Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

DESIGN AND TECHNOLOGY **0445/32**

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.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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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	Specification points include: must close automatically when foot is removed from pedal, attractive appearance, durable materials, easy to clean, stable in use, large pedal for foot 2×1	**2**	Accept any **valid** specification points. **N**ot lightweight, use recycled/recyclable materials.

Question	Answer	Marks	Guidance
2	Metal models: die casting 1 Plastic tubes: extrusion 1 Wooden chair: lamination, steam bending 1	**3**	**Not** casting.

Question	Answer	Marks	Guidance
3(a)	To cut the fibres of the wood to prevent splitting	**1**	
3(b)	To allow for the thickness of saw blade, to leave a small amount to finish square, allow tolerance for sawing, allow margin for error, allows to finish with sanding disc	**1**	

Question	Answer	Marks	Guidance
4	Angle/angle iron. Round tube. Flat or strip/flat strip. 3×1	**3**	Accept: angle iron, flat strip.

Question	Answer	Marks	Guidance
5	At least four fingers 1 Equal spacing 1 Accurate drawing of projected lines to show joint 1	**3**	

Question	Answer	Marks	Guidance
6	CFRP, carbon fibre, GRP, glass fibre, Kevlar, plywood, blockboard, laminboard, MDF, hardboard, chipboard 2×1	**2**	Accept any **valid** composites.

Question	Answer	Marks	Guidance
7	Facing off 1 Parting off 1	**2**	

Question	Answer	Marks	Guidance
8(a)	Sash	**1**	
8(b)	To prevent damage to the hardwood strips, to distribute pressure evenly 2×1	**2**	

Question	Answer	Marks	Guidance
9	Attractive, hardwearing, does not corrode when in contact with water, easy to clean, does not mark easily, easily bent to shape 2×1	**2**	Accept any **valid** reasons Durable must be qualified: will last for years, will not deform easily.

Question	Answer	Marks	Guidance
10	Practical idea: some sort of ‘hook’ or interlocking components 0–2 Added notes to expand on sketch 0–1	**3**	Pegs, pins, dowels = 1mark as they can be pulled apart. Technical details not required.

Question	Answer	Marks	Guidance
11(a)(i)	Plywood, MDF, hardboard	**1**	
11(a)(ii)	Aluminium, copper, brass, gilding metal	**1**	
11(b)(i)	Two reasons include: to drill an accurate hole, to prevent the drill from snagging, to prevent distortion, safety issue of board spinning 2×1	**2**	Stop it moving is too vague
11(b)(ii)	Saw to remove waste; use of coping, jig, Hegner, scroll, band saws 1 Use of files 1 Use of glasspaper 1	**3**	Must be **hand** method. Accept any other **valid** saw. **Not** laser.
11(c)	Method: use of 5 mm wide mortises/added block or bracket behind clock face 0–2 Use of PVA/adhesive 1	**3**	Do **not** accept use of nails, screws or dowels into 5 mm thick manufactured board.
11(d)	More even application, quicker, better finish, no brush strokes 2×1	**2**	**Not** easier.
11(e)	Legs made from sheet metal cut to shape 1 Bending metal to shape 0–2 Method of joining: use of rivets, solder or epoxy resin adhesive 0–2	**5**	Use of former, jig, scrap wood, mallet, vice Use of blowtorch, flux, solder, epoxy resin Ignore details of heating to bend or use of sheet metal benders. If candidate names a non-ferrous alloy the method of joining must be appropriate.
11(f)	Self-finished means no applied finish is added 1 The surface is cleaned and then buffed/polished 1	**2**	
11(g)	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, laser cutter set up, tool parameters. 0-2	**4**	Reward answers that demonstrate genuine knowledge of CAD-CAM.
11(h)	Movement, sound, lights, theme linked to TV, cinema or book character 2×1	**2**	Accept any **valid** methods.

Question	Answer	Marks	Guidance
12(a)	Reasons include: easy to bend, variety of colours available, attractive, easy to clean, self-finishing.	**2**	**Not** cheap, lightweight
12(b)	Pre-drilled hole 1 Cut out using coping, Hegner, scroll saw 1 Removal of waste to produce shape 1 Finishing: use of wet and dry, scraper, acrylic polish 1	**4**	
12(c)	Processes/details include: design drawings transferred/downloaded to CNC machine type of CNC machine used setting up of acrylic workpiece setting of machine parameters 4×1	**4**	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.
12(d)	Use of strip heater, line bender, oven 1 Use of former or machine setting [line bender] to obtain required angle 1 Method of retention 1	**3**	
12(e)(i)	Method of clamping: G cramps or applied weights. 1 Use of scrap wood to prevent damage, distribute pressure evenly 1	**2**	
12(e)(ii)	Disposable gloves: because acrylic cement is an irritant 1 Face mask: to prevent inhaling toxic fumes/splashes 1	**2**	Do not accept ‘protect’ unless qualified
12(f)	Sketches showing: layers of wood veneers glued 1 Use of a former/formers 0–2 Method of clamping laminate to retain shape, including vacuum bag 1	**4**	
12(g)	Evaluation carried out: insert tablet, phone and remote and test accessibility, stability, seek third party opinion re appearance	**2**	Accept any **valid** evaluation procedures.
12(h)	Consumer demand due to: advances in technology, use of tablets, phones, ease of accessibility essential, fashion trends.	**2**	Reward well-presented comments demonstrating an understanding of issues.

Question	Answer	Marks	Guidance
13(a)	4 main stages should include : Mark out shape 1 Cut off waste using a saw 1 Make flat and smooth by means of plane/glasspaper/disc sander, linisher 1 Rounded edge could be planed, glasspapered, filed, use of router + cutter 1 Tools/equipment named 1	**5**	Allow use of files for **rounded edge only**
13(b)	Safety **features** include: rounded edges/corners, strong materials, strong constructions, anthropometric considerations of height off ground, reach from seat to handlebars, backrest to prevent falling backwards, no sharp/dangerous protrusions, stability of four wheels 2×1	**2**	Accept any **valid** safety features in the design of the ride-on toy
13(c)(i)	To make it easier to start turning 1 Prevent the wood from splitting 1	**2**	Corners hitting the tool = 1 mark
13(c)(ii)	Two tools include: scraper, gouge, outside calipers, glasspaper 2×1	**2**	Accept named lathe tools including tool rest, faceplate
13(c)(iii)	Two advantages: plywood more stable, no grain considerations, less likely to split/break 2×1	**2**	**Not** cheaper, lighter
13(d)(i)	Drilling jig matches shape of end with hole drilled 1 Locates against one side 1 Locates against two sides 1 Locates against three sides 1 Suitable specific material: mild/stainless steel, wide range of non-ferrous metal 1	**5**	Do **not** accept wood-based materials
13(d)(ii)	Clearance hole larger than axle shown or stated 1 Free rotation: use of washer, bearing, ball race 1 Method of retention: ‘star’ washer, ‘cap’ 1	**3**	Axle is glued into wooden part **B** Axle can be made from wood or metal
13(e)(i)	Injection moulding, blow moulding	**1**	
13(e)(ii)	Soldering, brazing, welding	**1**	Do **not** accept adhesives
13(e)(iii)	Paint, dip-coated plastic, electroplating. 2×1	**2**	Do **not** accept lacquer