Cambridge Assessment International Education

Cambridge International A Level

DESIGN & TECHNOLOGY **9705/33**

Paper 3 **October/November 2022**

MARK SCHEME

Maximum Mark: 120

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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This document consists of **16** 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
Section A Part A – **Product Design**			
1	Discussion could include: • ecological considerations • social considerations • revolutionary/radical design • cost implications • impact on consumer/manufacturer examples/evidence could be • specific ecological considerations • specific social considerations • revolutionary products examination of issues • wide range of relevant issues 4–8 • limited range 0–3 quality of explanation • logical, structured 4–8 • limited detail, 0–3 supporting examples / evidence 4	**20**	

Question	Answer	Marks	Guidance
2(a)	suitable material: • aluminium alloy, brass, copper • attractive straight grained softwood, hardwood • abs, polypropylene, acrylic reasons : • relatively lightweight • attractive for interior design • not be affected by low heat from LED any other reason appropriate to material choice	**3**	
2(b)	quality of description: • fully detailed all/most stages 4–7 • some detail, 0–3 quality of sketches up to 2	**9**	*Dependant on material chosen.* *Laminated hardwood//softwood, e.g. beech, pine.* *ABS, polypropylene, acrylic thermoformed* *Must show shaping, bending and finishing of material*
2(c)	explanation could include: • change in process; • change in materials; • use of jigs, formers, moulds; • simplification of design. quality of explanation: • logical, structured 4–6 • limited detail, 0–3 quality of sketches up to 2	**8**	*Press forming, vacuum forming, laminating jigs.*

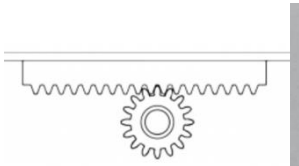
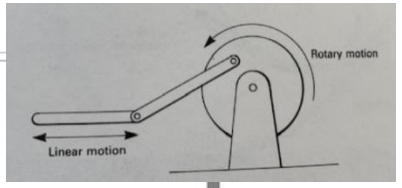
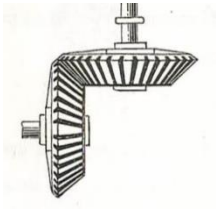
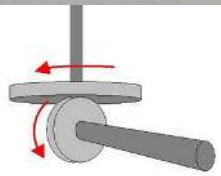
Question	Answer	Marks	Guidance
3(a)	description of process • fully detailed, all/most stages 3–5 • some detail, 0–2 quality of sketches up to 2 2 × **7**	**14**	***brazing*** • *prepare round tube to fit square tube* • *mark out rough profile* • *secure using fire bricks or wire* • *clean and flux joint area* • *apply heat to joint* • *red/orange 800°C + colour apply spelter to run and fill joint all around* • *allow to cool* ***rotational moulding*** • *split mould, preheated* • *measured polymer powder inserted* • *mould rotates in all directions whilst being heated* • *polymer forms shape on inside of mould* • *mould cooled and item removed* ***bridle joint*** • *mark out wood, use of gauges for bridle* • *indicate waste wood* • *piece 1, cut outside cheeks on waste side of line with tenon saw, chisel for accuracy* • *piece 2, cut inside of waste line with tenon saw* • *cut base of centre section with coping saw, chisel for accuracy* • *glue, cramp and finish* *Accept other correct variations or methods.*

Question	Answer	Marks	Guidance
3(b)	brazing – very strong joint – easy process to produce a good joint – gives better joint finish than welding rotational moulding – suitable for large hollow shapes – high quality finish, range of colours – minimal finish required and low wastage bridle joint – mechanically strong joint – lots of gluing area – attractive feature 2 × **3**	**6**	*Accept other valid explanations, brief outline points max 3*

Question	Answer	Marks	Guidance
Part B – **Practical Technology**			
4(a)(i)	AC – alternating current changes direction **1**	**1**	
4(a)(ii)	DC – direct current one direction only **1**	**1**	
4(b)(i)	I = V/R **1** 6/36 **1** 0.16 (160 mA) **1**	**3**	
4(b)(ii)	V = I × R **1** = 0.16 × 20 **1** = 3.2 v **1**	**3**	

