



Pearson
Edexcel

Mark Scheme (Standardisation)

Summer 2019

Pearson Edexcel GCSE
In Design & Technology (1DT0)
1D: Systems

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Summer 2019

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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.

Component 1 mark scheme – 1DT0/1D

Section A – Core content

Question number	Answer	Mark
1 (a) (i)	Any one property from: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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)

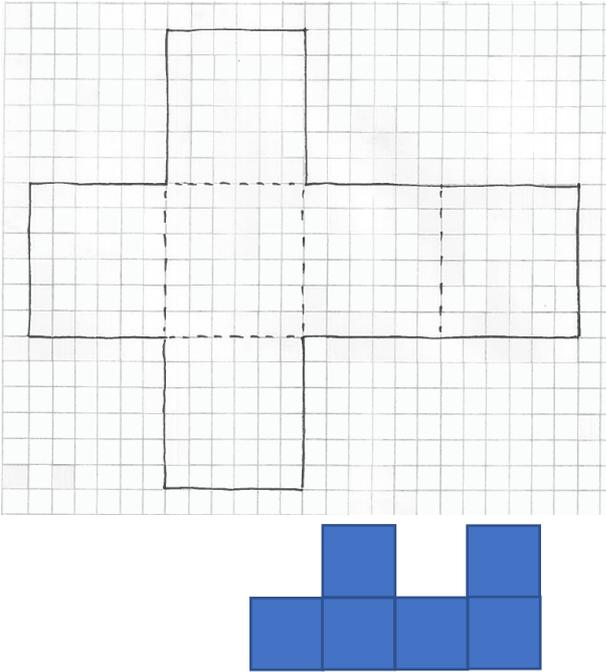
Question number	Answer	Mark
1 (a) (iv)	Any one property from: <ul style="list-style-type: none"> • rigid / stiffness (1) • hygienic and safe for food use (1) • pure with no smell or taste / inert (1) • good printability (1) • good insulator of <u>heat</u> (1) 	(1)

Question number	Answer	Additional guidance	Mark
1 (b)	<p>A calculation that includes:</p> <ul style="list-style-type: none"> • correct working $\frac{7.6 - 5.4}{7.6} \times 100$ <p>(1)</p> <ul style="list-style-type: none"> • correct answer to whole number <p>29%</p> <p>(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	Answer	Mark
1 (c)	<p>Any one negative effect (1) and a linked justification of that negative effect (1).</p> <ul style="list-style-type: none">• 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)	<ul style="list-style-type: none"> • Isometric drawing / projection (1) (Only answer) 	(1)

Question number	Answer	Mark
2 (b)	<p>Any one explanation that includes an accurate statement about the use of calico (1) and a linked justification of that statement (1).</p> <ul style="list-style-type: none"> • 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)	<p>A net that includes an image drawn with a ruler or free hand. Marks to be awarded for the following.</p> <ul style="list-style-type: none"> • 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) <div style="text-align: center;">  </div> <p>(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.)</p>	(4)

Question number	Answer	Mark
2 (d)	<p>Any one reason that includes an accurate statement about why designers use tracing paper (1) and a linked justification of that reason (1).</p> <ul style="list-style-type: none"> • 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)	<p>Any one property given:</p> <ul style="list-style-type: none"> • transparent / translucent / clear / see-through (1) • good electrical insulator (1) • lightweight (1) • waterproof (1) • durable / weather resistant (1) 	(1)

