

# Mark Scheme (Results)

November 2020

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.

### Section A – Core content

Question number	Answer	Mark
1 (a) (i)	<ul> <li>Any one property from:</li> <li>good resistance to corrosion (1)</li> <li>good fluidity / casts well (1)</li> <li>machinability (1)</li> </ul>	(1)

Question number	Answer	Mark
1 (a) (ii)	<ul> <li>Any one property from:</li> <li>water proof / water resistant (1)</li> <li>durable / long lasting (1)</li> <li>plasticity / softened when heated (1)</li> <li>tough / impact resistance (1)</li> </ul>	(1)

Question number	Answer	Mark
1 (a) (iii)	<ul> <li>Any one property from:</li> <li>excellent for scoring / bending / folding (1)</li> <li>rigid (1)</li> <li>hygienic / safe for food use / non-toxic (1)</li> <li>pure with no smell or taste (1)</li> <li>good printability (absorbency) / takes ink well (1)</li> <li>stiffness (1)</li> </ul>	(1)

Question number	Answer	Additional guidance	Mark
1 (a) (iv)	<ul> <li>Any one property from:</li> <li>hard / resistant to wear / indentation (1)</li> <li>tough / impact resistance (1)</li> <li>good compressive strength (1)</li> </ul>	Do not accept strong / high strength	(1)

Question number	Answer	Additional guidance	Mark
1 (b)	<ul> <li>A calculation that includes:</li> <li>correct working</li> <li>1 25 × 2 55 - 4 7025</li> </ul>	Award full marks for correct numerical answer without working.	(2)
	<ul> <li>1.35 x 3.55 = 4.7925 (1)</li> <li>correct answer to the nearest penny / 2 decimal places</li> </ul>	Allow for ECF if candidate gets part of calculation wrong.	
	£4.79 (1)		

Question number	Answer	Mark
1 (c)	<ul> <li>Any one advantage for using polyester for the school tie (1) and a linked justification of that advantage (1).</li> <li>It is stain resistant (1) so it will not mark / stain if food / drink gets spilt on it (1)</li> <li>It hangs / drapes well (1) which means it will look nice / presentable when worn / tied (1)</li> <li>It dries quickly (1) so it can be washed overnight and be ready for school the next day (1)</li> <li>It is resistant to abrasion (1) which means it will not get damaged / scarred if it rubs on a blazer / desk (1)</li> <li>It can be recycled (1) which means it does not have to end up in landfill (1)</li> <li>It does not shrink (1) therefore will not lose shape when it gets washed / wet (1)</li> <li>Polyester has good colour retention (1) so colour will not fade over time / resists fading in sunlight (1)</li> <li>Do not accept generic statements related to the fabric construction rather than the polyester fibres.</li> </ul>	(2)

Question number	Answer	Additional guidance	Mark
2 (a)	<ul> <li>Any one manufactured timber from:</li> <li>MDF / Medium Density Fibre board (1)</li> <li>Plywood (1)</li> <li>Chipboard (1)</li> <li>Blockboard (1)</li> <li>Laminboard (1)</li> </ul>	Do not accept hardboard	(1)

Question number	Answer	Mark
2 (b)	Any <b>one</b> reason for using SMAs (1) and a linked justification of that reason (1).	(2)
	<ul> <li>If they have been plastically deformed / bent into a shape that is not right / not big enough they can be heated (1) which means they go back to their original shape / can be used again to test a new shape / saves resources (1)</li> <li>Once the correct shape / size / profile has been achieved the material can be heated (1) which means it will go back to its original shape / can be used for something else (1)</li> <li>It is easier to reset / straighten the SMA wire in comparison to copper wire (1) because it can be heated rather than pulled through a die (1)</li> </ul>	

Question number	Answer		Additional guidance	Mark
2 (c) (i)	A calculation that includes:		Award full marks for	(2)
	correct working		correct numerical	
	3/5 x 35 (	1)	answer without working.	
	correct answer		Allow for ECF if candidate gets	
	21mm (	1)	part of calculation wrong.	
	Alternative method 35/5 x 3 = 21 mm			
		2)		

