CAMBRIDGE
International Education

Cambridge International A Level

DESIGN & TECHNOLOGY **9705/33**

Paper 3 **October/November 2024**

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.

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.

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 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
Section A Part A – **Product Design**			
1(a)	suitable material: – aluminium alloy, copper, stainless steel – hardwood laminate, e.g. beech, birch – abs, acrylic, polypropylene **1** reasons: – takes a good finish – looks attractive – cleans easily 1×2	**3**	*Accept any other suitable material or any other reason appropriate to material choice*
1(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.* *secure workpiece, waste board underneath work* *drill Ø40 hole, hole cutter, fly cutter* *use extended strip to drill Ø40 at each end, cut to length and R20* *finish edges* *bend using heat and former for polymer materials* *aluminium, copper can be carefully bent over former* *prepare formers for lamination* *glue thin strips together to required thickness, protect strips when placing between formers* *cramp together until set* *remove and shape* *drill Ø40 hole, hole cutter, fly cutter* *cut R20 with coping saw* *use appropriate abrasive to required finish* *apply wax, oil finish* *Must show all key stages of manufacture for full marks*

Question	Answer	Marks	Guidance
1(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**	*Would expect appropriate use of templates and jig* *Full details of CAD drawing and set up for 3D printing*

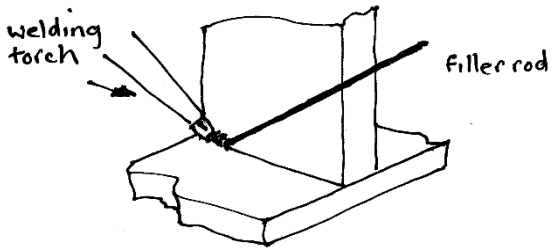
Question	Answer	Marks	Guidance
2	examination of issues – wide range of relevant issues 4–8 – limited range 0–3 quality of explanation – logical, structured 4–8 – limited detail, 0–3 – supporting examples / evidence 4	**20**	Discussion could include: – knowledge of – anthropometrics – psychological consideration – effective interaction between human and product/ environment examples / evidence could be – specific anthropometric, physiological or physical examples, – specific product/environment details

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**	***riveting*** – *accurately mark holes,* – *using drill template drill holes rivet ∅ in two handles and spatula blade* – *clamping three items together tightly and drill through possible, may create heat drilling through spatula blade* – *countersink outside faces of handles* – *assemble pieces,* – *use set part of snap and set to insert rivets tightly* – *turn over with rivet head side on firm metal surface* – *cut rivet to length* – *use ball pein hammer to fill countersink space, use flat face of hammer to firm down* – *carefully file flat* ***laminating*** – *prepare former* – *cut laminates to length* – *glue and build up laminates to required thickness* – *protective layer between laminates and former* – *clamp laminates starting at one end carefully checking for folds, air gaps* – *allow to set* – *remove and finish* ***vacuum forming*** – *prepare former, show details, include sufficient draft angle and air holes* – *insert in vacuum forming machine* – *insert plastic sheet* – *heat plastic until ready for forming*

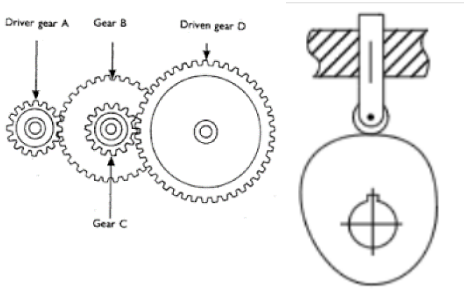
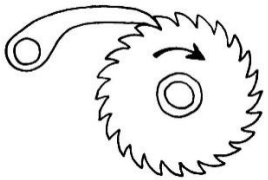
Question	Answer	Marks	Guidance
3(a)			– *raise former* – *apply vacuum (some may include plug assisted forming)* – *when cooler, carefully remove formed plastic* – *trim to shape* *Accept any – other correct variations or methods.*
3(b)	Explanation could include: riveting – aesthetic feature – very strong method of joining – minimal tooling/ machinery required laminating – solid, strong structure – allows aesthetic shape – minimal wastage vacuum forming – very accurate, dependant on quality of former – limited additional finishing – relatively quick process – no finishing required 2×3	**6**	*Accept other valid explanations, brief outline points max 3*

