Oxford Cambridge and RSA

GCSE (9–1)

Design and Technology

J310/01: Principles of design and technology

General Certificate of Secondary Education

Mark Scheme for Autumn 2021

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

1. **Annotations**

Annotation	Meaning
BP	Blank page
✔	Point where mark is awarded
L1	Level one response
L2	Level two response
L3	Level three response
ECF	Error carried forward
REP	Repetition
SEEN	Noted, but no credit given
PD	Poor diagram offering unclear response

2. Subject Specific Marking Instructions

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

LEVELS OF RESPONSE QUESTIONS (also refer to point 10 above):
The indicative content indicates the expected parameters for candidates' answers but be prepared to recognise and credit unexpected approaches where they show relevance.

Using 'best-fit', decide first which set of level descriptors best describes the overall quality of the answer. Once the level is located, adjust the mark concentrating on features of the answer which make it stronger or weaker following the guidelines for refinement.

Highest mark: If clear evidence of all the qualities in the level descriptors is shown, the HIGHEST mark should be awarded.
Lowest mark: If the answer shows the candidate to be borderline (i.e. they have achieved all the qualities of the levels below and show limited evidence of meeting the criteria of the level in question) the LOWEST mark should be awarded.
Middle mark: This mark should be used for candidates who are secure in the level. They are not 'borderline' but they have only achieved some of the qualities in the level descriptors.

Be prepared to use the full range of marks. Do not reserve (e.g.) highest level marks 'in case' something turns up of a quality you have not yet seen. If an answer gives clear evidence of the qualities described in the level descriptors, reward appropriately.

Assessment Objectives

AO3: **Analyse and evaluate –**

- **design decisions and outcomes, including for prototypes made by themselves and others**
- **wider issues in design and technology**

AO4 **Demonstrate and apply knowledge and understanding of –**

- **technical principles**
- **design and making principles**

Question	AO3	AO4	Question	AO3	AO4
1a		3	4ai		2
1b		1	4aii		1
1c		1	4b		2
1d	3	3	4ci		1
1e		1	4cii		2
1f*	6	2	5a		9
2		18	5bi		2
3ai		4	5bii		2
3aii	1		5ci		6
3aiii	1		5cii	2	4
3bi		4	6a		4
3bii	2		6b	5	3
3ci		1			
3cii		4			

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>Any three from e.g.:
• Can be cut, folded and scored easily
• Can be printed on
• Inexpensive compared to other materials
• Readily available material
• Can be recycled after use
• Rigid when formed into a box to protect chocolates

Award credit for any other appropriate reason</td><td>3</td><td>Reasons must be appropriate for the context in the question: box for the chocolates made of cardboard

Do not accept generic/vague answers such as cheap, strong, light, sustainable without qualification.

Be careful not to award repeat answers.</td></tr>
<tr><td>1</td><td>(b)</td><td></td><td>Any one from:

PET, ABS, PVC, PS, LDPE, acrylic, TPE

Accept any other named thermo polymer</td><td>1</td><td>Do not accept thermosetting polymers e.g. silicone, polyester resin

Accept full name or abbreviation.</td></tr>
<tr><td>1</td><td>(c)</td><td></td><td>Any one from:

Copper, tin, Silver

Accept any other named non-ferrous metal other than aluminium.</td><td>1</td><td>Do not accept Aluminium as this is given in the question.</td></tr>
<tr><td>1</td><td>(d)</td><td></td><td>Any three ways explained e.g.:

Reduce <u>amount</u> of materials (1) used in the packaging to lessen the use of raw materials (1)

Re-design the packaging (1) so that refills can be bought rather than disposing of the box (1)

Use recycled material/pulp (1) to make the packaging reducing the need for virgin material (1)</td><td>6</td><td>Answers must be appropriate to the packaging of the chocolates being made more sustainable <u>during designing or manufacturing - not after use.</u>

1 mark for identifying a suitable point
1 mark for explaining it.

