 1839 1217 2002"> <tr> <td data-bbox="320 1839 507 1888">1 mark</td> <td data-bbox="507 1839 1217 1888">$46 \div 32 = 1.4375$</td> </tr> <tr> <td data-bbox="320 1888 507 2002">1 mark</td> <td data-bbox="507 1888 1217 2002"> Answer 43.75% Accept 43.8% </td> </tr> </table>	1 mark	For recognising a 14 billion tonne increase in containers recycled ie 46-32 billion tonnes	1 mark	$14 \div 32 \times 100 = 43.75\%$ Accept 43.8%	1 mark	$46 \div 32 = 1.4375$	1 mark	Answer 43.75% Accept 43.8%	2 marks	AO4
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Qu	Part	Marking Guidance	Total marks	AO						
13		<p>Figure 4 shows a system diagram for an alarm.</p> <p>Complete the diagram by naming one component that could be used in each block.</p> <table border="1" data-bbox="320 539 1217 1420"> <thead> <tr> <th data-bbox="320 539 620 640">Suitable inputs</th> <th data-bbox="620 539 919 640">Suitable processes</th> <th data-bbox="919 539 1217 640">Suitable outputs</th> </tr> </thead> <tbody> <tr> <td data-bbox="320 640 620 1420"> <ul style="list-style-type: none"> • Light sensors • Temperature sensors • Pressure sensors • Switches • Pressure pad <p>Accept any switch/sensor used to activate or deactivate system, eg:</p> <ul style="list-style-type: none"> • PIR sensor • Sensor + qualification • Motion sensor • SPST switch • Key switch • Reed switch • Key pad </td> <td data-bbox="620 640 919 1420"> <ul style="list-style-type: none"> • Microcontrollers • Timers • Decision making <p>Accept trade names for specific components and:</p> <ul style="list-style-type: none"> • PIC chip • Genie chips • Picaxe • Arduino • Crumble • Genie • Counter • Transistor • Microprocessor • Transistor • Time delay • Monostable • Astable </td> <td data-bbox="919 640 1217 1420"> <ul style="list-style-type: none"> • Buzzers • Speakers • Lamps <p>Accept specific components:</p> <ul style="list-style-type: none"> • Bell • LED • Siren • App notification on phone </td> </tr> </tbody> </table>	Suitable inputs	Suitable processes	Suitable outputs	<ul style="list-style-type: none"> • Light sensors • Temperature sensors • Pressure sensors • Switches • Pressure pad <p>Accept any switch/sensor used to activate or deactivate system, eg:</p> <ul style="list-style-type: none"> • PIR sensor • Sensor + qualification • Motion sensor • SPST switch • Key switch • Reed switch • Key pad 	<ul style="list-style-type: none"> • Microcontrollers • Timers • Decision making <p>Accept trade names for specific components and:</p> <ul style="list-style-type: none"> • PIC chip • Genie chips • Picaxe • Arduino • Crumble • Genie • Counter • Transistor • Microprocessor • Transistor • Time delay • Monostable • Astable 	<ul style="list-style-type: none"> • Buzzers • Speakers • Lamps <p>Accept specific components:</p> <ul style="list-style-type: none"> • Bell • LED • Siren • App notification on phone 	3 marks	AO4
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Qu	Part	Marking Guidance	Total marks	AO									
14		<p>Name one specific commercial manufacturing process and describe what it is used for.</p> <p>Name of process</p> <p>Using notes and/or sketches describe the process you have named above.</p> <p>1 mark for a correctly named specific process</p> <p>1 mark for a simple descriptive point</p> <p>2 marks for a detailed response with two credit-worthy points made</p> <p>Indicative content:</p> <table border="1" data-bbox="320 981 1217 2042"> <tbody> <tr> <td data-bbox="320 981 507 1234">Papers and boards</td> <td data-bbox="507 981 775 1234"> Offset lithography Screen printing Digital printing Die cutting </td> <td data-bbox="775 981 1217 1234"> Printing design and information on paper and card. Cutting out of nets. Making perforations. Creasing of card. </td> </tr> <tr> <td data-bbox="320 1234 507 1823">Timber based materials</td> <td data-bbox="507 1234 775 1823"> Routing Turning Lamination Machine morticing </td> <td data-bbox="775 1234 1217 1823"> Production of grooves, rebates and joints. Turning cylindrical objects and shapes. Bonding layers of veneers or laminas together to create a large flat board or a complex curved shape using a former. Cutting square or rectangular holes in a piece of timber to create joints. (Also note that mortices often have round ends so must be considered if in answer). </td> </tr> <tr> <td data-bbox="320 1823 507 2042">Metal based materials</td> <td data-bbox="507 1823 775 2042"> Milling Casting </td> <td data-bbox="775 1823 1217 2042"> Horizontal or vertical milling of a flat surface, groove, rebate or hole. </td> </tr> </tbody> </table>	Papers and boards	Offset lithography Screen printing Digital printing Die cutting	Printing design and information on paper and card. Cutting out of nets. Making perforations. Creasing of card.	Timber based materials	Routing Turning Lamination Machine morticing	Production of grooves, rebates and joints. Turning cylindrical objects and shapes. Bonding layers of veneers or laminas together to create a large flat board or a complex curved shape using a former. Cutting square or rectangular holes in a piece of timber to create joints. (Also note that mortices often have round ends so must be considered if in answer).	Metal based materials	Milling Casting	Horizontal or vertical milling of a flat surface, groove, rebate or hole.	4 marks	AO4 1a AO4 1b
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			<p>Welding</p> <p>Brazing</p> <p>Sintering</p>	<p>Redistribution of metal in molten form to fill a mould or cavity.</p> <p>Redistribution of at least 2 pieces of metal along and edge/spot/seam to create a permanent joint.</p> <p>Use of solder to join two or more pieces of metal together without physically melting them.</p> <p>The compression of powdered metals in a die using heat and extreme pressure to create a solid product in final shape.</p>		
		Polymers	<p>Injection moulding</p> <p>Extrusion</p> <p>Vacuum forming</p> <p>Calendaring</p> <p>Rotational moulding</p> <p>Blow moulding</p>	<p>The heating and injection of molten polymer into a mould to produce a 3D shape.</p> <p>Where molten polymer is extruded through a die to produce a consistent shaped profile.</p> <p>Heating of sheet polymer so that it softens and can be shaped in a mould by extracting the air between the material and the form.</p> <p>Manufacture of thin thermoplastic film.</p> <p>Used to manufacture hollow 3D products using an enclosed mould containing thermoplastic polymer in powder form.</p> <p>Polymer in tube form is extruded (parison), the end sealed and hot air blown in to forcing the polymer out into a mould to create a hollow shape.</p>		
		Textile based materials	<p>Weaving</p> <p>Dying</p>	<p>Fabrics are woven on looms to produce large rolls of cloth in either plain or repeating patterns.</p>		

			<p>Printing</p> <p>Machine sewing</p>	<p>Fibres are dyed commercially before weaving to establish a fibre colour dyeing can be done by batch dyeing in a tank or continuous dyeing using various tanks and rollers to move the fabric along.</p> <p>Roller printing, screen printing and digital printing all transfer images to the fabric.</p> <p>Specialist sewing techniques like the overlock stitch can be used to create a tough and durable edge, hem or seam.</p>		
		<p>Electrical and mechanical systems</p>	<p>Pick and place assembly</p> <p>Flow soldering/ Reflow soldering</p> <p>Wave soldering</p> <p>PCB manufacture Etching</p> <p>PCB lacquering</p>	<p>Used to select and position individual components in pre-determined positions quickly and consistently on a PCB.</p> <p>Used in surface mounting of electrical components. Components are located on a PCB on pre-soldered pads. PCB is then placed in a reflow oven where the solder melts connecting the component to the PCB.</p> <p>Circuit boards have pre drilled holes with components located in position. PCB board then moves on a conveyer belt over a molten solder wave, bonding the components to the PCB as the solder cools.</p> <p>Different to photoresist PCB manufacture done in school by spraying the etch directly onto a developed PCB board.</p> <p>Application of a polymer layer to protect PCB from corrosion, dust and dirt.</p>		
<p>Accept other valid responses.</p>						

Qu	Part	Marking Guidance	Total marks	AO								
15		<p>Explain why each factor below would need to be considered by a manufacturer when sourcing materials/components.</p> <p>A maximum of 2 marks explaining why each factor needs to be considered when selecting materials or components</p> <table border="1" data-bbox="320 622 1217 757"> <tr> <td data-bbox="320 622 507 705">2 marks</td> <td data-bbox="507 622 1217 705">Two simple points of explanation given or one clarified in greater detail</td> </tr> <tr> <td data-bbox="320 705 507 757">1 mark</td> <td data-bbox="507 705 1217 757">A simple correct point of explanation given</td> </tr> </table> <p>Indicative content:</p> <p>The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.</p> <table border="1" data-bbox="320 974 1217 1951"> <tr> <td data-bbox="320 974 660 1460">Bulk buying</td> <td data-bbox="660 974 1217 1460"> <p>Economies of scale – buying in bulk will allow for reduced material/components costs and these can be passed on to the customer for a more competitive price. Manufactures will secure discounts that can be passed on to the customer.</p> <p>Stock forms – buying exactly the quantity of materials required for a product or range of products knowing they can be used without waste</p> <p>Standard components – bought in bulk to secure discounts and reduce final product cost</p> </td> </tr> <tr> <td data-bbox="320 1460 660 1951">Ethical factors</td> <td data-bbox="660 1460 1217 1951"> <p>Finite v renewable – avoid unnecessary consumption of finite resources that will run out. Use sustainable materials where possible.