CAMBRIDGE
International Education

Cambridge IGCSE™

DESIGN & TECHNOLOGY **0445/31**

Paper 3 Resistant Materials **October/November 2024**

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 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level 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 descriptions 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** diameter [gauge] of screw [1] **B** length of screw [1] **C** type of head [1]	**3**	**Not** width of screw, height, type of screw
2	Any 3 sources such as: solar, wind, tidal, geothermal, hydro, water, sun [3 × 1]	**3**	**Not** 'light'
3	Recognised groove drawn [1] Groove drawn **along** the grain [1]	**2**	Housing across grain = [1] Groove in end grain=1 'Stopped' groove =1
4	Any 3 features such as: attractive appearance, easy to clean, compact design, good use of material, holds phone safely, wide base for stability, gap for charger cable, pad on back to protect surface, portable, ergonomic viewing, lightweight [3 × 1]	**3**	Accept any other valid features Accept one-word answers; e.g. stable, portable, attractive
5	Use of a former [1] Use of mallet or hammer [1] Held securely [1] Quality of communication (sketches and notes) [1]	**4**	Accept folding bars/bending irons as a former **Do not** reward marking/cutting out & use of heat
6	Sand casting, casting	**1**	

Question	Answer	Marks	Guidance
7(a)	Planishing	**1**	
7(b)	To induce hardness into the metal to prevent deformation [1] To give an attractive appearance [1]	**2**	Accept 'smooth out imperfections' Accept 'strengthens the copper sheet'

Question	Answer	Marks	Guidance
8	Nickel Titanium [2 × 1]	**2**	
9	Blocks or brackets added to the 2 corners [0 – 2] **OR** 'Plates' attached to the front and back faces [0 – 2] Method of attaching additional materials [1]	**3**	**The joint must remain assembled** **Both** corners/faces must be strengthened One face strengthened = [1] Accept nails or screws inserted underneath or at an angle above =1
10	The lid is not a separate part of the container as it is attached, lid cannot be lost or misplaced, the lid is easy to open and close	**1**	Accept any other valid benefit

Question	Answer	Marks	Guidance
11(a)	Any 3 questions such as: how many reqd. what type of condiments, how many different condiments in each holder, where will they be used/stored/cleaned, portable, how large could it be, budget, weight of condiments, water resistant [3 × 1]	**3**	Accept any other valid questions
11(b)(i)	Softwoods are more readily available, cheaper	**1**	Accept any other valid reasons **Not** easier to work, more attractive
11(b)(ii)	Plywood, MDF, hardboard	**1**	**Not** blockboard
11(c)	Cut out using coping, Hegner, scroll, band, jig saws [1] Use of files to smooth sawn edges [1] Use of glasspaper to smooth sawn edges [1] Quality of communication [sketches and notes] [1]	**4**	Sketches of tools used to cut and file reqd. Accept 'abrasive paper'
11(d)	Dowel, mortise and tenon, housing joint, domino, biscuit named [1] Technical accuracy of construction: proportion, orientation [0 – 3]	**4**	**Do not** accept use of glue only

Question	Answer	Marks	Guidance
11(e)	Saw cut guide or 'stop' for saw blade [1] 200mm length measurement marked clearly on jig [1] Jig secured in position during use [1] Softwood held securely while sawn [1]	**4**	
11(f)(i)	Methods include: in a vice [1] held horizontally [1] **OR** against a bench stop [1] held flat on bench [1]	**2**	Accept any other practical methods; e.g. use of sash cramps, G cramps G cramps **must not** interfere with planing
11(f)(ii)	Jack, smoothing, block planes	**1**	
11(g)(i)	Panel pin, round (wire) nail, oval (brad)	**1**	**No alternative variations accepted**
11(g)(ii)	Nail/pin punch	**1**	
11(h)	In use ask students for feedback, analyse, ask members of catering staff, examine design against original specification, use questionnaire, survey [0 – 3]	**3**	Accept separate methods listed or one in-depth method

Question	Answer	Marks	Guidance
12(a)	Impact resistant, can be self-finished [2 × 1]	**2**	Award 0 if more than 2 statements are ticked
12(b)(i)	(Draw) file edges, use of 'scraper', use of wet and dry [silicon carbide] paper, various grades, apply polishing compound to mop and buff to high quality [3 × 1]	**3**	**Not** abrasive paper Accept 'polish

Question	Answer	Marks	Guidance
12(b)(ii)	Use of an oven to heat and soften acrylic [1] Use of a former [1] Drape softened acrylic around former [1] Method of retention while acrylic cools [1]	**4**	
12(c)(i)	Dividers	**1**	Accept use of compass with chinagraph pencil or marker pen
12(c)(ii)	Coping, Hegner, scroll, band saws	**1**	Accept use of laser cutter, CNC router
12(d)	High drill speed, acrylic clamped, sacrificial board under acrylic, apply tape to surface [2 × 1]	**2**	Accept any other valid precautions
12(e)	2 methods: engraved or applied **Engraved**: transfer file data to CNC machine, set up acrylic in machine (laser, router/engraver), set tool parameters, start machine [4 × 1] **OR** **Applied**: transfer file data to CNC machine (CAMM vinyl cutter), set up vinyl in machine, set tool parameters, start machine, cut out numbers, peel off and apply numbers to clock face [4 × 1]	**4**	Accept any valid stages in processes Accept **ONE** stage from CAD: 'transfer of data' to CNC machine
12(f)	Stages: heat up plastic until pliable, raise platen, turn on vacuum pump, switch off pump, lower platen, remove heater, remove moulded plastic, leave to cool [4 × 1]	**4**	**Do not** reward any stages **before** heating Accept any other valid stages in process
12(g)	Some form of blocks with Ø5 holes drilled or brackets [0 – 2] Method of joining to clock face [1] Appropriate materials [1]	**4**	**Do not** reward use of nuts and bolts/screws through clock face for 'method of joining to clock face'

Question	Answer	Marks	Guidance
13(a)	Beech, oak	**2**	
13(b)(i)	**A** sliding bevel [1] **B** mitre square [1]	**2**	
13(b)(ii)	Mitres sawn off [1] Sawn ends flat: use of sanding disc, linisher, band facer or plane [1] Additional sketch to **show** tools/equipment [1]	**3**	Use of sanding disc, linisher, band facer **ONLY** award max.1 mark Available saws: coping, tenon, band, Hegner, scroll, jig, mitre box [with saw] **Do not** reward use of files, glasspaper
13(c)(i)	Principle: insert dowel or 'strips' of wood between the frame and string [1] 2 inserts at each corner [1]	**2**	
13(c)(ii)	Methods: 'feather' of veneer, saw cut across corner and (contrasting coloured) wood inserted, 'key' inserted across corner on face of mitre joint	**3**	Award 0–3 for practical idea with additional notes to describe method clearly
13(d)(i)	Scriber [1] Engineer's try square, engineer's square, try square [1]	**2**	Do not accept 'square'
13(d)(ii)	Hold leg in vice [1] Hacksaw to saw down vertical sides of recess [1] File out waste [1] All 4 legs either marked out or cut out together [1]	**4**	
13(e)	Emery cloth to clean the joint before brazing [1] Flux to prevent oxidisation and help spelter to flow [1] Blow torch to heat up the joint [1] Brazing rod used to make the permanent joint [1]	**4**	Accept 'to clean off rust' Accept 'to heat up brazing rod'
13(f)	Practical idea: add a base on which legs could be attached, add 2 feet to the bottom of the legs [0 – 2] Additional notes to explain idea [1]	**3**	Accept any valid practical idea