CAMBRIDGE
International Education

Cambridge International AS & A Level

DESIGN AND TECHNOLOGY **9705/32**

Paper 3 Written **May/June 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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **15** printed pages.

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, brass • appropriate hardwood, eg. beech • nylon, polypropylene, **1** reasons: • turns well • accepts a good finish • will not damage if dropped 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**	*cut hexagonal bar to length* *place securely in 3 jaw chuck* *turn handle end to Ø12 × 30 long, knife tool* *face off end* *turn piece around in 3 jaw chuck* *turn pointed end, set tailstock for accuracy* *parting tool for groove to depth* *remove a abrade with emery cloth to finest garde, polish* *accurately drill small holes for dots* *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 use of jigs, templates CAM lathe, Accept detailed 3D printing response with possible additional finishing process* *Detail 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: • sales • streamlined production lines • target consumer meetings • market surveys • customer questionnaire/survey • customer product reviews examples / evidence could be • specific company practice • specific customer survey methods *Focus on how manufacturers access information from customers and how they respond to meet demand and need.*

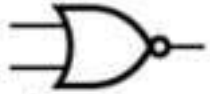
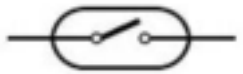
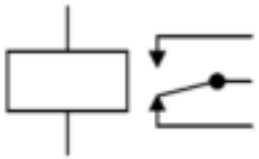
Question	Answer	Marks	Guidance
3(a)	description of process fully detailed, all/most stages 3–5 some detail 0–2 quality of sketches up to 2 2 × 7	**14**	***compression moulding*** • *2 part mould prepared and heated* • *Preform inserted* • *Heat / pressure* • *Cool – remove flashing* ***hardening and tempering*** • *clean point and heat to cherry red approx.* • *800 °C* • *quench immediately* • *cool and clean the point* • *gently heat until colours appear, quench when* • *yellow / light brwn colour appears approx.400 °C+* • *quench* • *clean up and polish* ***dowelling*** • *mark out holes on both pieces of wood* • *simple drilling jig would ensure exact position of* • *holes* • *accurately drill holes to depth, ensuring 90°* • *drill position on both pieces* • *glue and insert dowels on on piece, gently tap* • *into position* • *apply glue to exposed dowels, position and* • *gently fix together the two parts,wipe off excess* • *glue* • *sash clamp with protective blocks whilst glue* • *sets, clean up joint when set.* *Accept any other correct variations or methods.*

Question	Answer	Marks	Guidance
3(b)	compression moulding • suitable for thermosetting plastic • high quality finish • very quick process, minimal extra finishing required hardening and tempering • relatively quick process • no expensive equipment required • effective method of balancing hardness with toughness dowelling • limited cost of equipment • very strong joint, good gluing area • relatively quick 2×3	**6**	*Accept other valid explanations, brief outline points max 3*

Question	Answer	Marks	Guidance
Part B – **Practical Technology**			
4(a)(i)	moments about **RR** $\frac{1800 \times 8 + 2400 \times 6}{2800}$ **1** $\frac{14\,400 + 14\,400}{2800} = \frac{28\,800}{2800}$ **1** **RR** = 10.3N **1** **RL** = 3.7N **1**	**4**	
4(a)(ii)	see **Appendix 1** accurate drawing 2 bows notation used 2 correct responses 2	**6**	
4(b)	examination of issues • wide range of relevant issues 3–4 • limited range 0–2 quality of explanation • logical, structured 3–4 • limited detail 0–2 supporting examples / evidence 4	**10**	discussion could include: • product functions as expected, customers will buy • product safe to use • company maintains quality reputation, no bad publicity or returns examples / evidence could be • specific product problems • specific quality control method

Question	Answer	Marks	Guidance
5	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 quality of explanation • logical, structured 3–4 • limited detail 0–2 supporting examples / evidence 2	**20**	

Question	Answer	Marks	Guidance
6(a)(i)	$I = \frac{V}{R}$ $V = \frac{9}{500}$ **1** = 0.018 A or 1.8 mA **1** correct answer 1 correct unit	**3**	
6(a)(ii)	$\frac{20}{30+20} \times 5$ **1** $= \frac{2}{5} \times 5$ **1** = 2v **1**	**3**	

Question	Answer	Marks	Guidance
6(b)	**A** AND  **B** NAND  **C** NOR  **D** XOR  **1** mark for each correct name **1** mark for each correct symbol	**8**	
6(c)	quality of explanation • clear, logical, structured 3 • some detail 2 • limited detail 1 • no creditable response 0 3 × 2	**6**	**reed switch** is an **electromagnetic switch used to control the flow of electricity in a circuit.** They consist of two or more ferrous reeds encased within a small glass tube-like envelope, which become magnetised and move together or separate when a magnetic field is moved towards the switch  Relays are used for **the protecting and switching** of a number of the control circuits and other electrical components. All relays react to voltage or current to open or close the contacts or circuits. 

