Cambridge Assessment International Education

Cambridge IGCSE™

DESIGN AND TECHNOLOGY **0445/12**

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

Mark	Performance description
4	High standard of line quality, use of colour and proportions. Appropriate techniques used that show clearly all detail.
2–3	Good line quality, use of colour and proportions. Most of the detail presented.
1	Poor line quality and proportions. Little detail presented.
0	No creditable response.

Construction details

Mark	Performance Description
5–6	All construction detail clear with good annotations and/or additional detail drawings as necessary.
3–4	Most construction may be obvious from overall views or with some annotation.
1–2	A simplistic design; little or no detail of construction used.
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 – must fasten to a wall or stand on a flat surface, must be easy to see the model cars, cars must not fall or roll off the display unit, must protect the model cars from dust, must be aesthetically pleasing, must have a means of adding the name/details of the car, etc. [1 × 4]	**4**	Each specification point – 1 mark No repeats from question – display model cars, display six model cars, modular, can be joined together, identical units, must match the sizes of the car... Only accept unqualified or one/two-word answers if relevant to this specific design problem such as easy to clean, flat packed, stable, sturdy... Do **not** accept generic one-word answers such as safe, nice, strong, lightweight, durable, cheap... Any other valid response
1(b)	Accept drawings of any **two** methods – plate with screws, dowels or push fittings, interlocking shapes, magnets, additional parts, such as a frame, that joins the display units together, adhesives, Velcro, wood joints, slot fittings, nuts and bolts, metal catches etc. [2 × 2] If the joint does not physically hold together, max. 1 mark for each answer.	**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 for six cars (1 x 6, 2 x 3...) and modular.	**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 PVA, glasspaper, screws...

Question	Answer	Marks	Guidance
OR			
2(a)	Accept any **four** additional specification points – coins must be held securely to prevent them moving about or falling out, package must be as small as possible to reduce the costs of transportation, package must have a place to add delivery details/information, must be made from recycled materials, must be easy to place the coins into the package and seal for posting, etc. [1 × 4]	**4**	Each specification point – 1 mark No repeats from question – for coin collectors, for three coins, provide protection during transportation, convert to display the coins... Only accept unqualified or one/two-word answers if relevant to this specific design problem such as recyclable, lightweight, durable, waterproof... Do **not** accept generic one-word answers such as safe, nice, cheap, strong... Any other valid response
2(b)	Accept drawings of any **two** methods – products fit in a window cut in the middle layer of three layers of card, products wrapped in foam, products placed in plastic bags, products wrapped in bubble wrap, area around the products filled with polystyrene beads, shredded paper and card, corn starch, clear acrylic cover, etc. [2 × 2] Remember the question states products, not coins.	**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 for three coins, provide protection and convert to display coins.	**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. natural 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).** Award mark for foam.
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 card, PVA, varnish...

Question	Answer	Marks	Guidance
OR			
3(a)	Accept any **four** additional specification points – must be a means of putting the marbles into the container, should be able to see how many marbles are in the container, must have a means of carrying, should show games marbles can be used for, marbles should not rattle around if container is half full, easy to access the marbles etc. [1 × 4]	**4**	Each specification point – 1 mark No repeats from question – used for marbles, used for games, holds 20 of each size marble, holds 60 marbles, sorts the marbles or sorts marbles by size... Only accept unqualified or one/two-word answers if relevant to this specific design problem such as strong, durable, robust, handheld, safe to use... Do **not** accept generic one-word answers such as lightweight, nice, cheap, attractive... Any other valid response
3(b)	Accept drawings of any **two** methods of sorting different sized objects – mechanical system such as trays with different size holes, electronic system based on the weight of the objects, optical sensor, etc. [2 × 2] If storing rather than sorting, for example different size containers, award maximum 1 mark.	**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 be a container for 20 x each size marble and sort marbles by size.	**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, PVA, electronic components...