

# Cambridge International AS & A Level

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**DESIGN AND TECHNOLOGY**

**9705/12**

Paper 1 Written

**May/June 2024**

MARK SCHEME

Maximum Mark: 120

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**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.

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This document consists of **16** 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 descriptions 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)	Exemplar answers: Does not require a finish [1] Provides an attractive appearance [1] <p style="text-align: right;"><b>0–2</b></p>	<b>2</b>	AOVR Rust resistant [1] Hard/tough [1] Can be easily bent to shape [1]
1(b)(i)	Notes and/or sketches show:  Process of cutting the threads explained [0–3] Tools and equipment for cutting the internal thread e.g. vice, drill, tap, lubricant... [0–2] Safety precaution when cutting threads e.g. wear eye protection, work secured in a vice... [0–1] <p style="text-align: right;"><b>0–6</b></p>	<b>6</b>	
1(b)(ii)	Notes and/or sketches show:  Process of preparing and applying the finish explained [0–3] Tools and equipment for preparing the surface e.g. wire brush, emery cloth and adding a named finish e.g. paint, brush, thinners... [0–2] Safety precaution when preparing or applying a finish e.g. work in a well-ventilated area, wear a face mask... [0–1] <p style="text-align: right;"><b>0–6</b></p>	<b>6</b>	
1 (c)	Notes and/or sketches show: Process of turning explained [0–3] Tools and equipment for preparing and turning the beech base e.g. tenon saw, faceplate, woodscrews, screwdriver and for turning the base e.g. lathe, lathe tools, glasspaper... [0–2] Safety precaution when turning wood e.g. make sure the work spins freely before turning on the lathe, wear eye protection... [0–1] <p style="text-align: right;"><b>0–6</b></p>	<b>6</b>	

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
2(a)	Exemplar answers: Provides a rigid surface [1] Available in large sheets [1].  <b>0–2</b>	<b>2</b>	AOVR Provides a smooth surface [1] Surface can be cut, painted, or parts glued to it [1] Can easily be cut to shape [1]
2(b)	Notes and/or sketches show: Process of making the Styrofoam block explained [0–3] Tools and equipment for cutting Styrofoam e.g. bandsaw, and suitable named adhesive, double-sided tape, means of applying pressure to build size of block [0–2] Safety precaution when working with Styrofoam e.g. wear eye protection, work in a well-ventilated area [0–1]  <b>0–6</b>	<b>6</b>	Please note: Layers of Styrofoam must be joined together to make this block.
2(c)(i)	Notes and/or sketches show: Process of making the stickers explained [0–3] Tools and equipment for making the stickers e.g. computer, printer, drawing using a stencil and for cutting out the stickers e.g. plotter cutter, craft knife, cutting mat, safety rule [0–2] Safety precaution when making the stickers e.g. keep fingers behind the craft knife blade, use a safety rule [0–1]  <b>0–6</b>	<b>6</b>	Answers are likely to use a combination of CAD/CAM and hand production methods.
2(c)(ii)	Notes and/or sketches show: Process of applying the stickers explained [0–3] Tools and equipment for attaching the stickers e.g. use of self-adhesive sheet, appropriate adhesive and for spacing the stickers e.g. rule, guide [0–2] Safety precaution when attaching the stickers e.g. wipe off excess adhesive [0–1]  <b>0–6</b>	<b>6</b>	

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
3(a)	Exemplar answers: Lightweight [1] Does not require a finish [1]  <b>0–2</b>	<b>2</b>	AOVR Attractive appearance [1] Good strength to weight ratio [1] Will not rust [1] Easy to machine [1]
3(b)(i)	Notes and/or sketches show: Process of preparing and turning explained (must include parallel and taper turning for full marks) [0–3] Tools and equipment for preparing the aluminium rod e.g. marking out and then turning the aluminium rod e.g. centre lathe, lathe tools [0–2] Safety precaution when using a centre lathe e.g. make sure the work spins freely before turning on the lathe, wear eye protection... [1] <b>0–6</b>	<b>6</b>	
3(b)(ii)	Notes and/or sketches show: Process of temporarily joining explained [0–3] Tools and equipment for preparing the acrylic sheet e.g. pillar drill, HSS drill bit and the aluminium rod e.g. lathe, die for threading, lubricant [0–2] Safety precaution when working with aluminium and acrylic e.g. wear eye protection, make sure the work is held firmly when working on it [0–1] <b>0–6</b>	<b>6</b>	
3(c)	Sketches and/or notes show: Explanation of the process of generating electricity [0–3] Generator or magnets and coil [0–2] Rotary motion of the rotor blade [0–1] <b>0–6</b>	<b>6</b>	