Question	Answer	Marks	Guidance
4(c)	Explanation could include: **pneumatics** benefits – air relatively cheap – reduced safety hazards – cost effective system – clean operation, less plumbing the hydraulics drawbacks – not exact force – can freeze up – can be noisy in operation **hydraulics** benefits – efficient and accurate – constant force applied, no compression – more power than pneumatic drawbacks – leaks, can be messy – fluids can be hazardous – more maintenance required than pneumatics	**12**	quality of explanation: • logical, detailed and structured 8–12 • some detail and structured 4–7 • limited detail, 0–3 Must include benefits and drawbacks of bot pneumatics and hydraulics to achieve full marks

Question	Answer	Marks	Guidance
5(a)	Examples could be corrosion resistance – aluminium cladding, gold jewellery, copper pipes thermal conductivity – soldering iron tip, copper pans ductility – copper wiring brittleness – high carbon steel file, safety glass for each: example **1** × 4 quality of explanation: • detailed, structured 2–3 • limited detail, 0–1 **3** × 4	**16**	*<u>corrosion resistance</u>* *the resistance a material offers against a reaction with adverse elements that can corrode the material. Materials have different corrosion resistance rates. Treatments can be used to resist corrosion.* *<u>thermal conductivity</u>* *is a measure of how well a material conducts energy when it is heated.* *<u>ductility</u>* *the ability of a material to be stretched or shaped without breaking* *<u>brittleness</u>* *having hardness and rigidity but little tensile strength; breaks easily*
5(b)	Example could be: • concrete with steel reinforcing rods • polyester resin reinforced with fibre glass or carbon fibre example 1 quality of description and communication: • detailed, structured 2–3 • limited detail, 0–1	**4**	

Question	Answer	Marks	Guidance
6(a)	Rotation of **D** clockwise 1	**1**	
6(b)	Gear ratio **A B** 3:4 **C D** 3:1 1 $\frac{3}{4} \times \frac{6}{2} = \frac{18}{8}$ 1 = 2.25:1 1	**3**	
6(c)	method could be: rack and pinion example – moving drill head on drilling machine slider and crank example – steam engine method could be: bevel gears example – hand drill circular friction plates example – toy quality of description: • detailed, structured 3–4 • limited detail, 0–2 2 × 4 quality of sketching up to 2	**10**	   

Question	Answer	Marks	Guidance
6(d)	Explanation could include: • high quality components/materials • high quality/ correct assembly • lubrication if appropriate • maintenance checks quality of explanation: • fully detailed, structured 5–6 • some relevant detail 3–4 • limited detail, 0–2	**6**	

Question	Answer	Marks	Guidance
Part C – **Graphic Products**			
7(a)	See Appendix 1. scale 1 correct 2 point 1 detail 4 overall line quality 2 render 2	**10**	*Incorrect drawing type maximum 5 marks*