</p> <p>Provenance – where do the materials come from? Are they from an ethical source eg Forest Stewardship council (FSC) or Fairtrade.</p> <p>Working conditions – the promotion and support of people and communities in developing countries to ensure they are not exploited, having a detrimental impact on education, health and general well-being.</p> </td> </tr> </table> <p>Accept other valid responses.</p>	2 marks	Two simple points of explanation given or one clarified in greater detail	1 mark	A simple correct point of explanation given	Bulk buying	<p>Economies of scale – buying in bulk will allow for reduced material/components costs and these can be passed on to the customer for a more competitive price. Manufactures will secure discounts that can be passed on to the customer.</p> <p>Stock forms – buying exactly the quantity of materials required for a product or range of products knowing they can be used without waste</p> <p>Standard components – bought in bulk to secure discounts and reduce final product cost</p>	Ethical factors	<p>Finite v renewable – avoid unnecessary consumption of finite resources that will run out. Use sustainable materials where possible.</p> <p>Provenance – where do the materials come from? Are they from an ethical source eg Forest Stewardship council (FSC) or Fairtrade.</p> <p>Working conditions – the promotion and support of people and communities in developing countries to ensure they are not exploited, having a detrimental impact on education, health and general well-being.</p>	2 x 2 marks	AO4
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16	1	<p>The products/components shown below are manufactured from different materials.</p> <p>Choose one product/component and complete Table 2 below.</p> <p>One mark for each of:</p> <ul style="list-style-type: none"> • Specific main material • Stock form • Appropriate finishing technique <p>Indicative content:</p> <p>Content is illustrative and other correct responses should be rewarded.</p> <table border="1" data-bbox="320 949 1217 2029"> <thead> <tr> <th colspan="3" data-bbox="320 949 1217 999">Product: Metal can opener</th> </tr> <tr> <th data-bbox="320 999 620 1115">Specific main material used</th> <th data-bbox="620 999 920 1115">Stock form used in manufacture</th> <th data-bbox="920 999 1217 1115">Appropriate finishing technique</th> </tr> </thead> <tbody> <tr> <td data-bbox="320 1115 620 1317">Steel Stainless steel</td> <td data-bbox="620 1115 920 1317">Sheet Strip Bar</td> <td data-bbox="920 1115 1217 1317">Polymer over-moulding Left as finished/ polished finish Powered coated</td> </tr> <tr> <th colspan="3" data-bbox="320 1350 1217 1400">Product: Card shoe box</th> </tr> <tr> <th data-bbox="320 1400 620 1516">Specific main material used</th> <th data-bbox="620 1400 920 1516">Stock form used in manufacture</th> <th data-bbox="920 1400 1217 1516">Appropriate finishing technique</th> </tr> <tr> <td data-bbox="320 1516 620 1632">Solid white board Corrugated cardboard</td> <td data-bbox="620 1516 920 1632">Sheet</td> <td data-bbox="920 1516 1217 1632">Offset lithography Printing</td> </tr> <tr> <th colspan="3" data-bbox="320 1666 1217 1715">Product: Textile shopping bag with logo</th> </tr> <tr> <th data-bbox="320 1715 620 1832">Specific main material used</th> <th data-bbox="620 1715 920 1832">Stock form used in manufacture</th> <th data-bbox="920 1715 1217 1832">Appropriate finishing technique</th> </tr> <tr> <td data-bbox="320 1832 620 2029">Cotton drill Denim Hessian Calico</td> <td data-bbox="620 1832 920 2029">Roll</td> <td data-bbox="920 1832 1217 2029">Dying Screen printing Digital printing Stain resist finish Water resist finish</td> </tr> </tbody> </table>	Product: Metal can opener			Specific main material used	Stock form used in manufacture	Appropriate finishing technique	Steel Stainless steel	Sheet Strip Bar	Polymer over-moulding Left as finished/ polished finish Powered coated	Product: Card shoe box			Specific main material used	Stock form used in manufacture	Appropriate finishing technique	Solid white board Corrugated cardboard	Sheet	Offset lithography Printing	Product: Textile shopping bag with logo			Specific main material used	Stock form used in manufacture	Appropriate finishing technique	Cotton drill Denim Hessian Calico	Roll	Dying Screen printing Digital printing Stain resist finish Water resist finish	3 marks	AO4
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<p>Accept other valid responses.</p>										

16	2	<p>A number of calendars are being made.</p> <p>Given the sizes provided in Figure 5 and Figure 6, how many calendar pages can be made from one sheet?</p> <p>Indicative content:</p> <table border="1"> <tr> <td>1 mark</td> <td> <p>Correct calculation $280 \times 4 = 1120$ mm $210 \times 4 = 840$</p> <p>OR</p> <p>$1187 \div 280 = 4.2$ (so 4 sheets one way) And $841 \div 210 = 4$ the other way</p> <p>OR</p> <p>$(1187 \times 841) \div (280 \times 210) = 16.9773 = 16$ pages max</p> <p>OR</p> </td> </tr> </table>	1 mark	<p>Correct calculation $280 \times 4 = 1120$ mm $210 \times 4 = 840$</p> <p>OR</p> <p>$1187 \div 280 = 4.2$ (so 4 sheets one way) And $841 \div 210 = 4$ the other way</p> <p>OR</p> <p>$(1187 \times 841) \div (280 \times 210) = 16.9773 = 16$ pages max</p> <p>OR</p>	2 marks	AO4
1 mark	<p>Correct calculation $280 \times 4 = 1120$ mm $210 \times 4 = 840$</p> <p>OR</p> <p>$1187 \div 280 = 4.2$ (so 4 sheets one way) And $841 \div 210 = 4$ the other way</p> <p>OR</p> <p>$(1187 \times 841) \div (280 \times 210) = 16.9773 = 16$ pages max</p> <p>OR</p>					

			$998267 \div 58800 = 16.9773 = 16 \text{ pages max.}$		
		1 mark	Calculation that pages will fit in a 4 x 4 arrangement allowing 16 pages to be made from each sheet		

16	3	<p>What percentage of material is waste after cutting the pages calculated in Question 16.2?</p> <p>Give your answer to two decimal places.</p>		3 marks	AO4
		1 mark	<p>Step 1:</p> <p>Total sheet area = $1187 \times 841 = 998\,267$</p> <p>Total area of their answer from 16.2 = their $16 \times 280 \times 201 = 940\,800$</p>		
		1 mark	<p>Step 2:</p> <p>Total waste = $57\,467 \text{ mm}^2 - \text{their } 940\,800 = \text{their } 57\,467$</p>		
		1 mark	<p>Step 3:</p> <p>Percentage waste = their $57\,467 \div 998\,267 \times 100 = \text{their } 5.7567\% = \text{their } 5.76\%$</p>		
		Alternative method 1			
		1 mark	<p>Step 1:</p> <p>Vertical waste portion their $67 \times 841 = 56\,347 \text{ mm}^2$</p> <p>Horizontal waste portion = their $1 \times \text{their } 1120 = 1200 \text{ mm}^2$</p>		
		1 mark	<p>Step 2:</p> <p>Total waste = their $57\,467 \text{ mm}^2$</p> <p>Total sheet area = $998\,267 \text{ mm}^2$</p>		
		1 mark	<p>Step 3:</p> <p>Percentage waste = their $57\,467 \div 998\,267 \times 100 = \text{their } 5.7567\% = \text{their } 5.76\%$</p>		
		Alternative method 2			
		1 mark	<p>Step 1:</p> <p>Vertical waste portion their $67 \times \text{their } 840 = \text{their } \text{XXX} \text{ mm}^2$</p> <p>Horizontal waste portion = their $1 \times 1187 = \text{their } 1200 \text{ mm}^2$</p>		

		1 mark	Step 2: Total waste = XXX mm ² Total sheet area = 998 267 mm ²		
		1 mark	Step 3: Percentage waste = their XXX ÷ 998 267 × 100 = their 5.7567% = their 5.76%		

Qu	Part	Marking Guidance	Total marks	AO
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17		<p>Responsible design should consider social issues in the design and manufacture of products.</p> <p>Analyse and evaluate the types of pollution caused by the manufacture, use and disposal of products.</p> <p>Give examples in your answer.</p> <table border="1"> <tr> <td>7–8 marks</td> <td>A fully detailed analysis and evaluation of oceanic and/or atmospheric pollution and the impact it can have on the environment. Several good examples to support response.</td> </tr> <tr> <td>5–6 marks</td> <td>A good analysis of both oceanic and/or atmospheric pollution and the impact on the environment. Some evaluative points given in response to analysis information presented. Good example(s) to support response.</td> </tr> <tr> <td>4–3 marks</td> <td>Basic analysis of oceanic and/or atmospheric pollution. Expect an imbalance in response between the two types of pollution requiring consideration in the question. One or no evaluative point. Simplistic or vague attempt to include examples in response.</td> </tr> <tr> <td>1–2 marks</td> <td>One or two limited points considering oceanic and/or atmospheric pollution. Very limited analysis, evaluation and no examples.</td> </tr> <tr> <td>0 marks</td> <td>No attempt or nothing worthy of credit.</td> </tr> </table> <p>Indicative content:</p> <p>The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.</p> <p>Analysis – identification of component characteristics of each type of pollution</p>	7–8 marks	A fully detailed analysis and evaluation of oceanic and/or atmospheric pollution and the impact it can have on the environment. Several good examples to support response.	5–6 marks	A good analysis of both oceanic and/or atmospheric pollution and the impact on the environment. Some evaluative points given in response to analysis information presented. Good example(s) to support response.	4–3 marks	Basic analysis of oceanic and/or atmospheric pollution. Expect an imbalance in response between the two types of pollution requiring consideration in the question. One or no evaluative point. Simplistic or vague attempt to include examples in response.	1–2 marks	One or two limited points considering oceanic and/or atmospheric pollution. Very limited analysis, evaluation and no examples.	0 marks	No attempt or nothing worthy of credit.	8 marks	AO4
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0 marks	No attempt or nothing worthy of credit.													