Question number	Answer		Additional guidance	Mark
2 (c) (ii)	A calculation that includes:		Award full marks for	(2)
	<ul> <li>correct working π x 3.5<sup>2</sup> </li> </ul>		correct numerical	
		(1)	answer without	
	<ul> <li>correct answer</li> <li>38cm<sup>2</sup></li> </ul>		working.	
		(1)	Allow for ECF if candidate gets	
	Accept 38.4895 for 1 mark		part of calculation	
			wrong e.g. they have used mm instead of cm	

Question	Answer	
number		
2 (d)	Any <b>one</b> reason for using copper for the flowers (1) and a linked justification of that reason (1).	(2)
	<ul> <li>It is malleable / easily bent / formed (1) which means it will hold its shape once formed / stay in that shape permanently without any other form of treatment (1)</li> <li>It is a ductile material (1) which means it can be drawn out into the required long thin wires (1)</li> <li>It is a nice colour (1) and can be left without any additional surface finishing / will tarnish / natural finish (1)</li> <li>It will not rust (1) which would result in the jewellery changing colour / leaving a mark / stain on any clothing (1)</li> </ul>	

Question number	Answer	Additional guidance	Mark
3 (a)	<ul><li>Any one property from:</li><li>good electrical insulator (1)</li></ul>	Do not accept tough /	(1)
	<ul> <li>lightweight (1)</li> <li>durable / long lasting / hard-wearing (1)</li> </ul>	impact resistant	

Question number	Answer	Mark
3 (b)	Any <b>one</b> reason for using corrugated board (1) and a linked justification of that reason (1).	(2)
	<ul> <li>Excellent impact resistance (1) meaning it will cushion / absorb shock / withstand being thrown about in transit / protect the product (1)</li> <li>Excellent strength to weight ratio (1) therefore it provides good protection without adding additional cost to the postal costs (1)</li> <li>It is recyclable (1) which means it does not have to end up being sent to landfill (1)</li> <li>Corrugated board is a cost-effective material / cheap (1) which means it maximises the profits / returns (1)</li> </ul>	

Question number	Answer	Mark
3 (C)	Any <b>one</b> explanation that references the use of robotic materials (1) and a linked justification of that use (1).	(2)
	<ul> <li>They can be used to sense movement by the hand (1) and so can act as steering / directional controllers (1)</li> <li>They can sense pressure / being squeezed (1) therefore eliminating the use of additional buttons (1)</li> <li>Can be used to communicate with users (1) which means that some sensations can be generated back to the hands / vibrations / pulses (1)</li> <li>Robotic materials can be used for computational purposes within the material (1) therefore reducing the number of internal components (1)</li> </ul>	

Question number	Answer	Additional guidance	Mark
3 (d)	<ul> <li>A calculation that includes:</li> <li>correct working</li> <li><u>19 - 12.50</u> x 100</li> <li>12.50</li> </ul>	Award full marks for correct numerical answer without working.	(2)
	<ul> <li>(1)</li> <li>• correct answer</li> <li>52%</li> <li>(1)</li> </ul>	Allow for ECF if candidate gets part of calculation wrong.	

Question	Answer	Mark
number		
3 (e)	<ul> <li>Any two explanations that references environmental issues (1) and a linked justification of the issues (1).</li> <li>New materials are required to make the bodies for new games controllers (1) therefore putting pressure on the extraction / mining of finite resources to make plastics (1)</li> <li>Many old controllers are not correctly disposed of / dumped (1) which adds to landfill / increased demand on space / takes hundreds of years to break down (1)</li> <li>Games controllers should be properly disposed of / WEEE regulations (1) which means they are broken down / rare materials / elements taken out for recycling /because they contain hazardous substances / reducing the amount of materials going to landfill / incineration (1)</li> <li>Demand for energy used for materials / during manufacture / fuel for transportation (1) which results in additional demand on former (1).</li> </ul>	(4)
	finite resources / pollution generated (1)	

