



Cambridge IGCSE™

DESIGN & TECHNOLOGY

0445/31

Paper 3 Resistant Materials

October/November 2021

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.

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.

This document consists of **9** 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.

Question	Answer	Marks	Guidance
1(a)	Biscuit	1	
1(b)	Dowel, tongue and groove, domino, butt	1	

Question	Answer	Marks	Guidance
2(a)	Draw filing	1	Do accept 'drawing'
2(b)	Wet and dry paper	1	
2(c)	Loose clothing tucked in, hair tied back, safety glasses, work piece presented to lower half of buffing wheel 2 × 1	2	Do accept items of PPE Do not accept ear defenders, gloves

Question	Answer	Marks	Guidance
3	Completed drawing shows left hand flap Two holes shown in flap 1 1	2	Do accept max. 3 holes in added flap Do accept reverse shape on right with 2 holes shown

Question	Answer	Marks	Guidance
4	Aluminium	1	

Question	Answer	Marks	Guidance
5	A surface plate B surface gauge, scribing block 1 1	2	

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Question	Answer	Marks	Guidance
6	Two benefits: quicker than fabricating, greater profit for manufacturer, easier to produce comfortable curved shapes, aesthetically more interesting, less machining, stronger as it is made in one piece, design does not need joints, interesting shape, even curve produced 2×1	2	Accept any valid benefits

Question	Answer	Marks	Guidance
7	Modification to allow easier access: some sort of 'recess' for fingers to access leaflets, hinges on bottom of holder, recess on side of holder, lower top of holder by up to 1/3 $0-2$	2	Constructional detail not required. Look for simple modification and technical accuracy Award 1 mark for vertical 'separators'

Question	Answer	Marks	Guidance
8	Two advantages: lighter weight, greater fuel economy, corrosion resistant, easily moulded parts, good strength-weight ratio, easier to shape, stronger 2×1	2	Do not accept easier, easier to work

Question	Answer	Marks	Guidance
9(a)	A melamine and urea [formaldehyde], GRP B wide variety of hardwoods available 1 1	2	
9(b)	Two reasons for preference: rounded moulded plastic shape, more hardwearing, no joints to come apart, easier to clean, colours to 'match' environment, more durable, smoother surface, more aesthetic shape, lasts longer, water resistant 2×1	2	Do not accept lightweight, stackable, cheaper

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Question	Answer	Marks	Guidance
10(a)	Blow moulding	1	
10(b)	Polythene [terephthalate], PET, PETE, [high density] polythene	1	Do not accept LDPE
10(c)	Some plastics cannot be recycled due to their chemical structure, some plastics are contaminated with food, some authorities do not accept some plastics, people do not take plastic products to be recycled, some areas have no recycling facilities, plastics thrown away, people do not know which plastics can be recycled, some plastics have other materials making them non-recyclable 2 × 1	2	

Question	Answer	Marks	Guidance
11(a)	Two properties: hardwearing, long lasting, tough, finishes well, attractive, durable, weather resistant, shock resistant, less likely to splinter, strong justified-[will hold a lot of weight] 2 × 1	2	Do not accept hard
11(b)	Hand-hold clearly shown in position 1 Comfortable grip 1 Method of fitting to rocking horse 1	3	Do accept dowel + hole + glue for 3 marks Comfortable grip must be stated
11(c)	Mortise and tenon, dowel named 1 Technical accuracy of sketch 0–3 Housing joint not suitable = 0 marks but award maximum 0–2 marks for accurate sketch ECF	4	Technical accuracy mortise and tenon: e.g. proportion, shoulders Technical accuracy dowel: e.g. spacing, two dowels shown
11(d)	Rocker produced by steam bending process: 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 Reward any 5 relevant stages 5 × 1	5	