		<p>Evaluation – judgment on impact of each type of pollution on the environment</p> <table border="1"> <tr> <td data-bbox="320 349 660 1350"> <p>Oceanic pollution</p> </td> <td data-bbox="660 349 1214 1350"> <ul style="list-style-type: none"> • Pesticides and fertilisers being washed from the land by rain and carried by rivers into the sea. • Chemicals and toxic materials like mercury and lead find their way into oceans. These then can enter to food chain and poison water supplies. • Plastic which does not degrade is carried by rivers into the sea creating large pools of rubbish in the deep oceans where sea currents converge. • Pollution of the seas from oil spills during extraction and tanker accidents. • Oil and sewage pollution whilst better than in previous years, can still contaminate and pollute ecosystems and marine life eg coastlines. • Micro beads – no longer legal to use in cosmetics as from January 2018 in the UK (also banned in Europe and North America). Big problem due to size of less than 1 mm diameter is that they cannot be removed by water treatment making it all the way into the oceans to the detriment of sea life and ecosystems. </td> </tr> <tr> <td data-bbox="320 1350 660 2047"> <p>Atmospheric pollution</p> </td> <td data-bbox="660 1350 1214 2047"> <ul style="list-style-type: none"> • Acid rain – the combination of nitrogen oxide and sulphur dioxide combine and fall as acid rain which when carried by prevailing winds fall raising acidity levels in lakes killing fish and marine life and also raising acidity in the soil destroying plant based life. • Carbon monoxide contributes extensively to greenhouse gasses and raising the global temperature. • Carbon dioxide emissions from vehicles using fossil fuels is known to lower air quality affecting the health of the young, elderly and those with chronic breathing issues. • Particulates – when released into the atmosphere they can cause ‘global dimming’ restricting light to the surface of the earth. </td> </tr> </table>	<p>Oceanic pollution</p>	<ul style="list-style-type: none"> • Pesticides and fertilisers being washed from the land by rain and carried by rivers into the sea. • Chemicals and toxic materials like mercury and lead find their way into oceans. These then can enter to food chain and poison water supplies. • Plastic which does not degrade is carried by rivers into the sea creating large pools of rubbish in the deep oceans where sea currents converge. • Pollution of the seas from oil spills during extraction and tanker accidents. • Oil and sewage pollution whilst better than in previous years, can still contaminate and pollute ecosystems and marine life eg coastlines. • Micro beads – no longer legal to use in cosmetics as from January 2018 in the UK (also banned in Europe and North America). Big problem due to size of less than 1 mm diameter is that they cannot be removed by water treatment making it all the way into the oceans to the detriment of sea life and ecosystems. 	<p>Atmospheric pollution</p>	<ul style="list-style-type: none"> • Acid rain – the combination of nitrogen oxide and sulphur dioxide combine and fall as acid rain which when carried by prevailing winds fall raising acidity levels in lakes killing fish and marine life and also raising acidity in the soil destroying plant based life. • Carbon monoxide contributes extensively to greenhouse gasses and raising the global temperature. • Carbon dioxide emissions from vehicles using fossil fuels is known to lower air quality affecting the health of the young, elderly and those with chronic breathing issues. • Particulates – when released into the atmosphere they can cause ‘global dimming’ restricting light to the surface of the earth. 		
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		<table border="1"> <tr> <td data-bbox="320 241 660 533"></td> <td data-bbox="660 241 1219 533"> <ul style="list-style-type: none"> • Lower air quality – impact on human health particularly the young, old, people with asthma, heart and lung problems. Net impact on increase health care costs and mortality rates. Affected groups are told to stay indoors on days identified as ones with poor air quality. </td> </tr> </table> <p data-bbox="320 566 708 600">Accept other valid responses.</p>		<ul style="list-style-type: none"> • Lower air quality – impact on human health particularly the young, old, people with asthma, heart and lung problems. Net impact on increase health care costs and mortality rates. Affected groups are told to stay indoors on days identified as ones with poor air quality. 		
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Qu	Part	Marking Guidance	Total marks	AO								
18		<p>Explain why the two methods below are used to manufacture products in different volumes.</p> <p>Give specific examples of products in your answer.</p> <p>Maximum of 3 marks for each production method.</p> <table border="1" data-bbox="320 607 1217 943"> <tr> <td data-bbox="320 607 507 689">3 marks</td> <td data-bbox="507 607 1217 689">Two simple/One detailed point of explanation and specific example (s) to further clarify response.</td> </tr> <tr> <td data-bbox="320 689 507 808">2 marks</td> <td data-bbox="507 689 1217 808">One detailed/Two simple points or one simple point of explanation and a specific example to further clarify response.</td> </tr> <tr> <td data-bbox="320 808 507 891">1 marks</td> <td data-bbox="507 808 1217 891">One simple point of explanation or appropriate specific example to clarify response.</td> </tr> <tr> <td data-bbox="320 891 507 943">0 marks</td> <td data-bbox="507 891 1217 943">Nothing worthy of credit.</td> </tr> </table> <p>Indicative content:</p> <p>The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.</p> <p>Mass</p> <ul data-bbox="320 1223 1217 1592" style="list-style-type: none"> • Used to produce products in tens of thousands/ large production runs eg TVs, fridges, microwave ovens. • Highly suited to products that can be made using automated manufacturing techniques requiring minimal human involvement eg packaging and leaflets. • Where a large number of identical products are known to be needed, making it worthwhile setting up a dedicated production line. • Used where efficient material use is paramount to ensure a cost effective product with minimal waste/ zero defects to keep product costs low eg mobile phones. <p>Batch</p> <ul data-bbox="320 1697 1217 2040" style="list-style-type: none"> • Suited to small quantities of a product or slight variations of a product eg perishable goods like food, chemicals (adhesives & paint), home furnishings (wallpaper and tiles) some medical supplies etc. • Batches can be in single figures or several hundred depending on what the product is eg set of dining chairs, bridesmaid dresses • Extensive use of jigs, templates and moulds to assure consistency across a batch. • Opportunities for CAD/CAM to allow flexibility in manufacturing different batches of products. 	3 marks	Two simple/One detailed point of explanation and specific example (s) to further clarify response.	2 marks	One detailed/Two simple points or one simple point of explanation and a specific example to further clarify response.	1 marks	One simple point of explanation or appropriate specific example to clarify response.	0 marks	Nothing worthy of credit.	2 x 3 marks	AO4
3 marks	Two simple/One detailed point of explanation and specific example (s) to further clarify response.											