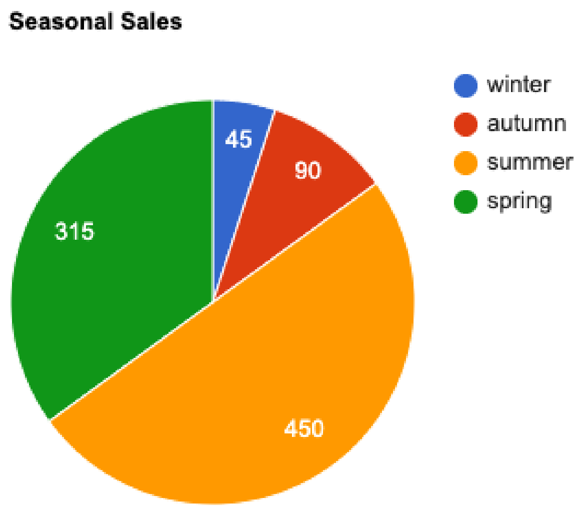
Do not accept answers relating Fairtrade as this is a social & economic issue.</td></tr>
</table>

			Don't use single use polymers (1) which can pollute the sea/rivers/landscape/wildlife (1) Use alternative energy in manufacturing, such as wind/solar/tidal power (1) to reduce the production of harmful emissions (1) **Award credit for any other appropriate reason**		
1	**(e)**		A biopolymer is a polymer created from a renewable / natural resource / accept a named example e.g. plant, starch or seaweed.	**1**	Do **not** accept 'sustainable material' or 'good for the environment' without qualification.

Question			Answer	Mark	Guidance: Content	Guidance: Levels of response
1	f*		Discussion could include: The reasons and the problems caused by packaging: • Packaging is usually disposed of and can involve a range of different materials – sometimes not separated or easy to separate. • Polymers do not break down easily and affect the environment causing toxins and leachates in landfill and ending up in oceans and rivers, harming wildlife and eco systems – packaging is often single use, bottles often left as rubbish/waste • Oil is running out and is also used as fuel, so alternatives are needed Sustainable materials: • Materials are being sourced to replace polymers in packaging. Seaweed and fish waste being used. • Government controls on single use polymers • Plantbottle technology used by coca- cola and Heinz making biopolymers from sugar cane and making more use of recycled and recycled polymers. • Refillable cups and bottles made from stainless steel and aluminium to cut down on use of disposable cups • Coconut husks, tapioca, bamboo and wood used in packaging of ready meals • More wide use of paper and card-based material, pulp. Wool replacing bubble wrap – woolcool used to insulate food and pharmaceuticals items hot or cold	8	Candidates should be drawing on examples to support their answer. If no examples are used, they should not be rewarded with marks higher than a Level 1. A candidate operating at Level 3 should be accessing all AO4 marks and at least four of the AO3 marks analysing/evaluating packaging materials and their impact on the environment. A candidate operating at Level 2 should be accessing all AO4 marks and at least one of the AO3 marks attempting to analyse/evaluate packaging materials and their impact on the environment A candidate operating at Level 1 will be accessing AO4 marks, but no AO3 marks.	**Level 3 (6–8 marks)** The candidate will demonstrate an excellent understanding of packaging materials and their impact on the environment. They will be able to discuss this convincingly, using examples that use sustainable materials to analyse and evaluate the reasons the right choice is important. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated with the use of examples of materials that are more commonly used to replace single use polymers. **Level 2 (3–5 marks)** The candidate will demonstrate some knowledge of packaging materials and their impact on the environment. They will be able to discuss this, using example(s) that use sustainable materials and attempt to analyse/ evaluate the reasons the right choices are important. There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence/examples. **Level 1 (1–2 marks)** The candidate will give a basic answer showing limited understanding of packaging materials and their impact on the environment.

			• Recycling schemes for glass and polymer bottles e.g. in Norway for polymers bottle so bottles are returned and can be recycled			Any examples given may not be appropriate. Any attempt at analysis or evaluation of the choices made will be limited and not be worthy of credit. The information has some relevance and is presented with limited structure or detail. The information is supported by limited evidence **Level 0 (0 marks)** No response or no response worthy of credit.

