

**INTERNATIONAL GCSE
DESIGN AND TECHNOLOGY: PRODUCT
DESIGN**

9252/W

Written Paper Technical, designing and making principles

Mark scheme

Specimen

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 oxfordaqaexams.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.

Section A – Core technical principles

Qu	Part	Marking guidance	Mark	AO
1		B Hydro-electrical	1 mark	AO4
2		C To switch equipment on or off	1 mark	AO4
3		A Can be drawn into a long length	1 mark	AO4
4		D Thermal conductivity	1 mark	AO4
5		A Corrugated card	1 mark	AO4
6		C Reacts to a stimulus.	1 mark	AO4
7		C Plywood	1 mark	AO4
8		D Rotary to reciprocating	1 mark	AO4
9		A An increase in robotics has led to a reduction in manual jobs	1 mark	AO4
10		D Repairable components	1 mark	AO4

Qu	Part	Marking guidance	Mark	AO
11	1	One mark for a correct specific named alloy. Indicative content: Brass Bronze Duralumin Pewter Steel (accept any specifically named steel e.g. die steel (tool steel), high speed steel (HSS), stainless steel) Accept all other valid responses.	1 mark	AO4

Qu	Part	Marking guidance	Mark	AO						
11	2	<table border="1"> <tr> <td>2 marks</td> <td>Two correct simple points of explanation or one point explained in detail possible using a specific example of use.</td> </tr> <tr> <td>1 mark</td> <td>One correct simple point of explanation.</td> </tr> <tr> <td>0 marks</td> <td>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 Possible reference to examples of use to enhance explanation: • 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	Mark	AO
12		<p>One mark for one correct advantage and one correct disadvantage.</p> <p>Indicative content:</p> <p>Advantages:</p> <ul style="list-style-type: none"> • Improved resistance to water absorption • Improved insulation properties • Improved 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

