



## Cambridge IGCSE™

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DESIGN AND TECHNOLOGY

0445/33

Paper 3 Resistant Materials

May/June 2021

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 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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This document consists of **10** 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	<p>Top ply Bottom ply 'Strips' run through front to back Accuracy and proportion</p>	<p>1 1 1 1</p>	4

Question	Answer	Marks	Guidance
2	Composite	1	

Question	Answer	Marks	Guidance
3	<p>Two reasons: uneven seasoning, drying out too quickly, brought into warm conditions while wet, not 'stacked' properly during seasoning or storage after seasoning, subjected to uneven weight applied to board</p> <p style="text-align: right;">2 × 1</p>	2	<p>Must relate to wood in dry/warm conditions Not 'wet' or 'outdoors'</p>

Question	Answer	Marks	Guidance
4	<p>Sketch showing inside Ø of tube measured Sketch showing outside Ø of rod or tube, thickness of material measured Depth gauge</p> <p style="text-align: right;">1 1 1</p>	2	Accept any <b>two</b> .

Question	Answer	Marks	Guidance
5	Two reasons: surface plate and base of gauge machined to high specification, Provide a true surface from which to mark out, repetitive accuracy possible, parallel lines can be drawn, heights tested, fine adjustments can be made 2 × 1	2	Surface plate flat Scribing block fixed position

Question	Answer	Marks	Guidance
6(a)	Polyester	1	
6(b)	Two advantages: lightweight, corrosion resistant, easily formed, excellent strength-weight ratio, easily repaired, inherent colour, weather resistant 2 × 1	2	Not 'cheaper', 'impact resistant', 'tough', 'strong', 'easier to work', easier to make 'durable'

Question	Answer	Marks	Guidance
7	Staple shown inserted through slot Staple includes bottom plate/base 1 1	2	

Question	Answer	Marks	Guidance
8	Stages include: wood placed in sealed chest, chest filled with steam, wood absorbs hot steam, wood held around a former, clamped in position, allowed to dry before removing from chest 3 × 1	3	Accept any valid stages Must include clamping for maximum marks Do not accept 'steam machine'

Question	Answer	Marks	Guidance
9	Damage: plastic can vibrate and snap/break during sawing, scratched in vice jaws Prevention: place plastic as low as possible in vice, saw slowly, support with scrap wood, soft vice jaws or protected material	1  1	2  Damage: not 'crack', 'shatter' or 'split'

Question	Answer	Marks	Answer
10(a)	Two advantages of MDF: easier to cut and shape, no prominent/open grain, more stable, finishes well, less likely to shrink or expand, less likely to split, cheaper, smooth surface 2 × 1	2	Not 'cheap' or 'more available'
10(b)	Two features: draft angle, no sharp edges, rounded corners, no undercuts, smooth surface, no indents or scratches 2 × 1	2	Do not award references to air holes in base

Question	Answer	Marks	Guidance
11(a)	Two benefits: colourful, easily shaped, attractive finish, hardwearing, self-finishing, variety of colours, easily cleaned, attractive appearance 2 × 1	2	Accept any valid advantages Not 'lightweight', 'easy to work'
11(b)(i)	Four stages: edit CAD drawing score, engrave and cut lines, position CAD drawing on A2 size paper, turn on laser, position acrylic on bed of machine, enter 'set up' parameters, computer file 'Print', 'Run' 4 × 1	4	Accept any valid stages
11(b)(ii)	Two benefits: repetitive accuracy, accurate, clean cut, requires less finishing, machine can be set up quickly, repeated quickly, eliminate human error, lower cost of production, minimal waste 2 × 1	2	

Question	Answer	Marks	Guidance
11(c)	Use of a line bender, strip heater, heat gun Use of former or jig Method of retention while cooling	1 1 1	<b>3</b>
11(d)	Some sort of rod/pivot/screw/bolt through stand and into mirror frame Retained in mirror frame / pivot attached to stand and loose in mirror frame Use of screw thread to provide tightening or alternative locking method Appropriate use of 'spacers'/washers Materials and constructions	1 1 1 1 0–2	<b>6</b> Accept 'stuck in frame' without additional details for method of retention
11(e)	<b>Waste cut off:</b> tinsnips, hacksaw, Hegner saw and appropriate blade, cold chisel Steel held in vice, clamp, folding bars  <b>Cut edges filed flat and smooth:</b> Use of hand, flat, half round files  <b>Bent to shape:</b> vice, clamp, folding bars, former, hammer, mallet, bending machine	<b>named</b> 1 1  <b>filed</b> 1 <b>named</b> 1  2 × 1	<b>6</b>
11(f)(i)	Emery cloth, wet and dry [silicon carbide] paper, steel wool		<b>1</b>
11(f)(ii)	Advantage: quicker, even finish possible, no brush strokes		<b>1</b>