**Section B**

Question	Answer	Marks	Guidance
4(a)	Feature X is designed to secure the posts of the sail [1] to the ground [1] <b>0–2</b>	<b>2</b>	
4(b)	Problem one identified [1] and described [1] Problem two identified [1] and described [1] e.g. mild steel bar too heavy [1] and will rust [1] <b>0–4</b>	<b>4</b>	Other acceptable answers include: <ul style="list-style-type: none"> <li>• tensioning system would not work [1] as no means of adjusting [1]</li> <li>• no horizontal pieces [1] so frame not rigid [1]</li> <li>• no means of fastening the rope [1] to the posts [1]</li> <li>• No side panels [1]</li> </ul>
4(c)	Explanation of how problem one could be overcome [0–3] Explanation of how problem two could be overcome [0–3] e.g. replace the mild steel bar [1] with $\varnothing 50$ [1] aluminium tube [1] <b>0–6</b>	<b>6</b>	<ul style="list-style-type: none"> <li>• add an internal thread [1] and an external thread [1] to the tensioning system for adjustment [1]</li> <li>• add horizontal pieces [1] at the top [1] to join the posts together and make a rigid frame [1]</li> <li>• add a hook [1] to the posts so that the rope can be tied onto them [1] and not slide down [1]</li> </ul>
4(d)(i)	Situation has been analysed and relevant issues/points identified Benefits of assembled by the customer e.g. easier to transport [1], minor adjustments can be made on site [1], ensures the product is installed correctly [1] <b>0–3</b>	<b>3</b>	
4(d)(ii)	Clear and appropriate explanations of why issues/points are considered relevant e.g. transporting bulky items is expensive [1], minor adjustments can be made during installation to accommodate site variations [1], trained professionals will install the product correctly and have the correct qualifications [1] <b>0–3</b>	<b>3</b>	
4(d)(iii)	Specific examples/evidence used to support conclusions e.g. outside electric lighting is usually installed by qualified electricians [1], school play equipment is usually installed by the manufacture to validate the warranty [1] <b>0–2</b>	<b>2</b>	

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
5(a)	Feature X is a barcode [1] that stores information about the product and can be read by a scanner [1] <b>0–2</b>	<b>2</b>	
5(b)	Problem one identified [1] and described [1] Problem two identified [1] and described [1] e.g. sizes of development (net) too large [1] to be made from an A3 sheet of card [1] <b>0–4</b>	<b>4</b>	Other acceptable answers include: <ul style="list-style-type: none"> <li>graphics – my protein bar wrong way up, limited graphics on bar and point – sale display...</li> <li>design of development (net) – top has no side flaps, top does not have a fold line, some fold lines incorrect...</li> <li>laminated card difficult to recycle.</li> </ul>
5(c)	Explanation of how problem one could be overcome [0–3] Explanation of how problem two could be overcome [0–3] e.g. rotate the top through 90 degrees [1] so that it joins onto the side and reduces [1] the overall size of the development (net) to 280mm x 380mm [1] <b>0–6</b>	<b>6</b>	Other acceptable problems include: <ul style="list-style-type: none"> <li>name of the bar [1] on the development (net) [1] needs to be rotated through 180 degrees [1]</li> <li>all fold lines [1] should be shown with dashed lines, [1] rather than solid lines [1]</li> <li>change the material [1] to card [1] so that it can easily be recycled [1]</li> </ul>
5(d)(i)	Situation has been analysed and relevant issues/points identified e.g. designing and printing packaging are specialist processes [1] packaging can be transported flat pack to the factory where it is filled [1] packaging can be ordered and reordered as required (JIT) [1] <b>0–3</b>	<b>3</b>	
5(d)(ii)	Clear and appropriate explanations of why issues/points are considered relevant. e.g. packaging will be more professional and economical if produced by specialist companies [1], transportation of bulky items is expensive, so flat-pack items will reduce costs [1], no need to store large amounts of packaging which will take up space and may get damaged [1] <b>0–3</b>	<b>3</b>	