Qu	Part	Marking guidance	Mark	AO										
13	1	<table border="1"> <tr> <td>1 mark</td> <td>0.45×50 $22.5 \div 4$ or 5.625</td> </tr> <tr> <td>1 mark</td> <td>Their number rounded up (Correct answer = 6 full tins)</td> </tr> <tr> <td colspan="2" style="text-align: center;">Or</td> </tr> <tr> <td>1 mark</td> <td>$50 \div (4 \div 0.45)$ or 5.625</td> </tr> <tr> <td>1 mark</td> <td>Their number rounded up (Correct answer = 6 full tins)</td> </tr> </table>	1 mark	0.45×50 $22.5 \div 4$ or 5.625	1 mark	Their number rounded up (Correct answer = 6 full tins)	Or		1 mark	$50 \div (4 \div 0.45)$ or 5.625	1 mark	Their number rounded up (Correct answer = 6 full tins)	2 marks	AO4
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13	2	<table border="1"> <tr> <td>1 mark</td> <td>their $5.625 \div$ their 6 (= 0.9375) or their 6 - their 5.625 (= 0.375 of a tin unused)</td> </tr> <tr> <td>1 mark</td> <td>$100 \times$ their 0.9375 (= 93.75% used) or their $0.375 \div$ their 6 (= 0.0625)</td> </tr> <tr> <td>1 mark</td> <td>Waste is: $100 -$ their 93.75 = 6.25% or their $0.625 \times 100 = 6.25\%$</td> </tr> </table> <p>Note: Where candidates have arrived at a different answer to 5.625 in question 13.1 and used it correctly in 13.2, all marks are still available for the method and answer.</p> <p>Do not penalise for not using 5.625 if working and final answer are correct.</p>	1 mark	their $5.625 \div$ their 6 (= 0.9375) or their 6 - their 5.625 (= 0.375 of a tin unused)	1 mark	$100 \times$ their 0.9375 (= 93.75% used) or their $0.375 \div$ their 6 (= 0.0625)	1 mark	Waste is: $100 -$ their 93.75 = 6.25% or their $0.625 \times 100 = 6.25\%$	3 marks	AO4
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14		<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"> <thead> <tr> <th colspan="3">Product: Card shoe box</th> </tr> <tr> <th>Specific main material used</th> <th>Stock form used in manufacture</th> <th>Appropriate finishing technique</th> </tr> </thead> <tbody> <tr> <td>Solid white board Corrugated cardboard</td> <td>Sheet</td> <td>Offset lithography Printing</td> </tr> <tr> <th colspan="3">Product: Metal can opener</th> </tr> <tr> <th>Specific main material used</th> <th>Stock form used in manufacture</th> <th>Appropriate finishing technique</th> </tr> <tr> <td>Steel Stainless steel</td> <td>Sheet</td> <td>Polymer over moulding Left as finished/ polished finish Powder coated</td> </tr> <tr> <th colspan="3">Product: Polymer gears</th> </tr> <tr> <th>Specific main material used</th> <th>Stock form used in manufacture</th> <th>Appropriate finishing technique</th> </tr> <tr> <td>Most gears are made from Nylon and Polyacetal Also accept: Polyphenylene sulfide (PPS) Thermoplastic polyester, fibre reinforced plastic</td> <td>Granules Also accept named gear stock forms e.g. spur, bevel, helical, worm, bevel, hypoid, crown gear</td> <td>Pigment added during injection moulding Left as finished in mould</td> </tr> <tr> <th colspan="3">Product: Wooden toy</th> </tr> <tr> <th>Specific main material used</th> <th>Stock form used in manufacture</th> <th>Appropriate finishing technique</th> </tr> <tr> <td>Beech Pine MDF Plywood</td> <td>Plank Board</td> <td>Cellulose Lacquer Varnish Oil</td> </tr> </tbody> </table> <p>Accept other valid responses.</p>	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: Metal can opener			Specific main material used	Stock form used in manufacture	Appropriate finishing technique	Steel Stainless steel	Sheet	Polymer over moulding Left as finished/ polished finish Powder coated	Product: Polymer gears			Specific main material used	Stock form used in manufacture	Appropriate finishing technique	Most gears are made from Nylon and Polyacetal Also accept: Polyphenylene sulfide (PPS) Thermoplastic polyester, fibre reinforced plastic	Granules Also accept named gear stock forms e.g. spur, bevel, helical, worm, bevel, hypoid, crown gear	Pigment added during injection moulding Left as finished in mould	Product: Wooden toy			Specific main material used	Stock form used in manufacture	Appropriate finishing technique	Beech Pine MDF Plywood	Plank Board	Cellulose Lacquer Varnish Oil	3 marks	AO4
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		<p>levels in lakes killing fish and marine life and also raising acidity in the soil destroying plant based life.</p> <ul style="list-style-type: none"> • 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. • 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. 		
<p>Accept other valid responses.</p>				