Question			Answer	Mark	Guidance
2	(a)	(i)	500x1370 = **685000** [1] **mm^2** [1] OR 0.5x1.37 = **0.685** [1] **m^2** [1] OR 50x 137 = **6850** [1] **cm^2** [1]	2	1 mark for a correct calculation of the area 1 mark for the correct unit for their given answer
2	(a)	(ii)	50m = 50000 mm [1] 50000mm* (length of fabric) / 1370mm (length of deck chair fabric) = 36.49 deck chair seats, rounded down to 36 seats [1] Fabric is 1m wide so two deck chair seats can be cut from each 1370mm length 36 x 2 = **72**	3	Award **3** marks if **72** seen If 72 not seen award working as shown (soi) **Special cases:** If 72.92 seen (no rounding applied) award 2 marks If 74 seen (rounded up) award 2 marks
2	(a)	(iii)	For **one** mark e.g.: The under and over/ warp and weft construction of the fibres (1) reinforces thread.	1	Do **not** award 'strong' on its own as this is given in the question
2	(b)		Need 100 lengths of each piece 1250, 890, 590. 1800 – 1250 = 550 (no use for leftover timber, so the two 1250 lengths need 2 standard lengths): Need 100 (1250) pieces from 100 lengths [1] 890 * 2 = 1780mm (1 length). Need 100 (890) pieces from 50 lengths [1] 590 *2 = 1180 mm (1 length) this leaves enough for another 590. Need 100 (590) pieces from 34 lengths [1] Total **184** lengths (100 + 50 + 34)	4	Award **4** marks if **184** seen If 184 not seen award working as shown (soi) **Special cases:** if answer is not the minimum no. of lengths award 2 marks e.g.: *890 + 590 = 1480 (1 length) x 2 = 2 lengths, then you would get 4 * 50 = 200 lengths.* Award 1 mark for: Total length of timber for one chair (or one side) x 50 chairs, then divided by 1.8
2	(c)	(i)	50 x 4 = 200 bolts needed [1]	2	Award **2** marks if **399.80** seen

			200/10 = 20 = 20 x 19.99 [1] = **399.80**		Award **1** mark if 200 or 20 packets or 20 x19.99 seen but final answer is incorrect
2	(c)	(ii)	400 x 19.99 = 7996, [1] 7996 – 5997 = £1999, [1] 1999/7996 x 100 = **25**%	3	Award **3** marks if **25** seen If 25 not seen award working as shown (soi)
2	(d)		360°/900 sales= 0.4° per sale (Winter 45 x 0.4 = 18° answer given) Autumn 90 x 0.4 = 36° Spring 315 x 0.4 = 126° Summer 450 x 0.4 = 180° 	3	Size of segments: Award **2** marks if size of all segments correct by eye or award **1** mark if only one segment correct by eye **Look for:** Autumn – double the size Winter, and Summer – half of circle Labels/Key: All labels/key correct **[1]**

<table>
<tr><td>3</td><td>(a)</td><td>i</td><td>
<table>
<tr><th>Function</th><th>Input or output</th><th>Electronic component</th></tr>
<tr><td>Detects lights and produces a signal</td><td>Input (1)</td><td>Light dependent resistor/ LDR (1)</td></tr>
<tr><td>Produces light</td><td>Output</td><td>Light-emitting diode/ LED/Bulb/Lamp (1)</td></tr>
<tr><td>Makes/breaks the circuit/ Switches the night light on/off (1)</td><td>Input</td><td>Switch</td></tr>
</table>
</td><td>4</td><td>1 mark for each correct answer</td></tr>
<tr><td>3</td><td>(a)</td><td>ii</td><td>One from e.g.:
• Batteries allow the light to be positioned anywhere
• No wires or mains plug is needed</td><td>1</td><td></td></tr>
<tr><td>3</td><td>(a)</td><td>iii</td><td>One from e.g.:
• Moulded from polymer which is an insulating material/safe for children to hold or touch/doesn’t get hot
• Needs a screwdriver to access batteries/ circuit
• Rounded smooth edges
• No small parts as a shell structure</td><td>1</td><td>Must be appropriate for the context in the question: night light used by children</td></tr>
</table>

