Cambridge Assessment International Education

Cambridge IGCSE™

DESIGN AND TECHNOLOGY **0445/13**

Paper 1 Product Design **May/June 2023**

MARK SCHEME

Maximum Mark: 50

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 May/June 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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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.

Performance description tables
Each question contains some marks which are awarded using the following performance description tables.

Part (c)

Communication of ideas	
Mark	**Performance description**
5–6	Ideas are communicated with precision and clarity through the use of accurate drawings and reasoned annotations linked to most of the requirements.
3–4	Ideas are displayed with some clarity through clear drawings supported by annotations referring to some of the requirements.
1–2	Simple drawings and limited annotations show little understanding of the requirements.
0	No creditable response.

Suitable designs	
Mark	**Performance description**
5–6	Creative solutions which fully meet the requirements. Designs showing most aspects of construction detail.
3–4	Sensible solutions that mostly meet the requirements. Designs with moderate construction detail.
1–2	Solutions do not meet many of the requirements. Simplistic designs with little construction detail.
0	No creditable response

Part (e)				
Quality of drawing			**Construction details**	
Mark	**Performance description**		**Mark**	**Performance Description**
4	High standard of line quality, use of colour and proportions. Appropriate techniques used that show clearly all detail.		5–6	All construction detail clear with good annotations and/or additional detail drawings as necessary.
2–3	Good line quality, use of colour and proportions. Most of the detail presented.		3–4	Most construction may be obvious from overall views or with some annotation.
1	Poor line quality and proportions. Little detail presented.		1–2	A simplistic design; little or no detail of construction used.
0	No creditable response.		0	No creditable response.

Guidance on using the performance description tables

Marking should be positive, rewarding achievement where possible but clearly differentiating across the whole range of marks available.
In approaching the assessment process, examiners should look at the work and then make a 'best fit' judgement as to which level statement it fits.
In practice the work does not always match one level statement precisely so a judgement may need to be made between two or more level statements.

Once a 'best fit' level statement has been identified the following guide should be used to decide on a specific mark:

- Where the candidate's work **convincingly** meets the level statement, the highest mark should be awarded
- Where the candidate's work **adequately** meets the level statement, the most appropriate mark in the middle of the range should be awarded
- Where the candidate's work **just** meets the level statement, the lowest mark should be awarded.

Candidates answer **one** question, **either** 1 **or** 2 **or** 3.

Question	Answer	Marks	Guidance
1(a)	Accept any **four** additional specification points – ease of lifting onto the storage unit, prevents damage to the bike, method of fixture to the wall, parts of the bike not causing an obstruction, easily cleaned, adaptable for different bike size, able to be fixed to a wall using common tools, prevention of damage to the room, fits with the decoration of the apartment [1 × 4]	**4**	Each specification point – 1 mark No repeats from question – store bicycle in an apartment, mounted off the floor, maximise space... Only accept unqualified or one/two-word answers if relevant to this specific design problem such as self-assembly/flat packed, durable, aesthetic, stable, lightweight, ... Do **not** accept generic one-word answers such as safe, nice, strong, cheap, waterproof, weatherproof, recycled ... Any other valid response
1(b)	Accept drawings of any **two** methods of supporting items - shaped hooks, shelf, brackets, sticky pads, magnets, nails, cradle, frame holders, glue, blue tack, tape, pullies. [2 × 2] The question asks for methods of mounting **items** off the floor, **not** a bicycle. Accept methods that touch the floor, but the item is raised.	**4**	Maximum of 2 marks for each method: Clear drawing of an appropriate method – 1 mark Notes describe or name an appropriate method – 1 mark Any other valid response
1(c)	Any **three** suitable ideas. Award up to **6 marks for communication of ideas** using the 'Communication of ideas' table. Award up to **6 marks for suitable designs** using the 'Suitable designs' table. For 6 marks the design/s must be mounted off the floor and for a bicycle.	**12**	At least **three different** ideas for maximum marks. Pro rata if fewer.

