



# Cambridge International A Level

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DESIGN & TECHNOLOGY

9705/33

Paper 3

October/November 2022

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.

Cambridge International is publishing the mark schemes for the October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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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 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.

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Question	Answer	Marks	Guidance
<b>Section A</b>			
<b>Part A – Product Design</b>			
1	<p>Discussion could include:</p> <ul style="list-style-type: none"> <li>• ecological considerations</li> <li>• social considerations</li> <li>• revolutionary/radical design</li> <li>• cost implications</li> <li>• impact on consumer/manufacturer</li> </ul> <p>examples/evidence could be</p> <ul style="list-style-type: none"> <li>• specific ecological considerations</li> <li>• specific social considerations</li> <li>• revolutionary products</li> </ul> <p>examination of issues</p> <ul style="list-style-type: none"> <li>• wide range of relevant issues           4–8</li> <li>• limited range                               0–3</li> </ul> <p>quality of explanation</p> <ul style="list-style-type: none"> <li>• logical, structured                       4–8</li> <li>• limited detail,                             0–3</li> </ul> <p>supporting examples / evidence           4</p>	<b>20</b>	





Question	Answer	Marks	Guidance
3(b)	brazing <ul style="list-style-type: none"> <li>– very strong joint</li> <li>– easy process to produce a good joint</li> <li>– gives better joint finish than welding</li> </ul> rotational moulding <ul style="list-style-type: none"> <li>– suitable for large hollow shapes</li> <li>– high quality finish, range of colours</li> <li>– minimal finish required and low wastage</li> </ul> bridle joint <ul style="list-style-type: none"> <li>– mechanically strong joint</li> <li>– lots of gluing area</li> <li>– attractive feature</li> </ul> 2 × 3	<b>6</b>	<i>Accept other valid explanations, brief outline points max 3</i>

Question	Answer	Marks	Guidance
<b>Part B – Practical Technology</b>			
4(a)(i)	AC – alternating current changes direction <b>1</b>	<b>1</b>	
4(a)(ii)	DC – direct current one direction only <b>1</b>	<b>1</b>	
4(b)(i)	$I = V/R$ <b>1</b> 6/36 <b>1</b> 0.16 (160 mA) <b>1</b>	<b>3</b>	
4(b)(ii)	$V = I \times R$ <b>1</b> $= 0.16 \times 20$ <b>1</b> $= 3.2 \text{ v}$ <b>1</b>	<b>3</b>	

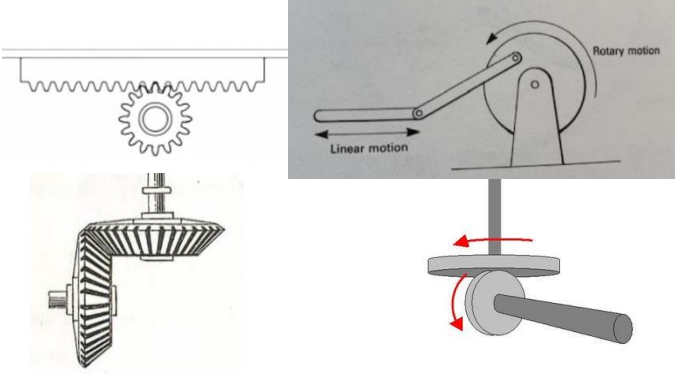
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Question	Answer	Marks	Guidance
4(c)	<p>Explanation could include:</p> <p><b>pneumatics</b></p> <p>benefits</p> <ul style="list-style-type: none"> <li>– air relatively cheap</li> <li>– reduced safety hazards</li> <li>– cost effective system</li> <li>– clean operation, less plumbing the hydraulics</li> </ul> <p>drawbacks</p> <ul style="list-style-type: none"> <li>– not exact force</li> <li>– can freeze up</li> <li>– can be noisy in operation</li> </ul> <p><b>hydraulics</b></p> <p>benefits</p> <ul style="list-style-type: none"> <li>– efficient and accurate</li> <li>– constant force applied, no compression</li> <li>– more power than pneumatic</li> </ul> <p>drawbacks</p> <ul style="list-style-type: none"> <li>– leaks, can be messy</li> <li>– fluids can be hazardous</li> <li>– more maintenance required than pneumatics</li> </ul>	<b>12</b>	<p>quality of explanation:</p> <ul style="list-style-type: none"> <li>• logical, detailed and structured 8–12</li> <li>• some detail and structured 4–7</li> <li>• limited detail, 0–3</li> </ul> <p>Must include benefits and drawbacks of bot pneumatics and hydraulics to achieve full marks</p>