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16		<table border="1"> <tr> <td>5-6 marks</td> <td>A detailed description making several correct points for selected addition process using notes and/or sketches. Specific correct and appropriate named tools and equipment to further clarify response.</td> </tr> <tr> <td>3-4 marks</td> <td>A description with points showing some understanding of the selected addition process using notes and/or and sketches. Basic reference made to some tools and equipment to clarify understanding.</td> </tr> <tr> <td>1-2 marks</td> <td>Simple notes or sketch showing limited understanding of selected addition process.</td> </tr> <tr> <td>0 marks</td> <td>Nothing worthy of credit</td> </tr> </table> <p>Indicative content:</p> <p>Lamination Expect reference to lamination of paper, plastics or wood. Looking for reference to use for improving strength, stability, flexibility and possibly aesthetics. Possible consideration of laminating machine with polymer pouches to stiffen and water proof card. Gluing layers of veneer under pressure (clamps) with adhesive using formers.</p> <p>Printing/3D printing Expect reference to application on paper, card. Developing technologies using PLA polymer with 3D printing machines to manufacture parts/components etc. Specific additional printing techniques include screen printing, digital printing, offset lithography printing, flexography, dye sublimation printing, direct printing, mordant printing.</p> <p>Soldering Expect reference to use in electronics, hard (brazing) soldering and soft soldering. Soldering irons e.g. electronic component soldering or commercial electronic soldering like wave or flow soldering. Soft soldering using a gas torch used in for example by a silversmith may be considered. Use of flux to allow solder to flow.</p> <p>Welding Expect reference to welding metals or polymers. Metals are welded using gas e.g. oxyacetylene using a very hot flame or MIG and TIG welding using a large electrical current to create heat and fuse metals together. Polymers can be fused using either heat or chemicals. Chemical welding e.g. Tensol and solvent cement are common in school environments. Heat welding involves using a hot air gun and polymer filler rod of a range of thermoforming plastics e.g. HDPE.</p> <p>Accept all other valid responses</p>	5-6 marks	A detailed description making several correct points for selected addition process using notes and/or sketches. Specific correct and appropriate named tools and equipment to further clarify response.	3-4 marks	A description with points showing some understanding of the selected addition process using notes and/or and sketches. Basic reference made to some tools and equipment to clarify understanding.	1-2 marks	Simple notes or sketch showing limited understanding of selected addition process.	0 marks	Nothing worthy of credit	6 marks	AO4
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17		<p>Indicative content:</p> <p>One mark for a named process:</p> <ul style="list-style-type: none"> • Die cutting • Perforation & punching • Turning • Sawing • Milling/Routing • Drilling • Cutting - including laser cutting • Shearing. • Abrasive removal e.g. sanding, filing <p>NOTE: RECYCLING AND WASTE MANAGEMENT IS INCORRECT</p> <p>Two marks for describing correct use:</p> <ul style="list-style-type: none"> • 1 mark for a simple descriptive point • 2 marks for a detailed response or two simple points made <table border="1"> <thead> <tr> <th>PROCESS</th> <th>DESCRIPTION OF USE</th> </tr> </thead> <tbody> <tr> <td>Laser cutting</td> <td>Information output from sources like 2D design can instruct laser to cut precisely, avoiding human error, repetitive design usually working with acrylic, plywood and card. Possible reference to setting up laser , x and y coordinates, focusing, cutting speed, power settings and extraction.</td> </tr> <tr> <td>Die cutting</td> <td>Used to remove a net or multiple nets from a piece of card in one operation. Process involves using knives, creasing bars and perforation blades. Used in the production of card packaging.</td> </tr> <tr> <td>Perforation & punching</td> <td>Perforating is where small localised areas of material are removed (paper, card & Corrugated) to weaken the material to allow a controlled tear to take place, eg tissue box opening. Punching uses a die to ‘punch’ out a hole or shape of material to form a hole or an opening. Takes place on sheet material.</td> </tr> <tr> <td>Turning</td> <td>Involves using either a wood turning lathe or a centre lathe to remove portions of material from a rotating work piece to produce a concentric profile, e.g. stair case spindles, metal cylinders and wooden bowls.</td> </tr> <tr> <td>Sawing</td> <td>Sawing takes place using one of a range of: Hand saws appropriate to a specific material or to cut straight or curved cuts, e.g. hacksaw (metal) dovetail or tenon saw (wood) coping saw (curved cuts in wood) Machine saws, e.g. band saw, fret saw and circular saw for removal of material more rapidly to cut out several or possibly larger parts from a</td> </tr> </tbody> </table>	PROCESS	DESCRIPTION OF USE	Laser cutting	Information output from sources like 2D design can instruct laser to cut precisely, avoiding human error, repetitive design usually working with acrylic, plywood and card. Possible reference to setting up laser , x and y coordinates, focusing, cutting speed, power settings and extraction.	Die cutting	Used to remove a net or multiple nets from a piece of card in one operation. Process involves using knives, creasing bars and perforation blades. Used in the production of card packaging.	Perforation & punching	Perforating is where small localised areas of material are removed (paper, card & Corrugated) to weaken the material to allow a controlled tear to take place, eg tissue box opening. Punching uses a die to ‘punch’ out a hole or shape of material to form a hole or an opening. Takes place on sheet material.	Turning	Involves using either a wood turning lathe or a centre lathe to remove portions of material from a rotating work piece to produce a concentric profile, e.g. stair case spindles, metal cylinders and wooden bowls.	Sawing	Sawing takes place using one of a range of: Hand saws appropriate to a specific material or to cut straight or curved cuts, e.g. hacksaw (metal) dovetail or tenon saw (wood) coping saw (curved cuts in wood) Machine saws, e.g. band saw, fret saw and circular saw for removal of material more rapidly to cut out several or possibly larger parts from a	3 marks	AO4
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			chosen material.			
		Milling/CNC milling	Vertical milling (common in school) and horizontal milling. Vertical milling allows slots as well as holes to be cut in materials like aluminium with ease. Horizontal milling allows large flat surfaces to be machined removing surface defects from such processes as casting.			
		Drilling	Production of a hole either through or blind using a twist drill or similar. Process can be complete using a hand drill, cordless drill, electric drill or pillar drill.			
		Cutting	Use of a rotary cutter in either a bench paper trimmer or hand held			
		Shearing	A guillotine uses a shearing action to cut paper, card and sheet metals. Hand held - tinsnips			
		Accept any other appropriate named process to remove waste material and supporting example if provided.				

