Cambridge Assessment International Education

Cambridge International A Level

DESIGN & TECHNOLOGY **9705/33**

Paper 3 **October/November 2021**

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 2021 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 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(a)	suitable material: <u>Body</u>. – hardwood e.g., walnut, beech – acrylic – aluminium alloy reasons: – attractive – sturdy, accept large thread <u>Stem</u> – brass – mild steel reasons: – thread cut easily – suit other components <u>Handle</u>. – acrylic – hardwood e.g., walnut, beech – brass reasons: – smooth for comfortable grip – takes good finish,	**3**	*Accept any other appropriate materials* *accept any other reasons 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**	*Dependent upon material chosen*

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**	

Question	Answer	Marks	Guidance
2(a)	description of process – fully detailed, all/most stages 3–5 – some detail, 0–2 – quality of sketches up to 2 $2 \times$ **7**	**14**	*<u>case hardening</u>* – *steel heated to red heat* – *dipped wholly into carbon rich compound* – *reheated – process can be repeated* – *quenched in water* *<u>compression moulding</u>* – *2-part mould prepared and heated* – *preform inserted* – *heat/pressure* – *cool – remove flashing* *<u>profile forming</u>* – *prepare rectangular section* – *set spindle cutter to cut top curve* – *set fence, apply H&S procedures PSE* – *use push stick or automatic feed* – *set cutter for groove* – *use push stick or automatic feed* *Accept other correct procedures*

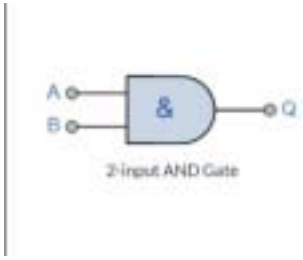
Question	Answer	Marks	Guidance
2(b)	case hardening – best option to provide tough inner with hard outer – economical option, no need for higher grade expensive alloy – quick, inexpensive process compression moulding – suitable for thermosetting plastic – high quality finish – quick process, minimal extra finishing required profile forming – consistently good finish – very accurate – minimal final finishing $2 \times$ **3**	**6**	

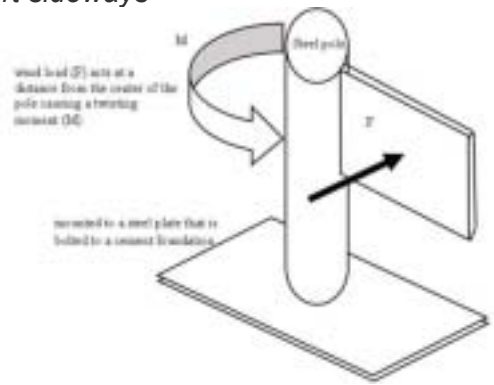
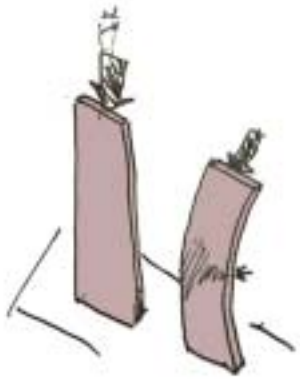
Question	Answer	Marks	Guidance
3	Discussion could include: – timber deforestation – finite resources – plastic waste issues – cost implications – legislation – recycling examples / evidence could be – specific reference to materials/resources – specific local/government action – specific company action – detailed public response 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
Part B – **Practical Technology**			
4(a)(i) & (ii)	quality of description: – detailed, logical, structured – Well-communicated 4–5 – limited detail, 0–3 2 × **5**	**5** **5**	***(i)*** *<u>Temporarily</u>* *using machine screws* *clip for handle to fit in* ***(ii)*** *<u>Permanently</u>* *rivetted,* *brazed, welded*
4(b)	Clear understanding of method 1 4 Clear understanding of method 2 4 Comparisons/contrasts drawn 2	**10**	*Could be cast or pressed*

