

Mark Scheme (Results)

Summer 2023

Pearson Edexcel GCSE
In Design & Technology (1DT0)
1A: Metals

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

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Component 1 mark scheme

Section A – Core content

Question number	Answer	Additional guidance	Mark
1 (a) (i)	 Any one property from: Electrical insulator / does not conduct electricity (1) Good heat resistance (1) Good chemical resistance (1) Hard (1) Stiffness / rigidity (1) 	Do not accept Insulator on its own	(1)

Question	Answer	Mark
number		
1 (a) (ii)	Any one property from:	(1)
	 Low density (1) Lightweight / light (1) Soft (1) 	
	- 5011 (1)	

Question number	Answer	Mark
1 (a) (iii)	Any one property from:	(1)
	Hard / hardness / scratch resistant (1)	
	Tough / toughness / impact resistant (1)	
	Resistant to corrosion / will not rust (1)	
	Durable (1)	
	Waterproof / water resistant (1)	

Question	Answer	Additional	Mark
number		guidance	
1 (a) (iv)	 Any one property from: Rigid / stiffness / hard to bend (1) Absorbent / accepts ink well / printability (1) 	Do not accept hard on its own	(1)

Question number	Answer	Mark
1 (b) (i)	 Any one advantage of the company being operated as a privately-owned company (1) and a linked justification of that advantage (1). The company can be more flexible in how it works / make / take their own decisions / control the share allocation (1) therefore they can adopt / exploit new technologies without having to consult shareholders / other stakeholders (1) The company can make changes fast / make quick decisions without having to consult shareholders (1) which means they can respond to market trends / fashions very quickly (1) Any profits go to the owners rather than shareholders / can be easily re-invested / spent on new and emerging technologies (1) which provides a greater incentive for the company owners to make a success of the business / work hard / more profits (1) A privately owned company does not need to publish their accounts (1) therefore they can keep their finances more private (1) The company can close / cease trading / take any money out (1) and start a new company under a new name (1) 	(2)

Question number	Answer		Additional guidance	Mark
1 (b) (ii)	A calculation that includes:correct setting out of formula		Award full marks for correct numerical answer without	(2)
	30 x 150,000 100 • correct answer	(1)	working. Allow for ECF if candidate gets part of transposition wrong.	
	£45,000 Alternative method	(1)	If a candidate shows working out and gives an answer of £195,000 and shows	
	• £150,000 x 1.3 = £195,000	(1)	it as an answer, 1 mark can be awarded. If however they just provide an answer of £195,000	
	• £195,000 - £150,000 = £45,000	(1)	without any working out, no marks should be awarded.	

Question number	Answer	Mark
2 (a)	 Oblique (1) Oblique projection (1) Cavalier oblique (1) Cabinet oblique (1) Cavalier projection (1) Cabinet projection (1) 	(1)

Question number	Answer	Mark
2 (b)	 Any one reason for using concrete (1) and a linked justification of that reason (1). Concrete is fire proof (1) which means if any wax is spilt / drips onto it, it will not burn (1) Concrete is dense / heavy (1) which means it will be stable / unlikely to be knocked / topple over (1) The candle holder is cast into shape (1) which means an exact volume can be mixed / minimises waste (1) 	(2)

Question number	Answer	Mark
2 (c)	 Any one reason for manufacturing the concrete candle holder to hold a candle of a standardised size (1) and a linked justification of that reason (1) The candles will be widely available / commonly used (1) which means they can be purchased from many different suppliers / shop around to find the cheapest price / know they can source candles in the future (1) The candle holder can be sold / manufactured in different countries (1) which means it has much better sales potential / more profits for the company (1) The candle holder can be mass produced since the candle is a standard sized (1) which minimises production changes / set up costs (1) 	(2)

