



# Cambridge IGCSE™

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**DESIGN & TECHNOLOGY**

**0445/32**

Paper 3 Resistant Materials

**October/November 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 October/November 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.

**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 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.

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Question	Answer	Marks	Guidance
1	<b>Pillar drill:</b> make sure sheet is clamped securely, check drill speed for Ø drill, use of scrap wood under workpiece, personal safety, no loose clothing, hair tied back <b>Disk sander:</b> eye protection, mask to prevent dust inhalation	2	

Question	Answer	Marks	Guidance
2	High carbon steel	1	

Question	Answer	Marks	Guidance
3	Recognised KD fitting shown: screws shown in 2 directions Technical accuracy	3	<b>Do not</b> accept dowel <b>Do accept</b> different KD fittings; e.g. cam lock, wooden block

Question	Answer	Marks	Guidance
4(a)	<b>A</b> claw hammer <b>B</b> pincers	2	<b>Do accept</b> 'pinchers'
4(b)	Purpose of scrap wood to prevent damage caused by leverage of hammer	1	

Question	Answer	Marks	Guidance
5(a)	Machine vice	1	Not vice on its own.
5(b)	Knurling	1	

Question	Answer	Marks	Guidance
6(a)	Fabricated: the way in which materials are joined together	1	
6(b)	Casting, die casting, sand casting	1	

Question	Answer	Marks	Guidance
7	Some form of 'stay' that joins the adjustable board to the fixed board 1 Locked in <b>any</b> position 1 Method of tightening/loosening 1	3	

Question	Answer	Marks	Guidance
8	Chinagraph pencil to <b>mark out</b> the shape of the holder 1 Scroll saw to <b>cut out</b> the shape 1 Hand file to work to the lines after sawing, <b>smooth/flatten cut edges</b> 1 Buffing machine to <b>polish</b> the acrylic, <b>apply a finish, finishing, shine</b> 1	4	<b>Do not accept</b> smooth the surfaces

Question	Answer	Marks	Guidance
9	Temperature	1	

Question	Answer	Marks	Guidance
10(a)	Hardwood boards of required width not available, to provide a stable table top	1	<b>Do accept</b> rigidity

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

Question	Answer	Marks	Guidance
10(b)	Hardwoods dry out and shrink If all three boards were joined with same end grain arrangement the table top is more likely to 'cup' or warp To stabilise the table top, to prevent warping	<b>2</b>	<b>If stability is given in question 10(a) the answer must give additional information; e.g. to prevent warping, splitting, allow for movement</b>  Look for answers that indicate an understanding of the drying out, shrinkage and allowance issues in explanation
10(c)	To allow the screws to move when the table top shrinks or expands	<b>1</b>	

Question	Answer	Marks	Guidance
11(a)	Two properties: hardwearing, long lasting, tough, finishes well, attractive, durable, weather resistant, shock resistant $2 \times 1$	<b>2</b>	Accept any valid property <b>Do not accept</b> hard, strong
11(b)	Sliding bevel could be used to mark out the 'angled' joint across the leg Sketch showing sliding bevel 1 Sketch showing sliding bevel <b>in use</b> 1	<b>2</b>	
11(c)(i)	Through housing drawn across the grain/width of the leg 1 Proportion/size/angle relates to Fig. 11.1 0–2	<b>3</b>	Must be cut out of leg, <b>not</b> step
11(c)(ii)	Router	<b>1</b>	
11(c)(iii)	No trailing leads, check set up of tool in cutting tools, check condition of electrical fittings, no 'observers', work piece held securely, switch off power source when not in use, check condition of wiring, keep both hands on machine	<b>1</b>	Accept any valid safety precaution
11(d)	Ø of dowels used appropriate: 6–10 1 Number of dowels used 2–3 max. 1 Spacing between dowels stated <b>or</b> shown in sketch 1	<b>3</b>	

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Question	Answer	Marks	Guidance
11(e)	Strengthened. Some form of 'gusset', triangular piece or added rail on or below area <b>A</b> Correct position Constructions	3 1 1 1	
11(f)(i)	Two advantages: quicker and easier to apply, paint more likely to chip, oil easier to maintain, oil shows natural features of attractive oak 2 × 1	2	<b>Do not accept</b> easier to clean
11(f)(ii)	Two benefits: easier to access, able to glasspaper along the grain 2 × 1	2	
11(g)	Position of hand-hold Method of joining hand-hold to stool Comfortable to grip 2 important sizes <b>Do not include 1metre height</b>	1 0–2 1 2 × 1	6