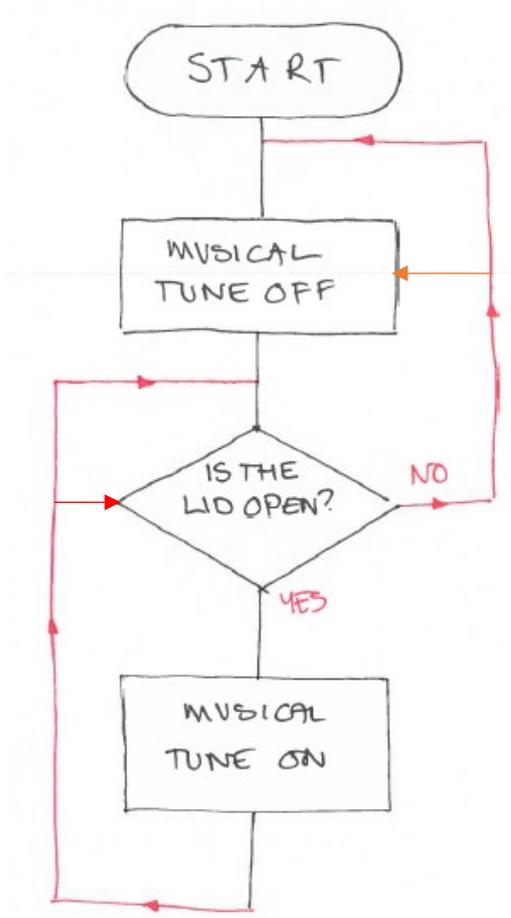
Question number	Answer	Mark
3 (b)	<p>Any one reason for using stainless steel (1) and a linked justification of that reason (1).</p> <ul style="list-style-type: none"> • Stainless steel is a hard material / has good compressive strength (1) therefore it can be pushed into the ground without bending / 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)

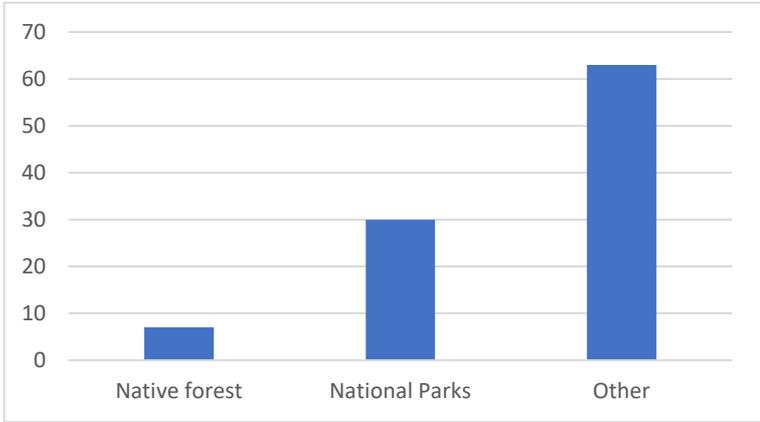
Question number	Answer	Mark
3 (c)	<p>Any one explanation that references how the company can reduce their carbon footprint (1) and a linked justification of that way (1).</p> <ul style="list-style-type: none"> • They can try and use renewable energy sources / maximise energy efficiency for heating / 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 / CO² 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)	<p>A calculation that includes:</p> <ul style="list-style-type: none"> • correct working <p>£4.97 x 1/12</p> <p>(1)</p> <ul style="list-style-type: none"> • correct answer to 2 s.f. <p>£0.41 or 41 pence</p> <p>(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> <p>Do not accept 41 on its own</p>	(2)

Question number	Answer	Mark
3 (e)	<p>Any two ways that references the effects of new and emerging technologies for the apprentices (1) and a linked justification of that way (1)</p> <ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • LDR / Light Dependent Resistor (1) (Only answer) 	(1)

Question number	Answer	Mark
4 (a)(ii)	<p>A flowchart that includes feedback loops and labels to the decision box.</p> <ul style="list-style-type: none">• '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)  <pre>graph TD; Start([START]) --> TuneOff[MUSICAL TUNE OFF]; TuneOff --> LoopOpen{IS THE LOOP OPEN?}; LoopOpen -- NO --> TuneOff; LoopOpen -- YES --> TuneOn[MUSICAL TUNE ON]; TuneOn --> LoopOpen;</pre>	(3)