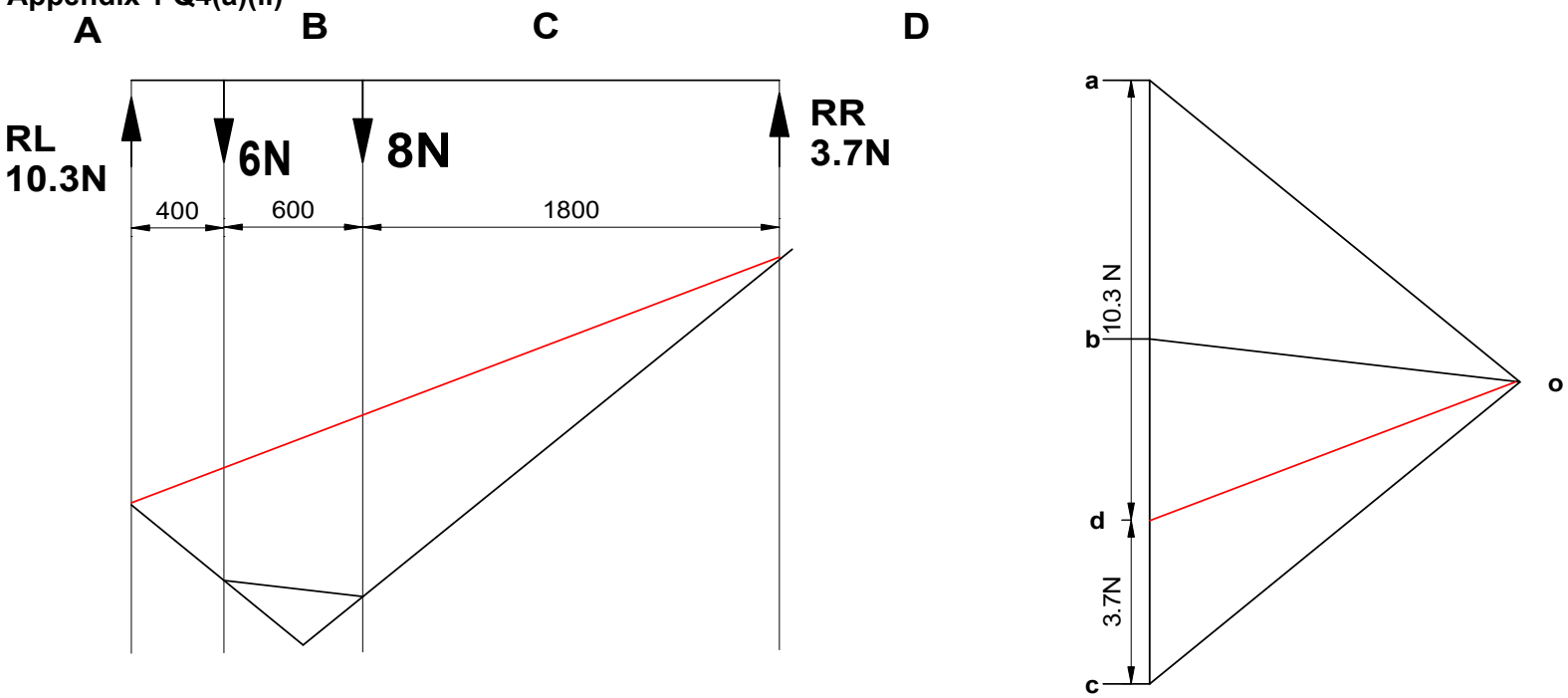
Question	Answer	Marks	Guidance
Part C – **Graphic Products**			
7	See **Appendix 2** Isometric 1 scale 1 camera body 4 top detail button 3 view finder 3 flash 1 lens 4 accuracy / line quality 3	**20**	Accept other correct responses to view finder

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 • importance of visual impact to attract • interest / sales • colour and fashion trends • specific product use constraints • material / finish / texture • impression of quality • immediate impact or subtle harmonious examples could be • packaging • magazine covers • specific aesthetic features

Question	Answer	Marks	Guidance
9(a)	suitable material: • solid white board • duplex board • card with weight above 160 gsm 1 reasons: • solid enough to protect bulb • can be printed on • easy to cut and press form 1×2	**3**	*Accept any other suitable material or any other reason appropriate to material choice*
9(b)	quality of description: • fully detailed all / most stages 4–7 • some detail 0–3 • quality of sketches up to 2	**9**	• *prepare accurate development (net)* • *include sufficient tabs* • *include graphics, printed* • *use craft knife, cutting mat and safety rule to cut* • *shape accurately* • *use blunt scribing instrument to create fold lines* • *fold up packaging shape* • *apply glue / double sided tape to tabs and join*
9(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**	• *prepare accurate development (net)* • *produce press form / die cutter* • *include cutting and folding edges* • *appropriate card fixed on roller* • *print using appropriate method (eg. digital* • *prontingy, flexography)* • *cut and form fold lines* • *remove waste for recycling* • *pile for distribution*

Question	Answer	Marks	Guidance
Section B			
10, 11 and 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** 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 Q4(a)(ii)



accurate drawing		2
bows notation used		2
correct response 10.3 N	3.7 N	2

Appendix 2 Q7

isometric	1
scale	1
camera body	4
top detail	
button	3
view finder	3
flash	1
lens	4
accuracy/line quality	3