Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

DESIGN AND TECHNOLOGY **6043/12**

Paper 1 Technology **October/November 2019**

MARK SCHEME

Maximum Mark: 100

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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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.

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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.

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Question	Answer	Marks	Guidance
Section A Part A – Product Design			
1	Low melting point, soft and malleable, non-toxic material and/or fumes	**2**	Any 2 from the list

Question	Answer	Marks	Guidance
2(a)	ABS – originates from crude oil/fossil fuel so finite amount/drilled from ground/ can lead to oil spills endangering wildlife and surroundings/high energy use in material production/can be recycled but is hard to.	**2**	Any 2 for each material from the list. Allow any other suitable answer.
2(b)	Pine – relatively fast-growing tree/grows well in most conditions/can be forested in a managed way so infinite amounts/easily recycled.	**2**	Any 2 for each material from the list. Allow any other suitable answer.
2(c)	Steel – iron ore mined from the ground so damages the environment/high energy use in mining the material/high energy use in material production/easily recycled	**2**	Any 2 for each material from the list. Allow any other suitable answer.

Question	Answer	Marks	Guidance
3(a)	Scriber knurled shaft fine end	**2**	Clear impression of what each tool looks like 
3(b)	Tenon saw ridged back handle flat blade	**2**	Clear impression of what each tool looks like 

Question	Answer	Marks	Guidance
4(a)	Wasting material – removing material from a block/piece to make another shape	**1**	Accept any other correct answer
4(b)	Shaping by bending or twisting	**1**	

Question	Answer	Marks	Guidance
5(a)	screwdriver, cross-head screwdriver, Phillips screwdriver, posi screwdriver	**1**	
5(b)	to turn a screw	**1**	

Question	Answer	Marks	Guidance
6	Self-finishing Material naturally looks good and needs no protection or surface finish	**1**	Accept any other correct answer

Question	Answer	Marks	Guidance
7	Preparing for brazing • ensure a clean and close finish, remove rust and paint (file and emery cloth) and degrease – allowing brazing rod to flow around and adhere to area to be joined • clamp together ensuring parts are brazed in correct position, allowing for expanding and contracting of heated material • apply flux to stop oxidisation of surface so getting a smoother brazed joint. [3 × 2]	**6**	

Question	Answer	Marks	Guidance
8	The jaws from the metal vice would mark the softer surface of the wood	**1**	

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Question	Answer	Marks	Guidance
9(a)	polypropylene, ABS	**1**	Accept any other correct answer
9(b)	oak, ash, elm (allow any other close grained, hard wood)	**1**	Accept any other correct answer
9(c)	stainless steel, high carbon steel	**1**	Accept any other correct answer

Question	Answer	Marks	Guidance
10	Hand width, hand grip, foot width, user height	**1**	

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Question	Answer	Marks	Guidance
Part B Section 1 – Tools and Materials			
11(a)	A Pliers [1] Gripping, holding and/or cutting wire [1] B Tin snips [1] Cutting thin sheet metal [1] C Pincers [1] Pulling out nails [1]	**6**	Accept any other correct answer
11(b)(i)	the ridges help hold items more firmly / adds grip	**2**	Accept any other correct answer
11(b)(ii)	to stop hands from hitting each other and the tin snips from over biting	**2**	
11(b)(iii)	the rounded end acts as a pivot giving greater leverage when pulling out the nail / reduces damage to workpiece	**2**	
11(c)(i)	sketch [2] cutting straight lines in large sheets of metal [1]	**3**	guillotine - sketch to include long handle for leverage and clear cutting blade. guillotine - sketch to include long handle for leverage and clear cutting blade. 