Question	Answer	Marks	Guidance
Part B – **Practical Technology**			
4	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**	Discussion could include: – safety – legal issues – potential modes of failure such as plastic hinging, buckling, twisting, changes in temperature and fatigue examples / evidence could be – specific mode of failure – specific examples e.g. Tahoma bridge

Question	Answer	Marks	Guidance
5(a)	description of process – fully detailed, all/most stages 3–4 – some detail, 1–2 – no creditable response 0 – quality of sketches up to 2 2 × **6**	**12**	***hard soldering a ring*** – *clean/degrease joint* – *apply appropriate flux* – *position in hearth* – *apply heat with flame until temperature reached* – *apply solder (silver solder)* – *position flame to draw the solder through the joint* – *when clear line of solder visible allow to cool* – *quench* ***soldering an LED onto circuit board*** – *correctly position LED* – *clean and tin soldering iron bit* – *use heat sink (pointed pliers) to protect LED* – *heat the joint for one leg, apply solder* – *remove iron and solder* – *repeat for second leg* ***gas welding*** – *apply appropriate health and safety procedures, – -wear correct PPE, leather apron, gloves, face mask* – *clean and carefully position components in hearth, surround with fire bricks* – *set/adjust flame* – *heat from one end until metal begins to melt* – *apply filler rod to molten pool* – *move gently across the join* – *at end remove filler rod and flame* – *allow to cool*

Question	Answer	Marks	Guidance
5(a)			
5(b)	– clear understanding of drawing metal process 2 – some understanding of drawing metal process 1 – clear understanding of extruding metal process 2 – some understanding of extruding metal process 1 – clear comparison of processes 3–4 – limited comparison of processes 1–2 – no creditable response 0	**8**	drawing requires metal to be pulled through a die, usually wire or simple section lengths. extrusion forces a heated billet through a die which can be more complex

Question	Answer	Marks	Guidance
6(a)	– full and clear explanation 2 – partial explanation 1 2 × 2	**4**	Efficiency can be the ratio of the useful work performed by a machine or in a process to the total energy expended or heat taken in. Velocity ratio is the ratio of the distance moved by the point at which the effort is applied in a simple machine to the distance moved by the point at which the load is applied, Accept variations of meanings

Question	Answer	Marks	Guidance
6(b)	Full and clear description, well communicated 3 Partial description and communication 1–2 No creditable response 0 examples could be: **1** mark cam – car engine, simple moving toy, compound gear train – food mixer, lathe, milling machine ratchet – screwdriver, spanner, tennis net 3 × 4	**12**	 cam compound gear train  ratchet and pawl
6(c)	quality of explanation – clear, detailed 3–4 – limited detail, 0–2	**4**	lubrication – reduces wear, – reduces noise – dissipates heat – reduces friction, enables smooth movement

Question	Answer	Marks	Guidance
Part C – **Graphic Products**			
7	See **App. 1** scale 1 door 1 window 2 shower 1 shower screen 2 towel rail 2 wash basin unit on cabinet 4 towel cabinet 2 bath 3 overall line quality 2	**20**	*Incorrect projection maximum 10 marks* *accept 45° × 45° and 45° × 60°* individual parts must be sited in correct position

