



Cambridge International AS & A Level

DESIGN & TECHNOLOGY

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Paper 1

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MARK SCHEME

Maximum Mark: 120

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **15** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Section A

Question	Answer	Marks	Guidance
1(a)	Polypropylene HDPS 0–2	2	Easy to work, Aesthetics (colour) Transparent Economically viable
1(b)(i)	Appropriate process described Details of appropriate tools, equipment Safety precaution 0–3 0–2 0–1	6	Hand techniques or CAM both acceptable Measured, marked, cut out external shape Glue or fold tabs, jig and assemble Ruler, pencil, scissors, guillotine, craft knife, jig Eye protection, hair tied back, fingers clear
1(b)(ii)	Appropriate process described Details of appropriate tools, equipment Safety precaution 0–3 0–2 0–1	6	Hand techniques or CAM both acceptable Material marked out, accuracy, detail of folds (1) Cut out (1) Use of template – placed over card (1) Ruler, pencil, scissors, guillotine, craft knife Eye protection, hair tied back, fingers clear, work clamped
1(c)	Net Drawn Quality of sketch 0–3 0–3	6	2D Net drawn (1) Double walls/tabs shown (1) Proportion (1) Poor line quality or limited detail (1) Good line work and detail (2) Accurate line work and fully detailed (3)

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Question	Answer	Marks	Guidance
2(a)	MDF, Plywood	0–2	2 AVOR
2(b)(i)	Appropriate process described Details of appropriate tools, equipment Safety precaution	0–3 0–2 0–1	6 Hand techniques or CAM both acceptable Measured and marked out (1) Cut out external/internal shape (1) File and sand (1) Ruler, pencil, band saw, guillotine, file, jig Eye protection, hair tied back, fingers clear, work clamped
2(b)(ii)	Appropriate process described Details of appropriate tools, equipment Safety precaution NB Dowel not accepted as wood is only 5 mm thick; too thin.	0–3 0–2 0–1	6 Measure and marked out, widths same – QC (1) Cut out sides and base (1) Finished, joined, jugged (1) Ruler, pencil, saw/band saw, files, pins, glue, jig Eye protection, hair tied back, fingers clear, work clamped
2(c)	Appropriate issues identified Clear and appropriate explanations of why issues/points are considered relevant	0–3 0–3	6

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Question	Answer	Marks	Guidance
3(a)	Two reasons	0–2	2 Ease of machining/working Cost effective Accepts a finish Readily available Tensile strength
3(b)(i)	Appropriate method of cutting and shaping described Details of appropriate tools, equipment Safety precaution	0–3 0–2 0–1	6 Measured and marked out centrally (1) Holes drilled (1) Filed smooth (1) Accept Milling machine and CAM Rule, scribe, sawing, filing, finishing, emery Eye protection, hair tied back, fingers clear, work clamped
3(b)(ii)	Appropriate method of cutting and shaping described Details of appropriate tools, equipment Safety precaution	0–3 0–2 0–1	6 Marked out accurately (incl. angle/curve) (1) Cut out (1) Filed smooth (1) Accept Milling machine and CAM Rule, scribe, sawing, filing, finishing, emery Eye protection, hair tied back, fingers clear, work clamped
3(c)	Appropriate method of case hardening described Details of appropriate tools, equipment Safety precautions	0–3 0–2 0–1	6 Heat steel (cherry red)/reheat (1) Plunged into case compound (high in carbon) (1) Plunge into cold, clean water (1) NB Case hardening hardens the surface of mild steel only. Brazing hearth, torch, compound, tongs Eye protection, hair tied back, fingers clear, gloves, work clamped

Section B

Question	Answer	Marks	Guidance
4(a)	Two reasons 0–2	2	Allows water to run off Aesthetic/Decorative Protect public from wind Doesn't allow water to build up on the roof
4(b)	Problem one identified [1] and described [1] Problem two identified [1] and described [1] e.g. Roof is too low down [1] so it is difficult to push the bicycle in [1] 0–4	4	Too low down to easily push bike in No visible means of securing bicycles No visible means of standing bicycle up Rain runs onto public, no guttering No signage No anchoring to ground No support for the roof Bikes difficult to remove when crowded AOVR
4(c)	Explanation of how problem one could be overcome [0–3] Explanation of how problem two could be overcome [0–3] e.g. Add a support [1] fixed to the roof [1] and secured to the ground [1] 0–6	6	Adding/altering to suit height, security, stand, guttering, signage and anchoring
4(d)(i)	Situation has been analysed and relevant issues/points identified 0–3	3	Avoid producing an unwanted product Avoid mistakes Ensure user happy Environmentally better – less waste Streamline production process Gains user support
4(d)(ii)	Clear and appropriate explanations of why issues/points are considered relevant 0–3	3	Ensuring the end user is happy will make them more likely to use/buy product in the future
4(d)(iii)	Specific examples/evidence used to support conclusions 0–2	2	Scale models CAD models/actual 3D models Car manufacture