Question	Answer	Marks	Guidance
11(c)(ii)	sketch [2] sawing curves and shapes in thin sheets of wood, metal or plastic [1]	**3**	Coping saw – frame holding blade in tension, handle 

Question	Answer	Marks	Guidance
12(a)	Aluminium alloy Uses – window frames, drinks cans, chairs, car wheels, aircraft. Other suitable. Properties – can be extruded, light weight, high strength to weight ratio, doesn't rust [3 × 1] Mild steel Uses – car bodies, construction, framework, containers. Other suitable. Properties – easy to work, rusts, easy to join. Other suitable [3 × 1] Polyethylene (PE) Uses – bottles, containers, plastic carrier bags. Other suitable. Properties – self-finishing, good for recycling, tough, weatherproof, good chemical resistance, low cost, easily manufactured. Other suitable. [3 × 1] Polystyrene Uses – cups, packaging. Other suitable. Properties – hard, brittle, good for recycling, good for injection moulding, vacuum forming and other low temperature processes. Other suitable. [3 × 1] Pine Uses – furniture, doors, building. Other suitable. Properties – sustainable, low cost, takes a stain well, easy to work. Other suitable. [3 × 1]	**15**	Accept any other correct answer for **each** material **one** use and **two** properties

Question	Answer	Marks	Guidance
12(b)(i)	a metal that is made of 2 or more metals **or** a metal and a non-metal.	**1**	
12(b)(ii)	to improve its usable or workable properties.	**1**	
12(b)(iii)	brass, bronze, pewter, cast iron, steel, solder.	**1**	

Question	Answer	Marks	Guidance
13(a)	Beech, oak, teak, mahogany. [1] Reason – hard wood, good looking, close grain, teak has good weather resistance (natural oils) [1] ABS, polypropylene, nylon. [1] Reason – high strength to weight ratio, colour, durable, easy to clean, weather resistant, flexible. [1] Galvanised steel, aluminium, mild steel. [1] Reason – durable, no maintenance, easy to manufacture. [1]	**6**	Accept any correct answer Award **one** mark for any correct material and **one** mark for a correct reasons
13(b)(i)	Chair A – oil, varnish, paint [2 × 1]	**2**	Any **two** correct answers for each
13(b)(ii)	Chair C – anodised, paint, galvanised, powder coated. [2 × 1]	**2**	
13(c)(i)	ABS, nylon, Delrin/acetal	**1**	Any correct **one** for each.
13(c)(ii)	centre lathe, injection moulding, 3D printer	**1**	

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Question	Answer	Marks	Guidance
13(d)	Marking out • Steel rule, engineer square, try square, combination square, marking gauge, marking knife, pencil. Holding • Wood working vice, G-clamp/cramp, bench hook. Cutting • Tenon saw, chisel. • detailed, labelled [4–6] • some /limited/ detail [0–3]	**6**	Accept any correct answer

Question	Answer	Marks	Guidance
14(a)	Properties for comb. Easy to clean, stiff, strong, durable. [1 × 2]	**2**	
14(b)	Polystyrene [2 × 1] Selecting – can be injection moulded in large quantities, easily cleaned, comes in many colours, low cost. Rejecting – not durable, scratches easily, teeth easily snap or bend, not sustainable.	**6**	Accept any other correct answer **one** mark each for a correct selection and **one** mark each for a correct rejection.
	Aluminium [2 × 1] Selecting – easily cleaned, durable, long lasting, can be produced in quantity, recyclable. Rejecting – stiff, sharp, high cost to manufacture.		
	Mahogany [2 × 1] Selecting – high quality appearance, sustainable. Rejecting – hard to clean, hard to manufacture in quantity.		

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Question	Answer	Marks	Guidance
14(c)	Method of production includes moulds such as injection moulding or casting, cutting jig used, 3D printing or stamping.	**1**	Accept any correct answer
14(d)	Accept any suitable production technique. Polystyrene – injection moulding – to mainly include a two part mould, hopper, plastic granules, heated chamber, feed screw, injected under heat and pressure, ejector pins. Aluminium – horizontal milling machine to cut teeth (use of jig or CNC machine to ensure accuracy of teeth) and grinding wheel or linisher or milling machine to shape the body. Emery cloth to smoothen edges and polish to finish. Mahogany – horizontal milling machine to cut teeth (use of jig or CNC machine to ensure accuracy of teeth) or milling machine to shape the body. Glass/sand paper to smoothen edges and oil/wax/varnish to finish. • detailed, labelled [7–9] • some detail [4–6] • limited detail [0–3]	**9**	Sketches must be clear and well labelled with key points. **Do not** accept hand cut teeth.