Qu	Part	Marking guidance	Mark	AO										
18	1	<p>One mark for a correctly named specific source or origin.</p> <p>Indicative content:</p> <table border="1"> <tr> <td>Material</td> <td>Source or Origin</td> </tr> <tr> <td>Metal based materials</td> <td>Rocks or Ore</td> </tr> <tr> <td>Paper and boards</td> <td>Trees, forests, woods and plant fibres</td> </tr> <tr> <td>Polymers</td> <td>Crude oil and plants e.g. sugar cane (biopolymers)</td> </tr> <tr> <td>Timber based materials</td> <td>Trees, forests or woods</td> </tr> </table> <p>Accept all reasonable responses</p>	Material	Source or Origin	Metal based materials	Rocks or Ore	Paper and boards	Trees, forests, woods and plant fibres	Polymers	Crude oil and plants e.g. sugar cane (biopolymers)	Timber based materials	Trees, forests or woods	1 mark	AO4
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19		<p>One mark for a correctly named specific process One mark for a simple descriptive point</p> <p>Two marks for a detailed response with two credit-worthy points made.</p> <p>Indicative content:</p> <table border="1" data-bbox="319 577 1220 2056"> <tbody> <tr> <td data-bbox="319 577 512 779">Papers and boards</td> <td data-bbox="512 577 778 779"> Offset lithography Screen printing Digital printing Die cutting </td> <td data-bbox="778 577 1220 779"> Printing design and information on paper and card. Cutting out of nets. Making perforations. Creasing of card. </td> </tr> <tr> <td data-bbox="319 779 512 1352">Timber based materials</td> <td data-bbox="512 779 778 1352"> Routing Turning Lamination Machine morticing </td> <td data-bbox="778 779 1220 1352"> 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="319 1352 512 2056">Metal based materials</td> <td data-bbox="512 1352 778 2056"> Milling Casting Welding Brazing Sintering </td> <td data-bbox="778 1352 1220 2056"> Horizontal or vertical milling of a flat surface, groove, step or hole. Redistribution of metal in molten form to fill a mould or cavity. joining at least two pieces of metal along and edge/spot/seam to create a permanent joint using same metal. Use of hard solder to join two or more pieces of metal together without melting them. The compression of powdered metals in a die using heat and extreme pressure to create a </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 Welding Brazing Sintering	Horizontal or vertical milling of a flat surface, groove, step or hole. Redistribution of metal in molten form to fill a mould or cavity. joining at least two pieces of metal along and edge/spot/seam to create a permanent joint using same metal. Use of hard solder to join two or more pieces of metal together without melting them. The compression of powdered metals in a die using heat and extreme pressure to create a	4 marks	AO4
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				solid product in its final shape		
		Polymers	Injection moulding	The heating and injection of molten polymer into a mould to produce a 3D shape.		
			Extrusion	Where molten polymer is extruded through a die to produce a consistent shaped profile.		
			Vacuum forming	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.		
			Calendaring	Manufacture of thin thermoplastic film.		
			Rotational moulding	Used to manufacture hollow 3D products using an enclosed mould containing thermoplastic polymer in powder form.		
			Blow moulding	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. Alternatively heated sheet is held in a clamp and air introduced to expand the sheet into a hollow shape.		

