



Rewarding Learning

**General Certificate of Secondary Education
2022**

Technology and Design

Unit 2:
Option C: Product Design

[GTY23]

THURSDAY 16 JUNE, AFTERNOON

MARK SCHEME

General Marking Instructions

Introduction

Mark schemes are intended to ensure that the GCSE examinations are marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses. The mark schemes should be read in conjunction with these general marking instructions.

Assessment objectives

Below are the assessment objectives for **GCSE Technology and Design**.

Candidates must:

- AO1 Recall, select and communicate their knowledge and understanding of Technology and Design in a range of contexts;
- AO2 Apply skills knowledge and understanding, including quality standards in a variety of design contexts. Plan and carry out investigations and making tasks involving an appropriate range of tools, equipment, materials and processes; and
- AO3 Analyse and evaluate evidence, design proposals and outcomes, make reasoned judgements and present conclusions and recommendations.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of an unanticipated answer, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive Marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Types of mark schemes

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

Levels of response

Tasks and questions requiring candidates to respond in extended writing are marked in terms of levels of response. In deciding which level of response to award, examiners should look for the 'best fit' bearing in mind that weakness in one area may be compensated for by strength in another. In deciding which mark within a particular level to award to any response, examiners are expected to use their professional judgement. The following guidance is provided to assist examiners.

- **Threshold performance:** Response which just merits inclusion in the level and should be awarded a mark at or near the bottom of the range.
- **Intermediate Performance:** Response which clearly merits inclusion in the level and should be awarded a mark at or near the middle of the range.
- **High Performance:** Response which fully satisfies the level description and should be awarded a mark at or near the top of the range.

Marking calculations

In marking answers involving calculations, examiners should apply the "own figure rule" so that candidates are not penalised more than once for a computational error.

Quality of written communication

Quality of written communication is taken into account in assessing candidates' responses to all tasks and questions that require them to respond in written form. These tasks and questions are marked on the basis of levels of response. The description for each level of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within levels of response as follows:

Level 1: Quality of written communication is limited.

Level 2: Quality of written communication is satisfactory.

Level 3: Quality of written communication is very good.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided below:

Level 1 (Limited): The level of accuracy of presentation, spelling, punctuation and grammar is limited. The candidate makes a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary.

Level 2 (Satisfactory): The level of accuracy of presentation, spelling, punctuation and grammar is satisfactory. The candidate makes a satisfactory selection and use of an appropriate form and style of writing supported with appropriate use of diagrams as required. Relevant material is organised with some clarity and coherence. There is some use of specialist vocabulary.

Level 3 (Very Good): The level of accuracy of presentation, spelling, punctuation and grammar is very good. The candidate successfully selects and uses the most appropriate form and style of writing, supported with precise and accurate use of diagrams where appropriate. Organisation of relevant material is very good. There is very good use of appropriate specialist vocabulary.

COVID-19 Context

Given the unprecedented circumstances presented by the COVID-19 public health crisis, senior examiners, under the instruction of CCEA awarding organisation, are required to train assistant examiners to apply the mark scheme in case of disrupted learning and lost teaching time. The interpretation and intended application of the mark scheme for this examination series will be communicated through the standardising meeting by the Chief or Principal Examiner and will be monitored through the supervision period. This paragraph will apply to examination series in 2021–2022 only.

		AVAILABLE MARKS
1	<p>(a) Nuts, bolts, bulbs, motors, screws, wheels (2 × [1]) [2] All relevant, valid responses will be given credit</p> <p>(b) A component that is mass produced/to the same specification [1]/for use in a range of products [1] [2] All relevant, valid responses will be given credit.</p> <p>(c) Any three from the following: No need for specialist machinery/equipment to produce components No need to stock materials to manufacture the standardised parts No need to employ extra/skilled/specialist staff to produce components Fewer staff needed for the factory/production line Can bulk buy to reduce costs Reduces production time Smaller premises required (3 × [1]) [3] All relevant, valid responses will be given credit.</p> <p>(d) Any three from the following: The availability of more specialist staff Reduced labour costs Proximity of raw materials Reduced Transportation/distribution costs. Environmental issues (3 × [1]) [3] All relevant, valid responses will be given credit.</p>	10