Question number	Answer	Mark								
4 (b)	<p>A bar chart that includes:</p> <p>Correct height for National Parks at 30 (1)</p> <p>Correct height for other at 63 (range of 62-64) (1)</p>  <table border="1" data-bbox="429 698 1189 1120"> <caption>Data from Bar Chart</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Native forest</td> <td>7</td> </tr> <tr> <td>National Parks</td> <td>30</td> </tr> <tr> <td>Other</td> <td>63</td> </tr> </tbody> </table>	Category	Value	Native forest	7	National Parks	30	Other	63	(2)
Category	Value									
Native forest	7									
National Parks	30									
Other	63									

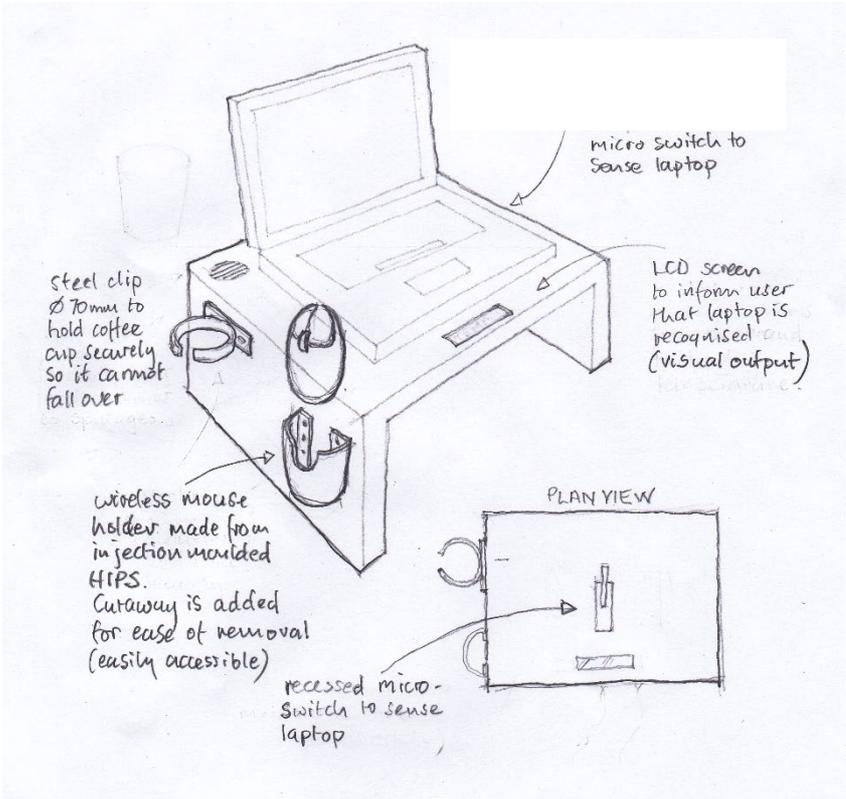
Question number	Indicative content	Mark
4 (c)	<ul style="list-style-type: none"> • Collaboration could be used whereby different people look at problems from different perspectives / viewpoints such as technically / from a manufacturing perspective / materials / users' needs and wants • Collaboration 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	<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.

		<ul style="list-style-type: none">• A well-balanced appraisal of the information/issues, containing judgements that show a thorough awareness of the interrelationships between factors or competing arguments.
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Component 1 mark scheme – 1DT0/1D

