



Pearson
Edexcel

Mark Scheme

Summer 2022

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 – 1DT0/1A

Section A – Core content

Question number	Answer	Additional information	Mark
1 (a) (i)	<p>Any one property from:</p> <ul style="list-style-type: none"> • Malleable (1) • Ductile (1) • Excellent strength to weight ratio (1) • Lightweight / low density (1) • Waterproof / Impermeable (1) • Resistance to corrosion / won't rust (1) • Food safe / non-toxic (1) 	<p>Do not accept 'can be recycled'</p> <p>Do not accept 'durable'</p>	(1)

Question number	Answer	Additional information	Mark
1 (a) (ii)	<p>Any one property from:</p> <ul style="list-style-type: none"> • Elasticity / mouldability (1) • Soft (1) • Insulator (1) • Permeable / breathable (1) • Insulator / heat insulator (1) 	<p>Do not accept 'durable'</p>	(1)

Question number	Answer	Mark
1 (a) (iii)	<p>Any one property from:</p> <ul style="list-style-type: none"> • Transparent / see through (1) • Translucent / semi translucent (1) • Smooth surface (1) 	(1)

Question number	Answer	Additional information	Mark
1 (a) (iv)	<p>Any one property from:</p> <ul style="list-style-type: none"> • Flexible / flexibility / bendable (1) • Good tensile / compressive strength (1) • Moisture / water resistance (1) • Elasticity (1) • Tough / impact resistance (1) 	Do not accept 'durable'	(1)

Question number	Answer	Mark
1 (b)	<p>Any one disadvantage of urea formaldehyde (UF) for the 3-pin plug (1) and a linked justification of that disadvantage (1)</p> <ul style="list-style-type: none"> • UF is brittle (1) therefore if it gets banged / knocked it can break / shatter / splinter (1) • UF is a thermosetting plastic (1) therefore it cannot be recycled if it breaks / is not biodegradable (1) • UF can melt / burn at high temperatures (1) therefore it becomes a hazard / danger (1) 	(2)

Question number	Answer	Additional guidance	Mark
1 (c)	<p>A calculation that includes:</p> <ul style="list-style-type: none"> • correct calculation of ratios $50 / (13 + 7) = 2.5$ (1) • correct answer $2.5 \times 13 = 32.5 \text{ kg}$ (1) 	<p>Award full marks for correct numerical answer without working.</p> <p>Allow for ECF if candidate gets part of transposition wrong.</p>	(2)

Question number	Answer	Additional guidance	Mark
2 (a)	<p>Any one other hardwood from:</p> <ul style="list-style-type: none"> • Oak (1) • Beech (1) • Ash (1) • Birch (1) • Jelutong (1) <p>Any other appropriate hardwood</p>	Do not accept balsawood or mahogany	(1)

Question number	Answer	Mark
2 (b)	<p>Any one working property of mahogany that makes it an appropriate choice of material (1) and a linked justification of that working property (1)</p> <ul style="list-style-type: none"> • It is hard / durable (1) which means that it will withstand wear as the books are placed in and taken out of the holder (1) • It is tough (1) which means that it is capable of being knocked / bumped / dropped without damaging (1) • It has close / tight grain (1) which means it does not damage the book when lifted in or out (1) 	(2)

Question	Answer	Mark
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number		
2 (c)	<p>Any one advantage for the manufacturer (1) and a linked justification of that advantage (1)</p> <ul style="list-style-type: none"> • They do not hold lots of stock (1) which means they do not need to pay for storage space / tie up finance / not susceptible to falling demand (1) • They could change the type of wood used / easily change the size / change design (1) which means they can respond to individual customers' needs / wants / size of book (1) • Each one will be unique / exclusive (1) which means the manufacturer can charge a higher price (1) • No excess products / stock (1) which means the manufacturer will not have to reduce the price to get rid of stock (1) • Happier / more engaged workforce (1) therefore higher quality products manufactured / greater staff retention (1) 	(2)