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1 marks	One simple point of explanation or appropriate specific example to clarify response.											
0 marks	Nothing worthy of credit.											

		<ul style="list-style-type: none">• Quick change over between one batch of products and another without time consuming human involvement eg manufacture from a CAD file.• Economies of scale as some materials/ components can be sourced/purchased in bulk. <p>Accept other valid responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO								
19		<p>Choose one of the companies from Table 3.</p> <p>Outline the design features and/or manufacturing techniques that have made your chosen company successful.</p> <p>You should refer to specific products in your answer.</p> <table border="1" data-bbox="320 611 1217 1081"> <tr> <td data-bbox="320 611 507 763">5–6 marks</td> <td data-bbox="507 611 1217 763">Thorough description of a wide range of design features and/or manufacturing techniques provided for one company. Two or more clear examples provided to support response.</td> </tr> <tr> <td data-bbox="320 763 507 880">3–4 marks</td> <td data-bbox="507 763 1217 880">A good description with consideration of some design features and/or manufacturing techniques provided for one company.</td> </tr> <tr> <td data-bbox="320 880 507 996">1–2 marks</td> <td data-bbox="507 880 1217 996">Limited description identifying generic products associated with one company rather than design features and/or manufacturing techniques.</td> </tr> <tr> <td data-bbox="320 996 507 1081">0 marks</td> <td data-bbox="507 996 1217 1081">Nothing worthy of credit/ a company not in the question has been discussed</td> </tr> </table> <p>Indicative content:</p> <p>The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.</p> <p>Alessi Unique products produced with a distinctive design flavour. Heavy focus on kitchen products and products for the household. Products make extensive use of stainless steel mixed with brightly coloured polymers. Artistic design A focus on high quality – hand crafted objects made with the help of machines Fun design imprinted with characterful features Products designed to be aesthetic as well as functional with varying degrees of success:</p> <ul style="list-style-type: none"> • Whistling bird kettle 1985 by Michael Graves • Juicy Salif 1990 by Philippe Starck • Anna G corkscrew 1994 by Alessandro Mendini • Condiment set 1978 by Ettore Sottsass <p>Apple Computers, portable music and phones:</p> <ul style="list-style-type: none"> • Apple 2 and 3 PCs in the 1970s • Apple Macintosh computers in 1980s • Macintosh mouse 1984 	5–6 marks	Thorough description of a wide range of design features and/or manufacturing techniques provided for one company. Two or more clear examples provided to support response.	3–4 marks	A good description with consideration of some design features and/or manufacturing techniques provided for one company.	1–2 marks	Limited description identifying generic products associated with one company rather than design features and/or manufacturing techniques.	0 marks	Nothing worthy of credit/ a company not in the question has been discussed	6 marks	AO4
5–6 marks	Thorough description of a wide range of design features and/or manufacturing techniques provided for one company. Two or more clear examples provided to support response.											
3–4 marks	A good description with consideration of some design features and/or manufacturing techniques provided for one company.											
1–2 marks	Limited description identifying generic products associated with one company rather than design features and/or manufacturing techniques.											
0 marks	Nothing worthy of credit/ a company not in the question has been discussed											

	<ul style="list-style-type: none"> • iMac G3 1998 designed by Jonathan Ive with cases in distinctive and various colours to catch attention • Mini desktops – the Power Mac cube 2000 • PowerBook 100 1991 – miniaturised parts of the desktop range to create a lap top with integrated mouse • iPod Generation 1 2001 with click wheel technology for ease of track selection • iPod shuffle 2005 – random track selection • MacBook Pro 2006 with aluminium case. The benchmark for all other manufacturers • iPhone 2007 with touch screen technology. Apps from the Apple shop <p>Braun A company forever linked with the work of German industrial designer Dieter Rams and his 10 principles for good design:</p> <ol style="list-style-type: none"> 1. Innovative 2. Useful 3. Aesthetic 4. Understandable – good design that does not need an instruction booklet! 5. Unobtrusive 6. Honest 7. Long lasting 8. Design down to the last detail 9. Environmentally friendly 10. As little design as possible <p>A range of electrical and electronic products designed with simple lines, function in mind and intuitive design:</p> <ul style="list-style-type: none"> • Portable radios • Digital bedside radio/alarm clocks • Battery powered/electric shavers eg Braun sixtant razor 1962 • Hair and skin care products eg hairdryers • Health products eg blood pressure monitors <p>Dyson Electrical and electronic products using imagination and innovation to create stylish products that are also highly functional</p> <ul style="list-style-type: none"> • DC01 – the first dual cyclone vacuum cleaner 1993. • Washing machine CR01 2000 with twin opposing drum technology for a quicker more thorough wash supposedly. • Dyson digital motor 2004 – with high speed impeller. Used in later iterations of cleaners for improved efficiency. • Dyson ball vacuum cleaner DC15 2005 – for improved manoeuvrability. Traditional cleaners have fixed wheels and only go in straight lines. • First Hand held cleaner 2006 – DC16 using root cyclone technology. • Airblade AB01 2006 – hand dryer with airblade technology. Works by scraping water off washed hands, hygienic and drying hands in 10 seconds approx. 		
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	<ul style="list-style-type: none"> • Air multiplier fan AM012009 – no blades and multiplies air flow by 15 times. • Dyson digital slim cordless vacuum cleaner 2018 – no cord connectivity. Power provided by high output lithium ion batteries effective for whole house cleaning. <p>Gap Established in the late 1960s (American fashion) in response to different fashion requirements for customers between childhood and adulthood – the gap:</p> <ul style="list-style-type: none"> • Men – trousers, shirts, shorts • Women – dresses, maternity • Children – baby and kids <p>Empowering women – PACE (Personal Advancement and Career Advancement) launched 2007. Used to support women in the apparel industry where barriers to education have impacted on progression and development into leadership and management in the workplace and also personal and professional growth. Used as appositive promotional point for gap product.</p> <p>Products designed and marketed with sustainability in mind – great durable products designed using new technology and product innovation, reducing the impact on people and the planet of what we wear.</p> <p>By 2020 eliminate the use of wood derived fabrics sourced from ancient and endangered forests.</p> <p>By 2021 100% of cotton will be from sustainable cotton sources including Better Cotton Initiative (BCI).</p> <p>By 2020 80% of Athleta materials will be made from sustainable fibres. By 2020 25% of Athleta’s products will be made using techniques that save water.</p> <p>Primark A focus on ‘fast fashion’ designed for rapid change beyond seasonal but also social, especially for teenagers and young adults.</p> <p>Clothes are marketed as cheaply as possible and this has led to complaints about irresponsible design as some items are worn only once.</p> <p>Products made sell themselves ie little advertising.</p> <p>Manufactured products don’t use expensive hangers, tags or labels that add to the product cost.</p> <p>Suppliers are asked to pack clothes like t-shirts so they are ready to go on shelves straight away.</p> <p>Designs and products go beyond just clothing.</p>		
