

Cambridge IGCSE™

DESIGN AND TECHNOLOGY**0445/32**

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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This document consists of **10** 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 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.

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Question	Answer	Marks	Guidance
1	2 tenons [1] Correct width [1] Correct thickness [1]	3	Do not accept incorrect orientation or guidelines drawn only. Ignore length of tenons.

Question	Answer	Marks	Guidance
2	A metric [1] B diameter [1] C length [1]	3	

Question	Answer	Marks	Guidance
3	Explanation: when a product is designed and manufactured so that it can only be used for a limited time before it has to be replaced [1] Specific product [1]	2	Do not reward named product without correct explanation.

Question	Answer	Marks	Guidance
4(a)	Digital or vernier caliper [1]	1	
4(b)	Explanation: the measurement taken has to be set against a rule [1] Likelihood of moving caliper legs/human error taking reading [1]	2	

Question	Answer	Marks	Guidance
5(a)	Carbon	1	
5(b)	Glass	1	

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Question	Answer	Marks	Guidance
6	The shape will be the same as at stage 1 [1]	1	Accept written statement only.

Question	Answer	Marks	Guidance
7(a)	Annealed	1	
7(b)	Sand bag, sand pad	1	Accept variations including 'sand.....'

Question	Answer	Marks	Guidance
8	Some form of 'stay', chain, ribbon, string, spring [1] Attached to lid and attached to side [2×1]	3	Award 0–2 for method of attaching to box.

Question	Answer	Marks	Guidance
9(a)	Polystyrene	1	
9(b)	Any two benefits: less waste, less resources used, less litter, lower manufacturing costs, less landfill [2×1]	2	Accept any valid benefits. Do not accept 'better' for environment/planet.

Question	Answer	Marks	Guidance
10	Some form of wooden 'block', metal 'bracket' [1] Construction [1] Suitable material named [1]	3	

Question	Answer	Marks	Guidance
11(a)	Wide variety of softwoods available: pine, parana pine, redwood, fir, whitewood, [western red] cedar, larch, spruce [1]	1	
11(b)(i)	Softwood trees do not produce wide enough boards, two boards glued together are more resistant to warping [1]	1	
11(b)(ii)	Minimum 2 cramps shown across boards [1] Use of scrap wood between cramps and boards [1] Named cramps: sash, F cramps, 'fast', 'quick' [1]	3	Maximum 3 cramps used.
11(b)(iii)	Any two checks: cramps tight, boards flat boards in line, removal of surplus glue [2×1]	2	
11(c)(i)	A butt [1] B tee [1]	2	
11(c)(ii)	The 'arm' of hinge B is longer than that of hinge A [1] and will cover a greater surface area of the wood, support more weight [1]	2	
11(d)	Method to locate screwdriver blades: Use of wooden block, spring clips, 'box' [0–2] Holds 6 screwdrivers [1] Attached to inside of hinged side [1] Named materials appropriate [1]	5	Look for practical 'principle'.
11(e)	Some form of purchased 'catch'; e.g. toggle catch. Use of 'made' catch, clasp, strap, clips [that swivel across and is secured to handle], magnets, hasp and staple, string	3	Award 0–2 for a practical idea. Accept use of Velcro. Award 1 for notes describing how it works.
11(f)(i)	Dovetail	1	

Question	Answer	Marks	Guidance
11(f)(ii)	The dovetail shape prevents the handle from being pulled out when the toolbox is lifted [1] Wider at bottom than top preventing upward movement [1]	2	Do not accept 'more surface area'.
11(g)	Any three advantages: moulded shape with no sharp corners, lightweight, more durable, waterproof, weather resistant, easy to clean [3×1]	3	Must relate to USE . Accept any valid advantages.

