



Cambridge IGCSE™

DESIGN & TECHNOLOGY

0445/32

Paper 3 Resistant Materials

October/November 2020

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 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 bolt, screw [thread] 1 B washer 1 C wing nut, 1	3	

Question	Answer	Marks	Guidance
2	3 stages include: apply flux, insert pegs into holes, position on hearth [firebricks], heat to appropriate temperature, apply brazing rod, make sure brazing rod 'runs' into joint, degrease holes 3 × 1	3	'Heat' must be qualified

Question	Answer	Marks	Guidance
3	Methods: use of a wedge, dowel, nails, screws, bolts 1 nail/screw/bolt = 1 mark 2 nails/screws/bolts = 2 marks 1 or 2 dowels = 2 marks	2	Do not reward supporting blocks underneath joint

Question	Answer	Marks	Guidance
4	Basic understanding of the term 'anthropometrics' 1 Height dependent on distance from part of the leg behind the knee to the ground [popliteal height]. 1	2	Reference to human measurements

Question	Answer	Marks	Guidance
5(a)	Alloy is a mixture 1 Two or more metals 1	2	Accept purpose is to create a metal with specific properties 1 mark Must refer to metals not materials
5(b)	Stainless steel, brass 2 × 1	2	

Question	Answer	Marks	Guidance
6(a)	Purpose: to prevent the load [weight of the gate] sagging inwards towards the post, increase rigidity, acts as a brace, support, keep shape	1	Accept answers that show basic understanding of 'sagging' effect. Do not accept vague answers such as 'stronger'.
6(b)	Tee hinge	1	

Question	Answer	Marks	Guidance
7	Plastic made from oil, a finite source, many plastics cannot be recycled, do not decompose, produce landfill, products thrown away, manufacturing creates toxic gases,	2	Accept any valid environmental impact point. Accept one point well explained or separate points.

Question	Answer	Marks	Guidance
8	Practical idea: some sort of 'stand' or 'support' shown 1 'Stand' joined to hardboard back or mild steel frame 0–2	3	Appropriate materials 1 Appropriate constructions 1

Question	Answer	Marks	Guidance
9	(a) Die 1	2	Not tapper
	(b) Tap 1		

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Question	Answer	Marks	Guidance
10	Advantage: quick-drying process, requires no clamping 1 Disadvantage: not as strong as PVA, some risk of burns, time taken to set up glue gun, requires electrical power source 1	2	Not a quicker process Not an easier process

Question	Answer	Marks	Guidance
11(a)	Hardwood: accept any appropriate/correctly named hardwood 1 Manufactured board: plywood, MDF, hardboard 1 Thermoplastic: acrylic, polystyrene, ABS, PVC, LDPE, HDPE, polypropylene, PET 1 Non-ferrous metal: aluminium, brass, copper 1	4	Not lead
11(b)	Appropriate recognised joint: 0–2 Accuracy of sketch, correct orientation, proportion 1	3	Butt, dowel, half-lapped, finger, dovetail Butt: 2 marks= nail/screw +glue otherwise 1 mark for nail/screw only or 1 mark for glue only
11(c)(i)	Method of cut out: use of tenon, coping, Hegner, scroll saw, band saw Named 1 Finished using chisel or file 1	2	Not hacksaw
11(c)(ii)	Use of tenon, coping, Hegner, scroll, jig saws or chisel to remove waste 1 Use of disc sander, files, glasspaper to finish shape 1	2	
11(d)(i)	Measure length using a steel rule, ruler, tape measure 1 Mark out using a scribe 1 Hold metal rod in vice 1 Saw off length using a hacksaw 1	4	Must be hand tools . Award max. 2 marks for answers with no sketches
11(d)(ii)	Less likely to corrode, self-finishing, do not need an applied finish, attractive 2 × 1	2	Accept any valid advantages Not cheaper, lighter, last longer