Section B – Systems

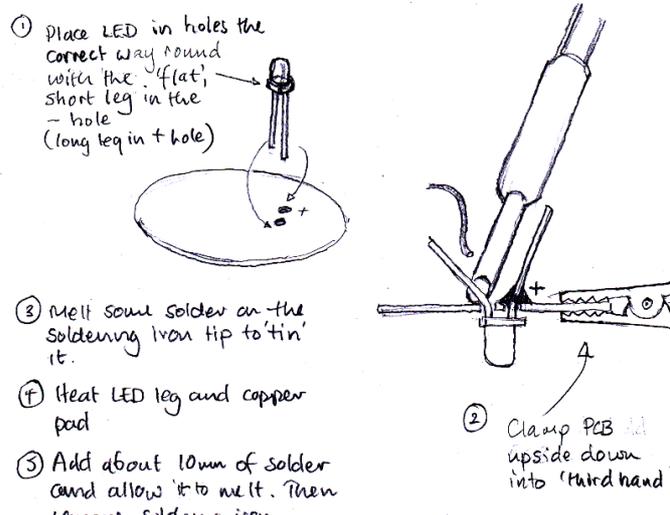
Question number	Answer	Mark
5 (a)	<p>Marks will be awarded for understanding of design and technology, not graphical skills.</p> <p>Notes and sketches that include:</p> <ul style="list-style-type: none"> • a means of sensing when the laptop is placed on the stand (1) and a visual output to show that it has been recognised (1) e.g. PTM switch / microswitch / motion / pressure sensor / ultrasonic / LDR e.g. LCD / LED • a method of holding a coffee cup (1) without the risk of it falling over (1) e.g. clip holder / extension with hole / correct dimensions (65 -70 mm) / clearly stable • Store a wireless mouse (1) so that it is easily accessible (1) e.g. drawers / side pockets / easily opened / open top / shelf <p>Example of candidate response.</p>  <p>The sketch shows a perspective view of a laptop stand with a laptop on top. Labels include: 'steel clip Ø 70mm to hold coffee cup securely so it cannot fall over' pointing to a clip on the left; 'micro switch to sense laptop' pointing to a switch on the top right; 'LCD screen to inform user that laptop is recognised (visual output)' pointing to a screen on the right; 'wireless mouse holder made from injection moulded HIPS. Curaway is added for ease of removal (easily accessible)' pointing to a holder on the front; and 'recessed micro-switch to sense laptop' pointing to a switch on the front. A 'PLAN VIEW' is shown below, illustrating the layout of the front panel with the mouse holder and the recessed micro-switch.</p>	(6)

Annotated notes:

- recessed microswitch to sense laptop (1) an LCD screen to inform user that the laptop is recognised (visual output) (1)
- a steel clip (1) with a diameter of 70mm to hold coffee cup securely so it cannot fall over (1)
- wireless mouse holder made from injection moulded HIPS (1) cutaway is added for ease of removal (easily accessible) (1)

Question number	Answer	Additional guidance	Mark
5(b)	<p>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)</p> <ul style="list-style-type: none"> • The head is life sized / correctly proportioned (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) • Rotating table could be made to move slowly / smoothly / too fast (1) so glasses are not shaken off the stand / fall off (1) • The angle of the nose is very steep (1) which may mean that the glasses slide down so are not secure (1) • As the head rotates (1) the glasses can be seen all round / 360 degrees / all angles (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)	<p>Any two advantages which include an explanation (1) and a linked justification (1)</p> <ul style="list-style-type: none"> • Manufacturers are restricted in the amount or type of harmful substances they can use (1) therefore reducing any potential risk / damage to the environment / user (1) • The product can be marked as RoHS compliant (1) which will widen market appeal /allows customers to make informed choices about products (1) • Workers/recyclers/users would be safer/healthier (1) as there is less contact with dangerous substances (1) • Allows for product to be sold in Europe (1) which gives access to a larger market / increased sales (1) 	(4)