Question number	Answer	Mark
4 (a)	<ul> <li>One electronic sensor given from:</li> <li>Thermistor (1)</li> <li>Thermocouple (1)</li> <li>Thermometer (1)</li> </ul>	(1)

Question number	Answer	Mark
4 (b)	<ul> <li>Any one disadvantage that references the wearing of the uniform <ol> <li>and the linked justification of the disadvantage (1).</li> </ol> </li> <li>Lack of breathability (1) which means they will sweat / be hot to wear (1)</li> <li>They are heavy to wear (1) which will sap their energy / slow them down / only able to wear them for a short time / restrict mobility (1)</li> <li>Lack of flexibility / stiffness / bulky (1) which makes it difficult for them to move around easily (1)</li> </ul>	(2)

Question number	Answer	Mark
4 (c) (i)	┿┥╽┃┝━╸ ─┤ <b>╏</b> ──│┣──	(1)

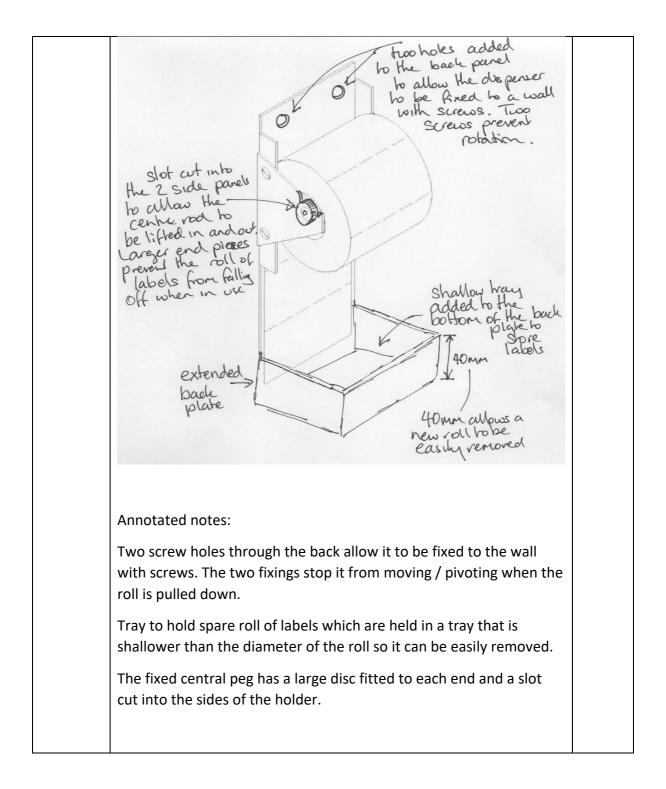
Question number	Answer		Additional guidance	Mark
4 (c) (ii)	A calculation that includes:		Award full marks for correct numerical	(2)
	<ul> <li>correct substitution / transposition</li> </ul>		answer without	
	350 = <u>1000 x 0.7</u>		working.	
	hours			
	hours =_1000 x 0.7 / 350 = 2 hours		Allow for ECF if	
			candidate gets part	
		(1)	of calculation	
	correct answer in minutes		wrong.	
	120			
		(1)		

Question number	Indicative content	Mark
-	<ul> <li>Candidates might refer to some/all of the following in their response, but candidates should be rewarded for other pertinent contextualised answers</li> <li>Saves time travelling and reduces cost / expense of travelling / lost time because of travelling</li> <li>Reduction in pollution caused because of travelling</li> <li>Can be recorded to be replayed and shown to those who could not attend</li> <li>Serves as a record of what was discussed and agreed</li> <li>Allows files to be shared over the internet</li> <li>More opportunities for collaborative design</li> <li>Allows for screens to be shared so others can work on ideas and add notes</li> </ul>	(6)
	<ul> <li>Requires an investment into physical hardware</li> <li>Needs access to the internet which might not always be available</li> <li>Susceptible to internet reliability and security so might be difficult to access in certain areas and not always able to discuss confidential / sensitive material</li> <li>It relies on a certain etiquette in terms of not interrupting</li> </ul>	

