



# Cambridge IGCSE™

---

**DESIGN & TECHNOLOGY**

**0445/32**

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 **11** 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 features: <ul style="list-style-type: none"> <li>• lightweight tray</li> <li>• strong frame</li> <li>• handle grips</li> <li>• large wheel for ease of movement</li> </ul> [3 × 1]	3	Accept any valid good design features. Accept written as a Specification. Accept one-word answers but <b>not</b> 'mild steel frame' and 'polypropylene tray' given in Fig. 1.1. Ignore reference to mild steel frame being lightweight.

Question	Answer	Marks	Guidance
2	Any two of: Tenon / Dovetail tenon / Coping / Band / Hegner / Scroll  [2 × 1]	2	Accept <b>only</b> those listed.

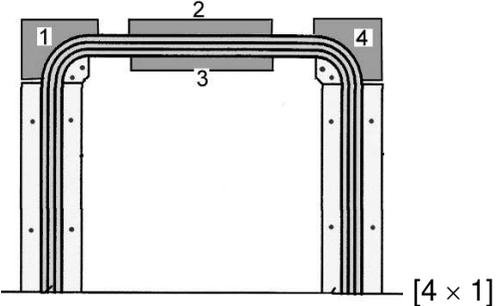
Question	Answer	Marks	Guidance
3	Modification includes 'lip' on front or side of bracket [0 – 2]  <b>OR</b>  Holes drilled in horizontal face of bracket and screwed [0 – 2]	2	Award 0–2 dependent on quality of design, sketches and notes

Question	Answer	Marks	Guidance
4(a)	Corrosion resistant / resistant to chemicals / waterproof	1	
4(b)	Chrome, nickel	1	

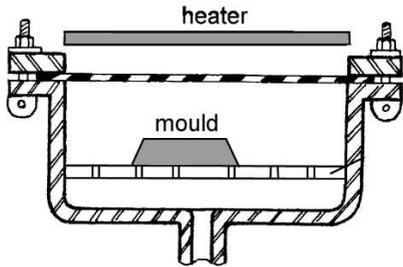
Question	Answer	Marks	Guidance
5(a)	Mortise and tenon / dowel / halving	1	Accept 'tenon joint' and 'mortise joint'.
5(b)	Tee hinge	1	
5(c)	Sketch showing a brace fitted diagonally from bottom left to top right corner	2	 1 mark      1 mark      2 marks

Question	Answer	Marks	Guidance
6	<b>A</b> hand file [1] <b>B</b> half-round file, round or rat tail file [1]	2	Accept <b>only</b> those listed. <b>No</b> variations

Question	Answer	Marks	Guidance
7	2 benefits: <ul style="list-style-type: none"> <li>• allows for maintenance and repair</li> <li>• allows for reuse of parts and components</li> <li>• helps material recycling</li> <li>• reduces landfill and pollution</li> <li>• less waste</li> </ul> [2 × 1]	2	Accept any valid benefits.

Question	Answer	Marks	Guidance
8	 <p>[4 × 1]</p>	4	Accept 'curved' shape at corners. Where one piece is shown across top of laminate award 1 mark only.

Question	Answer	Marks	Guidance
9(a)	Copper	1	
9(b)	Lead	1	

Question	Answer	Marks	Guidance
10	 <p>[2 × 1]</p>	2	Reward positions shown and <b>not</b> the drawings of the mould and heater.

Question	Answer	Marks	Guidance
11(a)	<p>Any three of:</p> <ul style="list-style-type: none"> <li>• Shape and size of paint tins</li> <li>• weight of paint tins</li> <li>• brushes</li> <li>• dimensions of ladder</li> <li>• outdoor materials</li> <li>• finishes</li> <li>• constructions</li> </ul> <p>[3 × 1]</p>	3	Accept any valid research items. Do not accept one-word answers.
11(b)	<p>2 properties: corrosion resistant / easily shaped / ductile / lightweight / malleable [2 × 1]</p>	2	Accept any valid properties

