



DESIGN AND TECHNOLOGY

0445/31

Paper 3 Resistant Materials

May/June 2019

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 **9** 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(a)	Ear defenders: power router, band saw.		Accept any specific process where there is a high level of noise. Do NOT accept 2 same situations. Do NOT accept: sanding wood, drilling.
1(b)	Safety glasses: drilling machine, lathework, handling dangerous chemicals, sanding machine, belt sander. 1	2	Accept any specific process where eye protection is vital.

Question	Answer	Marks	Guidance
2	Cross filing: quick removal of waste 1 Draw filing: finishing, smoothing 1	2	

Question	Answer	Marks	Guidance
3	Award 0–3 dependent on technical accuracy. Housing shown correct depth =1, stop on 'shelf' =1, stop on vertical side =1.	3	Double stopped =2, stop shown on 1 piece only =1, through housing =1

Question	Answer	Marks	Guidance
4(a)	2 advantages: no grain markings, more stable, easier to shape, cheaper, smooth surfaces 2 · 1	2	Do NOT accept environmentally friendly
4(b)	2 features: draft angle, rounded edges/corners, depth of former 2 · 1	2	Do NOT accept air holes, heat resistant

Question	Answer	Marks	Guidance
5(a)	Die-casting	1	
5(b)	No restriction on mains cable length, more versatile in use, safer as no lead to trip, portable	1	Do NOT accept safer without qualification, lighter

Question	Answer	Marks	Guidance
6	Acrylic has a flexible property that allows the material to be bent Returns to original shape	1 1	2

Question	Answer	Marks	Guidance
7	Functional improvement: some form of 'second' base or applied strips to prevent the pens, pencils sliding about, extra compartments for equipment, handles to carry 0–2	0–2	2 Marks awarded for practical design idea clearly drawn. Accept holes in base even if shown same size as shown in desk tidy Technical detail not required.

Question	Answer	Marks	Guidance
8(a)	Short grain indicated clearly in 4 areas at top of rack	1	
8(b)	Short grain occurs in solid woods that have grain structure Manufactured boards are constructed to minimise grain weakness	1 1	2

Question	Answer	Marks	Guidance
9	Principle/concept sound For example: Use of lugs and plugs, inserted plates Technical details	1 0–2	3

Question	Answer	Marks	Guidance
10(a)	Checks include: measurements of wood cut to length, positions for joints, squareness when pinned and glued, removal of glue, parts attached securely, holes in correct position	1	Accept any valid quality control check carried out during the manufacture .
10(b)	Checks include: dimensions of product after moulding, visual check for blemishes/marks/imperfections, no sharp edges, holes in correct position	1	

Question	Answer	Marks	Guidance
11(a)(i)	Hardwearing, tough, close grain, does not split easily, good finish, doesn't chip easily, can be bent to shape, non-toxic, aesthetically pleasing 2 · 1	2	Do NOT accept strong or durable, cheap, easy to work, lightweight
11(a)(ii)	3 marking out tools: steel rule, try square, engineers try square, marking knife, mortise/marking gauges 3 · 1	3	Do NOT accept metalworking tools or any form of felt tip/marker pens
11(a)(iii)	Slot cut out: chisel and mallet, mortise machine or drilled holes chiselled out, plunge router, check depth of holes Award 1 mark for technical accuracy 2 · 1 stages 1	3	For example: router or mortise machine =1 + details can = 3 marks
11(b)(i)	Brass, aluminium, copper, duralumin, gilding metal	1	
11(b)(ii)	Can provide an attractive clear finish that does not corrode/rust	1	Accept takes a long time to corrode
11(c)	Method 1: Between centres wood turning. Award 0–5 marks for each relevant detail in process including: preparing the wood before setting up, correct set up, use of gouges/scrapers to make round, parting off. Method 2: Make each disc individually by marking out a circle, cutting to shape and finishing on disc sander, hole drilled, method of achieving identical discs 5 · 1 Method 3: Use of hole saw. Accurate sketch of hole saw and mandrel 0–2, fitted into drill 1, wood held securely 1, hole drilled and disc removed 1.	5	

