



# Cambridge IGCSE™

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**DESIGN AND TECHNOLOGY**

**0445/33**

Paper 3 Resistant Materials

**May/June 2023**

MARK SCHEME

Maximum Mark: 50

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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 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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This document consists of **9** printed pages.

**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.

Question	Answer	Marks	Guidance
1	Any 3 specification points such as: Lightweight / corrosion resistant / easily stored/packed away / strong constructions / stable in use / comfortable / portable / safe to use / compact / include a cup holder / waterproof material / easy to clean [3 × 1]	3	Accept any valid specification points  Do not accept 'durable' or 'aesthetics' without qualification

Question	Answer	Marks	Guidance
2	Award 0–3 dependent on accuracy	3	Correct size/proportion to fit existing joint Shaded 'waste' area [max 1 mark]

Question	Answer	Marks	Guidance
3(a)	Folding bars / bending irons	1	
3(b)	To avoid damaging the surface of the mild steel sheet, e.g. dents / Greater surface area of mallet face, evenly distributed force	1	

Question	Answer	Marks	Guidance
4(a)	Polypropylene / PP / PVC / polyethylene / PET / HDPE / ABS / HIPS	1	
4(b)	Blow moulding / rotational moulding	1	
4(c)	Ribs add rigidity/strength to the structure of the watering can	1	

Question	Answer	Marks	Guidance
5(a)	Lamination / steam bending	1	
5(b)	2 advantages: quicker process / easier to make / greater production / more profit / less waste [2 × 1]	2	Must relate to <b>manufacturer</b> .  Do not accept 'stronger construction'.

Question	Answer	Marks	Guidance
6	3 ways considered anthropometric data: accept any reference to body measurements <b>and</b> parts of the bike [3 × 1]	3	Example: design of frame dependent on arm reach length / leg length. Brake levers relates to hand dimensions Do not accept references to 'weight' or 'wheel/tyre sizes'

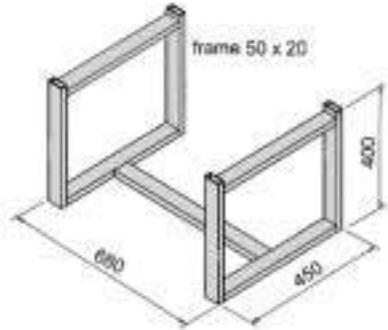
Question	Answer	Marks	Guidance
7(a)	Extrusion	1	
7(b)	Injection moulding	1	
7(c)	Plastic requires no applied finish or fabrication / low maintenance / easier to make in large quantities / smoother to slide / self-finishing / variety of colours / more durable	1	Candidates may answer from the standpoint of the manufacturer

Question	Answer	Marks	Guidance
8	<b>A</b> polystyrene [1] <b>B</b> aluminium [1] <b>C</b> steel [1]	3	

Question	Answer	Marks	Guidance
9	Beech	1	

Question	Answer	Marks	Guidance
10	Thermochromic ink	1	

Question	Answer	Marks	Guidance
11(a)	Oak [1] Teak [1]	2	
11(b)	2 advantages: easier to work / no grain pattern / smoother finish possible / cheaper [2 × 1]	2	
11(c)	Practical modification: Wood lengths held securely while sawn [1] 2 different lengths can be sawn accurately without need to measure [2 × 1] Appropriate materials named [1] Methods of construction clear [1]	5	
11(d)	Any 2 reasons such as: greater gluing/surface area / dowels less likely to twist or break [2 × 1]	2	Accept any valid reason
11(e)	Template with 2 holes drilled [1] <b>OR</b> Template + 1 side located [2] <b>OR</b> Template + 2 sides located [3] <b>OR</b> Template + 1 side and 1 end located [3]  Appropriately named material [1]	4	
11(f)	2 checks: select correct type of cutter / secure cutter in router / adjust depth of cut / test on scrap wood / router switched off [2 × 1]	2	Do not accept 'workpiece secured' Do not accept references to personal checks; e.g. PPE
11(g)	Method of retaining acrylic in frame such as: applied beads / cut rebate / slots in top and side of frame / allow for removal of top and/or side pieces of frame [0–3] Photos can be changed easily [1] Named materials [1] Quality of annotation [1]	6	Frame must not be <b>completely</b> disassembled
11(h)	Any 2 benefits: clear finish allows natural beauty of grain to be seen / allows for additional polishing / preserves / protects / moisture resistant / aesthetically pleasing [2 × 1]	2	