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Question	Answer	Marks	Guidance
5(a)	<p>Examples could be</p> <p>corrosion resistance – aluminium cladding, gold jewellery, copper pipes</p> <p>thermal conductivity – soldering iron tip, copper pans</p> <p>ductility – copper wiring</p> <p>brittleness – high carbon steel file, safety glass</p> <p>for each: example <span style="float: right;">1 × 4</span></p> <p>quality of explanation:</p> <ul style="list-style-type: none"> <li>• detailed, structured <span style="float: right;">2–3</span></li> <li>• limited detail, <span style="float: right;">0–1</span> <span style="float: right;">3 × 4</span></li> </ul>	<b>16</b>	<p><u>corrosion resistance</u> <i>the resistance a material offers against a reaction with adverse elements that can corrode the material. Materials have different corrosion resistance rates. Treatments can be used to resist corrosion.</i></p> <p><u>thermal conductivity</u> <i>is a measure of how well a material conducts energy when it is heated.</i></p> <p><u>ductility</u> <i>the ability of a material to be stretched or shaped without breaking</i></p> <p><u>brittleness</u> <i>having hardness and rigidity but little tensile strength; breaks easily</i></p>
5(b)	<p>Example could be:</p> <ul style="list-style-type: none"> <li>• concrete with steel reinforcing rods</li> <li>• polyester resin reinforced with fibre glass or carbon fibre</li> </ul> <p>example <span style="float: right;">1</span></p> <p>quality of description and communication:</p> <ul style="list-style-type: none"> <li>• detailed, structured <span style="float: right;">2–3</span></li> <li>• limited detail, <span style="float: right;">0–1</span></li> </ul>	<b>4</b>	

Question	Answer	Marks	Guidance
6(a)	Rotation of <b>D</b> clockwise 1	1	
6(b)	Gear ratio <b>A B</b> 3:4 <b>C D</b> 3:1    1  $\frac{3}{4} \times \frac{6}{2} = \frac{18}{8}$ 1  = 2.25:1    1	3	
6(c)	method could be: rack and pinion example – moving drill head on drilling machine slider and crank example – steam engine  method could be: bevel gears example – hand drill circular friction plates example – toy  quality of description: • detailed, structured    3–4 • limited detail,    0–2    2 × 4  quality of sketching    up to 2	10	 <p>The diagrams illustrate various mechanical motion conversions. On the left, a rack and pinion mechanism is shown with a gear meshing with a rack. Below it is a 3D perspective drawing of a bevel gear. On the right, a slider-crank mechanism is shown with a crank rotating and a slider moving linearly. Labels 'Rotary motion' and 'Linear motion' are present. Red arrows indicate the direction of motion for the slider and crank.</p>

Question	Answer	Marks	Guidance
6(d)	Explanation could include: <ul style="list-style-type: none"> <li>• high quality components/materials</li> <li>• high quality/ correct assembly</li> <li>• lubrication if appropriate</li> <li>• maintenance checks</li> </ul> quality of explanation: <ul style="list-style-type: none"> <li>• fully detailed, structured      5–6</li> <li>• some relevant detail              3–4</li> <li>• limited detail,                        0–2</li> </ul>	<b>6</b>	