- 2 (i) Any **two** from:
Interviews, surveys, questionnaires and the internet [2]
- (ii) **Market Pull:**
Market or consumer forces demanding new or improved products
The growth in consumer demand for a product [1]
- Technology Push:**
Advances in technology which stimulate the development of new products or designs
Developments in new materials or manufacturing processes which stimulate new products or designs
Continuous product development in response to developments in the electronics or manufacturing industry [1]
All relevant, valid responses will be given credit.
- (iii) **Market Pull Influence:**
[1] for suitable product [1] for influence
Consumer demand for new products in the fashion industry (clothes/ accessories/cosmetics/footwear) influences and pulls the development for new designs or products
Consumer demand for travel/holidays influences new destinations/hotel development abroad
Car manufacturing company produces and launches a new vehicle in response to similar product from a competitor [2]
All relevant, valid responses will be given credit.
- (iv) **Technology Push Influence:**
[1] for suitable product [1] for influence
Televisions, Mobile phone, laptops, games consoles are continually being developed in response to developments in the electronics industry and manufacturing processes
Development of Apps for mobile phones or laptops in response to developments in the electronics industry and manufacturing processes [2]
All relevant, valid responses will be given credit.

AVAILABLE
MARKS

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3 (a) Disassembly

Disassembly, often part of reverse engineering, is taking apart an existing product [1] /breaking down a product into its constituent parts [1] [2]

Features:

Any **two** from:

Helps to understand how something works/parts fit together/why particular materials are used/stimulate creativity/ideas/good or poor features of a product [2]

All relevant, valid responses will be given credit.

(b) User Trips

This is when a designer attempts to become a user of a product [1] from a particular user's point of view [1] The designer takes a critical trip through the product [2]

Features:

Any **two** from:

Helps to understand features associated in using a product by a particular user(s)

Helps the designer to understand user difficulties/discover problems with a product/make improvements/create new solutions/ideas [2]

All relevant, valid responses will be given credit.

(c) Physical Models

Physical models are a 3D representation [1] of a design proposal or outcome [1] [2]

Features:

Any **two** from:

Gives the designer a realistic idea of sizes/can see if parts can/will fit together/can see if moving parts will work/can test the solution/enables designer to see if modifications are required/can present solution to others/how will it look [2]

All relevant, valid responses will be given credit.

AVAILABLE
MARKS

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- 4 (a) (i) Any **two** from:
- Curvaceous
 - Soft furnishing
 - Boutique with a contemporary edge
 - Modern
- [2]
- All relevant, valid responses will be given credit.
- (ii) A commitment to supporting local UK craftspersons
A belief that UK craftspersons are the only ones whose great skill can be felt in the supreme comfort and cozy warmth of the collection [2]
- (b) (i) Any **two** from:
- Bethan Gray works mainly with luxurious natural materials: leather, marble, semi-precious stones and solid wood
 - Bethan Gray has an extensive knowledge of craftsmanship and cutting-edge manufacturing technologies
 - She designs best-selling collections
 - She designs high-profile pieces for global retailers and brands
 - Much of her work can be seen in some of the world's most prestigious stores, including Lane Crawford, Liberty and Harrods [2]
- All relevant, valid responses will be given credit.
- (ii) Any **two** from:
- A lot of her work is a fusion of ideas through her collaboration with other designers and artists
 - Bethan Gray merges traditional craft with modern, elegant and contemporary design
 - Her love for and curiosity about the arts has resulted in extensive travel in India, Asia, the Middle East, Northern Africa, and South America to research other cultures
 - She became Design Director in Habitat and this gave her a unique insight into global retail [2]
- All relevant, valid responses will be given credit.
- (iii) Any **one** from:
- Habitat
 - Liberty
 - Harrods
 - The Ruby Tree Collection
 - Lapidida
 - Crate & Barrel USA
 - John Lewis
 - Hobbs
 - Maison & Objet
 - Salone del Mobile Milano [1]
- All relevant, valid responses will be given credit.

- 5 (a) (i) The panels are press-formed [1]
- (ii) Mild Steel, Stainless Steel, Aluminium Alloy [1]
All relevant, valid responses will be given credit.
- (iii) To increase the surface area of the radiator [1]
To radiate/produce more heat [1] [2]
- (iv) Spot welding or welding [1]
- (v) To attach the radiator to the wall [1]

(b) Calculation:

$$2400 \times 1200 = 2880000 \text{ mm}^2 \text{ per Metal Sheet}$$

$$600 \times 600 = 360000 \text{ mm}^2 \text{ per Radiator panel}$$

$$\frac{2880000}{360000} = 8 \text{ panels [1]}$$

$$8 \text{ panels Material A per sheet} = £18.75 \times 2 \text{ panels} = £37.50 [1]$$

$$8 \text{ panels Material B per sheet} = £12.50 \times 2 \text{ panels} = £25.00c [1]$$

$$\text{Difference in Cost} = £12.50 \text{ per radiator [1]}$$

or

Each Metal Sheet will produce 8 Panels [1]

