Pearson Edexcel

Mark Scheme (Standardisation)

Summer 2019

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

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2019
Publications Code 1DT0_1A_1906_MS

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.

Component 1 mark scheme – 1DT0/1A

Section A – Core content

Question number	Answer	Mark
1 (a) (i)	Any **one** property from: • resistant to water / waterproof (1) • fungus / insect resistant (1) • durable / weather resistant / rot resistant (1)	**(1)**

Question number	Answer	Additional guidance	Mark
1 (a) (ii)	Any **one** property from: • hard / hardness / good resistance to wear / hard wearing (1) • compressive strength (1) • good fluidity / casts well (1)	Do **not** accept unqualified response in relation to strong or strength. Do **not** accept brittle.	**(1)**

Question number	Answer	Mark
1 (a) (iii)	Any **one** property from: • water resistant / waterproof / weather resistant (1) • durable (1) • crease / stain / abrasion resistant (1) • resistant to mildew / bacteria (1) • fibres have high tensile strength (1)	**(1)**

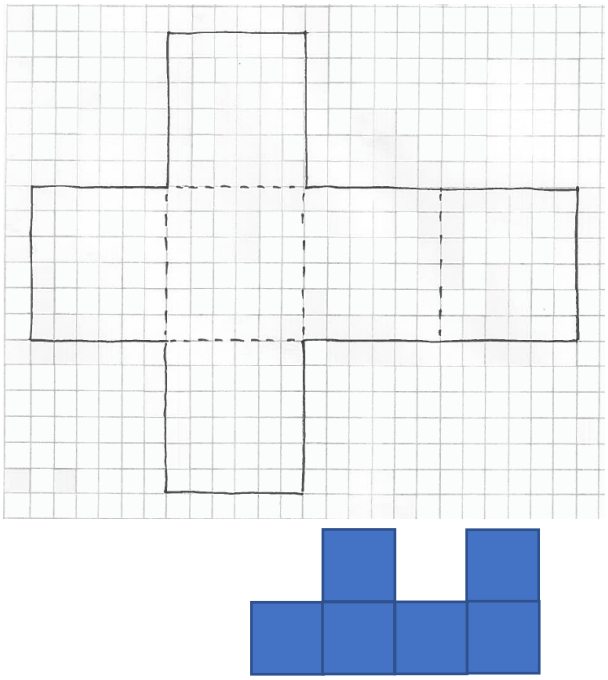
Question number	Answer	Mark
1 (a) (iv)	Any **one** property from: • rigid / stiffness (1) • hygienic and safe for food use (1) • pure with no smell or taste / inert (1) • good printability (1) • good insulator of <u>heat</u> (1)	**(1)**

Question number	Answer	Additional guidance	Mark
1 (b)	A calculation that includes: • correct working $\frac{7.6 - 5.4}{7.6} \times 100$ (1) • correct answer to whole number 29% (1)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong.	**(2)**

Question number	Answer	Mark
1 (c)	Any **one** negative effect (1) and a linked justification of that negative effect (1). • Smaller workforce required (1) therefore there would be loss of jobs / cost of redundancies (1) • The company might go out of business / close / downsize (1) resulting in a loss of jobs / profits reduced / loss of income prosperity in the area (1) • Money will be tied up in old machinery used to make bags / degrading (1) which cannot be used for anything else / still need to be kept serviced / maintained (1)	**(2)**

Question number	Answer	Mark
2 (a)	• Isometric drawing / projection (1) (Only answer)	**(1)**

Question number	Answer	Mark
2 (b)	Any **one** explanation that includes an accurate statement about the use of calico (1) and a linked justification of that statement (1). • Calico is a <u>relatively</u> cheap material (1) therefore it keeps the cost down in terms of prototyping / developing the product (1) • Calico can accept a range of surface finishes (1) therefore colours and designs can also be prototyped / tested out (1) • Calico is absorbent (1) therefore it can accept a range of surface finishes (1) • Calico is rigid / stiff when sewn along a seam (1) which means it can hold its shape / allows a 3D shape to be formed / supports its own weight (1) • Calico is the same on both sides / looks / feels the same on both sides (1) therefore it does not matter which way round the material is used (1)	**(2)**