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	<ul style="list-style-type: none"> • Homeware • Sweets and confectionary <p>Under Armour A primary focus on sportswear and footwear. Designed originally to enhance performance by keeping athletes comfortable and cool.</p> <p>Origins based in the identified need of sports tops that did not become wet during exercise- led to the development of a synthetic ‘moisture wicking’ fibre that kept the participant dry</p> <p>Has moved into the design and manufacture of casual clothing. Examples of specific materials used in products like shorts, socks, trainers, tops are:</p> <ul style="list-style-type: none"> • Heatgear – Original product. Regulates body temperature, keeps you cool. • Coldblack – reflects heat when it is hot • Coolswitch – pulls heat away from the body during exercise • Iso-chill – dissipates heat from the body to keep you cool. <p>Zara A focus on ‘fast fashion designed for rapid change beyond seasonal patterns, but also social change for particularly young girls and teenage girls.</p> <p>Prides itself on keeping up with fashion, high quality at reasonable prices. Products sold based on customer trends</p> <ul style="list-style-type: none"> • Men’s clothing • Women’s clothing • Kids clothing (Zara kids) <p>Life label (Join life) – recycling scheme. Home pick up of unwanted clothes. Clothes they go for recycling and /or reuse to finance social projects.</p> <p>Use of REFIRRA – a fibre made from recycled cotton and wool from sustainable forests.</p> <p>Working to ensure all products are sustainable throughout raw materials used, design and production.</p> <p>Accept other valid responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO								
20	1,2,3	<p>Figure 7 shows three different kettles.</p> <p>Analyse and evaluate the kettles in terms of the three features identified below.</p> <p>You should not use an analysis or evaluation point more than once.</p> <p>Award up to 4 marks for each of the three parts of the question.</p> <table border="1" data-bbox="320 674 1217 992"> <tr> <td data-bbox="320 674 507 790">3–4 marks</td> <td data-bbox="507 674 1217 790">Well described and justified analysis containing full evaluation, drawing on conclusions having considered both positive and negative factors.</td> </tr> <tr> <td data-bbox="320 790 507 943">1–2 marks</td> <td data-bbox="507 790 1217 943">Brief points mentioned but not fully explained. Analysis present but limited evaluation/ conclusions drawn. May have focused solely on either positive or negative factors.</td> </tr> <tr> <td data-bbox="320 943 507 992">0 marks</td> <td data-bbox="507 943 1217 992">No attempt or nothing worthy of credit.</td> </tr> </table> <p>Indicative content:</p> <p>The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.</p> <p>NB Do not reward repeats ie where some candidate may try to use the same response multiple times in 20.1/20.2/20.3</p> <table border="1" data-bbox="320 1301 1217 2007"> <tr> <td data-bbox="320 1301 547 2007">Ergonomics</td> <td data-bbox="547 1301 1217 2007"> <ul style="list-style-type: none"> • Ergonomic handle on polymer kettle allowing firm safe grip • Polymer construction is an insulator and prevents transfer of heat and burns • Carrying handle is away (opposite side) from steam outlet on polymer kettle unlike other two when hot steam rises and may burn you • Polymer could make use of thermochromic pigment to indicate when contents are hot • Whistling kettle gives audible sound when water is boiling • Polymer kettle has viewing window so user can see if kettle needs re filling • Awkward carrying position with handle over the top of the main kettle body • No viewing window on cast iron kettle • Cast iron kettle lid may prove difficult to reseal especially if hot and it has expanded • Spout of cast iron kettle not as easy to control flow due to shape </td> </tr> </table>	3–4 marks	Well described and justified analysis containing full evaluation, drawing on conclusions having considered both positive and negative factors.	1–2 marks	Brief points mentioned but not fully explained. Analysis present but limited evaluation/ conclusions drawn. May have focused solely on either positive or negative factors.	0 marks	No attempt or nothing worthy of credit.	Ergonomics	<ul style="list-style-type: none"> • Ergonomic handle on polymer kettle allowing firm safe grip • Polymer construction is an insulator and prevents transfer of heat and burns • Carrying handle is away (opposite side) from steam outlet on polymer kettle unlike other two when hot steam rises and may burn you • Polymer could make use of thermochromic pigment to indicate when contents are hot • Whistling kettle gives audible sound when water is boiling • Polymer kettle has viewing window so user can see if kettle needs re filling • Awkward carrying position with handle over the top of the main kettle body • No viewing window on cast iron kettle • Cast iron kettle lid may prove difficult to reseal especially if hot and it has expanded • Spout of cast iron kettle not as easy to control flow due to shape 	12 marks	AO4
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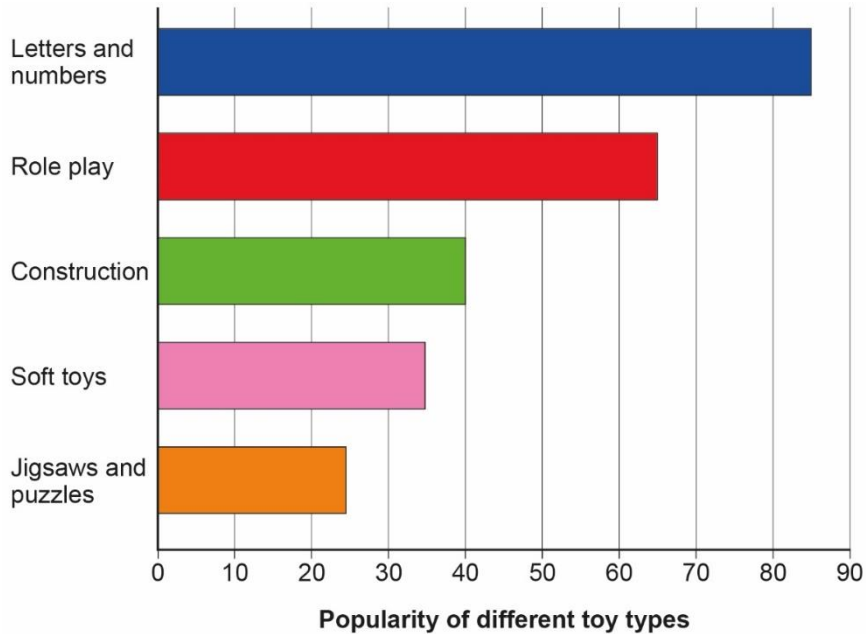
		<table border="1"> <tr> <td data-bbox="320 241 547 331"></td> <td data-bbox="547 241 1219 331"> <ul style="list-style-type: none"> • Iron is a conductor so hot to the touch including the handle </td> </tr> <tr> <td data-bbox="320 331 547 1245">Functionality</td> <td data-bbox="547 331 1219 1245"> <ul style="list-style-type: none"> • No trailing flex with the iron stove top kettle – less chance of being pulled off stove surface • Hinged lid on polymer kettle for ease of closure and resealing • Docking unit means kettle flex and plug do not go anywhere near water which would be a possible risk of electric shock • Light weight for elderly and less able body to carry and manipulate • Thermostatic trip when the water has boiled, preventing kettle from boiling dry • Cast iron kettle can be used over an open fire or hearth • Cast iron kettle is heavy and could be dropped leading to scalding • Risk of electric shock if kettle develops a fault or water accesses the electrics • Rising steam could burn users hand on the cast iron kettle • Difficult to gauge how much water you are boiling, which may lead to heating too much water • Polymer kettle MUST be near an electrical point • Whistling kettle MUST be near a gas/electric/inductive hob </td> </tr> <tr> <td data-bbox="320 1245 547 2054">Innovation</td> <td data-bbox="547 1245 1219 2054"> <ul style="list-style-type: none"> • Viewing window so you can see exactly how much water you are boiling • Viewing window has water level marks to indicate precise capacity • Trip switch to turn polymer kettle off and save electricity • Polymer kettle acts as an insulator and will keep the water hotter for longer requiring less frequent boiling • Use of lighter materials • Use of materials that insulate and keep the water warmer for longer • The polymer and whistling kettle consider the safety more effectively • The polymer and whistling kettles consider the ease of use more effectively than the cast iron kettle • The use of new materials has allowed for kettle development to consider the aesthetics of the product rather than just the function • Modern kettles consider energy efficiency far more than the cast iron style kettle • Just plug into electricity supply </td> </tr> </table>		<ul style="list-style-type: none"> • Iron is a conductor so hot to the touch including the handle 	Functionality	<ul style="list-style-type: none"> • No trailing flex with the iron stove top kettle – less chance of being pulled off stove surface • Hinged lid on polymer kettle for ease of closure and resealing • Docking unit means kettle flex and plug do not go anywhere near water which would be a possible risk of electric shock • Light weight for elderly and less able body to carry and manipulate • Thermostatic trip when the water has boiled, preventing kettle from boiling dry • Cast iron kettle can be used over an open fire or hearth • Cast iron kettle is heavy and could be dropped leading to scalding • Risk of electric shock if kettle develops a fault or water accesses the electrics • Rising steam could burn users hand on the cast iron kettle • Difficult to gauge how much water you are boiling, which may lead to heating too much water • Polymer kettle MUST be near an electrical point • Whistling kettle MUST be near a gas/electric/inductive hob 	Innovation	<ul style="list-style-type: none"> • Viewing window so you can see exactly how much water you are boiling • Viewing window has water level marks to indicate precise capacity • Trip switch to turn polymer kettle off and save electricity • Polymer kettle acts as an insulator and will keep the water hotter for longer requiring less frequent boiling • Use of lighter materials • Use of materials that insulate and keep the water warmer for longer • The polymer and whistling kettle consider the safety more effectively • The polymer and whistling kettles consider the ease of use more effectively than the cast iron kettle • The use of new materials has allowed for kettle development to consider the aesthetics of the product rather than just the function • Modern kettles consider energy efficiency far more than the cast iron style kettle • Just plug into electricity supply 		
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		<ul style="list-style-type: none">• Cast iron kettle will require more energy to heat and energy will be lost more readily into the surrounding environment from the hob plate• The polymer kettle MUST have a (240v) electric supply to work		
Accept other valid responses.				