Question	Answer	Marks	Guidance
11(d)	2 advantages: quicker process [after mould has been produced], repetitive consistency/accuracy, smoother finish, inherent colours, less waste. 2 · 1	2	Cheaper must be qualified Do NOT accept easier to do
11(e)	Lengths marked out 1 Lengths cut 1 Sides joined appropriately: pin and glue, glued butt, mitre, finger, lapped 0–2	4	Do NOT accept dowel
11(f)	CAD: used to design the numbers on screen, change font, size, on-screen modelling, data transferred/downloaded to CNC machine. 0–2 CAM: numbers engraved into surface or applied to surface; use of specific machine such as CAMM 1 vinyl cutter or CNC router set up, tool parameters. 0–2	4	Reward answers that demonstrate genuine knowledge of CAD-CAM. Accept laser cutter = 1 mark Details required re set up etc. 4 · 1

Question	Answer	Marks	Guidance
12(a)	Methods of joining include: dowel, mortise and tenon, housing, biscuit, pin and glue, screw from underneath base. 1 Appropriate construction named 0–2 Sketch showing constructional details	3	
12(b)(i)	Metal fitting: nut and bolt or screw drawn clearly 0–2 2 important sizes: length, diameter of bolt or screwthread or head 2 · 1	4	Do NOT accept rivet Length of screw/bolt must be minimum 35 mm
12(b)(ii)	2 benefits: attractive appearance, prevents corrosion/tarnishing, more hardwearing 2 · 1	2	
12(c)(i)	2 advantages: 3 mm thick plywood is more practical than solid wood, more stable, stronger construction less likely to split, easier to work with 2 · 1	2	
12(c)(ii)	3 mm thick plywood needs corner reinforcement: use of small blocks/strips glued to the inside. Use of cloth tape, GRP, 'laced' 1 Correctly named construction 0–2 Technical accuracy of construction shown 1 One added detail: for example: clamping, holding, gluing	4	

Question	Answer	Marks	Guidance
12(d)	2 properties of brass: corrosion resistant, easily joined, attractive, malleable, bend to shape, reflects 2 · 1	2	
12(e)	Cutting out the shape: use of tinsnips, guillotine Bending to shape: use of folding bars, wooden former Soldering edges: hard silver soldering details Cleaning and finishing 0–2 0–2 0–2 0–2	8	e.g. method of holding, securing / cutting e.g. use of mallet, scrap wood, vice e.g. type of solder, flux, blowtorch e.g. use of wet and dry, polishing mop and compound, Brasso. Do NOT accept emery cloth or wire wool
13(a)(i)	Plywood, blockboard, MDF, chipboard, laminboard	1	Do NOT accept hardboard
13(a)(ii)	Pine, redwood, deal, parana pine, whitewood, spruce, cedar, scots pine	1	
13(b)	2 benefits: attractive finish, hardwearing, stain resistant, heat resistant, easier to clean, hygienic, smooth surface, protects, no splinters, prevents scratches 2 · 1	2	
13(c)(i)	Adjustable height: children using table are different heights, children will grow	2	Reward any valid reasoning.
13(c)(ii)	Granules fed into hopper Rotating feed screw takes the granules through heating chamber to melt Screw forces plastic through die 1 1 1	3	Do NOT accept labels without description. For maximum 3 marks the 1st stage [granules in hopper] and the 3rd stage [plastic forced through die] must be noted otherwise maximum 2 marks
13(c)(iii)	Adjustable positions Pin, peg or dowel Locking method Notes provide a description of how it works 1 1 1 1	4	Accept existing 'base' position as 1st position. Method involves 2 or 3 holes drilled in sleeve and 1 in leg or vice versa.

Question	Answer	Marks	Guidance
13(d)	Benefit of same section softwood: quicker production time Justification since there is less machine setting up required	2 1 1	Award 1 mark maximum for 'cheaper by buying in bulk'.
13(e)(i)	Sketch showing 2 screws used Details of screws: length, gauge [diameter], type of head, spacing	1 2 · 1	3 Ignore use of adhesive Accept any 2 from 3 details
13(e)(ii)	Sketch showing minimum of 2 dowels per rail Details of dowels: length, diameter, spacing	1 2 · 1	3 Accept any 2 from 3 details
13(f)	Benefits of self-assembled products to manufacturer: quicker production time means less costs, lower prices available, more profits, less storage space required	0–2	2
13(g)	Functional improvement: lipping to top to prevent items falling off, dedicated space/s into table top for storage, rounded corners for safety.	0–2	2 Award marks for a practical design idea clearly communicated.