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Question	Answer	Marks	Guidance
11(d)(iii)	A facing off B parting off	1 1	2 Accept: facing, parting
11(d)(iv)	Modifications include the use of grooves, 'ridges', tapered shape, knurled surface 0–2	2	1st mark for practical modification 2nd mark for accuracy of sketch
11(e)(i)	Two modifications include : draft angle, rounded edges, air holes in top of former 2 × 1	2	
11(e)(ii)	Plastic not hot enough: plastic will not form to the required shape 1 Plastic too hot: it can melt or produce webbing 1	2	

Question	Answer	Marks	Guidance
12(a)	Two advantages: smooth surface-no grain, stable, cheaper, easier to work, no knots, readily available 2 × 1	2	Not lighter
12(b)	Dovetail, finger [comb], dowel, lapped, half-lapped, mitre named 1 Suitable joint recognised 1 Correct orientation [as per Fig. 12.1] 1 Good proportion/accuracy 1	4	Mitre joint must be drawn in 3D. 2D drawing of mitre = 2 marks max.
12(c)	Recognised rebate/ groove/ beads 1 Good proportion/size/accuracy 0–2	3	Do not reward methods visible on outside of box
12(d)(i)	Modification to bench hook 1 'Stop' to locate end of MDF length 1 150mm measured distance for saw cut Added notes/details to describe the jig 1	4	
12(d)(ii)	Method: use of disc sander, shooting board, belt finisher, plane 1 Accurate sketch showing method 0–2	3	Smoothing, jack, block plane Do not reward files, glass paper

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Question	Answer	Marks	Guidance
12(e)	Dots could be designed using CAD 1 CAD drawings are downloaded to a CNC machine 1 CNC machine and MDF are set up 1 CNC machine cuts out dots, MDF is removed 1	4	Alternative method involves use of CAD, downloaded data to vinyl cutting machine. Added details relating to setting up machine, applying vinyl to dominoes. Candidates can achieve maximum marks for this method.
12(f)(i)	Plastic dominoes gives a smooth finish, inherent colour, easier to clean, safe rounded edges/corners to handle, durable 2 × 1	2	Not water resistant
12(f)(ii)	Named industrial process: injection moulding 1 2 reasons: quick [after mould/tool has been produced], accurate/repetitive process, little waste/economical 2 × 1	3	For 2 marks accept one point well argued or two separate issues discussed. Not cheap, easy to set up ECF for incorrect process but correct reasons

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Question	Answer	Marks	Guidance
13(a)	Two properties: tough, durable, hardwearing, attractive, moisture resistant 2 × 1	2	Accept any valid property.
13(b)	Recognised dowel joint drawn 1 Diameter of dowel Ø6 – Ø9 1 Number of dowels reqd. min. 2 max. 4 1 Accurate marking out of dowel centres for drilling Named adhesive: e.g. PVA 1	5	Accept use of jig for accurate marking out
13(c)(i)	Centre bit, twist bit, forstner bit, saw tooth bit, flat bit, speed bit	1	Not twist drill
13(c)(ii)	To prevent splitting underneath the base. To secure the wood for safe drilling. To prevent damage to surface underneath base. Prevent damage to drill bit. Stop wood moving around. Indicates drill through workpiece. Produces a clean hole. 2 × 1	2	
13(d)(i)	Steel rule, try square, scribe, odd legs, centre or dot punch, scribing block and surface plate 2 × 1	2	Not pencil, marker pen, felt tip
13(d)(ii)	Metal strip held securely in vice or around former 1 Method of force: mallet or hammer 1 Correctly named tools and equipment 1	3	Accept heat treatment/annealing as a stage.
13(d)(iii)	Attractive appearance, protect metal from corrosion 2 × 1	2	Accept any valid reason.
13(e)	Trees can be planted to replace those used, wood can be reused to make manufactured boards, material that does not run out	2	Accept any valid point to support sustainability.

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Question	Answer	Marks	Guidance
13(f)	Some form of recognisable 'legs' 1 Supported at 500 height 1 Plant holder 'fits' into/onto 'leg' support 1 Suitable materials 1 Appropriate constructions and fittings 1 Accuracy of design drawings 1	6	