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

#### Section B – Metals

Question number	Answer	Mark
5 (a)	Marks will be awarded for understanding of design and technology, not graphical skills. Notes and sketches that include:	(6)
	<ul> <li>allow for an empty roll of labels to be removed easily (1) replaced securely (1) <ul> <li>e.g. removable central peg / slot cut in side panel / cap on one end of peg to stop it falling out / off</li> </ul> </li> <li>be held vertically on a wall (1) and not move when the label is pulled off (1) <ul> <li>e.g. two screws fixed into the wall / two mirror plates which fix the holder rigid / firm and does not allow for any rotation / movement / proprietary wall fixings</li> <li>provide easily accessible storage space (1) for a spare roll of labels (1) <ul> <li>e.g. drawer / shelf with clear access / method to open drawer</li> </ul> </li> </ul></li></ul>	
	Example of candidate response.	



Question number	Answer	Mark
5(b)	Any <b>two</b> explanations that include a way the markers meet or fail to meet the requirement (1) and a linked justification of that way (1).	(4)
	<ul> <li>They have a sharp pointed end (1) which means they will be able to be pushed into the soil (1)</li> <li>The text identifies the planted item (1) therefore allowing the gardener to easily locate the plant / seed so as to be able to provide the necessary aftercare (1)</li> <li>The text is quite small / the copper is quite thin (1) which means the letters might be easily broken off / will not be able to see / read what vegetable it is that has been planted (1)</li> <li>The copper will not corrode in the wet ground (1) which means the labels will last a long time (1)</li> </ul>	

Question number	Answer	Mark
6 (a)	Any <b>two</b> factors which include an explanation (1) and a linked justification (1)	(4)
	<ul> <li>Supply of stock materials may be limited (1) meaning that a range of different suppliers may need to be used (1)</li> <li>Increased demand for specialist alloys of steel (1) could result in lack of availability of mild steel for production (1)</li> <li>The market price of mild steel may change (1) increasing demand for the metal by other industries (1)</li> <li>Reduction in steel manufacturing capability (1) will reduce supplies / require buying in from overseas (1)</li> </ul>	

Question number	Answer	Additional guidance	Mark
6 (b)	Marks will be awarded for understanding of design and technology, not graphical skills.	Cap at 3 marks if no sketches or all sketches	(4)
	Notes and sketches that include:	and no notes	
	<ul> <li>Metal is cleaned / emery clothed to remove surface oxide / provide a key for dip coating (1)</li> <li>Hang hook from wire (1)</li> <li>The hook is heated uniformly / soaked for 15-20 mins (1)</li> <li>Hook is placed in fluidised plastic particles / air blown through the plastic to create fluid bed (1)</li> <li>The hook is placed in an oven to allow granules to fuse (1)</li> </ul>		
	<ul> <li>Leave to cool and solidify (1)</li> <li>Example of candidate response:</li> <li><i>①</i> Hook is heated</li> </ul>		
	De la Heated hade is placed into plastic particles Sospended plastic particles (3) Hook is re-heated (4) Plastic solidifies and cures		
	Annotated notes:		
	<ol> <li>Hook is heated to a suitable temperature</li> <li>The heated hook is placed into plastic particles</li> <li>The hook is reheated</li> <li>The plastic solidifies and surge</li> </ol>		
	4. The plastic solidifies and cures		

Question number	Answer	Mark
6 (c)	<ul> <li>Any one explanation that includes a reason for buying metal of a specific gauge (1) and a linked justification for that reason (1).</li> <li>Mild steel will be supplied at the correct thickness (1) which means the manufacturer can cut it / form it knowing that all hooks will be consistent (1)</li> <li>Steel supplied to a specific gauge will be within specific tolerances (1) which saves the manufacturer time in not having to roll/reduce the steel to the correct thickness before manufacture (1)</li> </ul>	(2)