Question	Answer	Marks	Guidance
5(a)	<u>Plasticity</u> the ability of a material to undergo permanent deformation under load <u>Toughness.</u> is the ability of a material to absorb energy and plastically deform without fracturing. Full definition **1** mark 2 × **1**	**2**	
5(b)	Plastic material could be – clay, gold, silver, lead Tough material could be hickory, ash, steel, polypropylene, ABS 2 × **1**	**2**	
5(c)	quality of description: – detailed, logical, structured 4–6 – limited detail, 0–3 – quality of sketches up to 2	**8**	*Basic impact test*

Question	Answer	Marks	Guidance
5(d)	quality of explanation: – detailed, logical, structured 6–8 – some detail and understanding 3–5 – limited detail 0–2	**8**	*Young's Modulus is a measure of the ability of a material to withstand changes in length when under tension or compression.* *Can be referred to as the modulus of elasticity, Young's modulus is equal to the longitudinal stress divided by the strain.* *High YM – stiff, Low YM – elastic.* *Provides material data, e.g., tensile strength for cables. chains – must have reference to product.* *All or most points covered for full marks*

Question	Answer	Marks	Guidance
6(a)(i)	**X** LDR Light Dependent Resistor **Y** Thermistor $2 \times$ **1**	**2**	
6(a)(ii)	**Z** AND gate. 1 Truth table fully correct 2 partially correct 1	**3**	 B A Q 0 0 0 0 1 0 1 0 0 1 1 1
6(a)(iii)	Thermistor and AND gate form a switch **1 mark**, light and temperature dependent **1 mark** Potential divider arrangement **1 mark** – in daylight input 1 (LDR resistance lower than 10k Ω) When cold, thermistor resistance >100 Ω input 1 **1 mark** AND gate opens **1mark**	**5**	

Question	Answer	Marks	Guidance
6(b)	quality of explanation: – detailed, logical, structured 8–10 – some detail and understanding 4–7 – limited detail 0–3	**10**	*<u>Twisting</u> is created when a moment or 'turning force' is applied to a structural member (or piece of material) making it deflect at an angle (twist). A moment that causes twisting is called a twisting or torsional moment. Torsion produces shear stresses inside the material. A beam in torsion will fail in shear; the twisting action causes the molecules to be slid apart sideways*  *<u>Buckling</u> example shows vertical loading applied, almost insignificant off vertical column will buckle* 

Question	Answer	Marks	Guidance
Part C – **Graphic Products**			
7(a)	See Appendix 1. Correct elevation **1** Correct construction **3** Lines of intersection on elevation **2** Correct plan **1** Correct construction **3** Lines of intersection on plan **2** Line quality **2**	**14**	
7(b)	Correct construction **2** Correct shape **3** Line quality **1**	**6**	