Question number	Answer	Additional guidance	Mark
2 (d)	<p>A calculation that includes:</p> <ul style="list-style-type: none"> • correct calculation of the total length of timber required $(2 \times 30) + 40 = 100 \text{ cm}$ (1) • correct calculation of volume $100 \text{ cm} \times 5 \text{ cm}^2 = 500 \text{ cm}^3$ (1) • correct conversion of units from cm^3 to m^3 $500 \text{ cm}^3 = 500/1,000,000$ or $10^6 = 0.0005 \text{ m}^3$ (1) • correct calculation of final cost $0.0005 \times 1200 = \text{£}0.6$ or 60 pence (1) 	<p>Award full marks for correct numerical answer without working.</p> <p>Allow for ECF if candidate gets part of calculation wrong.</p> <p>Special case: Award a max of 3 marks if the factor of 6 unit conversation is incorrect or not evident; for example: £6, £60, £6000, £600000</p>	(4)

Question number	Answer	Mark
3 (a)	<ul style="list-style-type: none"> • Light emitting diode / LED (1) (Only answer) 	(1)

Question number	Answer	Mark
3 (b)	<p>Any one reason for using a bevel gear (1) and a linked reason for the use (1)</p> <ul style="list-style-type: none"> To convert rotary motion through 90° (1) so it will take up less space inside the drill (1) To increase / decrease rotary speed (1) which means that the chuck can be made to turn faster / slower than the motor speed (1) To increase the torque (1) which means it will be able to drill harder / denser materials (1) 	(2)

Question number	Answer	Additional guidance	Mark
3 (c)	<p>A calculation that includes:</p> <ul style="list-style-type: none"> Correct calculation of the compound gear ratio $(40 / 20) \times (40 / 20) = 4$ (1) Correct calculation of driven RPM $4 \times 400 = 1600 \text{ RPM}$ (1) <p>Alternative method:</p> $(40 / 20) = 2 \times 400 = 800$ (1) $(40 / 20) = 2 \times 800 = 1600$ (1)	<p>Special case:</p> <p>If only one step has been calculated, e.g. $40 / 20 = 2 \times 400 = 800$ (1)</p> <p>If no working out and answer is 800 (0)</p>	(2)

Question number	Answer	Mark
3 (d)	<p>Any one benefit of using a battery (1) and a linked justification of the benefit (1)</p> <ul style="list-style-type: none"> • Portability / convenience (1) therefore the user does not need to be near a power supply / plug / ease of use (1) • No power leads (1) which means improved safety as there will be no trailing cables (1) • The battery can be replaced with a fully recharged battery (1) which means the hand drill can continue to be used (1) 	(2)

Question number	Answer	Additional guidance	Mark
3 (e)	<p>Any two benefits of using carbon fibre for the main body (1) and a linked justification of that benefit (1)</p> <ul style="list-style-type: none"> • It is lightweight (1) which means it is not too heavy for the user to hold / can work longer without tiring (1) • It can be formed into complex shapes / forms (1) which means smooth / sleek / ergonomic forms can be manufactured (1) • It has excellent strength to weight ratio (1) which means although being light, it is capable of normal / intended use (1) 	Do not accept durable, hard wearing or tough	(4)