Question	Answer	Marks	Guidance
12(a)	A flat [1] B square [1]	2	
12(b)	Brazing [1] Welding [1]	2	Do not accept soldering , rivets.
12c	 practical idea [0–2] Detailed notes describing method [0–2]	4	Some type of bracket or screwed from inside the rail. Large hole for screwdriver blade to fit Do not reward 'long' screw through entire 45 mm wide rail.
12(d)	Hole drilled in outer tube [1] Slot removed in inner tube [1] Some form of pin, screw, bolt through hole and slot, 'push-button' [1] Method of locking/securing pin, screw, bolt in position [1]	4	Award max.2 if a number of holes are drilled rather than a slot
12(e)(i)	The plugs: provide an attractive appearance [1] hide the sharp ends of the steel tube/are safer [1] prevent dust and dirt from entering [1] are easier to clean [1]	2	
12(e)(ii)	Epoxy resin, 'Araldite'	1	

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Question	Answer	Marks	Guidance
12(f)	Wooden or metal ‘supports’ attached to underside of desk top [0–2] Added beads applied to supports or grooves cut in supports and added beads applied to drawer sides [0–2] Appropriately named materials and constructions [0–2]	6	Give credit to any practical method
12(g)(i)	Any two reasons: Do not apply extreme pressure which could cut through veneer, damage to veneer, scratch the veneer, make surface uneven [2×1]	2	Accept any other valid reasons
12(g)(ii)	Description to include: use of a paint brush, brush strokes in same direction, applied evenly, along the grain, multiple (more than 1) coats, thin layers [2×1]	2	

Question	Answer	Marks	Guidance
13(a)	Any two properties: variety of colours, attractive, easy to work, durable material, easily cleaned, self-finishing, easily shaped when heated [2×1]	2	Do not accept corrosion resistant, lightweight. Accept any other valid properties.
13(b)(i)	Extrusion	1	
13(b)(ii)	A granules [1] B heater/heating element/heat source/heating plate, heating chamber [1] C die [1]	3	Reward variations including reference to ‘heater’ or ‘heating’.

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Question	Answer	Marks	Guidance
13(c)	Jig has saw cuts to guide saw for 5 different lengths or measurements marked out on jig [0–2] Adapting jig to secure in vice [1] Method of holding acrylic tube securely when sawn [0–2] Appropriately named materials [1]	6	
13(d)	Rounded edges to help plastic to form to shape without thinning/splitting [1] Tapered sides allow the mould to be released from the formed plastic [1]	2	
13(e)(i)	Three clear stages such as: Plastic sheet is heated in an oven Sheet is positioned on top of the ‘plug’ ‘Yoke’ is pressed down onto the plug [guide pegs] Clamp in position until plastic has cooled down [3×1]	3	Accept any other valid stages in process Stages must start with heating plastic. If no heating is given anywhere in answer award 0 marks. If heating appears elsewhere in answer only mark correct stages after heating is stated.
13(e)(ii)	Any two advantages: much quicker process, more accurate [2×1]	2	Accept ‘easier’ only if it is qualified.

Question	Answer	Marks	Guidance
13(f)	4 methods: 1 Woodturning between centres. Stages include: prepare square section length of wood by planing off corners, saw cuts made in one end, centre marked on other end, one end inserted into fork centre in headstock, other end inserted into tailstock, tool rest set up, use of gouges, chisels to turn to shape, glasspaper to make smooth, check with calipers, part off, saw off and use glasspaper to remove sharp edges. [6×1] 2 Hole saw. Details to include: Hole saw sketch and name, holes marked out, workpiece clamped securely, use of sacrificial board or drill $\frac{1}{2}$ way and turn workpiece over, glasspaper to remove sharp edges. [6×1] 3 Laser cutter. Details to include: Disks drawn using CAD software, material into laser cutter, export CAD programme to laser cutter, set parameters, set laser cutter to cut out shapes. [6×1] 4 Cutting disks from wooden board. Details to include: Mark out disks on board, cut out using appropriate saw, [coping, Hegner, scroll], use of disk sander, files, glasspaper. [5×1]	6	Accept any relevant stages. Accept any relevant details. Accept any relevant details. Accept any relevant details. Maximum 5 marks for this method as it would not produce 5 identical disks.