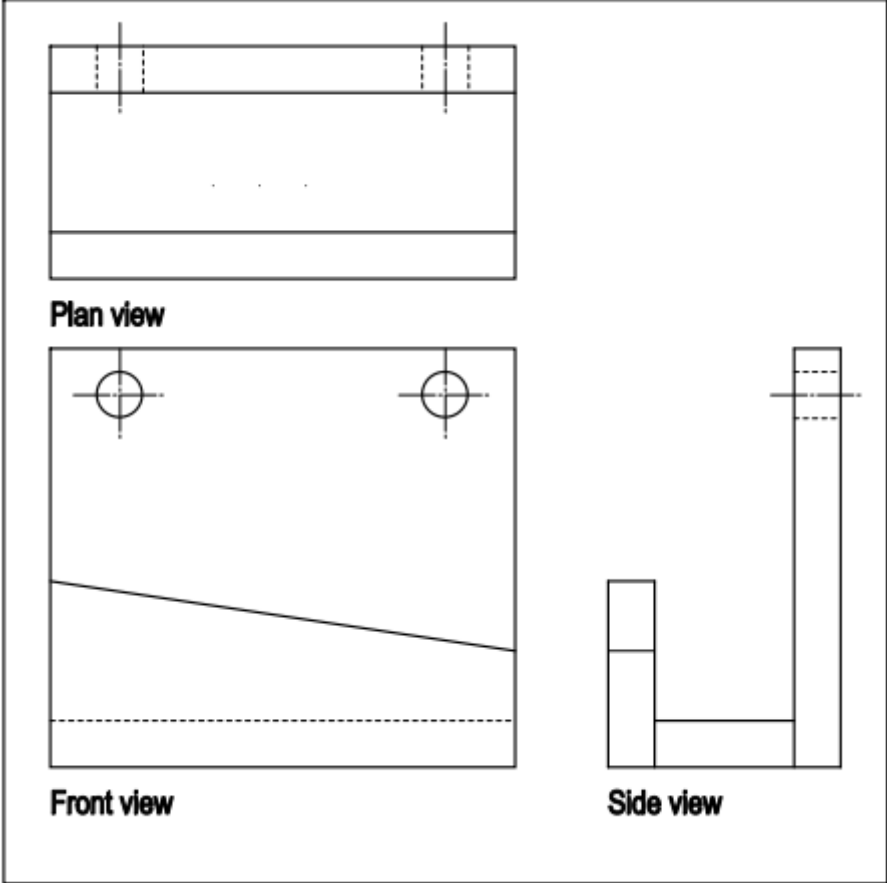
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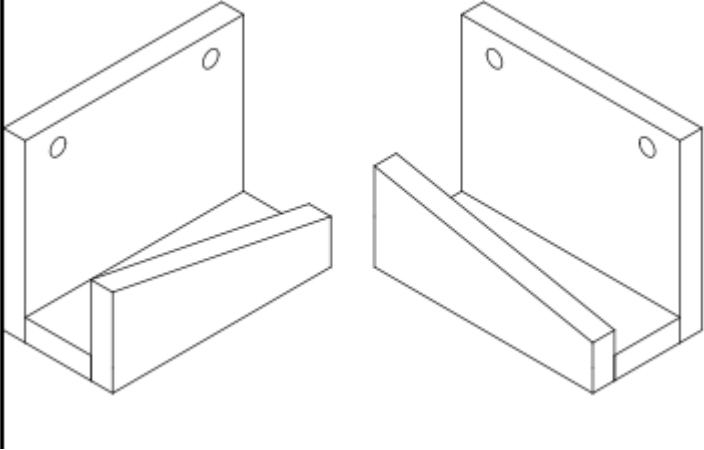
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21	1,2,3	<p>Award up to Four marks for each of the three parts of the question.</p> <table border="1"> <tr> <td>3–4 marks</td> <td>Well explained and justified analysis containing full evaluation, drawing on conclusions having considered both positive and negative factors</td> </tr> <tr> <td>1–2 marks</td> <td>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>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>NB Do not reward repeats i.e. where some candidate may try to use the same response multiple times in 20.1, 20.2, 20.3</p> <table border="1"> <tr> <td>Ergonomics</td> <td> <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 • Iron is a conductor so hot to the touch including the handle </td> </tr> <tr> <td>Functionality</td> <td> <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 </td> </tr> </table>	3–4 marks	Well explained 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 • 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 	12 marks	AO3
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			<p>or hearth</p> <ul style="list-style-type: none"> • 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 		
		<p>Innovation</p>	<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 • 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 mains voltage electric supply to work 		