<table>
<tr><td>3</td><td>(b)</td><td>i</td><td><table><tr><th>Description of how renewable energy is used to create electricity</th><th>Type of renewable energy</th></tr><tr><td>A dam is used to trap water, when water is released it turns turbines which turn generators</td><td>HYDROELECTRIC [1]</td></tr><tr><td>Blades catch wind, which turn turbines/powers generators</td><td>Wind power</td></tr><tr><td>Photovoltaic cells convert light to electricity</td><td>SOLAR POWER [1]</td></tr><tr><td>Fuel (wood, organic material, sugar cane etc) is burnt to generate heat which creates steam and turns turbines which turn generators</td><td>BIO MASS or BIO FUEL [1]</td></tr></table></td><td>4</td><td>1 mark for each correct answer</td></tr>
<tr><td>3</td><td>(b)</td><td>ii</td><td>Two from e.g.:
• Burning fossil fuel creates waste products/ such as sulphur dioxide gas/ nitrogen dioxide (1)
• Creates air pollution (1)
• Contributes to global warming as creates carbon dioxide when burnt (1)
• Transportation of oil/coal can cause pollution (1)</td><td>2</td><td></td></tr>
<tr><td>3</td><td>(c)</td><td>i</td><td>One from e.g.:
• Thermochromic
• Photochromic
• Self-Healing material
• Shape Memory Alloy (SMA) or Shape Memory Polymer
• Super Hydrophobic
• BioLogic fabric

Accept any named smart material other than phosphorescent</td><td>1</td><td>Do not accept Phosphorescent or glow-in-the-dark as this is given in the question
Do not accept modern materials such as
• Teflon
• Hydrophobic
• Nomex
• Graphene
Smart materials respond and change</td></tr>
</table>

3	(c)	ii	**Two** ways described e.g: **Thermochromic paints and polymers** change colour with temperature (1) – baby spoon to let parent know when food is too hot, used in thermometers, clothing, hospital pajamas (1) **Hydrochromic ink/ paint** changes colour when wet (1) used in mural to brighten streets/ used on benches to warn when wet (1) **Self-healing** paint, **self-cleaning** coatings. **self-healing** concrete. (1) repairs fine cracks easily before they worsen e.g. scratches in cars (1) **Nano technology** fibres protecting against odour, bacteria etc (1) medical textiles, fighting bacteria, creams to protect against sunburn, capsules that contain beneficial substances applied to fabric and released gradually through abrasion with the skin, wound dressings, children's wear, sportswear, household textiles. (1) **Technical Smart textiles such as super hydrophobic coatings**– changes to have a hydrophobic coating to repel water (1) used for keeping surfaces or fabrics clean and avoid corrosion**. (1)** **BioLogic** – shape changing fabric responds to sweat/humidity (1) improves breathability used in sports wear to improve keep athletes cool (1)**.** **Other examples could include:** **Smart Memory Alloys and polymers** -car bodies, medical and dental products, returns to shape when heat or electrical current applied. **Fastskin** - mimics the skin of a shark giving a streamlining effect when under water. **Conductive paints, thread and fibres** - Wearable computers or electronics combined in the fabric. Walls that conduct electricity and allow lighting with no wires.	4	Candidate answers must describe ways the smart material improves functionality or benefits the user. Any reference to materials that react to light, heat, electricity or other stimuli and react but must relate to how technology functions to benefit users. For each point – **1 mark** for showing understanding of what the smart material is/does and **1 mark** describing how it improves the function of the product/ benefits the user

4	**(a)**	**i**	Image A - **Lever**	**1**	This is the only correct answer
4	**(a)**	**ii**	Up to **two** marks for an explanation e.g. • they make jobs easier/quicker to carry out (1) because of mechanical advantage/ allowing greater or magnified force to be applied (1) **Accept any other acceptable answer**	**2**	Must be **appropriate** for the context in the question: mechanisms used in kitchen gadgets
4	**(b)**		Up to **two** marks for an explanation e.g. • It does not conduct heat so won't get hot when the metal saucepan is heated (1) the user will be able to pick up the saucepan without getting burning hand (1) • The handle retains it shape (1) when used near heat as once moulded it cannot be reheated and remoulded (1)	**2**	Reason must be **appropriate** for the context in the question: saucepan
4	**(c)**	**i**	**One** from: • Oak • Beech • Birch • Mahogany **Accept any other named hardwood.**	**1**	
4	**(c)**	**ii**	**Two** from: • It is a natural material and is better for the environment • Most timbers contain no toxins to contaminate food • People like natural finishes/looks attractive • The chopping board can be sanded down/oiled again/longevity	**2**	Reason must be **appropriate** for the context in the question: chopping board/utensils made from wood Do not accept generic/vague answers such as cheap, strong, durable without qualification. Be careful not to award repeat answers.