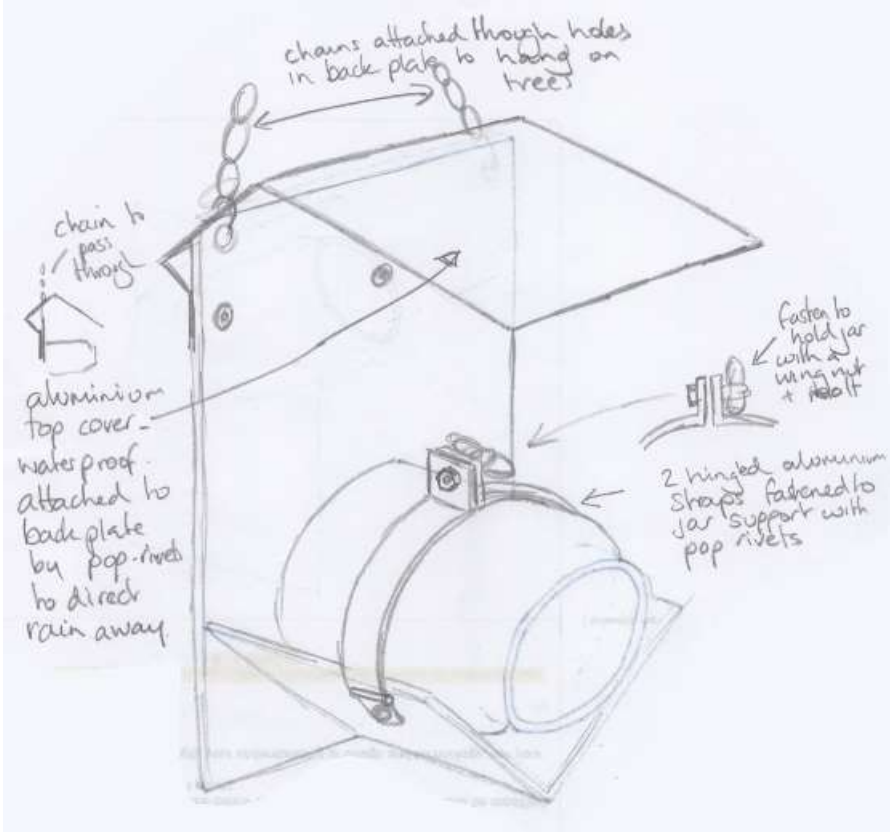
Question number	Answer	Mark
4 (a)	<p>Any two explanations that references the way in which agro-textiles can be used (1) and a linked justification of each way (1)</p> <ul style="list-style-type: none"> • They can be used to stop soil erosion (1) which means nutrients / soil will not be washed away (1) • They can be used to warm the ground (1) which means crops may grow faster / increased yields (1) • They can be used to help retain moisture in the soil (1) which means that the amount of water required to grow crops is reduced / saves valuable water (1) • They can be used to help protect the crops from birds / insects / pests (1) which means the crop will be bigger / more crops / fewer crops lost by being eaten (1) • They can be used to protect against adverse weather conditions such as wind / frost / hail / solar radiation (1) which means they have a greater chance of surviving / growing (1) • They can be used as a weed control membrane (1) which means time can be saved by not having to remove weeds (1) 	(4)

Question number	Answer	Additional guidance	Mark
4 (b)	<p>A calculation that includes:</p> <ul style="list-style-type: none"> • correct working out of area of roll of agro-textile $50 \times 1.2 = 60\text{m}^2$ (1) • correct working out of number of rolls $420 / 60 = 7$ rolls (1) <p>Alternative method: $420 / 1.2 = 350$ (1) $350 / 50 = 7$ (1)</p>	<p>Award full marks for correct numerical answer without working.</p> <p>Allow for ECF if candidate gets part of calculation wrong.</p>	(2)

Question number	Indicative content	Mark
4 (c)	<ul style="list-style-type: none"> • Fair trade supports the development of farmers and producers working in local communities / communes / cooperatives by receiving a fair price for their crops / products • Products / crops displaying the fair-trade logo have been produced by small-scale farmer organisations who employ local people • Locals benefit from employment / regular income / improved standards of living • Communities benefit from money going back into the local economy • There are a set of environmental and social conditions that must be met to be branded as a fair-trade producer meaning improved benefits for the environment and locals • Workers have some rights which are protected and enforced by being a fair-trade supplier • Minimum prices are set / adhered to / guaranteeing a fair price for the crop / products • Fairtrade Premiums are paid on products and are reinvested in local business / community projects to support farmers / residents • Fairtrade allows for farming to be a reliable source of income for local families meaning that the skills of farming can be passed from one generation to the next leading to improvements in lifestyle and local economy • Fairtrade emphasises the reduction of exploitation and child labour / developing the skills of workers / improved human rights 	(6)

Level	Mark	Descriptor
	0	
Level 1	1 - 2	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