Qu	Part	Marking Guidance	Total marks	AO																
21		<p>Describe the following two types of investigation.</p> <p>Give examples to show how they help when designing. These can be examples of use</p> <p>Primary research:</p> <table border="1" data-bbox="320 607 1217 857"> <tr> <td data-bbox="320 607 507 689">3 marks</td> <td data-bbox="507 607 1217 689">Correct definition of primary research and two or more named examples of primary research</td> </tr> <tr> <td data-bbox="320 689 507 772">2 marks</td> <td data-bbox="507 689 1217 772">Correct definition for primary research and one correct example of primary research</td> </tr> <tr> <td data-bbox="320 772 507 857">1 mark</td> <td data-bbox="507 772 1217 857">Simple definition point or one correct example of primary research</td> </tr> </table> <p>Indicative content:</p> <p>The guidance provided is illustrative and not exhaustive. Credit any specific points made in support of the band descriptors above.</p> <p>DO NOT credit vague responses like to identify needs and wants.</p> <table border="1" data-bbox="320 1160 1217 1619"> <tr> <td data-bbox="320 1160 507 1317">Definition of primary research:</td> <td data-bbox="507 1160 1217 1317"> <ul style="list-style-type: none"> • Involves the collection of research first-hand • Information you have collected yourself • Completed by the author of the research • All forms of field research </td> </tr> <tr> <td data-bbox="320 1317 507 1619">Examples of primary research:</td> <td data-bbox="507 1317 1217 1619"> <ul style="list-style-type: none"> • Interviews – telephone, social media and face to face • Questionnaires • Material testing • Product analysis • Measuring – useful sizes • Surveys • Focus groups </td> </tr> </table> <p>Secondary research:</p> <table border="1" data-bbox="320 1720 1217 2007"> <tr> <td data-bbox="320 1720 507 1839">3 marks</td> <td data-bbox="507 1720 1217 1839">Excellent definition with clear understanding of secondary research and two or more named examples of secondary research.</td> </tr> <tr> <td data-bbox="320 1839 507 1921">2 marks</td> <td data-bbox="507 1839 1217 1921">Correct definition for secondary research and one correct example of secondary research.</td> </tr> <tr> <td data-bbox="320 1921 507 2007">1 mark</td> <td data-bbox="507 1921 1217 2007">Simple definition point or one correct example of secondary research.</td> </tr> </table>	3 marks	Correct definition of primary research and two or more named examples of primary research	2 marks	Correct definition for primary research and one correct example of primary research	1 mark	Simple definition point or one correct example of primary research	Definition of primary research:	<ul style="list-style-type: none"> • Involves the collection of research first-hand • Information you have collected yourself • Completed by the author of the research • All forms of field research 	Examples of primary research:	<ul style="list-style-type: none"> • Interviews – telephone, social media and face to face • Questionnaires • Material testing • Product analysis • Measuring – useful sizes • Surveys • Focus groups 	3 marks	Excellent definition with clear understanding of secondary research and two or more named examples of secondary research.	2 marks	Correct definition for secondary research and one correct example of secondary research.	1 mark	Simple definition point or one correct example of secondary research.	2 x 3 marks	AO4
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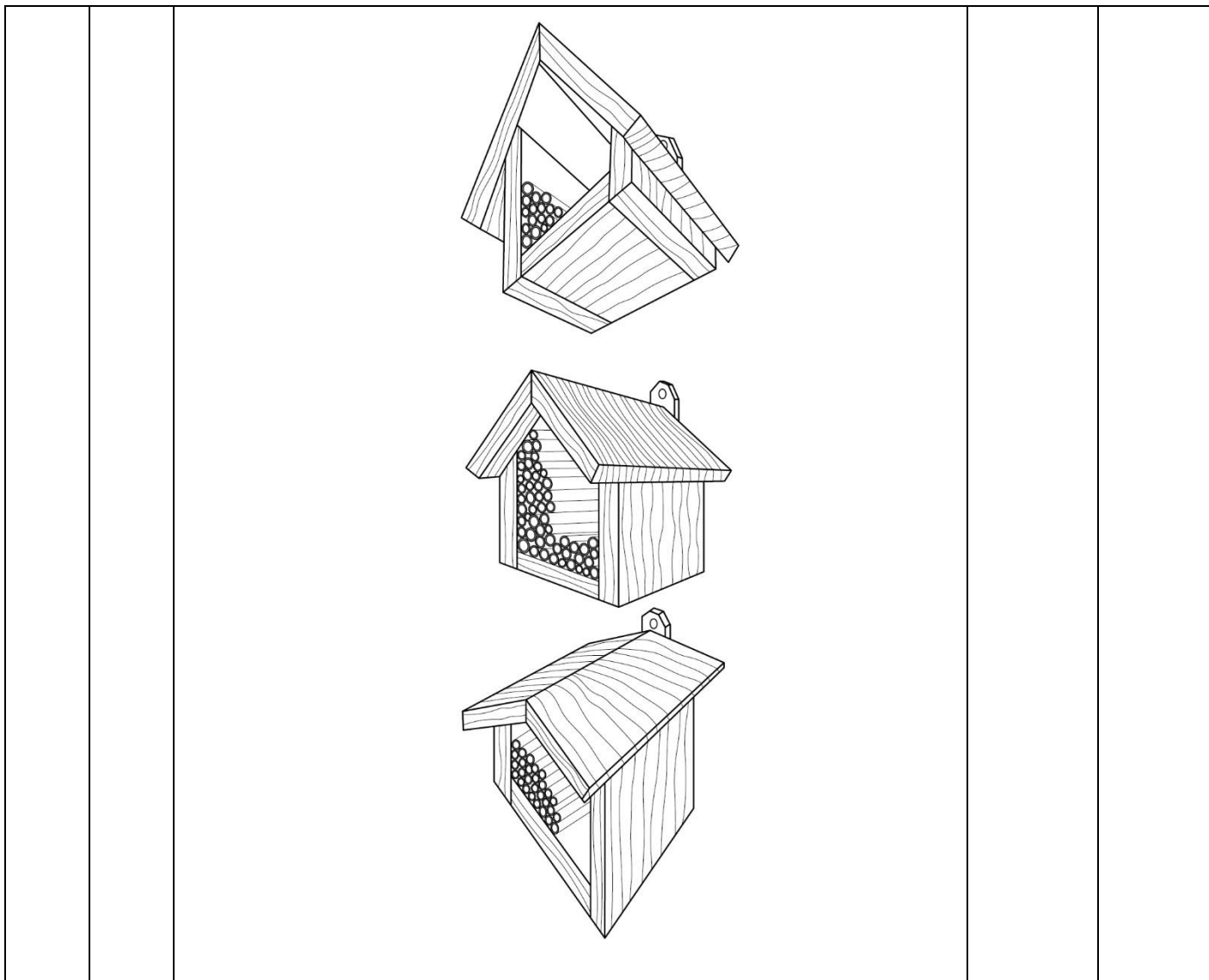
22	1	<p>A designer has been asked to design a prototype toy suitable for use by a child between 3 and 5 years of age. They are using the data in Table 4.</p> <p>Complete the two missing values in Table 4 for popularity votes.</p> <table border="1" data-bbox="320 1279 1217 1395"> <tr> <td data-bbox="320 1279 507 1395">1 mark</td> <td data-bbox="507 1279 1217 1395">One mark for both missing popularity vote values if correct. NO MARKS IF ONE LEFT BLANK OR ONE OUT OF TWO INCORRECT</td> </tr> </table> <p>Indicative content:</p> <table border="1" data-bbox="331 1498 1206 2047"> <thead> <tr> <th data-bbox="331 1498 624 1588">Type of toy</th> <th data-bbox="624 1498 916 1588">Popularity votes</th> <th data-bbox="916 1498 1206 1588">Popularity votes as a percentage</th> </tr> </thead> <tbody> <tr> <td data-bbox="331 1588 624 1666">Role play</td> <td data-bbox="624 1588 916 1666">65</td> <td data-bbox="916 1588 1206 1666">26%</td> </tr> <tr> <td data-bbox="331 1666 624 1744">Construction</td> <td data-bbox="624 1666 916 1744">40</td> <td data-bbox="916 1666 1206 1744">16%</td> </tr> <tr> <td data-bbox="331 1744 624 1823">Letters and numbers</td> <td data-bbox="624 1744 916 1823">85</td> <td data-bbox="916 1744 1206 1823">34%</td> </tr> <tr> <td data-bbox="331 1823 624 1901">Jigsaws and puzzles</td> <td data-bbox="624 1823 916 1901">25</td> <td data-bbox="916 1823 1206 1901">10%</td> </tr> <tr> <td data-bbox="331 1901 624 1980">Soft toys</td> <td data-bbox="624 1901 916 1980">35</td> <td data-bbox="916 1901 1206 1980">14%</td> </tr> <tr> <td data-bbox="331 1980 624 2047">Total</td> <td data-bbox="624 1980 916 2047">250</td> <td data-bbox="916 1980 1206 2047">100%</td> </tr> </tbody> </table>	1 mark	One mark for both missing popularity vote values if correct. NO MARKS IF ONE LEFT BLANK OR ONE OUT OF TWO INCORRECT	Type of toy	Popularity votes	Popularity votes as a percentage	Role play	65	26%	Construction	40	16%	Letters and numbers	85	34%	Jigsaws and puzzles	25	10%	Soft toys	35	14%	Total	250	100%	1 mark	AO4
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22	2	<p>Use your values from Question 22.1 to complete the bar chart below and label the x axis.</p> <table border="1" data-bbox="320 383 1217 600"> <tr> <td data-bbox="320 383 507 432">1 mark</td> <td data-bbox="507 383 1217 432">Step 1 – 1 mark for x axis</td> </tr> <tr> <td data-bbox="320 432 507 512">1 mark</td> <td data-bbox="507 432 1217 512">Step 2 – 1 mark for correct size of letters and numbers bar (ft their answer from 22.1)</td> </tr> <tr> <td data-bbox="320 512 507 600">1 mark</td> <td data-bbox="507 512 1217 600">Step 3 – 1 mark for correct size and placement of soft toys bar (ft their answer from 22.1)</td> </tr> </table> <p>Indicative content:</p> <p><u>x axis label:</u></p> <p>Accept: Popularity of different toys Popularity votes</p> <p>Not: Popularity votes as a percentage</p> <p>Note: The graph below shows the correctly completed missing bars (in blue and pink) if a student has provided the correct values in 22.1.</p> <p>If a student has provided incorrect values for 22.1 but their bar chart correctly matches their values, they should receive the mark(s).</p> <p><u>Completed graph:</u></p> <p>Correctly completed missing bars shown in blue and pink below:</p>  <table border="1" data-bbox="320 1373 1189 2004"> <caption>Popularity of different toy types</caption> <thead> <tr> <th>Toy Type</th> <th>Popularity (Percentage)</th> </tr> </thead> <tbody> <tr> <td>Letters and numbers</td> <td>85</td> </tr> <tr> <td>Role play</td> <td>65</td> </tr> <tr> <td>Construction</td> <td>40</td> </tr> <tr> <td>Soft toys</td> <td>35</td> </tr> <tr> <td>Jigsaws and puzzles</td> <td>25</td> </tr> </tbody> </table>	1 mark	Step 1 – 1 mark for x axis	1 mark	Step 2 – 1 mark for correct size of letters and numbers bar (ft their answer from 22.1)	1 mark	Step 3 – 1 mark for correct size and placement of soft toys bar (ft their answer from 22.1)	Toy Type	Popularity (Percentage)	Letters and numbers	85	Role play	65	Construction	40	Soft toys	35	Jigsaws and puzzles	25	3 marks	AO4