Question number	Answer	Mark
2 (c)	A net that includes an image drawn with a ruler or free hand. Marks to be awarded for the following. • 6 surfaces separated by lines (1) • Correct size – all surfaces 6 squares by 6 squares (1) • Top surface will fold down to fit (using dashed lines) (1) • Bottom surface will fold up to fit (using dashed lines) (1)  (The third and fourth bullets points above are there to reflect that the top and bottom cannot both be at the top or the bottom since it would leave the play cube without a top or bottom I have shown this below. This would score 2 marks since the top two squares would fold onto each other and there are no dashed lines.)	**(4)**

Question number	Answer	Mark
2 (d)	Any **one** reason that includes an accurate statement about why designers use tracing paper (1) and a linked justification of that reason (1). • It is transparent / translucent / see-through (1) which means it can be placed over a drawing and drawn on to make a copy of the drawing / trace the image / see the pattern of fabric (1) • It can be placed over a drawing and drawn on (1) which means it can be used to transfer images / used as an overlay / used to be written / drawn on to provide additional information / detail (1)	**(2)**

Question number	Answer	Mark
3 (a)	Any **one** property given: • transparent / translucent / clear / see-through (1) • good electrical insulator (1) • lightweight (1) • waterproof (1) • durable / weather resistant (1)	**(1)**

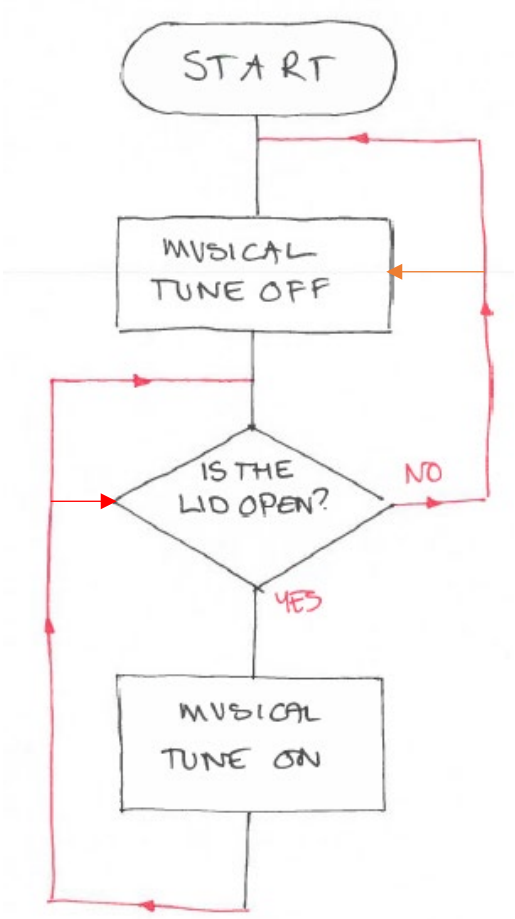
Question number	Answer	Mark
3 (b)	Any **one** reason for using stainless steel (1) and a linked justification of that reason (1). • Stainless steel is a hard material / has good compressive strength (1) therefore it can be pushed into the ground without bending / deforming (1) • Stainless steel is resistant to corrosion (1) therefore it will not rust in the wet / damp ground / retain its aesthetic characteristics (1) • Stainless steel is tough (1) which means it can be knocked into the ground with a hammer / withstand bumps / knocks from lawnmower (1)	**(2)**