Question number	Answer	Mark
6 (d)	Any <b>two</b> explanations that include a property (1), plus <b>two</b> linked justifications of that property (1) + (1).	(6)
	<ul> <li>It is tough (1) which means it can withstand knocks and bumps (1) therefore it will have a long service life (1)</li> <li>It is ductile /malleable (1) which means it will not fracture when being stretched / bent to shape (1) therefore it can be formed into a curve (1)</li> <li>It has good tensile strength (1) which means the hook will not stretch/deform when in use (1) therefore it will be able to support heavy tools (1)</li> <li>It is capable of withstanding relatively high temperatures (1) which means it will not deform when heated (1) therefore it can be dip coated (1).</li> </ul>	

Question number	Answer	Mark
7 (a)	<ul> <li>One name given from:</li> <li>Snap rivet / snap head rivet (1)</li> <li>Solid round head rivet (1)</li> <li>Dome head rivet (1)</li> <li>No mark awardable for 'rivet'</li> </ul>	(1)

Question number	Answer	Mark
7 (b)	<ul> <li>Any two explanations that include an advantage of using a template (1) plus a linked justification for the advantage (1).</li> <li>They can be quickly drawn / traced around (1) therefore saving time / speeds up production time (1)</li> <li>Each one will be identical (1) therefore ensuring that each / subsequent part will marry up / line up (1)</li> <li>The template could also be used to mark out additional features such as holes / cut outs (1) therefore ensuring that all the other parts will fit correctly into place (1)</li> <li>They require little skill when using them (1) therefore they can be used by workers with little / limited skill / require no specific</li> </ul>	(4)
	technical knowledge (1)	

Question number	Answer	Additional guidance	Mark
7 (c)	<ul> <li>A calculation that includes:</li> <li>Conversion of units either at the start or at the end <ul> <li>(1)</li> </ul> </li> </ul>	Award full marks for correct numerical answer without working.	(5)
	<ul> <li>Calculation of the surface area of the two straight parallel sides</li> <li>30 x 5 x 2 = 300 cm<sup>2</sup></li> <li>(1)</li> </ul>	Allow ecf if candidate gets part of calculation wrong.	
	<ul> <li>Calculation of semi-circular arc surface area / circumference</li> </ul>		
	$2 \pi rh = 2 \times 3.142 \times 10 \times 5 = 314.2 \text{ cm}^2$ (1) • Calculation of half cylinder surface area		
	314.2 / 2 = 157.1 cm <sup>2</sup> (1) • Total surface area		
	300 + 157.1 = 457.1 rounded to 457 cm <sup>2</sup> (1)		

Question number	Answer	Mark
7 (d)	<ul> <li>Any two explanations that includes a reason for welding (1), plus two linked justifications of that use (1) + (1).</li> <li>The welded joint will be rigid (1) which means the completed chain guard will not bend (1) therefore ensuring that the chain guard will not touch the pedals/wheels (1)</li> <li>Welded joints require no further components/tabs/nuts and bolts/set screws/rivets (1) which means smaller clearances are needed for the chain (1) therefore the overall size/weight of the guard could be reduced (1)</li> <li>Welding leaves a smoother surface finish than mechanical fixings (1) which means the guard will be able to take surface finishes</li> </ul>	(6)
	<ul> <li>well (1) improving the aesthetics of the guard (1)</li> <li>Welding allows a continuous joint to be made between the curved section and the front panel (1) resulting in a longer lasting product (1) which can withstand knocks/accidents in use (1)</li> </ul>	