2 × Panels used per radiator = 4 radiators per sheet

$$£150/4 = £37.50 [1] \quad £100/4 = £25.00 [1]$$

$$£37.50 - £25.00 = £12.50 [1]$$

or

Each Metal Sheet will produce 8 Panels [1]

2 × Panels used per radiator = 4 radiators per sheet

$$£150 - £100 [1] = £50/4 [1] = £12.50 [1] [4]$$

(c)

Response Type	Description	Mark Band
When response is not worthy of credit [0] should be awarded.		
Limited	Student produces sketches which do not convey a clear solution and show limited ideas. The construction lacks detail. The level of annotation conveys limited information and lacks technical vocabulary and specialist terms.	[1]–[3]
Satisfactory	Student produces satisfactory sketches which convey some ideas of the solution. The construction details are generally satisfactory. The level of annotation is satisfactory and contains some technical vocabulary and specialist terms.	[4]–[7]
Very Good	Student produces very good sketches which clearly convey most or all of the design solution. The construction details are detailed. The level of annotation and technical vocabulary and specialist terms is generally very good.	[8]–[10]

[10]

AVAILABLE
MARKS

20

6 (a)

Part	Material	Sizes in mm	No. off	Price/unit	Cost £
A	Veneered chipboard (back)	870 × 600	1	£10 per m ²	5.22
B	Veneered chipboard	900 × 200	1	£10 per m ²	1.80
C	Veneered chipboard	870 × 185	2	£10 per m ²	3.22
D	Veneered chipboard	600 × 200	2	£10 per m ²	2.40
E	Cam locks	Ø16	12	10p each	1.20
F	M4 dowels	35	24	£4 per 100	0.96
G	Iron on veneer edging	5000	1	48p per metre	2.40
H	Tin of varnish	250ml	1	£4.50 per tin	4.50
Total Cost					21.70

(6 × [1])

[6]

(b) $60/100 \times 20 = \text{£}12$ [1]

$60 + 12 = \text{£}72$ [1]

Answer: £72

(2 × [1])

[2]

(c) $1500 \times 60 = 90000$ [1]

$90000 \times 30/100$ [1] = £27000 [1]

Answer: £27000

(3 × [1])

[3]

AVAILABLE MARKS

11

			AVAILABLE MARKS
7	<p>(a) Any two from:</p> <ul style="list-style-type: none"> • lightweight • stackable • comfortable • stable • weather resistant <p>All relevant, valid responses will be given credit. (2 × [1])</p>	[2]	
	<p>(b) Features of using injection moulding:</p> <p>Any three from:</p> <ul style="list-style-type: none"> • Can produce complex shapes [1] with detailed features [1] • Very fast method of production [1] and highly efficient process [1] • Enhances the strength [1] at the same time reduces wastage [1] • Automation [1] saves cost in manufacturing [1] <p>All relevant, valid responses will be given credit. (3 × [2])</p>	[6]	
	<p>(c) Any two from:</p> <ul style="list-style-type: none"> • size of the human body to fit the chair when seated • height of adult leg from foot to knee when seated • height of adult leg from knee to back when seated • weight of a human <p>All relevant, valid responses will be given credit. (2 × [1])</p>	[2]	10
8	<p>The design solution should show evidence of the following features:</p> <ul style="list-style-type: none"> • Good quality annotated sketches giving consideration to line, shape, form and proportion. [5] • It should be free-standing, aesthetically pleasing and suitable for a baby's bedroom [3] • It must have an on/off switch and a timer switch. The 9 volt battery must have its own compartment to enable it to be safely removed and allow the battery to be changed. [3] • It should identify and justify the choice and thickness of material(s). [3] • It should identify and justify the main manufacturing techniques used in the construction of the night light. [4] • It should include three key dimensions to indicate size and proportion. [2] 	[20]	20

Overall general level indicators for the design

Response Type	Description	Mark Band
When a response is not worthy of credit, a [0] mark should be awarded		
Limited	Student makes an attempt to include some or all of the features listed. Student produces sketches which convey and show limited ideas. The level of annotation conveys limited information and lacks technical vocabulary and specialist terms. The accuracy of spelling, punctuation and grammar is limited.	[1]–[7]
Satisfactory	Student makes an attempt to include some or all of the features listed. Student produces satisfactory sketches which convey some ideas of the solution. The level of annotation is satisfactory and contains some technical vocabulary and specialist terms. The accuracy of spelling, punctuation and grammar is satisfactory.	[8]–[14]
Very Good	Student makes an attempt to include some or all of the features listed. Student produces very good sketches which clearly convey most or all of the design solution. The level of annotation and technical vocabulary and specialist terms is generally very good. The accuracy of spelling, punctuation and grammar is very good.	[15]–[20]

Total

AVAILABLE MARKS

100