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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
5(d)(iii)	Specific examples/evidence used to support conclusions e.g. food packaging is usually flat pack to reduce space taken up in the shop [1], some packaging comes in standard sizes, for example corrugated card packaging for refrigerators, but can then have specific print added to individual manufacturers requirements [1] <b>0–2</b>	<b>2</b>	
6(a)	Feature X is a pivot [1] that allows the handle to push the piston down [1] <b>0–2</b>	<b>2</b>	
6(b)	Problem one identified [1] and described [1] Problem two identified [1] and described [1] e.g. no seals [1] on the pistons [1] <b>0–4</b>	<b>4</b>	Other acceptable problems include: <ul style="list-style-type: none"> <li>• one-way valves missing [1] so would not work [1]</li> <li>• handle too short [1] so difficult to operate [1]</li> <li>• should be oil [1] not water in the system [1]</li> </ul>
6(c)	Explanation of how problem one could be overcome [0–3] Explanation of how problem two could be overcome [0–3] e.g. add seals [1] between the piston and the cylinder [1] to prevent the hydraulic liquid escaping [1] <b>0–6</b>	<b>6</b>	Other acceptable problems include: <ul style="list-style-type: none"> <li>• add one-way valves [1] to prevent the hydraulic liquid flowing back [1] when under pressure [1]</li> <li>• extend [1] the handle [1] so that there is more leverage [1]</li> <li>• replace the water [1] with oil [1] as it will not cause the parts of hydraulic lift to rust [1]</li> </ul>
6(d)(i)	Situation has been analysed and relevant issues/points identified e.g. over time parts can become worn and need replacing [1], regular testing ensures product continues to function as intended [1] regular testing provides safety certificates [1] <b>0–3</b>	<b>3</b>	
6(d)(ii)	Clear and appropriate explanations of why issues/points are considered relevant e.g. if parts become worn and need replacing the product may be dangerous to use [1] important that the product continues to perform as intended or it may become dangerous [1], legal safety certificates offer a degree of protection to the owner if someone is injured [1] <b>0–3</b>	<b>3</b>	

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
6(d)(iii)	Specific examples/evidence used to support conclusions e.g. portable electrical products should have a PAT test every two years [1], passenger carrying lifts should be tested every six months [1] <b>0–2</b>	<b>2</b>	

**PUBLISHED****Section C**

Question	Answer	Marks	Guidance
7(a)	<p><b>Flat-pack toy storage</b></p> <p>One pre-conceived idea presented <b>0–4</b></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 <b>5–8</b></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 <b>9–12</b></p> <p><b>Fully opening surface included to access 10–12 marks</b></p> <p>Clarity and quality of sketching and explanatory notes <b>0–4</b></p> <p>Evaluation (reasons for selection) <b>0–4</b></p>	<b>20</b>	
7(b)	<p><b>Device prevents accidental closure of opening surface</b></p> <p>One pre-conceived idea presented <b>0–4</b></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 <b>5–8</b></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 <b>9–12</b></p> <p><b>Must be able to be fixed in open position 10–12 marks</b></p> <p>Clarity and quality of sketching and explanatory notes <b>0–4</b></p> <p>Evaluation (reasons for selection) <b>0–4</b></p>	<b>20</b>	

**PUBLISHED**

Question	Answer	Marks	Guidance
7(c)	<p><b>Accessory allows toy storage to be personalised</b></p> <p>One pre-conceived idea presented <b>0–4</b></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 <b>5–8</b></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 <b>9–12</b></p> <p><b>Must be personalised using an accessory, such as a stencil, to access 10–12 marks</b></p> <p>Clarity and quality of sketching and explanatory notes <b>0–4</b></p> <p>Evaluation (reasons for selection) <b>0–4</b></p>	<b>20</b>	
7(d)	<p>The drawing will exhibit a reasonable standard of outcome and show some of the required design features <b>0–5</b></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 <b>6–9</b></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 <b>10–14</b></p> <p>Some use made of colour and tone to enhance the visual impact of the drawing <b>0–2</b></p> <p>OR Good use has been made of colour and tone to enhance the visual impact of the drawing <b>3–4</b></p> <p>OR Very good use has been made of colour, tone and material representation to enhance the visual impact of the drawing <b>5–6</b></p>	<b>20</b>	