Question number	Answer	Additional guidance	Mark
2 (d)	 A calculation that includes: Conversion of units at the start or end (1) 	Award full marks for correct numerical answer without working.	(4)
	 Calculation of the volume of the square prism 8 x 8 x 3 = 192 cm³ or 192,000 mm³ 	Allow for ECF if candidate gets part of transposition wrong.	
	 Calculation of the volume of the cylindrical hole 3.142 x 2.5² x 1.5 = 29.45625 cm³ or 29456.25 mm³ 	If answer is NOT rounded to a whole number do not award full marks	
	• correct answer 192 – 29.45625 = 162.54375 cm ³ or 162548 mm ³ rounded to 163 cm ³ (1)		

Question number	Answer	Mark
3 (a)	Any one softwood from: Pine / pine wood (1) Cedar (1) Larch (1) Redwood (1) Spruce (1)	(1)

Question number	Answer	Mark
3 (b)	 Any one reason for using a softwood for the frame rather than a hardwood (1) and a linked reason for the use (1) Softwoods are faster / quicker growing (1) which means there will be a greater supply of timber / more sustainable (1) Softwoods are cheaper (1) which means the overall cost of the frame will be lower / more likely to sell (1) Softwoods are less dense than hardwoods / have a more open grain (1) therefore they are easier to machine / cut (1) 	(2)

Question number	Answer		Additional guidance	Mark
3 (c)	A calculation that includes:		Award full marks for correct numerical	(2)
	 correct working out of waste left 		answer without	
	300 – 270 = 30 cm		working.	
		(1)		
	correct answer		Allow for ECF if	
	30/300 or 1/10 th or 10/100 th		candidate gets part	
		(1)	of calculation wrong.	

Question number	Answer	Mark
3 (d)	 Any one disadvantage of using mild steel for the fixing (1) and a linked reason for the disadvantage (1) Mild steel will rust / corrode in the outside conditions / damp soil (1) which means the joint / frame will come apart / fail / become weak (1) Mild steel has lower tensile strength / shear strength (1) which means the screw could shear / break / snap if overtightened (1) 	(2)

Question number	Answer	Mark
3 (e)	 Any two benefits of using corrugated board for the box (1) and a linked justification of the benefits (1). Corrugated board is lightweight (1) therefore it will not add too much cost to the postal delivery charges / will not add unnecessary weight when lifting (1) Corrugated board has good impact resistance / is fluted (1) therefore it is good at protecting the frame / parts inside / prevents damage to parts during transportation (1) Corrugated board is widely recyclable / biodegradable / can be made from recycled materials (1) therefore it will not need to go into general waste / landfill / can be recycled and used again / better for the environment (1) Corrugated board is absorbent / takes ink well / printability (1) therefore the box can be printed with the company's logo / brand / advertising / recyclable logos on it / stack height (1) Corrugated board is a cheap / readily available materials (1) therefore it helps to keep down the cost of packaging / overall production costs (1) 	(4)

Question number	Answer	Mark
4 (a)	Any one working property of polyester (1) and a linked justification of that property (1). • Polyester is waterproof / shrink resistant (1) which means it will protect the laptop inside from being damaged by the rain / liquids (1)	(2)
	 Polyester has good tensile strength (1) which means the strap / bag will support the weight of the laptop inside (1) Polyester is a durable material (1) which means it will resist wear as the bag rubs against the clothes being worn by the user (1) Polyester is stain/chemical resistant (1) which means it will not be affected by any liquids / coffee spilt on it (1) Polyester is stretch resistant (1) which means it will not deform/change shape due to any loading/weight of the laptop inside (1) 	

Question number	Answer	Additional guidance	Mark
4 (b)	 A calculation that includes: correct working out of recycled polyester 100% – 60% = 40 %	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong.	(2)
	Alternative method		
	 correct working out of new polyester 60/100 x 320 = 192		