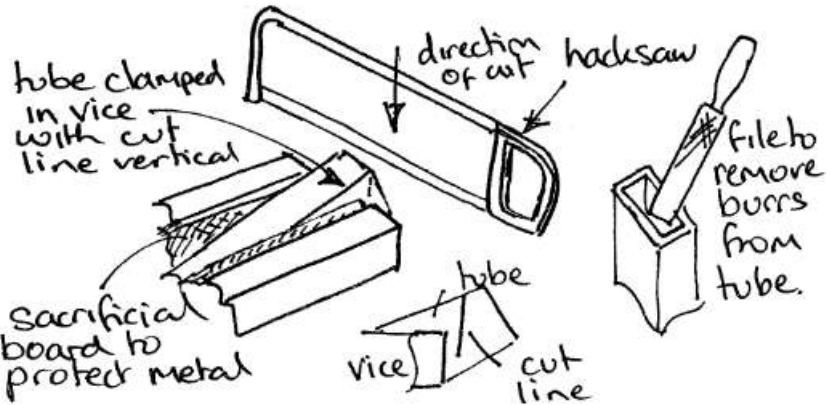
Question number	Answer	Mark
5 (a)	<p>Marks will be awarded for understanding of design and technology, not graphical skills.</p> <p>Notes and sketches to show how to:</p> <ul style="list-style-type: none"> hold the jar securely (1) and allow an empty jar to be easily replaced (1) e.g. clips / straps / turn buttons / lid over the top / MUST not be a permanent fixing include a cover that protects the back plate (1) and jar support and keeps the jar dry (1) e.g. roof must extend over or beyond the neck of jar / cover the width as a minimum / tile / pitch roof / slope / water run off be able to be hung up in a tree (1) and easily moved to another tree (1) e.g. chain / string / hole / mirror plate / capable of being removed / non-permanent / screw / nail <p>Example of candidate response:</p>  <p>The sketch shows a rectangular frame with a pitched roof. Annotations include: 'chains attached through holes in back plate to hang on trees' pointing to the top corners; 'chain to pass through' pointing to a hole on the left side; 'aluminium top cover - waterproof - attached to back plate by pop-rivets to direct rain away' pointing to the roof; '2 hinged aluminium straps fastened to jar support with pop rivets' pointing to a circular support at the bottom; and 'fasten to hold jar with a wing nut + bolt' pointing to a fastener on the support.</p>	(6)

	<p>Notes:</p> <p>Chains attached through holes in the back plate to hang on trees. Easily unhooked to move it.</p> <p>Two hinged aluminium straps fastened to jar support with pop rivets. Fasten to hold jar with a wingnut and bolt.</p> <p>Aluminium top cover extending beyond jar / waterproof. Attached to the back plate by pop-rivets to divert rain away.</p> <p>Chain to pass through.</p>	
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Question number	Answer	Mark
5(b)	<p>Any two explanations that include a way the metal money box meets or fails to meet the requirement (1) and a linked justification of that way (1).</p> <ul style="list-style-type: none"> • You can see how much you have saved / filled it up (1) therefore you can continue to save / break open to spend (1) • There is no easy / obvious way to gain access (1) which means that you are more likely not to touch / get the money out (1) • The tea cup is not an obvious shape / appealing to a young child (1) which means they are not going to be motivated to save (1) • See-through screen may get scratched (1) which means the children will not be able to see how much money is inside (1) • Not a lot of space for coins / too thin (1) which means not a lot of money can be stored / saved (1) 	(4)

Question	Answer	Mark
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number		
6 (a)	<p>Any two advantages for the manufacturer of using a standard sized sheet of metal (1) and a linked justification (1)</p> <ul style="list-style-type: none"> • The size of the painting surface can be made to match the size of a standard sized sheet of metal (1) which means less waste being produced / the designer can maximise the material / make most efficient use of the sheet (1) • Standard sized sheets of metal cost less (1) which will reduce the overall cost of the material / product (1) • As it is supplied to a set size there will be less cutting required (1) which means the overall manufacturing time will be reduced / quicker (1) • Standard sized boards are more readily available (1) which means the lead time for material supply to the manufacturer can be reduced (1) 	(4)