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Question	Answer	Marks	Guidance
11(e)	Anthropometric data that could be explained: height of child, reach, seating height, leg length, larger seat area/back, greater stability Quality of explanation 0–3	3	Accept any valid anthropometric data relating child to function of rocking horse
11(f)(i)	Two safer ways: lighter weight, lower to ground, more stable, rounded moulded plastic, curved shape more comfortable, easier to clean, less likely to splinter/snap, backrest prevents child falling off, wide footrest 2 × 2	4	Descriptions must be detailed for maximum marks: e.g. rounded moulded plastic [1] means that the child is less likely to ‘catch’ on any sharp corners [1]
11(f)(ii)	Two reasons: beech rocking horse is fabricated which uses more materials and takes longer to produce, plastic rocking horse can be moulded quickly, reusing the mould, hardwood is more expensive justified 2 × 2	4	Accept any detailed valid reasons Points listed must be expanded upon

Question	Answer	Marks	Guidance
12(a)	Acrylic, polystyrene, high density polythene, PET, PETE, ABS, polypropylene	1	Do not accept uPVC
12(b)	Stages include: place mould on platen, clamp plastic in place, heat plastic sheet, check ‘softness’ of plastic, turn on vacuum and raise platen, check if shape has formed, turn off vacuum, leave to cool 6 × 1	6	
12(c)(i)	Wide variety of suitable wood, metal or plastic available 1	1	
12(c)(ii)	Reason for choice of material in previous part (c)(i) Variety of material properties available 1	1	
12(c)(iii)	Dimensions provided for thickness and diameter must relate to the chosen material. 2 × 1	2	Maximum Ø 150 minimum Ø 120 Maximum thickness 20 minimum 15

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Question	Answer	Marks	Guidance
12(c)(iv)	Main stages of production: Marking out 1 Cutting [at least 1 tool named] 1 Shaping [at least 1 tool named] 1 Finishing [glasspapering] 1 Finishing [named finish] 1	5	Consider technical accuracy and quality of communication Ignore hole to be drilled in base
12(c)(v)	Suitable material: wood, metal or plastic rod or plastic and metal tube 1 Method of joining: drilled hole 1 Use of epoxy resin or adhesive corresponding to chosen material 1	3	
12(d)	Some form of collar/pin/peg to be fitted onto column 1 Named material for collar/pin/peg 1 Method of joining pin/peg fitted to column 1 Additional details 1	4	
12(e)	Two benefits: saves raw materials, reduces impact of landfill, reduces possible pollution caused by recycling or incineration, reduces need for collection, reduces plastic waste, less money spent on new materials 2x1	2	Accept any valid benefits of re-using items Do not accept less environmental damage, protects the environment

Question	Answer	Marks	Guidance
13(a)(i)	Manufactured boards more stable, less likely to expand or shrink, twist or warp, cheaper	1	Do not accept easier to work, cut, shape, lightweight
13(a)(ii)	MDF gives a better finish, smoother surface, less likely to splinter, easier to work	1	Do not accept cheaper
13(b)(i)	Scriber, odd-leg calipers, odd-legs, Jenny calipers	1	Do not accept calipers, marker pens

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Question	Answer	Marks	Guidance
13(b)(ii)	To prevent the tip of the drill wandering, to produce an accurate hole, no risk of damage to surface of metal, to guide the drill	1	
13(c)	Two checks: no trailing leads, check set up of tool, fence position and secure, check condition of electrical fittings, no 'observers', workpiece held securely 2 × 1	2	Do not accept items of PPE, no loose clothing etc.
13(d)(i)	Use of a try square/engineers square, spirit level, 'level' named Clear sketch showing tool in position against tube 1 0–2	3	Award 1 mark maximum for set square shown in position
13(d)(ii)	Emery cloth used to clean up joint before brazing Flux applied to parts of the joint to keep joint 'clean' and allow 'spelter' to flow Blowtorch is used to heat the metal joint Brazing rod applied to joint at appropriate temperature and heated to flow 1 1 1 1	4	
13(e)	Use of some type of screw fitted through underside of shelf Head 'sunk' [hidden] Inserted into tube Added details 1 1 1 1	4	
13(f)	Two reasons: MDF has an unattractive natural colour, marks more easily covered, colour of paint can 'match' environment 2 × 1	2	Do not accept easier to paint
13(g)	Three main processes involved in constructing the bracket: Marking out sketch shows marking out named 1 Cutting 2 tools/items of equipment used Joining nailed/screwed and glued =1 dowels/M&T = 2 1 + 1 2 × 1 0–2	6	