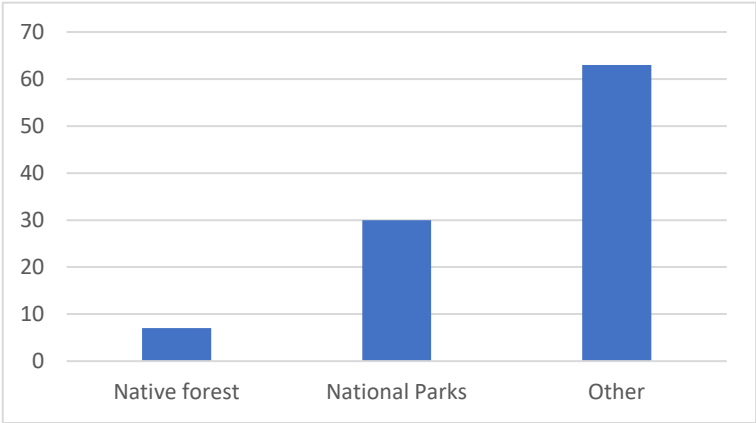
Question number	Answer	Mark
3 (c)	Any **one** explanation that references how the company can reduce their carbon footprint (1) and a linked justification of that way (1). • They can try and use renewable energy sources / maximise energy efficiency for heating / lighting / powering their factory (1) therefore reducing the demand on finite sources / reducing emissions / fumes (1) • They can use new modern / energy efficient machinery / energy recovery systems (1) which will reduce their energy use / consumption (1) • They can use virtual chat rooms / work rooms / video conference for meetings / robots for production (1) which means they will not have to travel / reducing pollution (1) • Potential replacement parts could be sent to customers as electronic files to be produced in situ (1) rather than sending physical components by road / air creating pollution (1) • Any fumes / pollution / waste generated at the factory can be cleaned / scrubbed / carbon filtered / CO^2 capture (1) therefore reducing the amount of pollutants released into the atmosphere (1) • They could use biofuels / electric vehicles (1) to help reduce emissions / fumes (1)	**(2)**

Question number	Answer	Additional guidance	Mark
3 (d)	A calculation that includes: • correct working £4.97 x 1/12 (1) • correct answer to 2 s.f. £0.41 or 41 pence (1)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong. Do not accept 41 on its own	**(2)**

Question number	Answer	Mark
3 (e)	Any **two** ways that references the effects of new and emerging technologies for the apprentices (1) and a linked justification of that way (1) • The apprentices will be exposed to the latest technology / manufacturing methods (1) therefore they will be trained / experienced in the latest / most current methods (1) • They will be very employable / in demand (1) as the technologies develop and spread to other companies / parts of the country / world (1) • They may be highly specialised / highly skilled / ready to move into advanced roles (1) therefore they can command higher salaries (1) • Once they have completed their training they may find themselves out of a job (1) because the new technology has replaced manual workers / more efficient technology (1) • Improved / safer working environments (1) because of the use of electronic control systems (1) • Lower skilled technician roles (1) results in lower paid positions (1)	**(4)**

Question number	Answer	Mark
4 (a)(i)	• LDR / Light Dependent Resistor (1) (Only answer)	**(1)**

Question number	Answer	Mark
4 (a)(ii)	A flowchart that includes feedback loops and labels to the decision box. • 'Yes' and 'No' correctly labelled (1) • Feedback loop with directional arrow from 'No' to above / to the 'MUSICAL TUNE OFF' box (1) • Feedback loop from below 'MUSICAL TUNE ON' to the / just above the diamond decision box (1) 	**(3)**

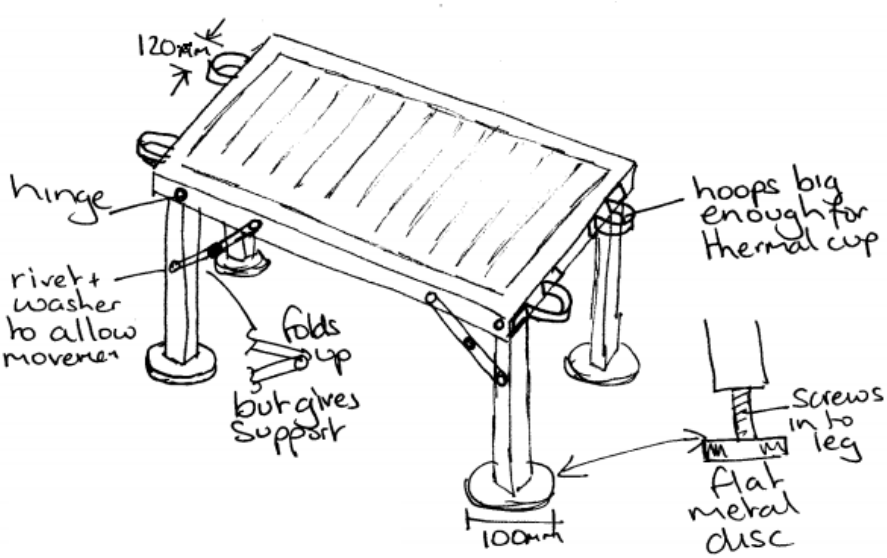
Question number	Answer	Mark
4 (b)	A bar chart that includes: Correct height for National Parks at 30 (1) Correct height for other at 63 (range of 62-64) (1)  	**(2)**