Question	Answer	Marks	Guidance
1(d)	Award up to **6 marks for evaluation** of the ideas: Evaluation [2 × 3] e.g. Advantage + disadvantage explained for each idea Selection [1] Justification[1]	**8**	Simple repeats of same points for each idea not rewarded. Specific not generic justification. Award maximum marks if only either advantage or disadvantage given for each as long as includes sophisticated reasoning.
1(e)	Award up to **4 marks for quality of drawing** using the 'Quality of drawing' table. Award up to **2 marks for dimensions:** 2 or 3 overall dimensions only – **1 mark** Additional detail dimensions – **1 mark** Award up to **6 marks for construction detail** using the 'Construction details' table.	**12**	Additional detail dimensions might show thickness of materials, diameters, etc.
1(f)	Accept any **two** suitable **specific** materials. [1 × 2] Accept any **appropriate** reason for choice of **each** material [1 × 2] A mark can be awarded for a reason that follows a generic material e.g. plastic [0] followed by available in a wide range of colours [1]	**4**	Each suitable specific material – 1 mark Generic terms such as wood, metal, plastic **not** accepted. Appropriate reason for each material – 1 mark Materials must be appropriate for the design shown in **(e)**
1(g)	Accept any suitable manufacturing process. [1 × 1]	**1**	Process must be appropriate and for part of the design in **(e)**.
	Award up to **3 marks for description of process**.	**3**	Detailed description for 3 marks
	Award up to **2 marks for names of tools or equipment used**.	**2**	Basic marking out tools, such as pencil or rule, or just drawings of tools/equipment = 1 mark only Do **not** accept materials or resources such as aluminium, paint, screws...

Question	Answer	Marks	Guidance
OR			
2(a)	Accept any **four** additional specification points – dimensions of the countertop, easy access to the computer so that customers can interact with it, eye catching, use of colour, no sharp edges [1 × 4]	**4**	Each specification point – 1 mark No repeats from question – freestanding, for a bike trip computer, allow customers to interact with it, for 12 trip computer packages... Only accept unqualified or one/two-word answers if relevant to this specific design problem such as recyclable, informative, stable, colourful... Do **not** accept generic one-word answers such as, safe, strong, lightweight, waterproof... Any other valid response
2(b)	Accept drawings of any **two** methods of joining lightweight materials (temporary and permanent), interlocking slots, Velcro fixing, fold-out flaps, popup mechanisms, double sided tape, adhesive (glue), plastic screw fittings [2 × 2]	**4**	Maximum of 2 marks for each method: Clear drawing of an appropriate method – 1 mark Notes describe or name an appropriate method – 1 mark Any other valid response
2(c)	Any **three** suitable ideas. Award up to **6 marks for communication of ideas** using the 'Communication of ideas' table. Award up to **6 marks for suitable designs** using the 'Suitable designs' table. For 6 marks the design/s must be interactive and for 12 packages.	**12**	At least **three different** ideas for maximum marks. Pro rata if fewer.