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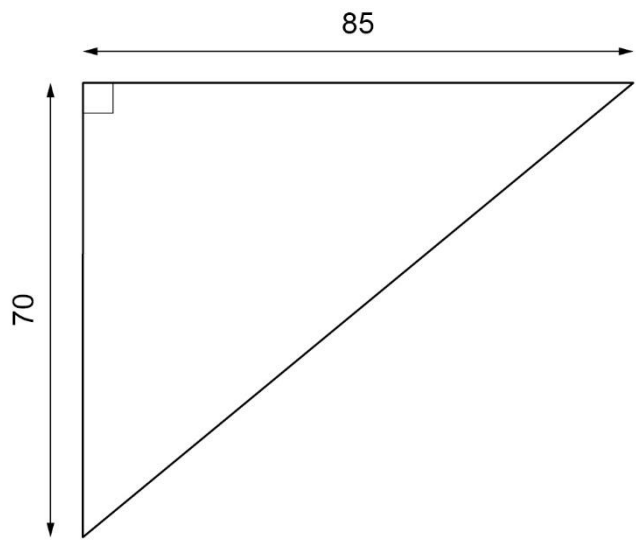
Qu	Part	Marking Guidance	Total marks	AO		
23		<p>Give five detailed specification points to help with the designing of a toy for use by 3 to 5 year-old-children.</p> <table border="1"> <tr> <td>1 mark</td> <td>One mark for each design specification point given appropriate for a toy suitable for use by 3 to 5 year old children.</td> </tr> </table> <p>Indicative content:</p> <p>The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptor above.</p> <ol style="list-style-type: none"> 1. It must amuse/entertain the child 2. Bright and colourful to engage the interest of the child 3. It must not contain any small parts that could be easily swallowed 4. There should be no sharp edges that could cause cuts to the child 5. There should be no pointed pieces that could stab/puncture the skin 6. Any finish (paint) applied must not be toxic/harmful in chewed/ingested 7. If the toy contains a battery it should be secured and not possible for a child to remove – battery directive (labelling bit) 8. There must be no gaps where a child could put a finger and trap it 9. Materials that are tough and durable need to be used to ensure it does not break if dropped or thrown 10. Materials need to be easy to clean (sanitise) because the child may chew it, drop food on it. <p>A credit worthy point must not be vague. Zero mark responses would be:</p> <ul style="list-style-type: none"> • It must be strong • It must not be too big • It must be made from cheap materials • Easy and simple to use <p>Accept other valid responses.</p>	1 mark	One mark for each design specification point given appropriate for a toy suitable for use by 3 to 5 year old children.	5 marks	AO4
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Qu	Part	Marking Guidance	Total marks	AO
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24	1	<p>Figures 8 and 9 show a front and side view of a bug box used to encourage insects to visit a garden.</p> <p>Complete a two-point perspective drawing of the bug box in the space provided below.</p> <table border="1" data-bbox="320 445 1217 813"> <tr> <td data-bbox="320 445 509 528">1 mark</td> <td data-bbox="509 445 1217 528">A recognisable attempt at a 3-dimensional drawing e.g. 3 connected elevations/sides to object.</td> </tr> <tr> <td data-bbox="320 528 509 611">1 mark</td> <td data-bbox="509 528 1217 611">Clear evidence of some perspective/foreshortening.</td> </tr> <tr> <td data-bbox="320 611 509 730">1 mark</td> <td data-bbox="509 611 1217 730">Drawing is recognisable as the bug box in the indicative content below (does not have to show hook or overhang of roof).</td> </tr> <tr> <td data-bbox="320 730 509 813">1 mark</td> <td data-bbox="509 730 1217 813">Inclusion of hook or extension to the front edge of the roof.</td> </tr> </table> <p>Indicative content:</p> <p>Responses with bug box drawn above, on or below a horizontal plane between two vanishing points (horizon line) are acceptable – see images opposite:</p>	1 mark	A recognisable attempt at a 3-dimensional drawing e.g. 3 connected elevations/sides to object.	1 mark	Clear evidence of some perspective/foreshortening.	1 mark	Drawing is recognisable as the bug box in the indicative content below (does not have to show hook or overhang of roof).	1 mark	Inclusion of hook or extension to the front edge of the roof.	4 marks	AO4 2c
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24	2	<p>Calculate the size of angle X in Figure 10 to the nearest whole degree to ensure an accurate fit of the two roof pieces.</p> <p>Show your working/construction.</p> <table border="1" data-bbox="320 416 1090 936"> <thead> <tr> <th colspan="2">Trig Method</th> </tr> </thead> <tbody> <tr> <td>1 mark</td> <td>85 seen</td> </tr> <tr> <td>1 mark</td> <td>Step 1 – correct use of tan formula: Tan Y = opp/adj</td> </tr> <tr> <td>1 mark</td> <td>Step 2 – correct substitution of correct size of opposite and adjacent lengths: Tan Y = 70/85</td> </tr> <tr> <td>1 mark</td> <td>Step 3 – Tan⁻¹ 0.8235294117 = 39.47 (degrees) Subtraction of angle from 90 degrees to give angle X: 90 – 39.47 = 51 degrees (Accept 50 degrees)</td> </tr> </tbody> </table> <table border="1" data-bbox="320 969 1090 1391"> <thead> <tr> <th colspan="2">Alternative Trig Method</th> </tr> </thead> <tbody> <tr> <td>1 mark</td> <td>85 seen</td> </tr> <tr> <td>1 mark</td> <td>Step 1 – correct use of tan formula: Tan X = opp/adj</td> </tr> <tr> <td>1 mark</td> <td>Step 2 – correct substitution of correct size of opposite and adjacent lengths: Tan X = 85/70</td> </tr> <tr> <td>1 mark</td> <td>Step 3 – Tan⁻¹ 1.214285714 = 51 degrees (Accept 50 degrees)</td> </tr> </tbody> </table> <table border="1" data-bbox="320 1424 1090 1809"> <thead> <tr> <th colspan="2">Drawn/constructed method</th> </tr> </thead> <tbody> <tr> <td>1 mark</td> <td>85 seen</td> </tr> <tr> <td>1 mark</td> <td>Constructing a triangle with sides 85 mm x 70 mm</td> </tr> <tr> <td>1 mark</td> <td>Accuracy of drawing</td> </tr> <tr> <td>1 mark</td> <td>Measuring interior angle with protractor to arrive at 39 – 40 degrees and subtracting that angle from 90° (Accept 50 – 51 degrees)</td> </tr> </tbody> </table> <table border="1" data-bbox="320 1843 1090 2027"> <thead> <tr> <th colspan="2">Alternative drawn/constructed method</th> </tr> </thead> <tbody> <tr> <td>1 mark</td> <td>85 seen</td> </tr> <tr> <td>1 mark</td> <td>Constructing a triangle with sides 85 mm x 70 mm</td> </tr> </tbody> </table>	Trig Method		1 mark	85 seen	1 mark	Step 1 – correct use of tan formula: Tan Y = opp/adj	1 mark	Step 2 – correct substitution of correct size of opposite and adjacent lengths: Tan Y = 70/85	1 mark	Step 3 – Tan ⁻¹ 0.8235294117 = 39.47 (degrees) Subtraction of angle from 90 degrees to give angle X : 90 – 39.47 = 51 degrees (Accept 50 degrees)	Alternative Trig Method		1 mark	85 seen	1 mark	Step 1 – correct use of tan formula: Tan X = opp/adj	1 mark	Step 2 – correct substitution of correct size of opposite and adjacent lengths: Tan X = 85/70	1 mark	Step 3 – Tan ⁻¹ 1.214285714 = 51 degrees (Accept 50 degrees)	Drawn/constructed method		1 mark	85 seen	1 mark	Constructing a triangle with sides 85 mm x 70 mm	1 mark	Accuracy of drawing	1 mark	Measuring interior angle with protractor to arrive at 39 – 40 degrees and subtracting that angle from 90° (Accept 50 – 51 degrees)	Alternative drawn/constructed method		1 mark	85 seen	1 mark	Constructing a triangle with sides 85 mm x 70 mm	4 marks	AO4
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Qu	Part	Marking Guidance	Total marks	AO