Question number	Answer	Additional Guidance	Mark
6 (b)	<p>Marks will be awarded for understanding of design and technology, not graphical skills.</p> <p>Notes and sketches to show how to:</p> <ul style="list-style-type: none"> • Place the upright in a vice with the line to be cut vertical (1) • Use soft jaws/sacrificial material to prevent damaging the aluminium tube (1) • Cut with hacksaw on the waste side of the line to the required angle through the tube (1) • Use a hand file to file down to the required line (1) • Use of hand files to remove burrs from the tube (1) <p>Example of candidate response:</p>  <p>Notes:</p> <p>Tube clamped in vice that has sacrificial pieces of board to protect the metal.</p> <p>Make sure that the cut is vertical</p> <p>Use a hacksaw to cut down through the tube</p> <p>File to remove burrs from the tube</p>	Cap at 3 marks if no sketches or all sketches no notes	(4)

Question number	Answer	Mark
6 (c)	<p>Any one explanation that includes a reason for applying a powder coating (1) and a linked justification for that reason (1).</p> <ul style="list-style-type: none">• Powder coating will provide a harder surface (1) which means it is less likely to get scratched when being cleaned / moved (1)• The powder coating will offer a layer of protection to the metal frame (1) which means that if any paint gets on the surface it will not react with the metal / begin to cause oxidisation (1)• Powder coating is available in a range of colours (1) which means the easel would not have a raw aluminium look / be a more attractive product (1)	(2)

Question number	Answer	Mark
6 (d)	<p>Any two explanations that include a method (1), plus two linked justifications of that method (1) + (1).</p> <p>Welding (1)</p> <ul style="list-style-type: none"> • It uses additional metal filler that is melted with the two pieces together (1) which means it is less likely to break apart / the joint is as strong as the metal being joined / permanent joint (1) <p>Pop rivets (1)</p> <ul style="list-style-type: none"> • Holes of equal sizes would be drilled in the lapped section of the bottom rail and upright (1) allowing the pop-rivet to pass through the holes and draw together the parts in compression (1) <p>Soldering (1)</p> <ul style="list-style-type: none"> • A joint is formed by melting an alloy that would bond to the two parts (1) which results in a continuous surface area capable of taking compressive loads (1) <p>Self-tapping screws (1)</p> <ul style="list-style-type: none"> • Holes are drilled in the upright and a pilot hole in the lapped section of the rail (1) which means a screw can be used to pull the rail into the upright (1) <p>Nut and bolt (1)</p> <ul style="list-style-type: none"> • A joint is formed by drilling a hole in the upright and the bottom rail (1) which means the nut and bolt can be used to hold the two parts together tightly (1) 	(6)

Question number	Answer	Mark
7 (a)	<ul style="list-style-type: none"> • Compression (1) • Compressive (1) 	(1)

Question number	Answer	Mark
7 (b)	<p>Any two working properties explained (1) plus a linked justification of the property (1).</p> <ul style="list-style-type: none"> • Brass has some degree of elasticity/is malleable (1) which means that it is capable of being bent / flexed to create the open shape of the lamp (1) • Brass has good levels of hardness (1) which means the surface of the lamp body will not become damaged / scratched over time (1) • Brass has good compressive strength (1) which means the small part across the top will not distort under pressure from the two sides (1) 	(4)

Question number	Answer	Additional guidance	Mark
7 (c)	<p>A calculation that includes:</p> <ul style="list-style-type: none"> • Conversion of units at the start or end (1) • Calculation of the area of the semi-circle (1) $\pi r^2 / 2$ $3.142 \times 1.5^2 / 2 = 3.53475 \text{ cm}^2$ • Calculation of the area of the rectangle (1) $10 \times 3 = 30 \text{ cm}^2$ • Calculation of the total area (1) $30 \text{ cm}^2 + 3.53475 \text{ cm}^2 = 33.53475 \text{ cm}^2$ • Calculation of the total volume (1) $33.53475 \text{ cm}^2 \times 2 = 67.0695 \text{ cm}^3$ Rounded to 67 cm^3 	<p>Award full marks for correct numerical answer without working.</p> <p>Allow ecf if candidate gets part of calculation wrong.</p> <p>Credit full marks for 67.0695 or 67.</p> <p>Alternative method may show calculation of volume of separate parts that are then added together</p>	(5)