Question	Answer	Marks	Guidance
2(d)	Award up to **6 marks for evaluation** of the ideas: Evaluation [2 × 3] e.g. Advantage + disadvantage explained for each idea Selection [1] Justification[1]	**8**	Simple repeats of same points for each idea not rewarded. Specific not generic justification. Award maximum marks if only either advantage or disadvantage given for each as long as includes sophisticated reasoning.
2(e)	Award up to **4 marks for quality of drawing** using the 'Quality of drawing' table. Award up to **2 marks for dimensions:** 2 or 3 overall dimensions only – **1 mark** Additional detail dimensions – **1 mark** Award up to **6 marks for construction detail** using the 'Construction details' table.	**12**	Additional detail dimensions might show thickness of materials, diameters, etc.
2(f)	Accept any **two** suitable **specific** materials. [1 × 2] Accept any **appropriate** reason for choice of **each** material [1 × 2] A mark can be awarded for a reason that follows a generic material e.g. wood [0] followed by aesthetically pleasing due to the attractive grain [1]	**4**	Each suitable specific material – 1 mark Generic terms such as wood, metal, plastic **not** accepted. Appropriate reason for each material – 1 mark Materials must be appropriate for the design shown in **(e)**
2(g)	Accept any suitable manufacturing process. [1 × 1]	**1**	Process must be appropriate and for part of the design in **(e)**.
	Award up to **3 marks for description of process**.	**3**	Detailed description for 3 marks
	Award up to **2 marks for names of tools or equipment used**.	**2**	Basic marking out tools, such as pencil or rule, or just drawings of tools/equipment = 1 mark only Do **not** accept materials or resources such as PVA, glasspaper, screws...

Question	Answer	Marks	Guidance
OR			
3(a)	Accept any **four** additional specification points – attachment to the frame, ease of stand deployment, does not add significant weight to the bike, does not interfere with the function of the bike, stability of the bike when the stand is in use, easy to maintain, will not damage the bike [1 × 4]	**4**	Each specification point – 1 mark No repeats from question – stores a bicycle upright, used in an open space... Only accept unqualified or one/two-word answers if relevant to this specific design problem such as weatherproof, waterproof, self-assembly/flat packed, easy to clean, durable, aesthetic, lightweight, lockable... Do **not** accept generic one-word answers such as nice, safe, strong, ... Any other valid response
3(b)	Accept drawings of any **two** extending or folding mechanisms, levers and linkages, screw threads, spring mechanisms, telescopic mechanisms, hinges, [2 × 2]	**4**	Maximum of 2 marks for each method: Clear drawing of an appropriate method – 1 mark Notes describe or name an appropriate method – 1 mark Any other valid response
3(c)	Any **three** suitable ideas. Award up to **6 marks for communication of ideas** using the 'Communication of ideas' table. Award up to **6 marks for suitable designs** using the 'Suitable designs' table. For 6 marks the design/s must hold a cycle in an upright position and consider the use in an open space.	**12**	At least **three different** ideas for maximum marks. Pro rata if fewer.

Question	Answer	Marks	Guidance
3(d)	Award up to **6 marks for evaluation** of the ideas: Evaluation [2 × 3] e.g. Advantage + disadvantage explained for each idea Selection [1] Justification[1]	**8**	Simple repeats of same points for each idea not rewarded. Specific not generic justification. Award maximum marks if only either advantage or disadvantage given for each as long as includes sophisticated reasoning.
3(e)	Award up to **4 marks for quality of drawing** using the 'Quality of drawing' table. Award up to **2 marks for dimensions:** 2 or 3 overall dimensions only – **1 mark** Additional detail dimensions – **1 mark** Award up to **6 marks for construction detail** using the 'Construction details' table.	**12**	Additional detail dimensions might show thickness of materials, diameters, etc.
3(f)	Accept any **two** suitable **specific** materials. [1 × 2] Accept any **appropriate** reason for choice of **each** material [1 × 2] A mark can be awarded for a reason that follows a generic material e.g. metal [0] followed by can be drilled and joined with rivets [1]	**4**	Each suitable specific material – 1 mark Generic terms such as wood, metal, plastic **not** accepted. Appropriate reason for each material – 1 mark Materials must be appropriate for the design shown in **(e)**
3(g)	Accept any suitable manufacturing process. [1 × 1]	**1**	Process must be appropriate and for part of the design in **(e)**.
	Award up to **3 marks for description of process**.	**3**	Detailed description for 3 marks
	Award up to **2 marks for names of tools or equipment used**.	**2**	Basic marking out tools, such as pencil or rule, or just drawings of tools/equipment = 1 mark only **Do not** accept materials or resources such as acrylic, wet and dry, screws...