Question	Answer	Marks	Guidance
12(a)	Allows for on-screen modelling and testing, easier to edit, accuracy for possible transfer to CNC machine, more accurate, more detailed, viewed from 360°, files can be shared faster, used to 3D print 2 × 1	2	Accept any valid advantages <b>Do not accept</b> quicker, faster
12(b)	Two benefits: lightweight, corrosion resistant, self-finishing, easy to work/cut/bend/make 2 × 1	2	Accept any valid benefits <b>Do not accept</b> easy to use or join, attractive, durable
12(c)(i)	Two features: draft angle/tapered sides, radiused corners/edges, no undercuts smooth surfaces 2 × 1	2	
12(c)(ii)	Not hot enough and the plastic will not form Too hot and the plastic will melt/deform	1 1	2 <b>Do accept</b> malleability to allow the plastic to form

Question	Answer	Marks	Guidance
12(c)(iii)	 Is plastic soft enough <input type="checkbox"/> Raise mould <b>or</b> turn on vacuum <input type="checkbox"/> Raise mould <b>or</b> turn on vacuum  Is shape fully formed <input type="checkbox"/> Turn off vacuum	1 1 1 1 1	5
12(d)(i)	Two hand tools: tin snips, hacksaw, guillotine, piercing saw 2 × 1		2 <b>Do not accept</b> metal shears, cold chisel
12(d)(ii)	Edges made safe by means of filing Use of abrasive paper	1 1	2
12(d)(iii)	Use of a vice and block [former], folding bars, cramp to secure aluminium Method of force: mallet or hammer and scrap wood Additional annotated notes	1 1 1	3 <b>Do not accept</b> use of heat Award 1 mark for use of scrap wood/vice jaws to protect surface of aluminium
12(e)(i)	Injection moulding, 3D printer		1
12(e)(ii)	Some form of axle Axle fitted onto wheel and secured Free rotation Use of washers/'spacers'	1 1 1 1	4 Axle could be 'stub' or one continuous axle fitted to two front wheels and one fitted to two rear wheels
Question	Answer	Marks	Guidance
13(a)(i)	To make it easier to turn, to prevent the edges from splitting, personal safety		1



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Question	Answer	Marks	Guidance
13(a)(ii)	Work piece is secured between centres, free rotation of work piece to ensure it is clear of the tee rest, lathe tools are sharp and free from damage, fork centre fitted correctly	1	
13(a)(iii)	Outside or external calipers, digital calipers, vernier calipers, micrometer	1	Must state 'outside' or 'external' calipers
13(a)(iv)	Gouge, scraper, chisel	1	
13(b)	Avoid over tightening in vice Vice: use of soft metal or plastic jaw covers or scrap wood against brass cap	1 1 2	
13(c)(i)	Purpose is mostly aesthetic, could give end grain protection from splitting, to protect the side of the mahogany	1	<b>Do not accept</b> to cover [too vague]
13(c)(ii)	Two advantages: better quality components, quicker than making them, more accurate	2 2 × 1	
13(d)(i)	Pencil, steel rule, try square, sliding bevel, marking knife, cutting gauge, mitre square, engineers square	2 2 × 1	
13(d)(ii)	<b>Method 1</b> plane off waste using a smoothing or jack plane wood held in vice Process: the wood is planed from end to centre then reverse process <b>Method 2</b> use of mitre saw finish with plane or sanding disc Process: the wood is sawn and pushed against the sanding disc at 45° angle	1 1 0–2 1 1 1	4 Process shown clearly 0–2  Look for technical accuracy, e.g. named tools and equipment

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Question	Answer	Marks	Guidance
13(e)	Completed drawer shown 1 Appropriate constructions used and clearly shown 0–3 Suitable materials 1 Sizes must fit the carcass 1	<b>6</b>	Appropriate constructions: 3 marks available <b>Sides:</b> butt, pin and glue, mitre = 1 Half lap. Lap, finger, dovetail = 0–2 <b>Base:</b> groove, rebate, flush = 1
13(f)	Hand-hold shape made from brass strip 1 Cutting and shaping processes 0–3	<b>4</b>	