Question number	Indicative content	Mark
4 (c)	• Collaboration could be used whereby different people look at problems from different perspectives / viewpoints such as technically / from a manufacturing perspective / materials / users' needs and wants • Collaboration allows people / teams to bounce ideas off each other, sparking imagination • Teams might be in different countries and contribute over the internet in chat rooms / video conference • User-centred design considers the needs and wants of others at the centre / heart of all decisions • User-centred design also ensures that users' views and opinions are considered at every stage of the design process • Feedback is taken very seriously in user-centred design ensuring users' needs and opinions are gathered and acted upon • Systems thinking looks at the whole problem and breaks it down into individual parts / blocks • Systems thinking looks at how different parts of a design / system fit / work / interact / feedback back into other parts of the system • Systems thinking considers where any energy / power will come from and what inputs / control / outputs will be required and work together • Evaluation / analysis of existing products / designers / movements • Use of external stimulus / triggers / biomimicry • Iteration is used to fine tune / develop ideas in response to consumer feedback	**(6)**

Level	Mark	Descriptor
	0	No rewardable content
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.

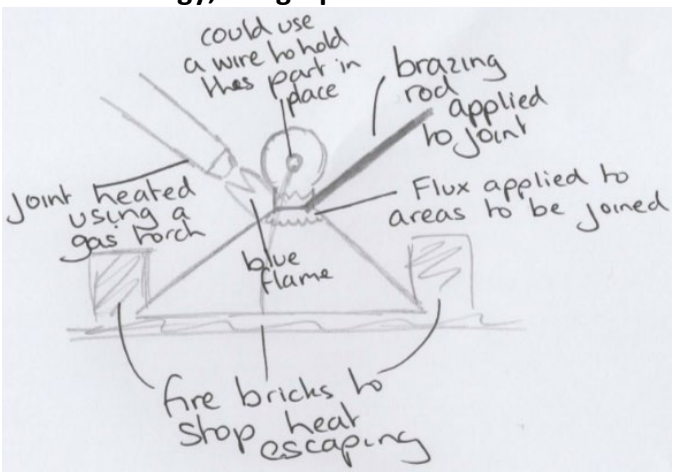
		• A well-balanced appraisal of the information/issues, containing judgements that show a thorough awareness of the interrelationships between factors or competing arguments.

Component 1 mark scheme – 1DT0/1A
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:  • fold away flat (1) but still provide a level surface when in use (1) e.g. hinges / removable legs / adjustable feet • provide a method to hold the insulated cup (1) preventing it from being knocked over (1) e.g. hole for cup in the table top / hoop or ring to support / evidence of dimensions • include a method that prevents the table from sinking into ground (1) that is also detachable (1) e.g. removable feet / screw-on pads / increased surface area Example of candidate response. Annotated notes: Hinges cut into place allowing the top to fold. Folding mechanism On the sides to lock the legs upright and stay level Top has four loops to hold the insulated cups at an appropriate diameter to stop them falling through or being knocked over Large screw in feet allow the weight of the table to be spread over a larger area and prevent sinking into the ground.	**(6)**

Question number	Answer	Additional guidance	Mark
5(b)	Any **two** explanations that include a way the unit meets or fails to meet the requirement (1) and a linked justification of that way (1). • The head is life sized / in proportion (1) which means the glasses can fit into place without having to be folded (1) • The bridge of the glasses will sit on the nose and the side bits on a small shelf like the ears (1) which simulates how the glasses will be worn / allows the user to see what they look like on (1) • The arms just sit on a small shelf like bit without anything to stop them moving (1) which means the glasses might fall / slip off / move around (1) • Aluminium edges may have sharp corners (1) which could cause damage to the glasses' frames (1) • The angle of the nose is very steep (1) which may mean that the glasses slide down so are not secure (1) • Large solid / stable base (1) which means it has a large surface area in contact with the table / difficult to fall over (1)	Do not accept anything related to secure in relation to theft	**(4)**

