



Cambridge IGCSE™

DESIGN & TECHNOLOGY

0445/31

Paper 3 Resistant Materials

October/November 2023

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 2023 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	3 safe working practices: • work secure • guard in position • face mask worn • no loose clothing • hair tied back • wear apron • location of emergency STOP button • drill bit secure in chuck [3 × 1]	3	Accept any valid safe working practices. Do not accept use of gloves, keep fingers out of way of drill Do not accept sacrificial wood under workpiece

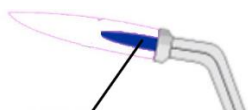
Question	Answer	Marks	Guidance
2(a)	Smoothing	1	
2(b)	A	1	

Question	Answer	Marks	Guidance
3	Method: KD fitting, screws / 'buttons' / brackets / added blocks / dowels / screws [1] Technical details [0 – 2]	3	For 'screws': (counterbored, pocket screwed, directly into underside of tabletop)

Question	Answer	Marks	Guidance
4	Crate: polypropylene, ABS, HIPS, HDPE [1] Electrical switch: urea formaldehyde [1] Electrical insulation: PVC [1]	3	
5	Quality control	1	

Question	Answer	Marks	Guidance
6(a)	Centre or dot punch	1	
6(b)	Dividers	1	

Question	Answer	Marks	Guidance
7(a)	Acrylic cement / Tensol cement / MMA [1]	1	Do not accept epoxy resin, contact adhesive
7(b)	Sketch showing adhesive 'tape', scrap paper, scrap wood [1] Applied 5 mm from end of bottom piece [1]	1 1	2 Accept line drawn showing area to be glued for 1 mark

Question	Answer	Marks	Guidance
8(a)	To reflect the heat, allows work piece to be heated more quickly, protects surface below workpiece, heat circulates, prevents heat from escaping [0 – 2] Award 1 mark for reference to 'safety'	2	Accept any valid explanations
8(b)		1	Award 1 mark for anywhere in the darkest zone

Question	Answer	Marks	Guidance
9	Change colour	1	

Question	Answer	Marks	Guidance
10(a)	Functional improvement: added bracket or strips to give greater support to the shelf, lipping to prevent items falling off [1] Added details [1]	2	Accept any valid functional improvement
10(b)	Aesthetic improvement: slight curve applied to front edge of shelf, rounded corners, application of paint, veneer, laminate [1] Added details [1]	2	Accept any valid aesthetic improvement Accept change of material for shelf for 1 mark

Question	Answer	Marks	Guidance
11(a)	Number of 'fingers' 5 or 7 [1] Equal spacing [1] Overall accuracy [1]	3	
11(b)(i)	Bench stop allows the wood to be planed without interference with the vice. Wood can be planed on a flat surface	1	Do not accept 'stable'
11(b)(ii)	Method: screws or nuts and bolts to provide method of clamping [0 – 2] Details of fittings and fixings to the clamping strip [0 – 2]	4	Award 1 mark for use of dowels, mortise and tenon joint, magnets.
11(c)	Suitable constructions: dowel, mortise and tenon, domino, housing [0 – 2] Technical accuracy of details [0 – 2]	3	Use of adhesive only - 0 marks Dowels: min. 2 – max. 3. Max. Ø6
11(d)(i)	2 settings: • correct size router cutter • locked in position • fence set to width • depth of cut • speed of router cutter [2 × 1]	2	

Question	Answer	Marks	Guidance
11(d)(ii)	Stage 2: insert saw blade and cut out shape leaving small amount of waste [1] Hegner saw or equivalent, jig saw, coping saw, mortising machine [1] Stage 3: remove waste and clean surfaces up to the line [1] Use of files and glasspaper [1]	4	Accept 'chain drilling' and use of files and / or chisels
11(e)	Piano hinge	1	
11(f)(i)	Angled lid ergonomic feature: consideration of different users [1] To angle the lid at a position that is best / most comfortable for them [1]	2	
11(f)(ii)	Some sort of practical 'connection' between lid and box: e.g. use of wood / metal strip with cut out or pins to provide fixed position [0 – 2] Details of materials, fittings and fixings used [0 – 3]	5	