Question	Answer	Marks	Guidance										
<b>Part C – Graphic Products</b>													
7(a)	See Appendix 1. <table style="width: 100%; border: none;"> <tr> <td style="padding-left: 20px;">scale</td> <td style="text-align: right; padding-right: 20px;">1</td> </tr> <tr> <td style="padding-left: 20px;">correct 2 point</td> <td style="text-align: right; padding-right: 20px;">1</td> </tr> <tr> <td style="padding-left: 20px;">detail</td> <td style="text-align: right; padding-right: 20px;">4</td> </tr> <tr> <td style="padding-left: 20px;">overall line quality</td> <td style="text-align: right; padding-right: 20px;">2</td> </tr> <tr> <td style="padding-left: 20px;">render</td> <td style="text-align: right; padding-right: 20px;">2</td> </tr> </table>	scale	1	correct 2 point	1	detail	4	overall line quality	2	render	2	<b>10</b>	<i>Incorrect drawing type maximum 5 marks</i>
scale	1												
correct 2 point	1												
detail	4												
overall line quality	2												
render	2												

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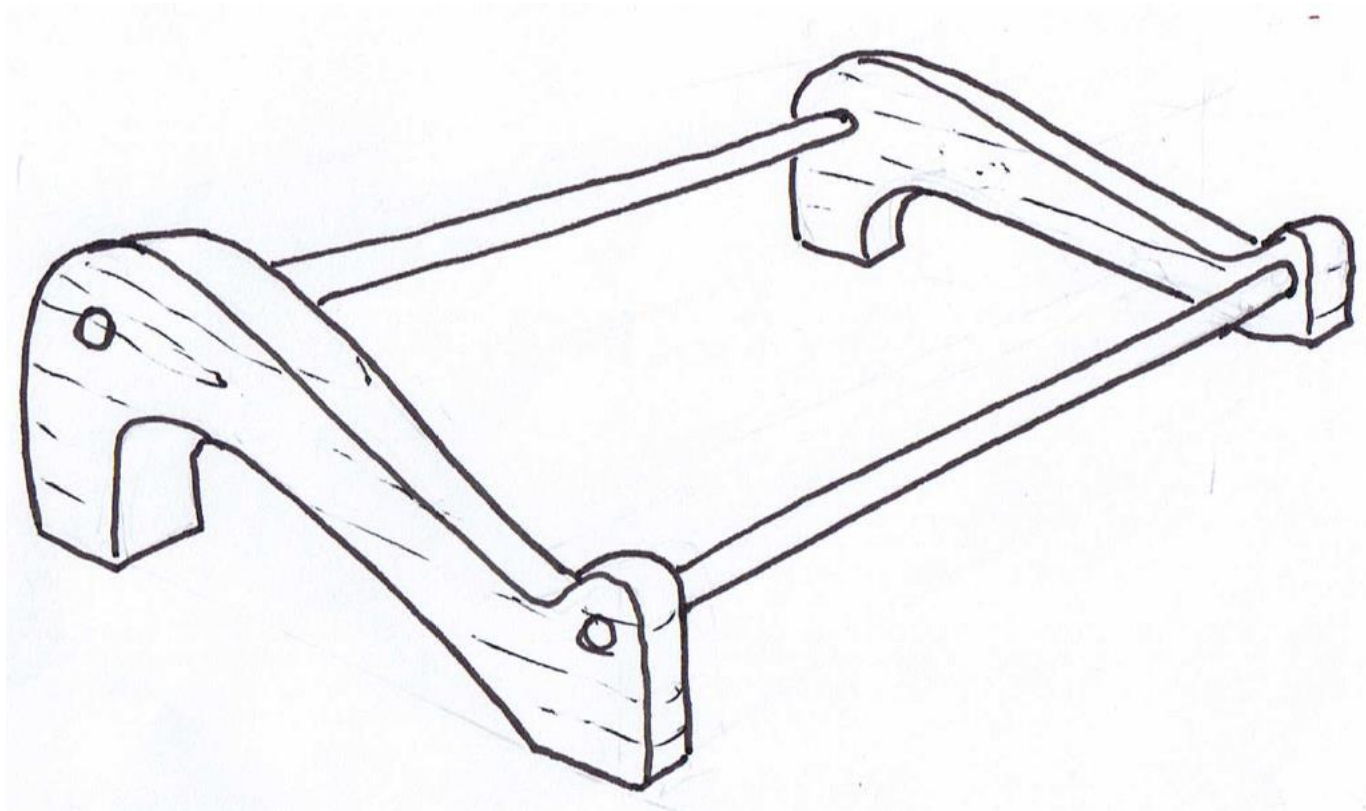
Question	Answer	Marks	Guidance
7(b)	<p>Explanation could include:</p> <ul style="list-style-type: none"> <li>• security issues</li> <li>• stability</li> <li>• user interaction</li> <li>• space for information/advertising</li> </ul> <p>quality of explanation:</p> <ul style="list-style-type: none"> <li>• fully detailed, structured      6–8</li> <li>• some relevant detail            3–5</li> <li>• limited detail,                      0–2</li> </ul> <p>Quality of sketching                      up to 2</p>	<b>10</b>	
8	<p>Discussion could include:</p> <ul style="list-style-type: none"> <li>• aesthetic features</li> <li>• costs involved</li> <li>• processes available</li> <li>• customer preferences/market research</li> </ul> <p>examples/evidence could be</p> <ul style="list-style-type: none"> <li>• specific product examples</li> <li>• specific cost implications</li> <li>• specific processes</li> </ul> <p>examination of issues</p> <ul style="list-style-type: none"> <li>• wide range of relevant issues      4–8</li> <li>• limited range                          0–3</li> </ul> <p>quality of explanation</p> <ul style="list-style-type: none"> <li>• logical, structured                  4–8</li> <li>• limited detail,                        0–3</li> </ul> <p>supporting examples / evidence      4</p>	<b>20</b>	