<table>
<tr><th colspan="3">Question</th><th rowspan="2">Answer</th><th rowspan="2">Mark</th><th colspan="2">Guidance</th></tr>
<tr><th></th><th></th><th></th><th>Content</th><th>Levels of response</th></tr>
<tr><td>5</td><td>a</td><td></td><td>Explanations must relate to the commercial manufacturing processes stated in the question:

Recipe cards - (papers and boards) – paper litho printed, laminated onto cardboard card

Oven Glove – (fibres and fabrics) Quilted layers sewn together, overlocked and edging applied

Electronic thermometer - (design engineering) PCB circuit board, surface mounted and soldered OR Injection moulded casing

Cutlery tray - (polymers) Vacuum formed, former made probably aluminium

Food grater- (metals) stamped and press formed

Recipe book/tablet stand - (timbers) lamination of layers/veneer

Explanations including step-by-step plans should follow an appropriate order and should cover the following:</td><td>9</td><td>Commercial manufacturing processes are stated in the question paper for each product.

Candidates can refer to manual, machine or CAD/CAM processes, but they must be appropriate for commercial manufacture.

Candidates are not required to but may use sketches to support their answer. No marks should be awarded for the sketches themselves, but marks can be awarded appropriately for supporting annotation.

Award upto Level 1 only for explanations of processes not given in the question.</td><td>Level 3 (7-9 marks)
The explanation will be comprehensive, demonstrating excellent understanding of the key features of the commercial manufacturing processes for the chosen product.

They will demonstrate a thorough understanding of any jigs, templates and formers required to manufacture and assemble their chosen product.

Level 2 (4-6 marks)
The explanation will offer some detail and use mainly appropriate terminology to demonstrate adequate understanding of the key features of the commercial manufacturing processes for the chosen product.

They will demonstrate a good understanding of any jigs, templates and formers required to manufacture and assemble their chosen product.

Level 1 (1–3 marks)
The explanation will show limited knowledge of the commercial manufacturing processes for the chosen production.
The response will demonstrate a basic level of understanding and this may be in relation to their own workshop experiences and</td></tr>
</table>

			Processes, techniques or skills, e.g.: • *wasting methods* used to cut the materials (with allowances / tolerances as appropriate) – including accurate use of specific tools. • *deforming and reforming methods* used to shape/mould or strengthen materials and/or components – including accurate use of specific tools or equipment. • *methods of addition* used to join materials and/or components • details of any jigs, templates and formers used. **Tools and digital** technology, e.g.; all tools required to fulfil the processes and techniques being used.			knowledge of tools and processes rather than the commercial level of production. Specific processes and techniques including the use of jigs, templates and formers may not be fully appropriate or identified. **Level 0 (0 marks)** No response or no response worthy of credit.

