



Cambridge IGCSE[®]

DESIGN & TECHNOLOGY

0445/03

Paper 3 Resistant Materials

For examination from 2020

MARK SCHEME

Maximum Mark: 50

Specimen

This document has **10** pages. Blank pages are indicated.

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:

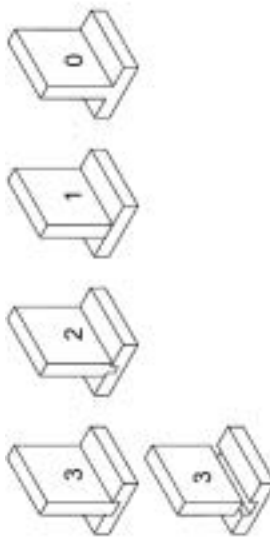
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

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.

Mark scheme key

- The symbol / separates alternative answers that could be given for the same mark(s).
- Square brackets around a number show partial marks that can be awarded.
- Square brackets around text show extra information not needed for the mark(s) to be awarded.

Question	Answer	Marks	Guidance
1	Award 1 mark for each ergonomic feature up to a maximum of 3 : buttons easy to see / comfortable or rounded shape in hand / appropriate size to fit hand / colour-coded buttons for ease of operation / rubber buttons for better selection. [3 × 1 mark]	3	Accept any valid ergonomic feature.
2	Marking gauge [1] Micrometer [1] Odd legs / odd leg calipers / Jenny[s] calipers. [1]	3	Not just 'calipers'
3	Award 0–3 marks depending on accuracy of sketch.	3	
4	High voltage / electric shock hazard / danger electricity [1] Flammable / fire hazard [1]	2	Not 'electric current'
5	Any two benefits of die casting: intricate designs possible / reusable moulds / little or no machining necessary / fast process / identical multiple parts / mass production possible. [2 × 1 mark]	2	Not 'accurate', 'water resistance'

Question	Answer	Marks	Guidance
6(a)	Polystyrene/polypropylene	1	
6(b)(i)	Keeps food hot / can be moulded quickly / one-piece production / hygienic / lightweight	1	
6(b)(ii)	Can produce litter / cannot be recycled / does not decompose	1	
Question	Answer	Marks	Guidance
7(a)	Steam bending / laminating	1	
7(b)	Fewer joints to construct / sturdier construction / attractive curved appearance / less waste	1	'Stronger' must be qualified, e.g. 'stronger because there are no joints'.
Question	Answer	Marks	Guidance
8	Any two of: Lightweight / greater fuel economy or speed (as lighter weight) / environmentally more friendly / does not corrode / more suitable for small production runs / less dense / higher strength–weight ratio. [2 × 1 mark]	2	Not 'more impact resistant', 'easier to mould/shape', 'stronger'
Question	Answer	Marks	Guidance
9(a)	[High density] polyethelene/polythene	1	
9(b)	Can be recycled	1	Not 'it has been recycled'
Question	Answer	Marks	Guidance
10	Template with 2 holes drilled [1] Located against 1 end OR edge [1] Located against 1 end AND 1 edge [1]	3	Accept genuine, pre-manufactured drilling jigs.

Question	Answer	Marks	Guidance
EITHER			
11(a)	Chipboard/plywood/MDF/laminboard/blockboard	1	Not hardboard
11(b)	Veneer can become chipped or split or dented / veneer is not easily repaired	1	Accept any one disadvantage.
11(c)	Practical idea: some form of lipping/edging/'frame' [1–2] Named materials appropriate [1] Methods of construction [1] Three important sizes [1]	5	Award 2 marks for practical idea drawn accurately and clearly; 1 mark for practical idea not clearly communicated; accept non-slip material. Must be a specific name of wood, metal or plastic. Constructions include pinning or screwing and gluing. Sizes include, e.g. length, width, thickness of material used; positions and distances materials are set in.
11(d)	Some form of metal plate / welded tube / brackets or block of wood attached to underside [1–2] Stand joined appropriately to plate / tube / brackets or block [1–2] Accuracy of technical detail including sizes, materials [1]	5	Award 2 marks for appropriate solution (metal plate, tube, block, bracket) and appropriate positioning; award only 1 mark if positioning inappropriate. Award 2 further marks for appropriate joining method, e.g. use of welding, screws, bolts shown clearly or referenced with sizes; award 1 mark only for appropriate joining method not shown clearly or without sizes.
11(e)	Practical method: gusset plate, brace in 2 directions / 'L' shaped plates [1–2] Sizes and constructions [1–2]	4	Award 1 mark for method if strengthening is in one direction only. Award 2 marks for full details and 1 mark for partial detail of sizes and constructions.

Question	Answer	Marks	Guidance
11(f)	Inner and outer tubes [or equivalent], gives height adjustment [1–2] Method of locking: screw / nut and bolt / spring pin [1–2] Materials, sizes and constructions [1–2]	6	For maximum marks details must be clearly shown and drawn accurately. Award 1 mark for adjustment principle poorly communicated. Practical locking device 1 mark; accurate details 1 mark. Award 1 mark if only one item from materials, sizes and constructions is given; award 2 marks if two of these are given.
11(g)	Reference to dimensions of human form [1] Reference to specific dimensions, e.g. reach [1] How this is related to the design of the bedside table [1]	3	For maximum marks explanation must say how it is used.
Question	Answer	Marks	Guidance
OR			
12(a)(i)	Any two benefits: Lower costs than ready assembled furniture / available for immediate collection / satisfaction of assembling at home / easier to transport. [2 × 1 mark]	2	
12(a)(ii)	Any two benefits: Less storage space required / fewer manufacturing processes means quicker production / competitive costs. [2 × 1 mark]	2	Accept easier to transport as a benefit for both consumer and manufacturer if qualified.
12(b)	Recognised KD fitting: corner block [1–2] At least 2 corner blocks positioned [1] Added notes [1]	4	Award 1 mark for corner block that would work but is inappropriate size. Notes to include, e.g. relevant sizes, types and lengths of screws, spacing of corner blocks.
12(c)	Accurate sketch of practical idea, e.g. pre-manufactured component runner or use of grooves [cut or applied]. [1–2] Materials [1] Constructions [1]	4	For 2 marks, sketch of pre-manufactured component runner must be drawn accurately. Award 1 mark for sketch if not accurate or for a housing joint into which complete thickness of shelf inserts. Notes to include, e.g. sizes and types of materials used. Grooves to be cut out or applied include width and depth dimensions.