Qu	Part	Marking guidance	Mark	AO		
22		<table border="1" data-bbox="320 309 1217 412"> <tr> <td data-bbox="327 318 496 403">1 mark</td> <td data-bbox="501 318 1211 403">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 data-bbox="320 450 576 479">Indicative content:</p> <p data-bbox="320 517 1046 546">The guidance provided is illustrative and not exhaustive.</p> <p data-bbox="320 584 1145 645">Credit any worthy points made in support of the band descriptor above.</p> <ol data-bbox="320 683 1214 1189" 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 data-bbox="320 1227 735 1256">Accept other valid responses.</p> <p data-bbox="320 1294 826 1323">A point worth credit must not be vague.</p> <p data-bbox="320 1361 826 1391">Typical zero mark responses would be:</p> <ul data-bbox="320 1397 826 1525" 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 	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	Mark	AO
23		<p>A maximum of Two marks for each advantage.</p> <p>One mark for each correct advantage with a second mark awarded where response is clarified/ additional detail is provided.</p> <p>Indicative content:</p> <p>This question is about drawing and about CAD.</p> <p>1 mark responses:</p> <ul style="list-style-type: none"> • You can see at least 3 sides of the object drawn • Drawing is more realistic • Create an artist's impression of an object <p>2 mark responses:</p> <ul style="list-style-type: none"> • 3D drawing provides a more realistic view of how the drawn product might look in real life • 3D drawing gives the viewer opportunity to imagine how the drawn product might feel when held/used • 3D drawing can be used to create a perspective view of an object, e.g. 1, 2 or 3-point perspective • Can be used to show how a product can be assembled, e.g. exploded drawings • Makes it easier to understand how to assemble flat pack furniture as viewer can see how the different parts/components relate to each other. • Viewer can see at least 3 sides providing detail of sizes and proportion 	4 marks	AO4

Qu	Part	Marking guidance	Mark	AO
24		<p>Orthographic side view:</p> <p>Correct width (from Plan view) 1 mark Correct height (from Front view) 1 mark Uprights in correct positions 1 mark Hidden detail (hole and centre lines) 1 mark</p> <p>Total 4 marks maximum</p>  <p>Isometric drawing:</p> <p>NB: Image is indicative of correct image from one corner only. A candidate may have drawn shape correctly from a different view point and full credit is available if it satisfies the criteria below.</p> <p>1 mark - Drawing uses provided grid (must be isometric, not perspective, oblique etc) 1 mark – general shape is correct (similar to drawing below) 1 mark – slope on front section shown correctly 1 mark – holes are in correct places (Accept circular or elliptical holes).</p> <p>Total 4 marks maximum</p>	8 marks	AO4