Product	Manufacturing process	Manufacturing process, techniques or skills To include any jigs, templates and formers
Product 1: Recipe cards (papers and boards)	Lithography printed, laminated	Printed on a large sheet of paper– by offset lithography – printing plates are produced – oil-based ink is applied as paper is pushed through a series of rollers, the process uses four ink colours CMYK the colours are overlayed to produce more colours Laminated to cardboard board material and a polypropylene film thermal lamination process to laminate both sides then could be CNC cut or die cut to shape Die cutting – a steel die is lowered cardboard and pressed to cut out the shape and hole for riveting punched at the same time. Cards are stacked held in place and riveted
Product 2: Oven glove (fibres and fabrics)	Quilted, overlocked and sewed	Layers of fabric are held together, and straight stitch machine sewn in diagonals to provide quilting with industrial sewing machine Glove shape is cut out following a pattern and two layers are sewn (double stitching of seams) and overlocked – edging and hanging loop is then sewn on separately
Product 3: Electronic thermometer (design engineering)	Surface mounted printed circuit board (PCB) Injection moulded casing	**Injection moulding** polymer granules/pellets are poured into the machine through a hopper. The granules are heated and melted to liquid form as they are carried along the barrel by the screw. The piston is drawn back then released so the liquid plastic is rammed by the screw into the mould through a nozzle. To cool the mould quickly, water is pumped around the mould chambers. The mould then opens and the part is ejected by the ejector pins. To finish the part the sprues and any flashing will need to be removed. **PCB board** produced by photo etching - surface mounted components, pick and place method, held in place by a sticky solder paste then soldered in a reflow soldering oven and assembled into an injection moulded casing
Product 4: Cutlery tray (polymers)	Vacuum formed	Vacuum forming - a mould/former made from aluminum with draft angles, filleted corners Sheet fed onto vacuum former using rollers, clamped into place and heated, heat is then removed and the vacuum pump is switched on to remove the air. This causes the polymer to be forced against the former taking its shape. The material is allowed to cool, sometimes blown air or a fine water spray. The component is then released from the mould with small amount of air pressure and then trimmed and edge finished as necessary. Next sheet placed over and process repeats
Product 5: Food Grater (metals)	Stamped and press formed	Sheet metal shape is punched as a blank then is moved to a former which is comprised of two steel dies that would shape the metal forming the raised areas for grater using a hydraulic press. The shape would then be bent with a folding machine and spot welded to hold in place

Product 6: Recipe book/tablet stand (timbers)	Lamination	A former made from aluminum or wood/aluminum, layers of wood with multi- directional grain (strength) are layered, glue is applied with a roller and layers are placed between the two formers, male and female or one-part mould and vacuum press bag could be used. Left to dry/cure. Once set edges laminate is removed from mould and edges are trimmed and finished and an oil-based finish applied

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>5</td><td>(b)</td><td>i</td><td>Two from:
<table>
<tr><td>Product 1: papers and boards: Recipe cards

Polypropylene
• Can be wiped clean
• Transparent
Cardboard/paper
• Can be die cut
• can be printed
• cheap compared to other materials</td><td>Product 2: Fibres & fabrics: Oven glove

Cotton/felted polyester:
• Can be washed
• Lightweight to wear
• Comfortable against skin
• Can be sewn and quilted easily
Felted polyester
• Heat resistant
• Resistance to mildew</td></tr>
<tr><td>Product 3: Design engineering: Electronic thermometer

ABS for casing:
• Can be moulded to shape
• Can be wiped down easily
• Durable in use</td><td>Product 4: Polymers: Cutlery tray

Polypropylene: cutlery tray
• Easily washed
• Can be moulded to shape
• Resistant to wear and tear</td></tr>
<tr><td>Product 5: Metals: Food grater

Stainless steel:
• Can be washed
• Rust proof, does not corrode
• Can be easily bent and formed to shape</td><td>Product 6: Timbers: Recipe book/tablet stand
Beech veneer:
• Can be laminated
• Strong when laminated
• Beech veneer can be finished with oil so it is aesthetically pleasing</td></tr>
</table></td><td>2</td><td>Working and characteristic properties are both acceptable.

Answers need to be appropriate to the chosen product.