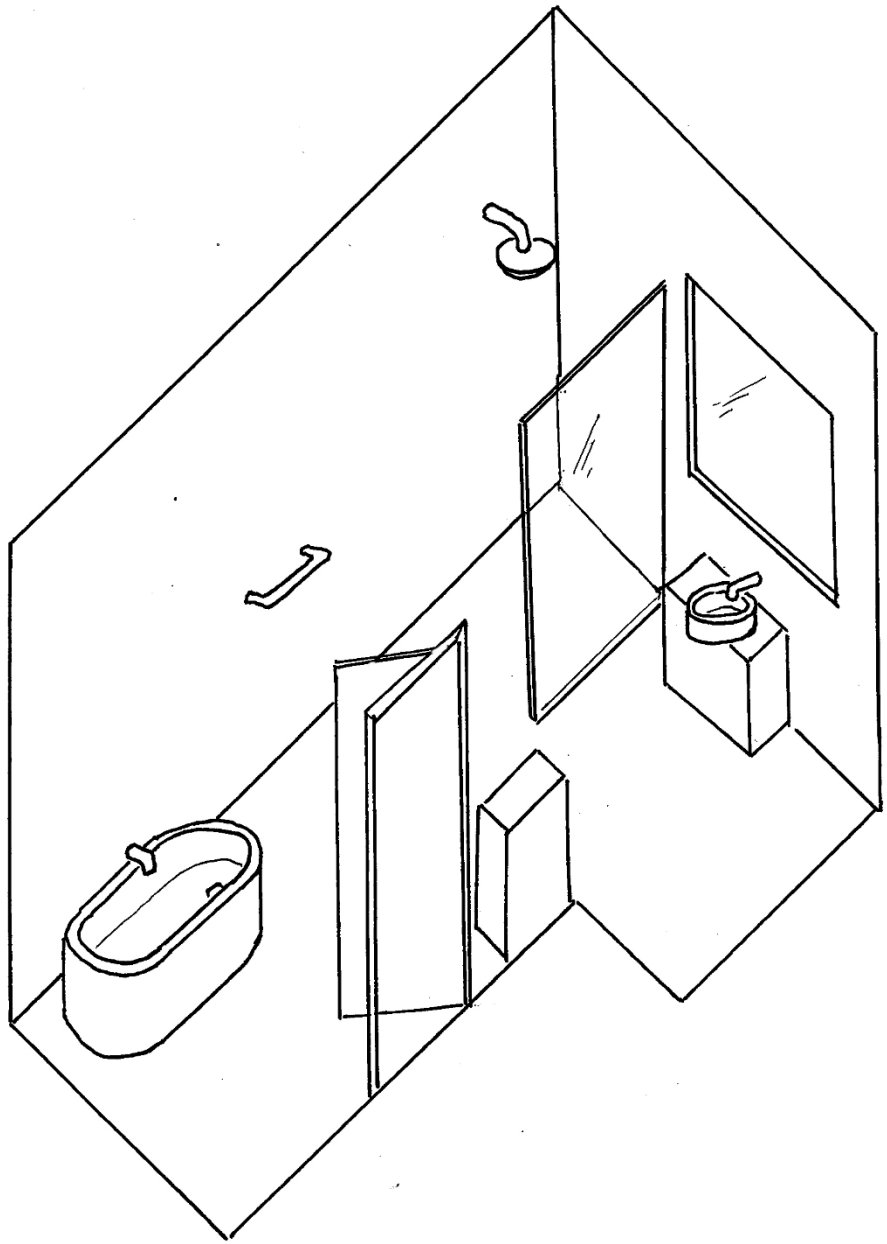
Question	Answer	Marks	Guidance
8	examination of issues – wide range of relevant issues 4–8 – limited range 0–3 quality of explanation – logical, structured 4–8 – limited detail, 0–3 supporting examples / evidence 4	**20**	Discussion could include: – safe environments – value for money – environmental considerations – improve quality of life – inclusion examples / evidence could be – sustainable design examples – specific architectural examples e.g. housing estates – specific products that make life better/easier

Question	Answer	Marks	Guidance
9(a)	see **App. 2** scale 1 proportion 2 curves 2 handle 1 Image 2 accuracy/line quality 2	**10**	max 3 if not isometric
9(b)	description of process – fully detailed, all stages 6–8 – some detail, most stages 3–5 – limited detail 1–2 – no creditable response 0 – quality of sketches up to 2	**10**	stages include: – net/development prepared – die, folding block prepared – image printed, flexography, digital printing – batch die cut – *remove waste for recycling* – packaged flat for despatch accept other appropriate methods

Question	Answer	Marks	Guidance
Section B			
10, 11 & 12	**Analysis** Analysis of the given situation/problem. **[0–5]** **Specification** 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. **[0–5]** development 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**	

App. 1 Q7

scale	1
proportion	2
curves	2
handle	1
logo	2
accuracy/line quality	2



App. 2 Q9(a)

scale	1
door	1
window	2
shower	1
shower screen	2
towel rail	2
wash basin unit on cabinet	4
towel cabinet	2
bath	3
overall line quality	2