		 <p data-bbox="312 730 1182 763">Isometric drawings from alternative viewpoints are acceptable</p>		
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Qu	Part	Marking guidance	Mark	AO								
25		<table border="1" data-bbox="320 309 1214 551"> <tr> <td data-bbox="327 318 427 358">1mark</td> <td data-bbox="432 318 1208 358">A recognisable attempt at a 3-dimensional drawing e.g. 3 connected elevations/sides to object.</td> </tr> <tr> <td data-bbox="327 365 427 405">1mark</td> <td data-bbox="432 365 1208 405">Clear evidence of some perspective/ foreshortening.</td> </tr> <tr> <td data-bbox="327 412 427 506">1mark</td> <td data-bbox="432 412 1208 506">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="327 512 427 553">1mark</td> <td data-bbox="432 512 1208 553">Inclusion of hook or extension to the front edge of the roof.</td> </tr> </table> <p data-bbox="320 584 576 616">Indicative content:</p> <p data-bbox="320 651 1222 750">Responses with bug box drawn either above, on or below a horizontal plane between two vanishing points (horizon line) are acceptable – see images provided below:</p> <div data-bbox="448 797 743 1760" style="text-align: center;"> </div>	1mark	A recognisable attempt at a 3-dimensional drawing e.g. 3 connected elevations/sides to object.	1mark	Clear evidence of some perspective/ foreshortening.	1mark	Drawing is recognisable as the bug box in the indicative content below (does not have to show hook or overhang of roof).	1mark	Inclusion of hook or extension to the front edge of the roof.	4 marks	AO4
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Qu	Part	Marking guidance	Mark	AO						
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1-2 marks	Basic explanation of collaborative design with little or no reference as to importance in how designers use it to create effective solutions to problems. Incorrect example(s) that do not support response.											
0 marks	Nothing worthy of credit											

		<p>lower quality and not address all the needs of the client or user (especially if complex or extensive), due to limitations of expertise or experience.</p> <ul style="list-style-type: none"> • Used to increase the range and quality of solutions/ possibilities generated to solve a need eg by using teams of designers in competition • Use different people with different skills, experience and expertise during the design process. Thus, ensuring a better end result. • Designers can inspire each other leading to innovative and creative solutions to problems • Shorter design timescale, as designers can work concurrently. <p>Accept all other valid responses</p>		
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Qu	Part	Marking guidance	Mark	AO								
28		<p>Maximum of three marks each for focus groups and market research responses.</p> <p>NB Maximum of two marks if no example is provided in response.</p> <table border="1"> <tr> <td>3 marks</td> <td>A very detailed and well explained example provided to clarify understanding of the techniques.</td> </tr> <tr> <td>2 marks</td> <td>A simply described understanding of the technique using an example or a well described understanding with no example.</td> </tr> <tr> <td>1 mark</td> <td>Simple statement demonstrating understanding of technique with no example</td> </tr> <tr> <td>0 marks</td> <td>No response 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>Focus groups:</p> <ul style="list-style-type: none"> • A primary source of information gathering, unlike written articles or online resources completed by another. • Very specific way of finding useful research talking to people of interested parties to prepare/help with designing, e.g. about a prototype product. • A gathered group of people where opinions and perceptions are observed/discussed/shared, e.g. features of a recently released product like a child's toy. • Focus groups allow for people to interact and share views and opinions unlike say interviews/survey/poll usually completed by/with an individual. • Allow a designer or manufacturer to talk/engage directly with consumers/customers. <p>Market research:</p> <ul style="list-style-type: none"> • A consideration of what's already on the market (product analysis), eg a competitor may want to evaluate the good and bad points (customer perceptions) of a mobile phone or totally electric car against a hybrid. • A critical evaluation of what's already on the market and what they would be in competition with. • Identification of a gap in the market for a particular product. • A manufacturer will want to know if the development of a product is viable, eg like Land Rover with their first SUV in the 1970s, or more recently Nespresso with their coffee pod machines. • May involve interviews or surveys. <p>Accept other valid responses.</p>	3 marks	A very detailed and well explained example provided to clarify understanding of the techniques.	2 marks	A simply described understanding of the technique using an example or a well described understanding with no example.	1 mark	Simple statement demonstrating understanding of technique with no example	0 marks	No response or nothing worthy of credit.	6 marks	AO4
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