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Question	Answer	Marks	Guidance
8(a)	<p><b>Design for a vacuum formed tray to hold the bottle</b></p> <p>One pre-conceived idea presented <b>0–4</b></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 <b>5–8</b></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 <b>9–12</b></p> <p><b>Tray must also hold the card to access 10–12 marks</b></p> <p>Clarity and quality of sketching and explanatory notes <b>0–4</b></p> <p>Evaluation (reasons for selection) <b>0–4</b></p>	<b>20</b>	
8(b)	<p><b>One-piece development (net) for the tray designed in (a)</b></p> <p>One pre-conceived idea presented <b>0–4</b></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 <b>5–8</b></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 <b>9–12</b></p> <p><b>Bottle and card must be visible when package is closed to access 10–12 marks</b></p> <p>Clarity and quality of sketching and explanatory notes <b>0–4</b></p> <p>Evaluation (reasons for selection) <b>0–4</b></p>	<b>20</b>	

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Question	Answer	Marks	Guidance
8(c)	<p><b>Appropriate name and colour scheme</b></p> <p>One pre-conceived idea presented <b>0–4</b></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 <b>5–8</b></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 <b>9–12</b></p> <p><b>Must link to good health to access 10–12 marks</b></p> <p>Clarity and quality of sketching and explanatory notes <b>0–4</b></p> <p>Evaluation (reasons for selection) <b>0–4</b></p>	<b>20</b>	
8(d)	<p>The drawing will exhibit a reasonable standard of outcome and show some of the required design features <b>0–5</b></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 <b>6–9</b></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 <b>10–14</b></p> <p>Some use made of colour and tone to enhance the visual impact of the drawing <b>0–2</b></p> <p>OR Good use has been made of colour and tone to enhance the visual impact of the drawing <b>3–4</b></p> <p>OR Very good use has been made of colour, tone and material representation to enhance the visual impact of the drawing <b>5–6</b></p>	<b>20</b>	

**PUBLISHED**

Question	Answer	Marks	Guidance
9(a)	<p><b>Device removes individual tablets from the blister pack</b></p> <p>One pre-conceived idea presented <b>0–4</b></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 <b>5–8</b></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 <b>9–12</b></p> <p><b>Designed for use by a person with limited hand movement must be considered to access 10–12 marks</b></p> <p>Clarity and quality of sketching and explanatory notes <b>0–4</b></p> <p>Evaluation (reasons for selection) <b>0–4</b></p>	<b>20</b>	
9(b)	<p><b>An attachment for the device designed in part (a)</b></p> <p>One pre-conceived idea presented <b>0–4</b></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 <b>5–8</b></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 <b>9–12</b></p> <p><b>Must guide a tablet to a compartment to access 10–12 marks</b></p> <p>Clarity and quality of sketching and explanatory notes <b>0–4</b></p> <p>Evaluation (reasons for selection) <b>0–4</b></p>	<b>20</b>	

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Question	Answer	Marks	Guidance
9(c)	<p><b>Allows the device to be easily located</b></p> <p>One pre-conceived idea presented <b>0–4</b></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 <b>5–8</b></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 <b>9–12</b></p> <p><b>Must attract attention 10–12 marks</b></p> <p>Clarity and quality of sketching and explanatory notes <b>0–4</b></p> <p>Evaluation (reasons for selection) <b>0–4</b></p>	<b>20</b>	
9(d)	<p>The drawing will exhibit a reasonable standard of outcome and show some of the required design features <b>0–5</b></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 <b>6–9</b></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 <b>10–14</b></p> <p>Some use made of colour and tone to enhance the visual impact of the drawing <b>0–2</b></p> <p>OR Good use has been made of colour and tone to enhance the visual impact of the drawing <b>3–4</b></p> <p>OR Very good use has been made of colour, tone and material representation to enhance the visual impact of the drawing <b>5–6</b></p>	<b>20</b>	