Question number	Answer	Mark
number 4 (c)	Any one explanation that references why carrying out a LCA can help to reduce the environmental impact (1) and a linked justification (1). • Materials would be sourced from local suppliers (1) which means there would be fewer miles / reduced travel / pollution created by not buying materials from overseas suppliers (1) • More recycled polyester / materials would be used in the bag (1) which will reduce the demand for new materials / impact of drilling for oil / conservation of finite resources (1) • The company would consider the types of vehicles used to distribute their products / use greener transport (1) which would reduce the pollution / greenhouse gas emissions from traditional fuelled vehicles (1) • The company would consider how the bag / customers can recycle the at the end of its useful working life / broken down / separated into different parts (1) which means materials / parts could be recycled / reused rather than being dumped in landfill / incinerated (1) • The company would use more sustainable sources of energy (1) which reduces the carbon footprint in the manufacture of the bag (1) • The company could consider how to adapt the design of the bag (1) which means they could reduce the amount of raw materials used in its manufacture (1) • The company should consider / review the manufacturing processes / techniques used for the manufacture (1) which means they could reduce the number of processes / machines / energy used (1)	(2)

Question number	Indicative content	Mark
4 (d)	 Improved battery capability has meant that it is possible to work for longer without the need to be plugged into mains power making it much easier to work on the move rather than needing to be based in an office / home Laptops have become smaller / lighter which has meant that they have become much more portable due to advances in materials technology / miniaturisation allowing users to take them home / travel with them easier which means they can work anywhere Many laptops now have built in cameras / speakers which means that remote working / video conference / zoom / teams has meant that the workforce can attend virtual meetings with little additional equipment / can join meetings from anywhere that has a Wi-Fi connection The processing power / increase in RAM / speeds of modern laptops make them much more capable of handling demanding software such as graphics / CAD based packages With Wi-Fi / internet ready / enabled laptops more computing can be carried out in 'cloud' based environments reducing the need for bigger more powerful processor based computers / meaning that more people can work without having to be connected to office / work place networks The ability to connect more devices such as printers / stylus pens / keyboards / mouse / tablets via blue tooth / wireless has reduced the need for USB ports meaning that laptops can be made thinner / tapered / more devices attached The ability to attach / connect additional screens / use of docking stations / has allowed for greater / improved working capability / office simulations 	(6)

Level	Mark	Descriptor
	0	
Level 1	1 - 2	Attempts to interrogate and deconstruct information but
		connections and logical chains of reasoning are flawed.
		An unbalanced appraisal of the information/issues, containing
		judgements that show a limited awareness of the interrelationships
		between factors or competing arguments.
Level 2	3 – 4	 Interrogates and deconstructs information and provides some
		connections and logical chains of reasoning.
		A balanced appraisal of the information/issues, containing
		judgements that show an awareness of the interrelationships
		between factors or competing arguments.
Level 3	5 - 6	 Interrogates and deconstructs information and provides sustained
		connections and logical chains of reasoning.
		A well-balanced appraisal of the information/issues, containing
		judgements that show a thorough awareness of the
		interrelationships between factors or competing arguments.

Section B - Metals

Question number	Answer	Mark
5 (a)	Marks will be awarded for understanding of design and technology, not graphical skills.	(6)
	Notes and/or sketches that include:	
	 be able to hold an additional three boxes of chocolates (1) and allow the top face of each individual chocolate box to be seen (1) e.g. shelf / longer / wider base / with clear sight lines to be able to see EACH box (no stacking boxes on top of each other) 	
	 include a method to show the price of a box of chocolates (1) that allows the price to be changed (1) e.g. magnetic labels / grooves for slot in labels / dry wipe board that allows prices to be written on and cleaned / wiped / cards in and out / technology based options be portable (1) so that it can be moved to another place without the chocolate boxes falling off (1) e.g. handle(s) / wheels / strap / lips around the edges 	
	Example of candidate response.	
	handle to allow carrying Second Shelf to hota 3 lookes of chocolates Mild steel plates to all ow magnetic price labels to be fixed/changed. Same clesion of loops out looks shelves to be easily removed to be easily re	
	Annotated notes: Handle to allow carrying	

Rails on sides and back to stop boxes falling off
Aluminium rods added to each side to support a second shelf
Second shelf to hold 3 boxes of chocolates
Mild steel plates to allow magnetic price labels to be fixed / changed
Same design of loops on both shelves to allow boxes to be easily removed and tops of boxes shown.