Question	Answer	Marks	Guidance
11(c)	Mitre joint marked out: use of mitre square and pencil or marking knife [2 × 1] Mitre joint cut out: use of tenon saw and sanding disk / belt sander [2 × 1]	4	Accept sliding bevel. Accept sanding disk: for max. 4 marks details showing 'slide' adjusted to 45° must be given
11(d)(i)	<b>A</b> groove [1] <b>B</b> rebate, lapped / lap joint [1]	2	
11(d)(ii)	2 advantages:  <ul style="list-style-type: none"> <li>• no nails or adhesive required</li> <li>• stronger construction to take weight of items stored</li> <li>• stable</li> <li>• more secure</li> </ul> [2 × 1]	2	
11(e)	Heat aluminium rod [1] Use of a Ø30 former / rod [1] Held securely in a vice or cramp [1] Method of force: mallet or hammer [1]	4	Accept any method of heating except furnace and those that melt the rod
11(f)	Practical idea: some form of 'hook' or bracket to fit over / around rung [0 – 2] Suitable materials named [1] Constructional details [1]	4	
11(g)	2 problems: <b>Climate:</b> effect of wind and rain, hot and cold conditions [2 × 1]  <b>Vandalism:</b> How overcome: Use of durable materials and finishes to cope with climate Products secured to avoid theft, special materials to deal with vandalism [2 × 1]	4	Accept any valid problems and sensible methods of how they could be overcome

Question	Answer	Marks	Guidance
12(a)	3 questions: <ul style="list-style-type: none"> <li>• height</li> <li>• weight of 3–4-year-old children</li> <li>• activities undertaken seated</li> <li>• number of chairs required by nursery</li> <li>• stacking feature</li> <li>• safety in use</li> <li>• materials</li> <li>• budget</li> </ul> [3 × 1]	<b>3</b>	Accept any valid questions asked at nursery
12(b)	Accept answers that ‘link’ body measurements e.g., distance from foot to behind knee to determine seat height or width across hips to determine seat width  Award 2 marks for explanation <b>OR</b> Award 1 mark for each separate example stated: e.g., height of chair, depth of chair, height of backrest	<b>2</b>	Do not reward references to weight
12(c)	2 advantages: cheaper than plywood, easier to work	<b>2</b>	Accept any valid benefits
12(d)(i)	Grain shown at 90° on each alternate layer	<b>1</b>	
12(d)(ii)	Advantage over solid wood: wide boards available, cheaper, more stable	<b>1</b>	
12(d)(iii)	Disadvantage: unattractive / limited methods of construction / difficult to work with	<b>1</b>	
12(e)(i)	Space for glue / increased gluing area / increased grip / more secure	<b>1</b>	
12(e)(ii)	Allows for easier entry	<b>1</b>	

Question	Answer	Marks	Guidance
12(f)(i)	Recognised hand hold marked out [1] Details of cutting out shape (for maximum 2 marks a hole must be drilled for a saw blade) [0 – 2]  Finishing shape [files / glasspaper] [1]	4	
12(f)(ii)	Strengthened using additional wooden strips, KD fittings, brackets, blocks [0 – 2] Correct position [1] Method of fixing: use of pins or screws and adhesive [1]	4	
12(f)(iii)	Correct position of attachment that fits over / against side of chair [1] Cup fits into holder [1] Details of constructions [0 – 2] Suitable named materials [0 – 2]	5	

Question	Answer	Marks	Guidance
13(a)(i)	Chinagraph pencil marks can be erased / a scribe leaves a permanent mark / can damage the surface	1	
13(a)(ii)	Dividers	1	
13(a)(iii)	Named saws: coping, piercing, Hegner, scroll saw, tenon, hacksaw [1] Use of files, sanding disk to finish to line [1]  Do not reward use of abrasive paper	2	
13(b)	Acrylic shown clamped [1] Sacrificial board underneath acrylic sheet [1] Technical accuracy of details and drawings [1]	3	

Question	Answer	Marks	Guidance
13(c)	2 materials / items of equipment: <ul style="list-style-type: none"> <li>wet and dry (silicon carbide) paper</li> <li>polishing (buffing) wheel</li> <li>polishing compound</li> <li>acrylic polish</li> </ul> [2 × 1]	<b>2</b>	Accept, 'polisher', 'buffer'. Do not accept use of files, emery cloth
13(d)(i)	Extrusion	<b>1</b>	
13(d)(ii)	Acrylic sheet heated using an oven [1] Use of a Ø120 former [1] Heated acrylic shown 'draped' or moulded around former [1] 'Held' in position while acrylic cools [1]	<b>4</b>	
13(e)	Use of screws, nuts and bolts [1] Locked by means of hand only; use of wing nut [1] Named materials appropriate [1] Technical accuracy of details and drawings [1]	<b>4</b>	
13(f)	4 layers of 5 mm thick acrylic sheet 150 × 150 cemented together to produce 20 mm thickness [1] Base Ø150 marked out using dividers [1] Base Ø150 cut out using variety of appropriate saws [1] Edges self-finished to high quality [1]	<b>4</b>	4 layers may be cemented as one 20 mm thick base at start of process <b>OR</b> Cut out separately and cemented later in process.
13(g)	Electrical cable emerges through or under base [1] Constructional details: holes drilled, channels cut out [0 – 2]	<b>3</b>	