Question number	Answer	Mark
7 (d)	<p>Any two explanations that includes a reason for fabricating the main body of the lamp rather than making from a single piece (1), plus two linked justifications of that reason (1) + (1).</p> <ul style="list-style-type: none"> • Fabrication will require less volume of material (1) which means the cost will be less (1) therefore allowing the product to be sold for less / make more profit for the manufacturer (1) • Less waste will be produced during the manufacture (1) which means that less material must be disposed of (1) therefore reducing the amount going to landfill / tipping (1) • Smaller sections of brass can be used (1) which reduces the amount of bigger sections of brass needing to be purchased / small off cuts used up (1) therefore maximising material usage / reducing the need for ore to be mined / processed / reduced energy use in production / more sustainable long term (1) • Fabricating the lamp base requires less machining (1) meaning the work force needs less training/skill (1) to make the lamp so reducing manufacturing costs (1) 	(6)

Question number	Answer	Mark
8 (a)	<p>Any one explanation that includes a benefit of using stainless steel (1) and a linked justification of that benefit (1).</p> <ul style="list-style-type: none"> • It does not react with water / salt / corrosion resistant / oxidise (1) which means it will be able to be cleaned / be hygienic in use / will not tarnish (1) • It has a self-healing outer layer (1) which means the holder does not need to have an additional surface finish applied to it (1) • Stainless steel is hard (1) which means it will stand up to use and abuse (1) 	(2)

Question number	Answer	Mark
8 (b)	<p>Any one explanation that includes an advantage of carrying out quality control checks (1), plus one linked justification of that advantage (1) + (1).</p> <ul style="list-style-type: none"> • The holder can be checked for dimensional accuracy (1) which means tooling can be checked / changed if the holder is not the correct size (1) therefore reducing the number of holders that would be cut of the wrong size / reducing waste / rejects (1) • The edges can be checked for burrs (1) which means edges / surfaces can be hand finished/polished (1) therefore reducing the risk of injury to users / returns / complaints from customers (1) • The depth of the holes can be checked (1) and tooling adjusted accordingly (1) which reduces the chance of salt/pepper falling out / over if the holes / slots are not deep enough (1) 	(3)

Question number	Answer	Mark
8 (c)	<p>Any two reasons of using a milling machine (1) and a linked justification of those advantages (1).</p> <ul style="list-style-type: none"> • The milling machine can be used with a tracer (1) which means that it can follow around a template and make identical copies of the holder (1) • It can be used to cut to different depths (1) which means it can cut out the recesses / holes / profile / shape (1) • Different sized / profiled cutters can be used (1) which means that shaped edges / rounded corners achieved / sharp edges removed (1) • Milling machines can be controlled by computers / CNC milling machines can be used (1) which means the holder can be cut unaided / 24/7 / faster than by manual methods (1) 	(4)

Question number	Indicative content	Mark
8 (d)	<ul style="list-style-type: none"> • The holder is a regular shape that will fit on a table / will balance and not tip over • Stainless steel is a hard material and might have quite sharp corners which could cause injury • The holder would be easy to clean / wash because it could be put in a dishwasher so it is good from a hygiene point of view if food gets spilt on it • Could be customised / personalised for use in restaurants / cafes / hotels with the logo / name machined / etched into the surface • The holder is manufactured from widely available materials / sustainable given it is made up from materials that are able to be recycled • The holder is quite thick and stable / will not bend as it is made from stainless steel which is a rigid material • The copper handle makes effective / efficient use of natural materials to create a nice contrasting finish rather than using paints/coatings • Stainless steel with a separate copper handle is cheaper than using solid copper for the whole of the holder • It will be easier to manufacture the holder in two pieces than try to cast it in one piece • The use of stainless steel means the product will not be affected / corroded by salt that may be spilt on it • The contrasting colours of the metals allows users to clearly identify the handle • Identifying the contents of the salt and pepper pots by the letters formed on the top of each pot allows users to clearly identify each 	(9)

Level	Mark	Descriptor
	0	
Level 1	1 - 3	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.