Question number	Answer	Mark
5(b)	 Any two explanations that include a way the metal puzzle meets or fails to meet the requirement (1) and a linked justification of that way (1). The steel balls need to be moved from the start to the finish via the grooves (1) which the young children need to tilt and turn the puzzle to control the direction of the steel balls (1) The children can see the steel balls through the acrylic screen (1) which means they can see where the balls are / where they need to move to (1) The puzzle has a clear lid on it to stop the steel balls falling out (1) which means the steel balls can only travel in the grooves / cannot go anywhere else so not that difficult / stops the balls getting lost rendering the game useless / stops cheating (1) The start / finish is not marked as such on the puzzle (1) therefore there is no clear indication / point / focus to the game and the children might not see any point in playing / using it (1) The steel balls can only travel in the grooves / slots (1) therefore there is very little control needed since the balls can only travel in straight lines up / down / across (1) There are multiple steel balls to be moved (1) therefore the game is more challenging / makes it more demanding / difficult (1) 	(4)

Question number	Answer	Mark
6 (a)	Any two explanations of characteristics of aluminium (1) and a linked justification (1)	(4)
	 Aluminium is non-toxic (1) which means that it is a safe metal to use / will not harm children if they put it in their mouth (1) Aluminium is a lightweight material (1) which means that it is not too difficult for the child to move / manoeuvre / pick up (1) Aluminium is corrosion resistant / does not rust (1) which means it will be able to be wiped / kept clean after / during use by young children (1) Aluminium will develop a surface oxide (1) which will prevent any 	
	need for extra surface finish / surface will not deteriorate (1)	

Question number	Answer	Additional Guidance	Mark
6 (b)	Marks will be awarded for understanding of design and technology, not graphical skills.	Cap at three marks if	(4)
	 Work / tin snips held in vice / clamped down (1) Work should be as low as possible in the vice to reduce vibrations / ensure it does not bend when being cut by junior hacksaw (1) 	no sketches or all sketches and no notes	
	 Junior hacksaw / tin snips used to cut into the waste and to start cutting around the shape (1) Work continues to be rotated in the vice (1) 		
	(Accept abrafile / piercing saw in place of junior / adjustable hacksaw)		
	Example of candidate response: What close to the weather side with a junior hacksaw hacksaw hacksaw The steel in to an engineers' vice work piece should be champed low		
	 Annotated notes: Workpiece should be clamped low Cut close to the waste side Vice Junior hacksaw 		