Question	Answer	Marks	Guidance
12(d)(i)	Any two advantages: even application possible / no brush strokes / faster / smoother. [2 × 1 mark]	2	
12(d)(ii)	Any two safety precautions: well-ventilated room / face mask / safety glasses. [2 × 1 mark]	2	
12(e)(i)	Safety: corners are rounded / desk is stable in use	2	Accept any sensible positive or negative evaluative comments about generic computer desks. Award 0–2 marks depending on quality of explanation and/or number of points made.
12(e)(ii)	Appearance: good space for keyboard monitor / attractive painted finish / clean simple form	2	Accept any sensible positive or negative evaluative comments about generic computer desks. Award 0–2 marks depending on quality of explanation and/or number of points made.
12(e)(iii)	Materials used: use of manufactured board is economical / manufactured boards lend themselves to KD constructions and therefore self-assembly and this can reduce the cost of the product	2	Accept any sensible positive or negative evaluative comments about generic computer desks. Award 0–2 marks depending on quality of explanation and/or number of points made.
12(f)	Limited lifetime issues include: Materials such as manufactured board may not be as long-lasting as solid wood. Constructions such as KD fittings dependent on strength of screw thread may not be considered long-lasting. Over time, in use, KD fittings may become worn. Fashion can dictate the change for furniture of this type. Technological developments mean that tables to accommodate computers, etc. may become obsolete.	3	Accept any valid points that relate to limited lifetime. Award 0–3 marks depending on quality of explanation and/or number of points made.

Question	Answer	Marks	Guidance										
OR													
13(a)	Any two benefits: wide variety of colours available / self-finished / easy to bend to shape / attractive / can be joined easily. [2 × 1 mark]	2	Accept any other valid benefits										
13(b)	Acrylic held in a vice or clamped down on bench [1] Appropriate saw used to cut shape: coping/tenon/vibro/hegner or equivalent [1] Sawn edges filed flat [1] Use of wet and dry [silicon carbide] paper to make smooth [1]	4	Award 1 mark (to maximum 4) for alternative stages including: use of scraper to smooth edges / use of two different grades of wet or dry [silicon carbide] paper to make smooth / polishing [buffing] mop and compound to polish surfaces.										
13(c)	Accept any three stages in the CAM production process: select type of CNC machine used / design drawings transferred or downloaded to CNC machine / setting up of acrylic workpiece / setting of machine parameters. [3 × 1 mark]	3	Although question asks how CAM could be 'used to cut out', the transfer/download of data can be rewarded as part of the overall operation. Reward any genuine points in the overall explanation. Types of CNC machine: miller, router, engraver, laser cutter. Do not accept lathe.										
13(d)	Main stages include: heat plastic using oven / strip heater / line bender / heat gun [1] accurate sketch of mould / former [1] retention of plastic while cooling; use of clamps / blocks [1] technical accuracy [1]	4											
13(e)	<table border="1"> <thead> <tr> <th>Stage</th> <th>Process</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Plastic granules fed into hopper. [1]</td> </tr> <tr> <td>2</td> <td>Granules heated up to liquid form. [1]</td> </tr> <tr> <td>3</td> <td>Forced by rotating screw into die. [1]</td> </tr> <tr> <td>4</td> <td><i>The extruded tube cools.</i></td> </tr> </tbody> </table> <p>Award 1 mark for each correct stage (1, 2, 3) in the process</p>	Stage	Process	1	Plastic granules fed into hopper. [1]	2	Granules heated up to liquid form. [1]	3	Forced by rotating screw into die. [1]	4	<i>The extruded tube cools.</i>	3	
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Question	Answer	Marks	Guidance
13(f)	<p>Practical solution [1–2]</p> <p>Quick removal [1]</p> <p>Details of constructions and fittings [1–2]</p>	5	<p>Do not reward solutions made from non-acrylic material.</p> <p>Practical solutions include use of 'L' shaped brackets that attach the tray to the tube by means of slots / use of pegs and drilled holes with interference fit.</p> <p>Quick removal should involve methods that can be carried out by hand without the use of tools.</p> <p>Details of constructions and fittings include: sizes of fittings used; dimensions of slots, pegs, brackets; and the use of acrylic cement or superglue to permanently fasten components.</p>
13(g)	<p>Base shown [1]</p> <p>Method of fitting tube into base [1]</p> <p>Permanent method of securing tube in base [1]</p> <p>Details of materials and sizes [1]</p>	4	<p>Base must be stable and take the tube and must be appropriate size/scale for 1 mark.</p> <p>Tube fits into base: use of drilled hole, peg inserted into base over which tube fits.</p> <p>Permanent method involves use of acrylic cement [with additional pins] or superglue.</p>