Question	Answer	Marks	Guidance
Section 2 – Processes			
15(a)(i)	Handle – oak, beech, teak, mahogany or any other suitable close-grained wood [1] Appropriate reason – hard wearing, close grained, does not splinter [up to 2]	**3**	Award mark for any **one** correct material and **two** marks for **two** correct reasons
15(a)(ii)	Bell – brass, bronze [1] Appropriate reason – appearance, sound quality/resonance [up to 2]	**3**	Award mark for any **one** correct material and **two** marks for **two** correct reasons
15(b)	Answer could include shape of the handle to fit comfortably in the palm, ridges to add grip for when bell is being rung, bulge stops bell form falling out of hand, diameter of handle so hand fits all the way round. [up to 3]	**3**	
15(c)	Wet and dry paper first then buffing wheel or cloth and polish. [up to 2]	**2**	
15(d)	Turning on lathe – end held in 3 jaw chuck and other end held in place, rest for chisel, suitable wood turning chisel, glass paper for smoothing, varnish. • detailed, labelled [5–7] • some /limited/ detail [0–4]	**7**	

Question	Answer	Marks	Guidance
16	Casting – include • Petrobond sand/sand, risers, cope and drag/split mould, crucible, molten aluminium, parting powder?, safety equipment, well-ventilated area. [up to 9] Drilling and tapping – include • Scriber, steel rule, engineers square, engineers blue, hammer, centre punch, tapping drill, clamping work down with scrap material underneath, tap, cutting compound, file off burrs, clearance hole in one of the two pieces to obtain a close fit. [up to 9] Shaping MDF – include • Pencil, string and point to make semi-circle or template, marking knife, steel ruler, try square, clamping work down, jigsaw, glass/sand paper, bradawl/centre punch for holes, drill (clearance and pilot), screwdriver and screws. [up to 9] quality of description: • fully detailed [4–7] • some detail [0–3] quality of sketches [up to 2] [9 × 2]	**18**	

Question	Answer	Marks	Guidance
17(a)(i)	Steps for making mild steel could be • Marking out , scriber, clamping work down, jigsaw, tank cutter/hole saw, centre punch, hammer, drill, cleaning (file, emery cloth), degrease de-burr, brazing, welding, file. [up to 6] • fully detailed [4–6] • some detail, [0–3]	**6**	

Question	Answer	Marks	Guidance
17(a)(ii)	Steps for making plywood could be • Marking out, pencil, jigsaw, coping saw, forstner bit, hole saw, glass paper/sand paper, PVA (wood glue), G-clamp/cramp [up to 6] quality of description and sketches: • fully detailed [4–6] • some detail, [0–3]	**6**	
17(b)	Plastic coating • Degrease metal**,** key the surface (emery cloth or wire brush), heat in oven or with brazing torch, dip in powder bath, hang and cool. [up to 6] quality of description and sketches: • fully detailed [4–6] • some detail, [0–3]	**6**	

Question	Answer	Marks	Guidance
18(a)	Piano hinge, butt hinge.	**1**	Accept any other suitable hinge.
18(b)(i)	pencil, bradawl for marking holes, pilot holes, clamp for holding hinge in place when marking out, countersunk screws. Line-up and attach one side first before starting the other. [up to 5] quality of description and sketches: • fully detailed [4–5] • some detail, [0–3]	**5**	Students must refer to lining up pieces to ensure holes are also in line.
18(b)(ii)	steel ruler, pencil, marking knife, try square, centre punch, clamp, jig to hold pieces in correct position, drill, nut and bolt or screws. [up to 5] quality of description and sketches: • fully detailed [4–5] • some detail, [0–3]	**5**	Students must refer to lining up pieces to ensure holes are also in line.

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Question	Answer	Marks	Guidance
18(c)	To include appropriate stay. Must be attached to the lid and body. If uses chain the lid needs to open more than 90 degrees to stop it from falling shut. [up to 4]	**4**	Any other suitable examples.  
18(d)	Any suitable improvement that could include place to hold equipment on desk lid, handle for lid, stop to reduce possibility of items rolling off lid, lid overhang for easy opening, cross bracing or triangulation of frame etc. [up to 3]	**3**	