Question number	Answer	Mark
6 (a)	Any **two** advantages which include an advantage (1) and a linked justification (1) • Less ore needs to be mined (1) because sustainable metal is from reclaimed/recycled sources (1) • Less energy is needed in processing the metal (1) reducing the overall costs of producing the candle holder / carbon footprint / emissions (1) • Lower amounts of waste metal are sent to landfill (1) reducing the overall environmental impact of the material (1) • Maintains natural resources (1) for future generations (1) • Can be marketed / branded as such (1) therefore appealing to a wider audience / allowing customers to make informed choices (1)	**(4)**

Question number	Answer	Additional guidance	Mark
6 (b)	**Marks will be awarded for understanding of design and technology, not graphical skills.**  Notes and sketches that include: • Cleaning the surfaces/surface area between the two parts (1) • Use of flux to assist flow of brazing rod (1) • using wire to hold parts together during brazing / put handle through hole (1) • Use of suitable method / apply heat to melt the brazing rod / brazing torch (1) • application of brazing rod / filler / material to the joint (1) Example of candidate response: Annotated notes: • brazing rod applied to the joint • Components wired/fixed together • Flux applied to the joint • Brazing torch/heat applied	Cap at 3 marks if no sketches or all sketches no notes	**(4)**

Question number	Answer	Mark
6 (c)	Any **one** explanation that includes a reason for using different non-ferrous metals (1) and a linked justification for that reason (1). • Metals have different properties (1) therefore making them appropriate for different parts of the candle holder (1) • Different types of metals have different colours / finishes/ textures / aesthetic properties (1) therefore they can be used to enhance different features in the candle holder / more appealing (1) • Metals will be available in different forms (1) therefore allowing the most appropriate size/shape to be used for sections (1) • Non-ferrous metals do not rust/oxidise as quickly as ferrous (1) so no/less surface finishing required (1)	**(2)**

Question number	Answer	Mark
6 (d)	Any **two** explanations that include a technique (1), plus **two** linked justifications of that technique (1) + (1). • Technique – CAM / CNC milling machine (1) Explanation - which can repeat cut (1) therefore making identical components (1) • Technique - chain drilling (1) Explanation - requires little specialist equipment (1) therefore can be completed with hand/power tools (1) • Technique - laser / plasma cutting (1) Explanation - produces fine details (1) therefore allows the internal angles to be produced with accuracy (1) • Technique - high pressure water jet cutting (1) Explanation - does not heat the metal during cutting (1) therefore does not alter material properties (1)	**(6)**

Question number	Answer	Mark
7 (a)	One surface finish given from: • Paint (1) • Dip coating (1) • Electroplating / anodising (1) • Powder coating (1) • Brushed (1) • Polished/buffed (1) • Lacquer (1)	**(1)**

Question number	Answer	Mark
7 (b)	Any **two** explanations that include a reason for using a stock sized brass tube (1) plus a linked justification for the reason (1) • They can be bulk purchased / bought in (1) therefore no need to make them / save time / cost in manufacture / just cut to length (1) • The brass tubes would be an exact size (1) therefore a standard 15 mm drill bit can be used to make the holes for the tubes to fit into the lamp shade (1) • It would be wasteful to make them from solid bar material (1) therefore it reduces waste (1) • It would be a time-consuming process to make them (1) since a hole would need to be drilled for the cables to pass through (1) • Stock sizes would be used from available range / sizes (1) therefore allowing design / manufacturing decisions to be made to suit (1) • Do not have to invest money in machinery (1) saving capital / training costs (1)	**(4)**

Question number	Answer	Additional guidance	Mark
7 (c)	A calculation that includes: • Conversion of units either at the start or at the end (1) • Tessellation to show that two pieces require minimum of 21 cm (130 + 30 + 50 mm) or (X + Y + 5cm) (subsequent tessellations only require 16 cm's) (1) • Calculation of maximum number of tessellations from 320 cm length 320 cm – 21 cm = 299 cm (1) • 299/16 cm = 18.68 (1) • 18.68 x 2 pieces per tessellation + 2 = 39.36 (rounded down to 39) (1)	Do not award the final mark if the final answer is not a whole number. Award full marks for correct numerical answer without working. Allow ecf if candidate gets part of calculation wrong.	**(5)**