Question number	Answer	Mark
8 (a)	<ul> <li>Any one explanation that includes a reason for using anodising (1) and a linked justification of that reason (1).</li> <li>Anodising creates a durable finish (1) meaning that parts will not be damaged when assembled/disassembled (1)</li> <li>It will make it more visually appealing / interesting (1) therefore will encourage the young children to play with it / more parents are likely to buy it (1)</li> <li>Different parts can be recognised by their colour (1) therefore making it easier to find the required parts (1)</li> <li>It could add more realism to the construction kit (1) as it would enable you to build more life-like models (1)</li> </ul>	(2)

Question number	Answer	Mark
8 (b)	<ul> <li>Any one explanation that includes a reason for using stock forms of metal (1), plus one linked justification of that reason (1) + (1).</li> <li>It means they can buy lots of the same form or shape of material / bulk purchase (1) which means they will get a better / cheaper price (1) therefore reducing overall costs / improve profit margin (1)</li> <li>They do not need to have lots of different forms of materials (1) which reduces the need for cutting/machining (1) therefore reducing waste / machining time / processes (1)</li> </ul>	(3)

Question number	Answer	Mark
8 (c)	<ul> <li>Any two explanations that include a reason (1) and a linked justification of that reason (1).</li> <li>Recycled aluminium is readily available (1) therefore reducing the need for raw materials/ore to be extracted from the ground (1)</li> </ul>	(4)
	<ul> <li>Recycling aluminium uses lower levels of energy compared to alternative metals (1) therefore the overall impact on the environment is reduced (1)</li> <li>Aluminium is a relatively lightweight material (1) which means less energy is used/fewer emissions created during transportation (1)</li> <li>Aluminium is easily recycled at the end of its useful life (1) so once discarded the parts can be easily sorted and recycled (1)</li> </ul>	

Question number	Indicative content	Mark
8 (d)	<ul> <li>AO3 (9 marks)</li> <li>Candidates might refer to some/all of the following in their response, but candidates should be rewarded for other pertinent contextualised answers</li> <li>Can be used as an educational toy / versatile as a construction kit</li> <li>Used to learn colours and hand eye co-ordination</li> <li>Used to learn use of simple hand tools / screwdrivers / spanners</li> <li>Pressure on traditional toys versus digital toys / computer games / internet based games / Minecraft</li> <li>Interactive / imaginative toys as opposed to online digital world</li> <li>Pressure on parents / peers to have the most up to date current game / device / electronic game</li> <li>Hand me down kind of toy / put away in the loft for grandchildren</li> <li>Long lasting toy made from metal which has no reliance on batteries / digital technology so will not go out of date</li> <li>Can be dismantled/reassembled multiple times</li> <li>Could be reformed into different products/shapes/forms</li> <li>Used to develop finer psyco-motor skills / dexterity in young children</li> <li>No language use required / meets the needs of all cultures</li> <li>Does not involve digital interaction or the possibility of being subjected to harmful images / chat room activity</li> </ul>	(9)

Level	Mark	Descriptor
	0	No rewardable content
Level 1	1 - 3	<ul> <li>Attempts to interrogate and deconstruct information but connections and logical chains of reasoning are flawed.</li> <li>An unbalanced appraisal of the information/issues, containing judgements that show a limited awareness of the interrelationships between factors or competing arguments.</li> <li>A conclusion may be presented but it is likely to be generic assertions rather than supported by relevant judgements.</li> </ul>
Level 2	4-6	<ul> <li>Interrogates and deconstructs information and provides some connections and logical chains of reasoning.</li> <li>A balanced appraisal of the information/issues, containing judgements that show an awareness of the interrelationships between factors or competing arguments.</li> <li>A conclusion is presented that is partially supported by relevant judgements.</li> </ul>
Level 3	7 - 9	<ul> <li>Interrogates and deconstructs information and provides sustained connections and logical chains of reasoning.</li> <li>A well-balanced appraisal of the information/issues, containing judgements that show a thorough awareness of the interrelationships between factors or competing arguments.</li> <li>A conclusion is presented that is fully supported by relevant judgements.</li> </ul>