Question	Answer	Marks	Guidance
12(a)	Two specification points: lightweight, safe in use, no sharp edges, folds flat easily, holds weight, water resistant, easy to clean, compact, easy to carry, portable, durable	2 × 1	<b>2</b> Accept any valid points Not 'easy to use'

Question	Answer	Marks	Guidance
12(b)	Curved shaped removed: use of spokeshave, rasp, Surform tool, coping or Scroll saws and files, compass plane, band saw, jig saw $2 \times 1$ Rail held securely: use of vice, bench stop, G cramps 1 Quality of sketches of tools/equipment 1	4	Do not accept 'use of glasspaper'
12(c)	Suitable construction: mortise and tenon, dowel named 1 Award 0-3 dependent on technical accuracy 0-3	4	
12(d)(i)	Sash	1	Only acceptable answer
12(d)(ii)	Wide range of adhesives available must be water resistant Includes epoxy resin, contact adhesive, PVA, synthetic resin	1	Check internet for 'unheard of' answers
12(d)(iii)	Cramp shown <b>directly under</b> rail and square against legs 1 Use of scrap wood to prevent bruising, apply even pressure 1	2	Must show 2 legs
12(d)(iv)	Two checks: squareness using a try square, make sure rail and leg are flat [not in winding], removal of surplus glue, rail and legs close fitting, check joint is secure, cramps tightened, not overtight $2 \times 1$	2	
12(e)	Benefit: the bolt has a square section under the head 1 the bolt does not move/rotate when the nut is tightened 1	2	Award 1 mark for: 'allow stool to fold/be taken apart'
12(f)	Two properties: corrosion resistant, lightweight, no finish required, rounded tube comfortable, easily bent/formed $2 \times 1$	2	Accept any valid properties Not 'attractive', 'durable', 'tough'
12(g)	Foot gives stability, prevents end of tube 'digging' into ground, slipping, sliding, provides grip, prevents dirt in end of tube	1	



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Question	Answer	Marks	Guidance
12(h)	Supports weight of user Seat is attached onto/around tube and stool can be folded Named plastic: polypropylene, PVC, ABS, HIPS, HDPE	1 0–2 1	4 Must be <b>one</b> piece moulded seat Do not award mark for hinged seats

Question	Answer	Marks	Guidance
13(a)(i)	Red deal, pine, red wood, Scots pine, Douglas Fir, Columbian pine, Western red cedar, spruce	1	Not 'parana pine' <b>If chosen wood is incorrect candidates' answers to part (a)(ii) can be marked as correct</b>
13(a)(ii)	Reason: good outdoors, water resistant, decay resistant, available, relatively cheap, cost effective, durable, sustainable	1	Not 'cheap', 'strong', 'lightweight', 'aesthetically pleasing'
13(b)(i)	The saw used to cut the parts will remove 1–2 mm of wood The 5 mm waste allows for the saw cut without reducing the length required	1 1	2 Acceptable points: 'thickness of saw blade', 'space for errors', 'waste to be removed later'
13(b)(ii)	Machine saw: Scroll, Hegner, jig saw, band saw, circular/table saw, mitre saw	1	
13(b)(iii)	Waste removed by planing. Wood held in vice and smoothing or jack plane used, from end to centre [then repeat from other end] <b>OR</b> Wood placed on table of sanding disc and pushed against disc or use of linisher	2	Do not reward the use of files and glasspaper Candidates can achieve max. 2 marks for the planing option by a combination of: 1 mark for 'planing' stated 1 mark for name of plane 1 mark for method
13(c)(i)	round [wire] nail oval [wire] nail panel pin	1	
13(c)(ii)	Wide range of adhesives available must be water resistant Includes epoxy resin, PVA, contact adhesive, synthetic resin	1	Check internet for 'unheard of' answers

Question	Answer	Marks	Guidance
13(d)	Corners have been removed to prevent build up of rubbish, easier to keep clean, allow for drainage, allow more air/ventilation	1	
13(e)(i)	Drill bits: forstner, saw tooth, hole saw, flat bit, step drill	1	
13(e)(ii)	Softwood shown flat on bench or drill table with thick scrap wood underneath G clamp to secure softwood	2 1 1	
13(f)	Suitable hinge drawn Named Hinge in correct position screwed to roof and back 2 hinges required or single type of pliable material across width of box	1 1 1 1	4 Suitable hinges: butt, back flap, piano, flush Accept 'rubber strip' or other pliable material attached to top and box Award 0–2 for 'lift-off' lids dependent on technical accuracy
13(g)	<b>Cutting jig:</b> could be used to assist sawing sides to length <b>Assembly jig:</b> could help position the sides when nailing the parts together 2 × 3	6	Appropriate type of jig Show it in use Describe its purpose 1 1 1 × 2
13(h)	Two factors: weather conditions, aesthetic appearance, vandalism, durability, Insect resistant, easy to clean, stability in use 2 × 1	2	Accept any valid factors described