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Question	Answer	Marks	Guidance
5(a)	Function of part X – Riser/support [1] to allow ease of use for Laptop for user [1] 0–2	2	Accept answers that relate to comfort/ease of use for user
5(b)	Problem one identified [1] and described [1] Problem two identified [1] and described [1] e.g. there are no side webs [1] to strengthen the product to support weight of laptop [1] 0–4	4	There is no side webs/strengthen sections Laptop will slide off – no ridge for it to rest against No slots to run power cable through
5(c)	Explanation of how problem one could be overcome [0–3] Explanation of how problem two could be overcome [0–3] e.g. side webs added [1] correctly shaped [1] fixed/glued in place [1] 0–6	6	Side webs added With slots or glue tabs Ridge added Slots for power cable added
5(d)(i)	Situation has been analysed and relevant issues/points identified 0–3	3	6 × Rs Marketing opportunity Aesthetic opportunity Could be costly in terms of energy in repatriation of used cardboard Environmentally friendly
5(d)(ii)	Clear and appropriate explanations of why issues/points are considered relevant 0–3	3	Environmentally friendly so that less new or virgin material is needed or required to be harvested
5(d)(iii)	Specific examples/evidence used to support conclusions 0–2	2	Seed pots made from recycled cardboard boxes

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Question	Answer	Marks	Guidance
6(a)	Function of part X – Tailstock [1] to hold a drill chuck [1] 0–2	2	Tail stock Support lengths of bar – dead centre/running centre Can hold drill chuck Taper can directly hold large drills/reamer
6(b)	Problem one identified [1] and described [1] Problem two identified [1] and described [1] e.g. No chuck guard [1] to protect the user from flying debris [1] 0–4	4	No on/off switch No Guard No chuck No carriage to carry • Tool post, compound slide, cross slide No means of connecting to the mains
6(c)	Explanation of how problem one could be overcome [0–3] Explanation of how problem two could be overcome [0–3] e.g. Chuck guard added [1] covering chuck [1] to protect user [1] 0–6	6	Add switches/coloured? Add Guard – around chuck Add chuck Add Carriage, tool post, compound/cross slide Add mains electric plug
6(d)(i)	Situation has been analysed and relevant issues/points identified 0–3	3	Accommodate different types of material Tougher/harder require slower speeds Softer, ductile can be machined at high speed
6(d)(ii)	Clear and appropriate explanations of why issues/points are considered relevant 0–3	3	Speed changes allow the lathe to accommodate different materials that may require faster or slower speeds depending on the toughness, size of process being carried out
6(d)(iii)	Specific examples/evidence used to support conclusions 0–2	2	Accommodate different tasks, screw cutting. Stainless Steel very tough Aluminium very soft

Section C

Question	Answer	Marks	Guidance
7(a)	<p>Clothes airer that allows racks to be used at the same time</p> <p>One pre-conceived idea presented 0–4</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to work but lacks some technical detail 5–8</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to technical detail to show that the proposed solution would clearly work 9–12</p> <p>Folds flat for storage must be included to access 10–12 marks</p> <p>Clarity and quality of sketching and explanatory notes 0–4</p> <p>Evaluation (reasons for selection) 0–4</p>	20	
7(b)	<p>Base</p> <p>One pre-conceived idea presented 0–4</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to work but lacks some technical detail 5–8</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to technical detail to show that the proposed solution would clearly work 9–12</p> <p>Folds flat for storage must be included to access 10–12 marks</p> <p>Clarity and quality of sketching and explanatory notes 0–4</p> <p>Evaluation (reasons for selection) 0–4</p>	20	