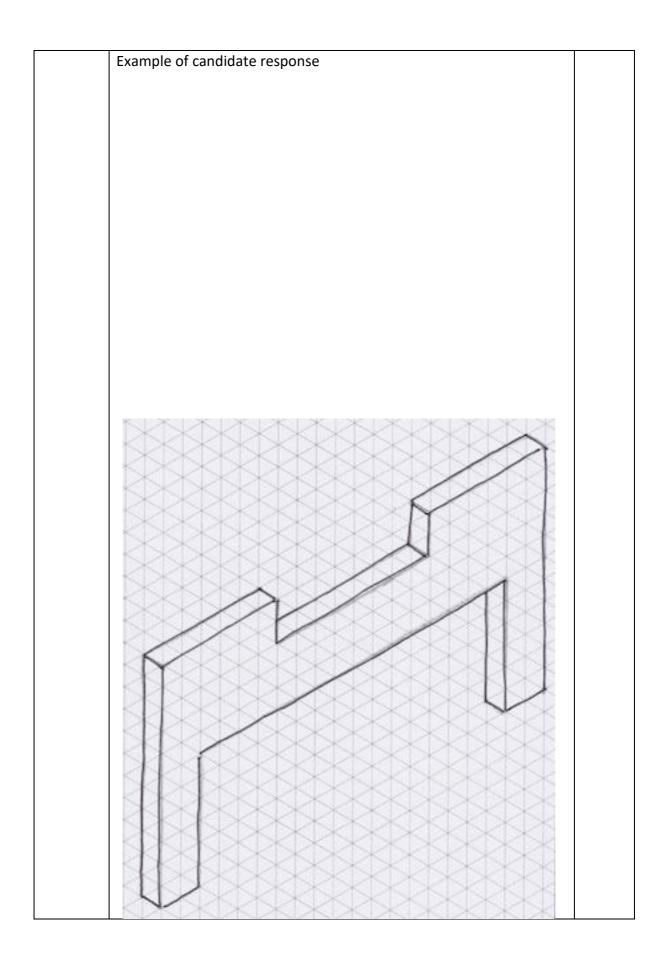
Question number	Answer		
6 (c)	 Any one explanation that includes a way of avoiding offence to potential buyers (1) and a linked justification for that way (1) Careful consideration must be given to the choice of colours used (1) as different colours are used to represent different things in some countries / bring bad luck / have different connotations (1) The use / choice of language / images must be considered (1) as some words / images when interpreted / seen have very different meanings / use / range of different languages / fonts (1) 	(2)	

Question number	Answer	Mark
6 (d)	Any two manufacturing methods (1), plus two linked justifications of that manufacturing method (1) + (1)	(6)
	Method	
	 Turned on a centre lathe / metalwork lathe / turning (1) Explanation 	
	 The handle can be turned round / cylindrical on the lathe (1) which means that any other processing / holes / chamfer / knurling / screw threads can all be done at the same time / concentrically / on the same machine (1) 	
	Method	
	• File (1)	
	 The handle can be held in a vice and turned (1) which means the corners / square edges can be removed to make a cylindrical shape (1) 	
	Method	
	Produced on CNC 4 axis mill (1)	
	Explanation	
	 The metal is held in a chuck (1) which means the work piece can be rotated as the milling cutter moves along the axis to machine the profile (1) 	

Question number	nswer			
7 (a)	 Any one nut from: Nut (1) Hexagonal nut (1) 	(1)		

Question number	Answer	Additional guidance	Mark
7 (b)	 Any two explanations that include an advantage of using CAM (1) plus a linked justification for the advantage (1). The centre hole will be accurately placed / machined in the centre (1) which means that the axle will be concentric to the outside edge (1) The wheel will be perfectly round / clean edge / smooth cut (1) which means it will roll without any deviation (1) All the wheels will be the same size / identical (1) which means that when they fit onto the axle the toy will be at the right height (1) The file / wheel can be nested / lay planned using the CAD software used to draw the wheel (1) which results in the most efficient use of the brass material / minimising waste (1) Cutting speed / feed rates can be set to produce a perfect finish (1) which means there will be less secondary finish required (1) 	Do not accept any responses related to 24/7 manufacture or comparisons to being hand made	(4)

Question number	Answer	
7 (c)	A drawing that includes:	(5)
	Correct overall length at 100mm (1)	
	Correct overall height at 55mm (1)	
	Correct overall thickness at 5mm (1)	
	Position of the top cut out (1)	
	Position of the bottom cut out (1)	



Question number	Answer	Mark
7 (d)	 Any two explanations that includes a disadvantage (1), plus two linked justifications of that disadvantage (1) + (1). The template could be the wrong size to start with (1) which means any parts marked out using it would be wrong (1) therefore the parts would not fit the rest of the toy (1) There is a chance it could get lost (1) which means that any other front pieces would need to be marked out by hand (1) therefore they could be the wrong size / different sizes (1) The template could wear / get damaged as it is used (1) which means the longer it is used the smaller each of the parts get (1) therefore resulting in parts that will not fit / be the right size (1) The template needs to be located correctly in the first place (1) which means initial errors can be compounded / template might slip / move during marking out (1) therefore resulting in parts that may be the same shape but a different size / meaning material is wasted (1) 	(6)