Strong, durable, cheap etc. must be qualified</td></tr>
</table>

			• **Plywood** is durable (must be qualified) • Can be bent & shaped **Accept any other appropriate answers related to the materials in the Insert for the chosen product.**		
5	(b)	ii	**Two** environmental considerations of the materials used e.g: • Does it come from a sustainable source/FSC managed forest/renewable source • Has renewable energy been used in manufacture/Wind/Solar/Tidal power • Has it been/can it be upcycled/ re-used/recycled • Does it have minimal impact on the environment during its <u>lifecycle</u> • Can it be disposed of safely after use	2	
5	(c)	i	**Three** reasons from: • To test functionality/ if it works or mechanisms (1) using working models (1) • To test size (1) using block models or calico models (1) • To see if its easy to use/ test ergonomics (1) with users (1) • To check what it looks like/test aesthetics (1) explore form, proportion, shape (1) • To get user feedback (1) and find ways to improve the design/ identify weaknesses (1) • To test materials (1) and how suitable they are for use (1) • To explore possible manufacturing methods (1) and construction techniques to work out best way to make it (1)	6	Answer should explain three reasons why designers use iterative modelling. For each point: Look for a suitable reason (1) and then an explanation of how the modelling is used (1) Look for an explanation of type of model and why it is used to award two marks
5	(c)	ii	Responses should identify specific materials used to model ideas and methods of specific model making tools and methods • Two methods identified (up to two marks) • Specific modelling materials identified (up to two marks) • Specific tools and equipment identified (up to two marks)	6	An early iterative model might be a model to test function e.g. a fastening method, a working mechanism or circuit. It could be a block model that tests appearance, ergonomics, usability or size.

			Processes, techniques or skills could cover • *Wasting methods* used to cut the materials – including use of specific tools. • M*ethods of addition* used to join materials and/or components. • *Tools and digital technology.* These could include: **Recipe cards** Model could be made from thin card with graphics printed on, font sizes and layout of text and images can be tested – paper would be glued to card spray mount or glue stick, cards would be cut with craft knife, using a safety ruler and cutting mat or scissors. A paper fastener would be used to trial position to achieve the cards movement and joining method. **Oven glove** A full size glove could be made from calico to test size of glove this would be hand (needle and cotton) or machine sewn – paper template or model/Toile made first and held against a hand to check, CAD could be used to make paper template, paper and calico cut with scissors or a craft knife. Real materials could be used to test a one side of the glove and quilting thickness and layers to check how functionality and heat protection. Stitches and finishes could be tried and tested for strength **Electronic thermometer** A block model of case can be made from, cardboard, Styrofoam or Jelutong to test comfort in use, string and straws can be used to create a model probe, 3D design could be modelled on a 3D CAD package such as solidworks, proengineer, AutoCAD or 3Dfusion. Breadboard can be used to test circuit is functional with actual components, circuit wizard to test circuit on a computer, a first PCB board can be produced using etching and components soldered to test circuit size **Cutlery tray** 3D design could be modelled on a 3D CAD package such as solidworks, proengineer, AutoCAD or 3Dfusion. Card model can be made to test size overall and compartments, card would be cut with craft knife, using a safety		A later model may use workshop processes and similar materials to make a first prototype Answers should refer to more than one method • Two modelling methods need to be identified • Specific modelling materials identified these could be for model itself or mould/patterns • Specific tools and equipment identified and explained

			ruler and cutting mat or scissors, glued using a glue gun. A first vacuum forming could be tried in school workshop, mould made from blocks of wood draft angles sanded with a belt sander – description will differ from the commercial process **Food Grater** 3D design could be modelled on a 3D CAD package such as solidworks, proengineer, AutoCAD or 3Dfusion. Card model can be made to test size overall and compartments, card would be cut with craft knife, using a safety ruler and cutting mat or scissors, glued using a glue gun. One part of the grater could be made in thin sheet steel or aluminum to test the grater cut using sheet metal cutter, tin snips or piercing saw. A 3D model from sheet aluminum could be cut and folded **Recipe book/tablet stand** 3D design could be modelled on a 3D CAD package such as solidworks, proengineer, AutoCAD or 3Dfusion. Card model can be made to test size overall and compartments, card would be cut with craft knife, using a safety ruler and cutting mat or scissors. Bends can be tested making a mould from Styrofoam and testing laminated sections using layers of 0.8mm birch-faced plywood and PVA glue (will differ from commercial manufacture)		
6	**(a)**		**Two** from: Recipe cards • Width of card allows it to be held in one hand • Ease of separating cards on pivot • Rounded edges comfortable to hold • Colour of font and/or size of font easy to read Oven glove • The size of the glove allows different size hands to use including 95th percentile • The shape of the glove allows thumb to slide in and achieve a comfortable fit • The glove is lightweight and easy to use • The hook is easy to hold and easy to use to hang the glove up	**4**	Answers need to relate to ease of use/ or ease of understanding/ comfort in use The size of product must be related to human use The size of a hand is not worthy of mark unless related to the size of product as this is anthropometrics not ergonomics