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Question	Answer	Marks	Guidance
7(c)	<p>Detachable Container</p> <p>One pre-conceived idea presented 0–4</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to work but lacks some technical detail 5–8</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to technical detail to show that the proposed solution would clearly work 9–12</p> <p>Easily attached/removed must be included to access</p> <p>10–12 marks</p> <p>Clarity and quality of sketching and explanatory notes 0–4</p> <p>Evaluation (reasons for selection) 0–4</p>	20	
7(d)	<p>The drawing will exhibit a reasonable standard of outcome and show some of the required design features 0–5</p> <p>OR The drawing will exhibit a good standard of outcome and show most of the design features required to make the product function as intended 6–9</p> <p>OR The drawing will be completed to a high standard of outcome and fully show the design features required to make the product function as intended 10–14</p> <p>Some use made of colour and tone to enhance the visual impact of the drawing 0–2</p> <p>OR Good use has been made of colour and tone to enhance the visual impact of the drawing 3–4</p> <p>OR Very good use has been made of colour, tone and material representation to enhance the visual impact of the drawing 5–6</p>	20	

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Question	Answer	Marks	Guidance
8(a)	<p>Pulling or pushing trolley</p> <p>One pre-conceived idea presented 0–4</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to work but lacks some technical detail 5–8</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to technical detail to show that the proposed solution would clearly work 9–12</p> <p>Method of steering must be included to access 10–12 marks</p> <p>Clarity and quality of sketching and explanatory notes 0–4</p> <p>Evaluation (reasons for selection) 0–4</p>	20	
8(b)	<p>Stopping straw bales falling off</p> <p>One pre-conceived idea presented 0–4</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to work but lacks some technical detail 5–8</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to technical detail to show that the proposed solution would clearly work 9–12</p> <p>Method for carrying 12 bakes must be included to access 10–12 marks</p> <p>Clarity and quality of sketching and explanatory notes 0–4</p> <p>Evaluation (reasons for selection) 0–4</p>	20	n

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Question	Answer	Marks	Guidance
8(c)	<p>Canopy</p> <p>One pre-conceived idea presented 0–4</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to work but lacks some technical detail 5–8</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to technical detail to show that the proposed solution would clearly work 9–12</p> <p>Method for removing canopy must be included to access 10–12 marks</p> <p>Clarity and quality of sketching and explanatory notes 0–4</p> <p>Evaluation (reasons for selection) 0–4</p>	20	
8(d)	<p>The drawing will exhibit a reasonable standard of outcome and show some of the required design features 0–5</p> <p>OR The drawing will exhibit a good standard of outcome and show most of the design features required to make the product function as intended 6–9</p> <p>OR The drawing will be completed to a high standard of outcome and fully show the design features required to make the product function as intended 10–14</p> <p>Some use made of colour and tone to enhance the visual impact of the drawing 0–2</p> <p>OR Good use has been made of colour and tone to enhance the visual impact of the drawing 3–4</p> <p>OR Very good use has been made of colour, tone and material representation to enhance the visual impact of the drawing 5–6</p>	20	

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Question	Answer	Marks	Guidance
9(a)	<p>Cardboard box</p> <p>One pre-conceived idea presented 0–4</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to work but lacks some technical detail 5–8</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to technical detail to show that the proposed solution would clearly work 9–12</p> <p>Method of opening and securely closing box must be included to access 10–12 marks</p> <p>Clarity and quality of sketching and explanatory notes 0–4</p> <p>Evaluation (reasons for selection) 0–4</p>	20	
9(b)	<p>Lettering and detailed graphics</p> <p>One pre-conceived idea presented 0–4</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to work but lacks some technical detail 5–8</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to technical detail to show that the proposed solution would clearly work 9–12</p> <p>Lettering must be in a style that reflects product to access 10–12 marks</p> <p>Clarity and quality of sketching and explanatory notes 0–4</p> <p>Evaluation (reasons for selection) 0–4</p>	20	

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Question	Answer	Marks	Guidance
9(c)	<p>Insert</p> <p>One pre-conceived idea presented 0–4</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to work but lacks some technical detail 5–8</p> <p>OR The development and selection of a range of ideas into a single design proposal which would appear to technical detail to show that the proposed solution would clearly work 9–12</p> <p>Method to prevent movement must be included to access 10–12 marks</p> <p>Clarity and quality of sketching and explanatory notes 0–4</p> <p>Evaluation (reasons for selection) 0–4</p>	20	
9(d)	<p>The drawing will exhibit a reasonable standard of outcome and show some of the required design features 0–5</p> <p>OR The drawing will exhibit a good standard of outcome and show most of the design features required to make the product function as intended 6–9</p> <p>OR The drawing will be completed to a high standard of outcome and fully show the design features required to make the product function as intended 10–14</p> <p>Some use made of colour and tone to enhance the visual impact of the drawing 0–2</p> <p>OR Good use has been made of colour and tone to enhance the visual impact of the drawing 3–4</p> <p>OR Very good use has been made of colour, tone and material representation to enhance the visual impact of the drawing 5–6</p>	20	