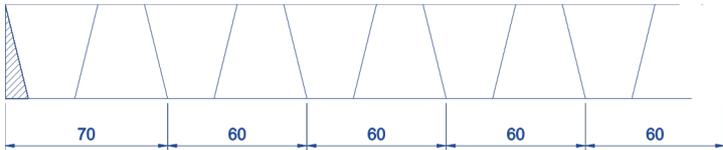
Question number	Answer	Additional guidance	Mark
6 (b)	<p>Marks will be awarded for your understanding of design and technology, not your graphical skills.</p> <p>Notes and sketches that include:</p> <ul style="list-style-type: none"> • Correctly orientate LED in the PCB (1) • Bend legs to hold in place / secure (1) • Heat component leg / pad (1) • Apply solder (1) • Cut legs off / trim (1) <p>Example of candidate response:</p>  <p>① Place LED in holes the correct way round with the 'flat' short leg in the - hole (long leg in + hole)</p> <p>② Melt some solder on the soldering iron tip to 'tin' it.</p> <p>④ Heat LED leg and copper pad</p> <p>③ Add about 10mm of solder and allow it to melt. Then remove soldering iron.</p> <p>② Clamp PCB upside down into 'third hand'</p> <p>Annotated notes:</p> <ul style="list-style-type: none"> • Place LED in the holes the correct way round with the 'flat'/short leg in the 'negative' hole (long leg in the 'positive' hole) • Clamp PCB in 'third hand' • Melt some solder on the soldering iron tip to tin it • Heat LED leg and copper pad • Add about 10mm of solder and allow to melt. 	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 adding texture (1) and a linked justification for that reason (1).</p> <ul style="list-style-type: none"> • Adds grips (1) therefore it is used as a torch it will not slide out of hands / so this is useful when the light is used outside / in wet conditions (1) • Creates friction when gripped between the hand / surface (1) therefore allowing the bits to be twisted / separated for batteries to be changed (1) • Texture adds to visual / aesthetic / ergonomic appeal (1) therefore leading to more customer interest / sales (1) 	(2)

Question number	Answer	Mark
6 (d)	<p>Any two explanations that include a technique (1), and two linked justifications of that technique (1) + (1).</p> <ul style="list-style-type: none"> • Technique - CNC router (1) Explanation - which can repeat cut (1) therefore making identical components quickly (1) • Technique - cutting jigs (1) Explanation - could be used to cut shapes / parts to size (1) requiring no / little marking out (1) • Technique – use of laser cutter (1) Explanation – producing very narrow cut / precise / accurate / identical products (1) producing minimal waste (1) Explanation – suitable for high production rates (1) because acrylic can be cut at relatively high speeds (1) 	(6)

Question number	Answer	Additional guidance	Mark
7 (a)	<p>One surface finish or surface treatment given from:</p> <ul style="list-style-type: none"> • Metal plating (1) • Nickel /plating / coating (1) • Gold / plating / coating (1) • Tin / plating / coating (1) • Silver / plating / coating (1) • Copper / plating / coating (1) • Brass / plating / coating (1) • (White) Bronze / plating / coating (1) • Electroplating (1) • Galvanising / zinc plating / coating (1) 	<p>Do not accept any finishes that would restrict electrical conductivity</p> <p>Do not accept: 'plating' 'coating' in isolation, 'anodising', 'painting'</p>	(1)

Question number	Answer	Mark
7 (b)	<p>Any two explanations that include a reason for using stock sized sleeving (1) and a linked justification for the reason (1)</p> <ul style="list-style-type: none"> • The sleeving can be bulk purchased / bought in (1) therefore no need to make it / save time in manufacture / save money (1) • The sleeving would be an exact size (1) therefore a standard diameter can be used to fit over the connector / wire (1) • It can be cut to any length (1) allowing it to be used for any other connection / spaces in the vending machine (1) • Widely available from a range of suppliers (1) therefore always likely to be in stock somewhere (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)	<p>A calculation that includes:</p> <ul style="list-style-type: none"> • Conversion of units either at the start or at the end (1) • Tessellation to show that two pieces require minimum of 7 cm (40 + 20 + 10 mm) or (X + Y + 1cm) (1) • Calculation of maximum number of tessellations from 181 cm length 181 cm – 1 cm = 180(1) • 180/ 6 cm = 30(1) • 30 x 2 pieces per tessellation = 60 <p style="text-align: right;">(1)</p> <p>STP two marks without recognition of tessellation</p> <p>Conversion of units (1) 181/4 = 45.25 rounded to 45 whole pieces (1)</p> <p>Alternative graphical solution:</p>  <ul style="list-style-type: none"> • Conversion to cm: Mild steel strip = 181cm Pair of connector blanks = 6cm • Calculation 181/6 = 30 (with required 1cm remaining) • Therefore 30 pairs can be obtained from strip • Answer = 60 collector blanks 	<p>Do not award the final mark if the final answer is not a whole number.</p> <p>Award full marks for correct numerical answer without working.</p> <p>Allow ecf if candidate gets part of calculation wrong.</p>	(5)
	<p>Alternative solution</p> $181 \times 4 = 724 \text{ cm}^2 \quad (1)$ $\frac{1}{2} (4 + 2) \times 4 = 12 \text{ cm}^2 \quad (1)$ $724 \div 12 \text{ OR } 72400 \div 1200 \quad (1)$ $= 60.3 \quad (1)$ $= 60 \quad (1)$		