Question	Answer	Marks	Guidance
9(a)	See Appendix 2.  given elevation                    2 end elevation                        2 correct projection                    2 plan                                        4 scale/accuracy                        2	<b>12</b>	
9(b)	development  construction                        3 slots                                        3 accuracy                                2	<b>8</b>	

Question	Answer	Marks	Guidance
<b>Section B</b>			
10, 11 and 12	<p><b>Analysis</b> Analysis of the given situation/problem. [0–5] Detailed written specification of the design requirements. At least five specification points other than those given in the question. [0–5]</p> <p><b>Exploration</b> <i>B – Bold sketches and brief notes to show exploration of ideas for a design solution, with reasons for selection.</i> range of ideas [0–5] annotation related to specification [0–5] marketability, innovation [0–5] evaluation of ideas, selection leading to development [0–5] communication [0–5]</p> <p><b>Development</b> <i>Bold sketches and notes showing the development, reasoning and composition of ideas into a single design proposal. Details of materials, constructional and other relevant technical details.</i> development [0–5] reasoning [0–5] materials [0–3] constructional detail [0–7] communication [0–5]</p> <p><b>Proposed solution</b> <i>Produce drawing/s of an appropriate kind to show the complete solution.</i> proposed solution [0–10] details/dimensions [0–5]</p> <p><b>Evaluation</b> Written evaluation of the final design solution. [0–5]</p>	80	

**Appendix 1**  
**Question 7(a)**

scale	1	
correct 2 point	1	
detail	4	
overall line quality	2	
render	2	<b>[10]</b>



**Appendix 2 Q9**

- |            |                    |             |
|------------|--------------------|-------------|
| <b>(a)</b> | given elevation    | 2           |
|            | end elevation      | 2           |
|            | correct projection | 2           |
|            | plan               | 4           |
|            | scale/accuracy     | 2           |
| <b>(b)</b> | development        | 3           |
|            | construction       | 3           |
|            | slots              | 2           |
|            | accuracy           | 2           |
|            |                    | <b>[20]</b> |