			Electronic thermometer • The width of the case is easy to hold in one hand • The buttons are easy to press when held in one hand • The battery is easy to access • The probe and case have rounded edges Cutlery tray • The compartments are suitable size for hand to reach in • The depth of compartments allows easy access to cutlery • Rounded corners and rounded trays comfortable to hold and move around Food Grater • Size is easy to use grater and handle width • Handle comfortable to hold when in use • No sharp edges on handle Recipe book/Tablet stand • Angled to make a book easier to read • Rounded edges make it comfortable to move around • Lightweight to carry and position		

Question			Answer	Mark	Guidance	
					Content	**Levels of response**
6	b*		Discussion could include: **Form follows function'** was a phrase often used to counteract the view that beauty was achieved by including additional decoration that didn't improve a product's function - form follows function means that the shape of a product should be based on its function or purpose Products are designed to suit the users' needs, work well, be easy to use and improve our lives when form follows function products can be easier to use/ more obvious how they function. Attractive products can be perceived to work better. If a products purpose is clear and straight forward it can be easier to use. Aesthetic judgment is subjective, but visual design elements can be combined in certain ways. Reference could be made to symmetry, proportion etc, styles, reference to colour schemes, material choice, texture and form. Examples should be given and can be from any material area and may use examples of both good and bad use of the form following function/ aesthetics of products to explain. Examples of designers or styles might be given to support response:	8	'Form follows function' Answers should relate to the importance of this principle when designing products **suitable for use in a kitchen**. As a guide for full marks there will be two or three examples of products or styles discussed. Answer should demonstrate an understanding of what importance aesthetics has and how this is applied to products in a kitchen and will include judgement of 'the importance'. At Level 3 candidates should be accessing all AO4 marks and at least three of the AO3 marks evaluating the importance of the principle. At Level 2 candidates could be accessing marks in a variety of ways. All AO4 marks: Examples only will gain a maximum of 3 marks. AO4 marks with limited attempt at evaluation (AO3) of the importance of the principle.	**Level 3 (6–8 marks)** The candidate will demonstrate an excellent understanding of what importance, form follows function and aesthetics has in design and how this is applied to products suitable for use in the kitchen. They will be able to discuss the importance of this principle convincingly, using examples of products to evaluate the importance. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated with the use of examples. **Level 2 (3–5 marks)** The candidate will demonstrate some understanding of what importance, form follows function and aesthetics has in design and how this is applied to products used in a kitchen. They will be able to discuss the importance of 'form follows function' principle using examples of products to provide some evaluation the importance. There is a line of reasoning presented with some structure. The information presented

			Form follows function' was a phrase often used to counteract the view that beauty was achieved by including additional decoration that didn't improve a product's function - form follows function means that the shape of a product should be based on its function or purpose, **Bauhaus**, influential in shaping an understanding of design and aesthetics. The design was integral to the production process rather than a visual add-on. Many chairs, tables, lamps used the form follows function principle. Many kitchen products are designed with this in mind. e.g. **Alessi** design. They use form follows function principle - the shape is often related to the functionality even though of many are quirky kitchen products popular inject fun and colour. **Anglepoise lamp** is another example practical function is of a primary concern over form. Others could include: • Umbrella • Paper Clip • Chairs • Angle poise lamps • Sport cap		A candidate operating at Level 1 will be accessing AO4 marks, but no AO3 marks. AO3 is analysis, compare, discuss this will be the relation between target market or designer and product/system AO4 is knowledge and understanding - 4 marks for use of examples 2 marks for showing understanding in depth.	is in the most-part relevant and supported by some evidence. **Level 1 (1–2 marks)** The candidate will give a basic answer showing limited understanding of what importance, form follows function and aesthetics has in the design of products. Any examples given may not be appropriate or relevant to use in a kitchen. Any attempt at an evaluation will be limited and not be worthy of credit. Information has some relevance and is presented with limited structure or detail. The information is supported by limited evidence. **Level 0 (0 marks)** No response or no response worthy of credit.

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