Question number	Answer	Mark
7 (d)	<p>Any two explanations that includes a characteristic (1), and two linked justifications of that characteristic (1) + (1).</p> <ul style="list-style-type: none"> • Microcontrollers (PICs) can be programmed / reprogrammed / reused (1) so they can be customised to different control systems (1) and updated easily (1) • Microcontrollers run on low voltage (1) which means they can use batteries (1) and therefore can be portable / backup (1) • Functionality / program can be simulated on software (1) allowing easy editing / updating (1) before being downloaded to the PIC (1) • Microcontrollers can be configured for either digital or analogue inputs (1) which allows keypads / thermostats to be detected (1) removing the need for dedicated circuitry (1) • Microcontrollers require fewer peripheral components (1) because they are multi-functional (1) therefore reducing the overall size of the board 	(6)

Question number	Answer	Mark
8 (a)(i)	<p>Any one explanation that includes a reason (1) and a linked justification of that reason (1).</p> <ul style="list-style-type: none"> • The quality / performance of the component (1) improves lifespan / longevity / impacts price (1) • Bulk purchasing / standardised components (1) reduces unit cost (1) • Source / availability of components (1) China / UK (1) 	(2)

Question number	Answer	Mark
8 (a)(ii)	<p>Any one explanation that includes a function (1), and one linked justification of that function (1) + (1).</p> <ul style="list-style-type: none"> • It is used to detect changes in temperature (1) which will trigger a control / process (1) to turn the fridge cooler on / off accordingly (1) • The thermistor senses temperature in the fridge (1) which leads to a change in resistance (1) which controls the fridge motor on / off (1) 	(3)

Question number	Answer	Mark
8 (b)	<p>Any two explanations that include an advantage (1) and a linked justification of that advantage (1).</p> <ul style="list-style-type: none">• Less toxic material finds its way into the environment (1) because products have to be disposed of responsibly (1)• Reduces pressure on landfill (1) because more products are recycled (1)• Reduces air pollution (1) because fewer products are incinerated (1)• Increases material / component recovery / reduces resources going to waste (1) because products are broken down / separated / reused (1)	(4)

Question number	Indicative content	Mark
8 (c)	<ul style="list-style-type: none"> • Difficult to meet demand / measure / gauge demand around world • Worldwide sporting events are popular around the world so demand predictions should be high • When the worldwide sporting event finishes there may be little or no demand so the manufacturer would have to change the design • The fridge is an inexpensive, small, novelty product which can be quickly customised to reflect temporary fashions and trends. • Demand for crude oil increases pressure on environment locally to the country of manufacture • Local communities are over-dependent upon crude oil which is a finite resource • Crude oil needs to be transported from Saudi Arabia by sea which increases probability of natural disaster from accidents and oil spills • Transportation and pollution issues to local communities because of high volume oil extraction • HIPS is quite easy to recycle and reuse once it has been separated out • Waste from the production of the mini fridges can be used for other things • Spray-painted finish may make it more difficult to recycle • Although HIPS is quite easy to recycle it is not widely recycled if it is not returned to the manufacturer/specialist processor • The difficult and dangerous recycling process of the electronic components is often carried out in developing countries raising health concerns • Novelty products will be short lived in relation to the sporting event and will lead to short life span / product obsolescence 	(9)

Level	Mark	Descriptor
	0	No rewardable content
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.

		<ul style="list-style-type: none"> • 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.