CAMBRIDGE
International Education

Cambridge IGCSE™

DESIGN AND TECHNOLOGY **0445/31**

Paper 3 Resistant Materials **May/June 2024**

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.

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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 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.

Question	Answer	Marks	Guidance
1	Any **two** properties: tough, lightweight, good wear resistance, durable, impact resistant, easily moulded [2x1]	**2**	Accept any other valid properties

Question	Answer	Marks	Guidance
2	Top – bottom: numbers 4 1 3 [3×1]	**3**	

Question	Answer	Marks	Guidance
3(a)	Award 1 mark for 2 correct flaps. Award 2 marks for 4 correct flaps	**2**	
3(b)	Safe edge is made to prevent injury from sharp edges of metal [1] Safe edge made by folding back narrow edge of sheet material [1]	**2**	

Question	Answer	Marks	Guidance
4	Award 0–3 dependent on technical accuracy [0-3]	**3**	Accurate projection lines from given drawing

Question	Answer	Marks	Guidance
5(a)	PVC	**1**	
5(b)	Urea formaldehyde, ABS	**1**	
5(c)	Insulator, does not conduct electricity, easily moulded	**1**	

Question	Answer	Marks	Guidance
6(a)	Annealing	**1**	
6(b)	Softer, more pliable, malleable, less brittle	**1**	

Question	Answer	Marks	Guidance
7	Sketch showing one-piece plastic design [1] Heat applied [1] Use of strip heater, line bender, heat gun [1]	**3**	

Question	Answer	Marks	Guidance
8	Case hardening	**1**	

Question	Answer	Marks	Guidance
9	The hardwood could dry out and shrink [1] Causing the base to split [1]	**2**	

Question	Answer	Marks	Guidance
10	Any **two** benefits: little waste, waste can be recycled, relatively cheap after initial tooling, repetitive accuracy of product [2×1]	**2**	Accept any other valid benefits

Question	Answer	Marks	Guidance
11(a)	Drill hole, insert blade of saw, cut out waste, file edges, named tools and equipment [4×1]	**4**	Accept alternative methods: e.g. use of chisel, mortise machine and other valid stages
11(b)	Main stages: cut sides to length, join sides, join front to sides. [4x1] Accept 'minor' stages: e.g. square sawn ends, use of pins, glue, clamping	**4**	Accept any other valid stages Do not accept glasspaper
11(c)	Method: vacuum forming, injection moulding [1] Named material: acrylic, HIPS, ABS [1] Description of appropriate method [0–2]	**4**	
11(d)(i)	Main stages: shape marked out, shape cut out 'roughly', sand/file to shape, woodturning between centres, held in chuck, hole saw [3×1]	**3**	Accept any other valid stages
11(d)(ii)	Award marks for relevant stages in CAD **and** CAM. Design numbers, transfer data to 'machine', cut out numbers, apply to disc Use of CAMM 1 vinyl cutter [0-4]	**4**	Accept imbalance; i.e. more info. For CAD than CAM and vice versa. Accept any other valid stages
11(e)	Use of 'spacer', metal or plastic tube, metal pin [1] Appropriately named material [1] 'Spacer' secured in position to prevent sliding [1]	**3**	
11(f)	Aluminium held securely: use of folding bars, vice, clamped [1] Use of hammer and scrap wood or mallet to bend [1] Correct tools and equipment named [1]	**3**	

Question	Answer	Marks	Guidance
12(a)	Diameter:3.5–5.0 mm [1] Material: steel, stainless steel, brass, aluminium [1] Length: minimum 15mm- maximum 30 mm [1] Type of head: countersunk [1]	**4**	
12(b)	Drill Ø30 hole, cut inside and outside curves, sanding disc/file outside curves, file inside curve, accurately named **most** tools and equipment [5x1]	**5**	Accept any practical processes
12(c)(i)	3 accurate at 90º bends [3×1] Tools/equipment: vice/clamping method, mallet or hammer + scrap wood [2×1]	**5**	
12(c)(ii)	Anodising gives a protective layer, greater corrosion resistance, attractive [coloured] appearance [2×1]	**2**	
12(c)(iii)	Epoxy resin 2 parts: resin and hardener [1] Equal amounts mixed together [1]	**2**	
12(d)	Practical idea: use of holes drilled in shelves/grooves cut out of shelves [1] Details of drilled holes: number of holes + diameter + type of drill bit + spacing position [4×1] **OR** Details of router: width + length of groove, spacing, set up of router [4×1]	**5**	

Question	Answer	Marks	Guidance
12(e)	Any **two** properties: attractive colours to match environment, corrosion resistance in wet areas, easily cleaned [2×1]	**2**	Accept any other valid properties

Question	Answer	Marks	Guidance
13(a)(i)	Plywood, chipboard, MDF, blockboard	**1**	Do not accept hardboard
13(a)(ii)	Any **one** benefit: cheaper than solid wood, appearance of solid wood, attractive [1] Any **one** drawback: damages easily, not easily repaired, less durable [1]	**2**	Accept any other valid benefits or drawbacks
13(b)	Any **two** benefits: increased durability, easily cleaned, heat resistant, resistant to spillages, wide range of decorative finishes [2×1]	**2**	Accept any other valid benefits
13(c)(i)	Coping saw, Hegner saw, scroll saw, band saw, jig saw	**1**	
13(c)(ii)	Half-round, round, rat tail files, spokeshave, sanding bobs, glasspaper [2×1]	**2**	
13(d)	Practical idea: complete raised lipping or additional surface strips [1] Suitable named materials [1] Constructions: adhesive, pin and glue, screw [1]	**3**	Do not accept plywood Lipping applied up to the edge **or** on top of tray
13(e)	Suitable construction named: mitre, half lap, dovetail, finger, dowels [1] Award 0–2 dependent on technical accuracy, proportion [0–2]	**3**	

Question	Answer	Marks	Guidance
13(f)	Some form of pin or bolt to act as a pivot [1] Pin or bolt secured in position [1] Details of fittings/materials used [1]	**3**	
13(g)	Recognised butt hinge: 2 or 3 holes [1] Knuckle and pin [1] 2 equal leaves [1]	**3**	
13(h)	Practical idea: some form of 'arm/s' attached to tray or rails [0–2] Locking method: added strips, use of nuts and screws [1] Locks at 4 different angles [1] Named materials [1]	**5**	