Question	Answer	Marks	Guidance
12(a)(i)	A metal that contains iron	1	Do not accept 'magnetic'
12(a)(ii)	Wide variety of ferrous metal available	1	
12(b)(i)	Hacksaw, junior hacksaw, tinsnips, bench shears / guillotine [2 × 1]	2	Accept 'snips', Hegner / scroll saws with metal cutting blade Do not accept 'curved snips'
12(b)(ii)	Sketch showing a wooden former [1] Sketch showing metal development clamped securely to former [1] Method of force: hammer or mallet [1] Correctly named tools and equipment [1]	4	
12(c)(i)	Close grain	1	
12(c)(ii)	Checks: hardwood securely held between centres, rotate hardwood to ensure clear from Tee rest, Tee rest at correct height / position, check to see if hardwood is centred	1	

Question	Answer	Marks	Guidance
12(c)(iii)	Scraper, chisel, gouge	1	
12(c)(iv)	Outside / external calipers, vernier calipers, micrometer	1	Do not accept 'calipers'
12(d)(i)	Tap	1	
12(d)(ii)	Epoxy resin, Araldite	1	Check alternative trade names: must include the name 'epoxy resin'.
12(e)	<u>Method of cutting tape efficiently: practical idea</u> Some form of horizontal bracket in correct position [0 – 2] Joined to upright support or to base [1] Suitable additional materials named [1] Constructional details [1]	5	If 'bracket' is not practical, award max. 2 marks for 'joining', 'additional materials' and 'constructional details'.
12(f)	3 processes include: • Plastic in fluidised state • Heat metal to 180 °C in an oven • Plunge metal into tank of fluidised polythene • Reheat metal in an oven then leave to cool [3 × 1]	3	Must be in correct sequence
12(g)	Modification to base of dispenser [1] Secured to bench [1] Technical details [1]	3	Screw holes are not modifications. Use of screws or bolts: max 2 marks. Do not accept change of material; e.g. from mild steel to wood

Question	Answer	Marks	Guidance
13(a)(i)	2 advantages: quicker / repetitive accuracy [2 × 1]	2	

Question	Answer	Marks	Guidance
13(a)(ii)	Stage 1 hand drill, machine drill, drill bit [1] Stage 2 coping saw, Hegner, scroll saw or equivalent, router [1] Stage 3 hand, flat or half round files [1] Stage 4 scraper, wet and dry [silicon carbide] paper, polishing mop, polishing compound, buffing machine [1]	4	Do not accept Jigsaw or Laser Cutter. Do not accept sandpaper.
13(a)(iii)	2 methods: Tape 2 pieces of acrylic together and cut and shape as one piece [0 – 2] Or Cut out one frame, use as a template to draw round for the second frame [0 – 2]	2	Award 1 mark for appropriate method Award 1 mark for notes relating to the actual cutting / shaping.
13(b)(i)	More accurate and quicker to draw half the frame, click 'select all' and then click 'mirror image' to produce the opposite half to complete the frame	2	Award 0–2 marks dependent on level of CAD understanding demonstrated
13(b)(ii)	3 stages: position acrylic sheet in CNC machine, set machine parameters, press START button on machine to produce shape of frame [3 × 1]	3	Accept any relevant individual stages within 'set machine parameters'
13(c)	Practical idea: some form of clip, clamp, connecting pins or pegs [0 – 2] Suitable materials [1] Constructional details [1] 2 important sizes [2 × 1]	6	Do not accept use of hinges – 0 marks Do not accept repeats of measurements given in Figs.
13(d)	Metal rail Ø20 tube extended [1] Some form of stable base [1] Suitable materials named [1] Metal rail joined to base [1] 2 important sizes [2 × 1]	6	Accept use of aluminium welding as a construction. Do not accept repeats of measurements given in Figs.