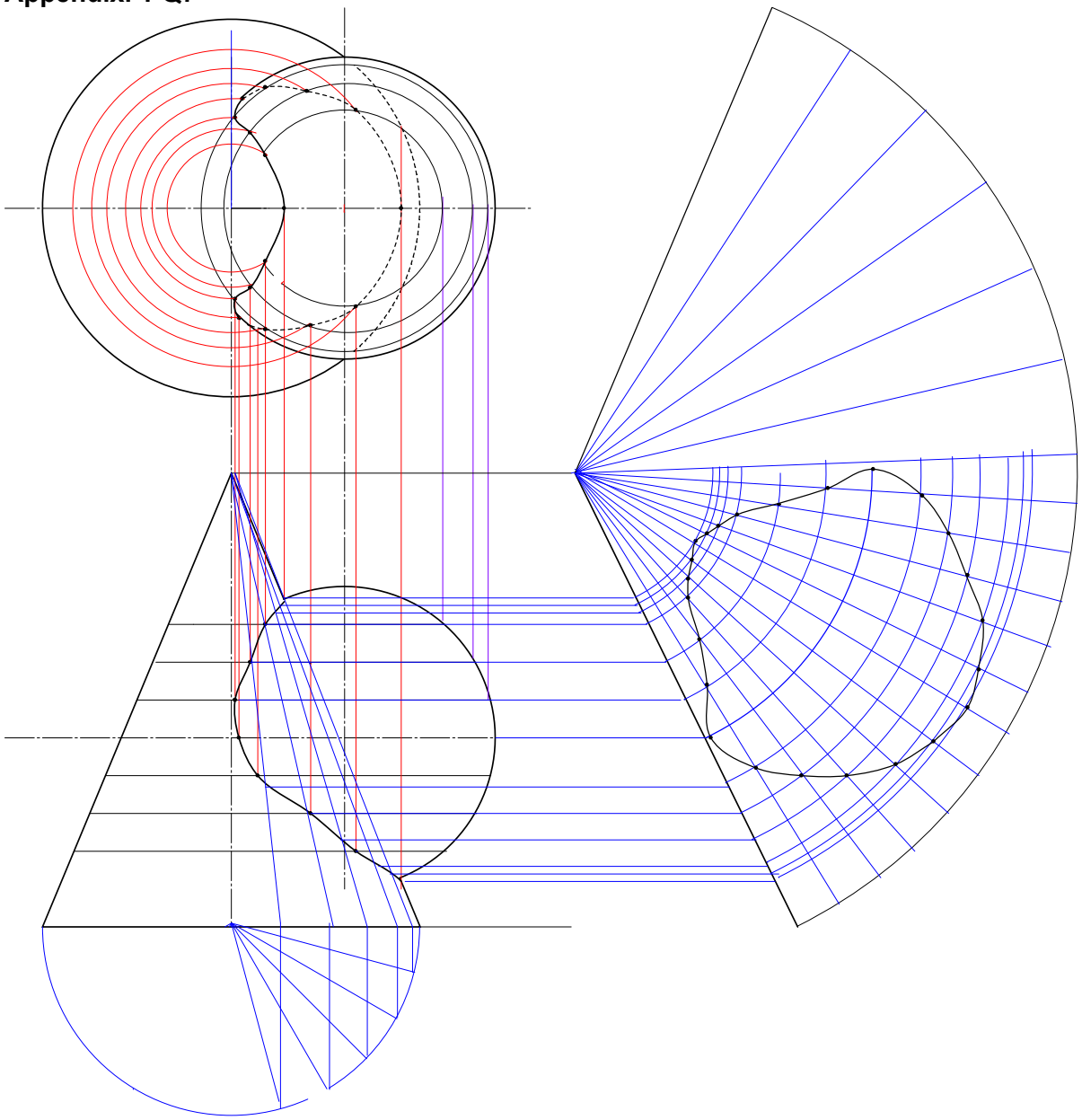
Question	Answer	Marks	Guidance
8(a)	Appropriate example e.g., bauhaus on furniture Example 1 Description/demonstration. up to 2 $2 \times$ **3**	**6**	
8(b)	Ways could be questionnaires, focus groups, product reviews on internet stores Example 1 Description/demonstration. up to 2 $2 \times$ **3**	**6**	
8(c)	quality of explanation: – detailed, logical, structured 6–8 – some detail and understanding 3–5 – limited detail 0–2	**8**	*check popularity of previous products* *analyse functions-still appropriate* *construction/materials used* *evaluate positive and negative features*

Question	Answer	Marks	Guidance
9	Discussion could include: – type of product requirement – safety/security – advertising – additional cost – environmental concerns – increased use of online shopping examples / evidence could be – specific reference to products – specific types of packaging – changes in company practise – specific online packaging system 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
Section B			
10, 11, 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. developments **[0–5]** reasoning **[0–5]** materials **[0–3]** constructional detail **[0–7]** communication **[0–5]**	**80**	

Question	Answer	Marks	Guidance
10, 11, 12	**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]**		

Appendix. 1 Q7



(a)	Correct elevation	**1**
	Correct construction	**3**
	Lines of intersection on elevation	**2**
	Correct plan	**1**
	Correct construction	**3**
	Lines of intersection on plan	**2**
	Line quality	**2**
(b)	Correct construction	**2**
	Correct shape	**3**
	Line quality	**1**