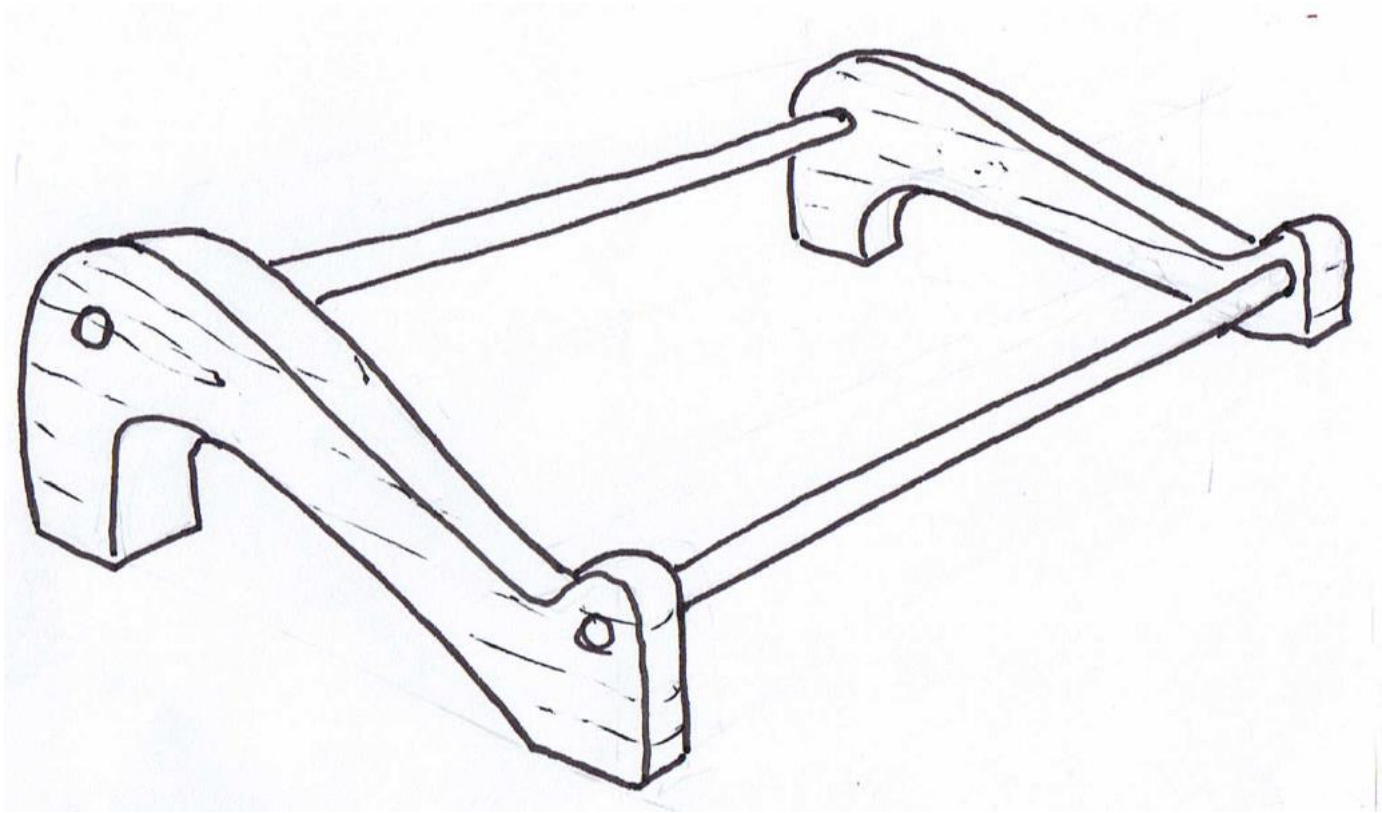
Question	Answer	Marks	Guidance
7(b)	Explanation could include: • security issues • stability • user interaction • space for information/advertising quality of explanation: • fully detailed, structured 6–8 • some relevant detail 3–5 • limited detail, 0–2 Quality of sketching up to 2	**10**	
8	Discussion could include: • aesthetic features • costs involved • processes available • customer preferences/market research examples/evidence could be • specific product examples • specific cost implications • specific processes examination of issues • wide range of relevant issues 4–8 • limited range 0–3 quality of explanation • logical, structured 4–8 • limited detail, 0–3 supporting examples / evidence 4	**20**	

Question	Answer	Marks	Guidance
9(a)	See Appendix 2. given elevation 2 end elevation 2 correct projection 2 plan 4 scale/accuracy 2	**12**	
9(b)	development construction 3 slots 3 accuracy 2	**8**	

Question	Answer	Marks	Guidance
Section B			
10, 11 and 12	**Analysis** Analysis of the given situation/problem. **[0–5]** Detailed written specification of the design requirements. At least five specification points other than those given in the question. **[0–5]** **Exploration** B – *Bold sketches and brief notes to show exploration of ideas for a design solution, with reasons for selection.* range of ideas **[0–5]** annotation related to specification **[0–5]** marketability, innovation **[0–5]** evaluation of ideas, selection leading to development **[0–5]** communication **[0–5]** **Development** *Bold sketches and notes showing the development, reasoning and composition of ideas into a single design proposal. Details of materials, constructional and other relevant technical details.* development **[0–5]** reasoning **[0–5]** materials **[0–3]** constructional detail **[0–7]** communication **[0–5]** **Proposed solution** *Produce drawing/s of an appropriate kind to show the complete solution.* proposed solution **[0–10]** details/dimensions **[0–5]** **Evaluation** Written evaluation of the final design solution. **[0–5]**	**80**	

Appendix 1
Question 7(a)

scale	1	
correct 2 point	1	
detail	4	
overall line quality	2	
render	2	**[10]**



Appendix 2 Q9

(a)	given elevation	2
	end elevation	2
	correct projection	2
	plan	4
	scale/accuracy	2
(b)	development	
	construction	3
	slots	3
	accuracy	2
		[20]