Question	Answer	Marks	Guidance
12(a)	<b>A</b> round tube [1] <b>B</b> angle [1]	<b>2</b>	Do <b>not</b> accept any alternative for round tube <b>A</b> Must include the term 'angle' for <b>B</b>
12(b)	Scriber [1] Try square/engineers square	<b>2</b>	Do <b>not</b> accept 'square'
12(c)(i)	Sash cramp / 'F' cramp	<b>1</b>	
12(c)(ii)	Emery cloth / files / wet and dry / silicon carbide / steel/wire wool [2 × 1]	<b>2</b>	Do <b>not</b> accept use of flux
12(c)(iii)	Correct temperature to ensure spelter melts [1] And joins the metal [1]	<b>2</b>	
12(d)(i)	Any 1 point such as: Boards from hardwood trees are not available in 400 mm+ widths / Cheaper than purchasing one wide board / Less liable to warping / more stable	<b>1</b>	
12(d)(ii)	Hardwoods shrink and expand [1] Slotted hole allows the screw fixed to the table top to 'move' [1]	<b>2</b>	
12(e)	Shelf shown fitted to end frames, suspended under table top [1] Length and width of shelf [2 × 1] Appropriate additional materials [1] Constructional details [0–2]	<b>6</b>	
12(f)(i)	Some form of 'cap' or 'block' insert [1] Specific suitable material [1] Important sizes [1]	<b>3</b>	

Question	Answer	Marks	Guidance
12(f)(ii)	Suitable construction using 50 × 20 section hardwood: dowel / mortise and tenon / housing / biscuit named [1]  Technical accuracy: correct size/proportion/orientation [0–3]	4	Accept K-D fittings: e.g. bloc fitting, cam lock
13(a)	2 benefits: the data from the CAD drawing could be transferred to a CNC machine / editing tools available / on-screen modelling / speed / accuracy / adjustments made quickly / easy to generate ideas / view from different angles / share data electronically [2 × 1]	2	Do <b>not</b> accept 'easy to use'. Do <b>not</b> accept 'more accurate' without stating what it is being compared with.
13(b)(i)	The holes would be more difficult/awkward to drill after bent to shape	1	
13(b)(ii)	Round or rat tail file / half-round file	1	
13(b)(iii)	Possible damage: scratch the surface of the acrylic [1] Prevention: soft vice jaws or insert 'padded' material [1]  <b>OR</b>  Possible damage: acrylic vibrates and cracks if too high in vice [1] Prevention: lower in vice or provide support to both sides of acrylic [1]	2	Award 1 mark for Damage and 1 mark for Prevention
13(c)	2 safety precautions: no loose clothing / long hair tied back / hold work piece firmly and apply pressure to underside of polishing mop / location of emergency stop button / fix work to larger piece of scrap material to hold against mop [2 × 1]	2	
13(d)	Reason: to ensure that the acrylic is heated thoroughly from both sides / Makes it easier to bend / evenly heated	1	
13(e)	Acrylic clamped horizontally [1] Acrylic clamped vertically [1]	2	Accept use of blocks with relevant annotation
13(f)(i)	MDF	1	

Question	Answer	Marks	Guidance
13(f)(ii)	Draft angle indicated correctly	1	
13(f)(iii)	Purpose: to allow the plastic to be released from the mould	1	
13(g)	<b>A</b> faceplate [1] <b>B</b> between centres [1]	2	
13(h)(i)	Award [1] mark for any <b>relevant</b> stage in the vacuum forming process, up to 5 marks [5 × 1]  Award [1] mark for technical accuracy / correct terminology / named components [1]	6	Stages include: position mould on platen, clamp plastic, heat plastic, raise platen, turn on pump to extract air, lower platen, turn off machine, leave to cool, remove from mould
13(h)(ii)	Waste removed using a wide variety of saws / trimmer / 'gerbil' / craft knife / tin snips [1] Finished shape using sanding disk/belt sander and use of files/wet and dry [silicon carbide] paper/glasspaper [0–2]	3	Accept coping saw, bandsaw, Hegner saw or equivalent