Question number	Answer	Mark
8 (a)	 Any one explanation that includes a benefit of using titanium (1) and a linked justification of that benefit (1). Titanium has a high strength to weight ratio (1) which means that thinner / smaller tubes can be used / making the bike lighter (1) Titanium is tough / impact resistant / able to flex / deform in use (1) which means that the bicycle will be more comfortable to ride / can absorb bumps from uneven surfaces (1) Titanium has high levels of corrosion resistance / does not rust (1) which means that the bicycle frame would not need to be painted / have a finish applied (1) 	(2)
	, nave a mish applied (1)	

Question number	Answer	Mark
8 (b)	 Any one explanation of a cost factor (1), plus one linked justification of that cost factor (1) + (1). The quality / grade of the titanium ore will have a bearing on the cost of the material (1) which means lesser / lower grades will be cheaper (1) which may result in a bicycle frame which lacks strength (1) The availability / location of ore containing titanium will be a factor (1) which means the prices may vary (1) therefore resulting 	(3)
	 factor (1) which means the prices may vary (1) therefore resulting in a higher cost (1) The levels of supply / demand for titanium will vary (1) due to its other uses within the automotive / chemical / aerospace industries (1) therefore resulting in higher cost prices (1) 	

Question number	Answer	Mark
8 (c)	Any two explanations of quality control checks (1) and a linked justification of those checks (1).	
	 The quality of welded joints would be checked (1) which means that any defect frames would be removed / sent for further processing (1) The size of the holes in the bicycle frames for other components would be checked (1) therefore ensuring that they are within a certain tolerance / allow other components to fit correctly (1) The frame would be checked for defects (1) therefore any titanium tubes that contained cracks / dents / scratches would be removed / repaired (1) 	

Question number	Indicative content	Mark
8 (d)	 Bicycles are a very common mode of transport in Europe and Asia Bicycle design has evolved for different markets and some are now assisted with electric motors so that they can be used by people who would not be able to ride a normal bicycle Bicycles can be bought / hired from shops all around the world Bicycles are often given to children as toys / for exercise, meaning that there is a continually growing market Bicycles are available in a wide range of sizes and shapes to suit a wide range of users from children through to adults, and different uses such as deliveries Some bicycles are designed for sports use and have advanced features to allow them to move faster Some nations actively promote the use of bicycles as a mode of transport / to improve their environmental credentials With increasing traffic congestion in towns and cities, bicycles are seen as a viable alternative to allow people to travel to school / work / for leisure / make deliveries Bicycles are used in many countries as 'taxis' transporting people round congested city areas Bicycles can be adapted for use as an alternative power source to drive grinding wheels for sharpening knives, scissors etc. Large numbers of bicycles are required / used hence the need for mass manufacture Trends / fashions / growing concerns around the use / transportation of materials given the negative environmental impact of transporting the titanium from China to USA from Europe to China 	(9)

Level	Mark	Descriptor
	0	
Level 1	1-3	 Attempts to interrogate and deconstruct information but connections and logical chains of reasoning are flawed. An unbalanced appraisal of the information/issues, containing judgements that show a limited awareness of the interrelationships between factors or competing arguments. A conclusion may be presented but it is likely to be generic assertions rather than supported by relevant judgements.
Level 2	4-6	 Interrogates and deconstructs information and provides some connections and logical chains of reasoning. A balanced appraisal of the information/issues, containing judgements that show an awareness of the interrelationships between factors or competing arguments. A conclusion is presented that is partially supported by relevant judgements.
Level 3	7 - 9	 Interrogates and deconstructs information and provides sustained connections and logical chains of reasoning. A well-balanced appraisal of the information/issues, containing judgements that show a thorough awareness of the interrelationships between factors or competing arguments. A conclusion is presented that is fully supported by relevant judgements.