	Conversion of units (1) 320/13 = 24.6 rounded to 24 whole sides (1) **Alternative method** Conversion of units (1) 320 x 20 = 6400 cm^2 = 640000 mm^2 (1) 0.5 (a + b)h = 0.5 (130 + 30) 200 = 16000 mm^2 (1) 200 x 50 = 10000 mm^2 (1) (640000 – 10000)/16000 = 39.375 rounded to 39 (1)	If the method opposite is used and the triangular waste area has been overlooked answer will equal 40, for which 4 out of 5 marks can be awarded provided that the calculations have been shown	

Question number	Answer	Mark
7 (d)	Any **two** explanations that includes a working property (1), plus **two** linked justifications of that working property (1) + (1). • Brass is malleable (1) which allows it to be cold worked / formed (1) allowing the shape to be formed without heat treatment / tearing / fracturing (1) • Brass does not corrode (1) therefore it will not degrade over time (1) as a protective coating forms on the surface (1) • Brass is a hard material (1) which means it will not easily be damaged by knocks (1) therefore bracket is unlikely to fail over time (1) • Brass is ductile (1) which means it can be drawn (1) allowing tubes to be formed (1).	**(6)**

Question number	Answer	Mark
8 (a)(i)	Any **one** explanation that includes an effect (1) and a linked impact of that effect (1). • Steel is made from a wide range of commodities (1) therefore the impact will depend on the quantity of each individual commodity in the steel (1) • Rising commodity prices / demand will increase the cost of steel (1) which then results in lower profit margins/increased retail price (1) • Retail prices may need to increase (1) reducing the potential market for the cutlery (1) • The quality / performance of the cutlery (1) is affected by the grade / hardness of the steel (1) • Geographical location of the steel / commodities (1) will have an impact on the transportation costs (1)	**(2)**

Question number	Answer	Mark
8 (a)(ii)	Any **one** explanation that includes a working property (1), plus **one** linked justification of that property (1) + (1). • It is corrosion resistant / non-toxic (1) which means it will not degrade when in contact with water / rust (1) therefore remains hygienic in use / extends lifespan of the product (1) • Stainless steel can be forged / cast / rolled / stamped (1) which means cutlery can be made in one piece (1) therefore removing the need for joints/welds/fixings (1) • Stainless steel is unaffected by changes in temperature (1) which means that it can cleaned at high temperatures (1) and will not lose its strength / will not deform (1) • Stainless steel has good toughness / hardness (1) allowing the prongs to retain their shape (1) whilst also being slender (1)	**(3)**

Question number	Answer	Mark
8 (b)	Any **two** explanations that include a negative effect (1) and a linked justification of that negative effect (1). • High energy consumption to produce steel (1) generates a lot of pollution / contributes to climate change (1) • Additional elements (chromium) need to be sourced (1) therefore consumes finite resources (1) • Mining for iron ore (1) results in environmental/landscape damage (1)	**(4)**

Question number	Indicative content	Mark
8 (c)	• Difficult to meet /measure demand globally in terms of need for new cutlery given shape / style not affected by trends / fashion • Demand for cutlery increases pressure on raw material sources in regions where ore is mined • Demand requires various metal ores so further sources of ore may need to be found in other locations • Mining causes issues for local communities in terms of land use / loss of habitats/ emissions / local eco-habitats • Mining creates job / prosperity in the local community • Transportation and pollution issues to local communities because of high volumes of ore / steel that will need to be processed • Stainless steel can be recycled and used for other products once it has been separated out from general waste/non-ferrous metals • Any offcuts of stainless steel can be reclaimed/recycled for use in other products	**(9)**

	• Surface treatments do not significantly reduce the ability to recycle stainless steel • Surface treatments do not significantly reduce the ability to recycle stainless steel • Stainless steel will not degrade so any sent to landfill will remain indefinitely • Stainless steel cannot be disposed of by incineration • Stainless steel properties result in long lifespan which means less likely to be disposed of / recycled	

Level	Mark	Descriptor
	0	No rewardable content
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.