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25		<p data-bbox="319 1366 1173 1444">During manufacture it is important to use materials efficiently and minimise waste.</p> <p data-bbox="319 1467 1189 1512">Explain how each of the following improves material management.</p> <table border="1" data-bbox="319 1579 1212 1915"> <tr> <td data-bbox="319 1579 502 1668">3 marks</td> <td data-bbox="502 1579 1212 1668">Two or more correct explanation points clearly made in detail.</td> </tr> <tr> <td data-bbox="319 1668 502 1780">2 marks</td> <td data-bbox="502 1668 1212 1780">Two or more simple explanation points lacking depth and understanding or one correct explanation point given in detail.</td> </tr> <tr> <td data-bbox="319 1780 502 1870">1 mark</td> <td data-bbox="502 1780 1212 1870">One simple correct point for technique is given demonstrating limited understanding.</td> </tr> <tr> <td data-bbox="319 1870 502 1915">0 marks</td> <td data-bbox="502 1870 1212 1915">Nothing worthy of credit.</td> </tr> </table> <p data-bbox="319 1948 582 1982">Indicative content:</p>	3 marks	Two or more correct explanation points clearly made in detail.	2 marks	Two or more simple explanation points lacking depth and understanding or one correct explanation point given in detail.	1 mark	One simple correct point for technique is given demonstrating limited understanding.	0 marks	Nothing worthy of credit.	2 x 3 marks	AO4
3 marks	Two or more correct explanation points clearly made in detail.											
2 marks	Two or more simple explanation points lacking depth and understanding or one correct explanation point given in detail.											
1 mark	One simple correct point for technique is given demonstrating limited understanding.											
0 marks	Nothing worthy of credit.											

	<p>The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.</p> <p>Nesting of shapes and parts/lay planning</p> <ul style="list-style-type: none"> • A process for planning and working out the best way to maximise the effective use of material and minimising waste as much as possible. • By placing similar shapes and parts next to each other to minimise waste. • Strategic way of planning material use and minimising waste. • Looking for patterns in nesting eg inverting shapes being cut out if they are triangular to save material by placing parts as close together as possible. • Tessellation is a process by which parts are placed together in interlocking and repeating patterns to minimise waste. • Consideration of standard forms and sizes of available material to ensure materials are sourced in the most cost-efficient form to minimise waste. <p>Cutting techniques</p> <ul style="list-style-type: none"> • Allow for the width of saw cuts eg 2mm with a dovetail saw to ensure the process of cutting does not accidentally reduce the size of material being cut out. • Failure to consider material removed by saw cuts will make shapes/parts being cut out possible too small (out of tolerance) and having to be rejected ie material wasted. • Seam allowance to allow for an effective join to be formed along the edges of fabric materials to be joined. • Use of different coloured lines for cut and score/crease lines in paper and boards to ensure fold flaps and glue flaps are created to ensure effective assembly. • Use of red line for cut and black lines for engrave/raster lines on a laser cutter to avoid errors in pre-cut checks. <p>Accept other responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO								
26		<p>Describe how materials can be formed when making a prototype.</p> <table border="1" data-bbox="320 439 1217 875"> <tr> <td data-bbox="320 439 507 555">3 marks</td> <td data-bbox="507 439 1217 555">A thorough understanding of what 'forming' is and how it can be used in prototype construction in a material area(s) studied by the candidate.</td> </tr> <tr> <td data-bbox="320 555 507 672">2 marks</td> <td data-bbox="507 555 1217 672">Basic understanding of 'forming' and how it is used in prototype construction in a material area(s) studied by the candidate.</td> </tr> <tr> <td data-bbox="320 672 507 824">1 mark</td> <td data-bbox="507 672 1217 824">Very limited understanding of 'forming' naming a forming process or giving an example of where it would be used in a prototype construction in a material area(s) studied by the candidate.</td> </tr> <tr> <td data-bbox="320 824 507 875">0 marks</td> <td data-bbox="507 824 1217 875">Nothing worthy of credit.</td> </tr> </table> <p>Indicative content:</p> <p>The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.</p> <p>Note: responses may consider deforming or reforming. Both processes involve a change in material shape without adding or removing material.</p> <p>Timber based materials</p> <ul data-bbox="320 1283 1206 1554" style="list-style-type: none"> • Timber strips can be steamed to make them more pliable and easier to bend. • The timber fibres are softened and bent without tearing or rupture eg stair hand rails, musical instruments. • Thin strips of timber can be laminated using a suitable adhesive using a former. • Pressure is applied until the adhesive cures/set and a change in shape is made. <p>Metal based materials</p> <ul data-bbox="320 1664 1206 2002" style="list-style-type: none"> • Bars and tubes can be bent found a former to change shape from a linear length. • Metals can be heated (annealed) to make them easier to bend. • Metals can be forged. Heating until red hot and shaped on an anvil. • Metals can be formed using casting processes where the metal is heated until molten and poured into a cavity or mould to make 3d products. • Metals can be pressed using extreme pressure eg car body panels. <p>Papers and boards</p>	3 marks	A thorough understanding of what 'forming' is and how it can be used in prototype construction in a material area(s) studied by the candidate.	2 marks	Basic understanding of 'forming' and how it is used in prototype construction in a material area(s) studied by the candidate.	1 mark	Very limited understanding of 'forming' naming a forming process or giving an example of where it would be used in a prototype construction in a material area(s) studied by the candidate.	0 marks	Nothing worthy of credit.	3 marks	AO4
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0 marks	Nothing worthy of credit.											

		<ul style="list-style-type: none"> • Accurate folds can be produced using creasing bar on a paper or board first. • Scoring can be used to cut fibres weakening a piece of paper or card making it easier. • Perforations ‘push’ material apart (creating small holes) making it easier to tear and separate material eg tissue box lid. • Scoring, creasing and perforations are all forming processes making it easier to perform a shape or direction change in a piece of paper or card. <p>Polymers</p> <ul style="list-style-type: none"> • Simple bends can be created by heating a piece of thermoplastic polymer in a straight line (using a line bender) where a bend is needed. • 3D shapes can be created using vacuum forming over a former by heating a polymer sheet and creating a permanent form when it cools. • Plug and yoke method can be used to form a shape in polymer sheet. • Injection moulding of polymers to create profiles and 3D products. • 3D printing to create a 3D prototype <p>Textiles</p> <ul style="list-style-type: none"> • Drape forming of felt based products like hats. • Gathering – uses a sewing technique to increase the ‘fullness’ of a material or prototype eg curtains. • Pleating – similar to gathering, but where textiles are folded and held by stitching along an edge. <p>Accept other valid responses.</p>		
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