Rewarding Learning

General Certificate of Secondary Education
2018

Technology and Design

Unit 3:
Product Design

[GTD31]

FRIDAY 25 MAY, 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.

Students must:

- recall select and communicate their knowledge and understanding of technology and design in a range of contexts (AO1);
- apply skills, knowledge and understanding, in a variety of contexts and in designing and making products (AO2); and
- analyse and evaluate products, including their design and production (AO3).

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.

1

Material	Ferrous Metal	Hardwood	Softwood	Thermosetting	Thermoplastic	Manufactured board
Parana Pine			✓			
Stainless Steel	✓					
Urea formaldehyde				✓		
ABS					✓	
Nylon					✓	
Oak		✓				
Polymorph					✓	
Plywood						✓

(8 × [1]) [8]

AVAILABLE MARKS

8

AVAILABLE MARKS

2 **(a)** It activates the linkage mechanism of all moving parts. [1]

(b) **(i)** Any **one** from the following list:
- Very strong board
- Available in large sheet form
- Easy to paint

Other appropriate answers will be considered
(1 × [1]) [1]

(ii) Scroll saw [1]

(iii) Any **two** from the following list:
Wear goggles;
Hold material flat and firmly;
Tie hair back;
Only one person using the machine
Other appropriate answers will be considered
(2 × [1]) [2]

(c) **(i)** Any **two** from the following list:
- CAM machines can operate quicker than humans increasing efficiency
- Less mistakes are made, meaning greater consistency
- Once set up the production is cheaper to run than paying manual workers
- Products can be repeated in larger qualities resulting in economy of scale
- Very accurate parts which make repeatability of identical products

Other appropriate answers will be considered
(2 × [1]) [2]

(ii) Any **one** from the following list:
Quality control is important for the assembly of the toy
To ensure all parts are accurately made
Other appropriate answers will be considered
(1 × [1]) [1]

8

				AVAILABLE MARKS
3	(a)	**Just-in time manufacture:** Products are created to meet demand rather than in advance of need.	[1]	
		Reason: Avoids waste with over production. Material bought in as it is needed. Limited stock held. Reduces costs associates with stock. (Any **one**)	[1]	
		Sub-contracting: Getting another company to manufacture/provide/ supply some parts.	[1]	
		Reason: Specialised task. Specialist expertise required. Cost effective. Can fix some costs. Reliability of the sub-contractor. (Any **one**) other appropriate answers will be considered.	[1]	
	(b)	**Ergonomics:** The design team need to have knowledge/understanding of: The relationship between people and the product they make. How people interact with a product. Design products so that they fit the people who use them. (Any **one** or similar) Reference to people and/or the product [1] Reference to relationship or interaction [1]	[2]	
	(c)	**In-line assembly process:** Line of assembly stations and workers. Specific task assigned to each station/worker. Product moves in sequence to next station and worker. Different parts assembled at each station. Product is progressively assembled. Bicycle completed at the end of the assembly line. Some work stations may not require a worker; can be robotic. (Any 2 × [1])	[2]	8

				AVAILABLE MARKS
4	(a)	1. Sheet 2. Tube/tubular	[2]	
	(b)	Kitchen worktop surface: Material: Melamine Property: Hardness or does not corrode Bicycle chain: Material: Carbon steel Property: Strength Front door of a house: Material: Mahogany/Oak/PVC Property: Mahogany/Oak: attractive, does not rot PVC: Does not corrode, Maintenance free, Range of colours Other appropriate answers will be considered (6 x [1])	[6]	8
5	(i)	Inception/Development Introduction Growth Decline (4 × [1])	[1] [1] [1] [1]	
	(ii)	Characteristics associated with the maturity stage of a product. Product is well established Sales reach a peak Other competitors enter the market with alternative solutions Competition increases between producers of the product New competition may lead to lower price for the product The product may be modified/improved to keep sales ahead of competitors Manufacturer may offer incentives to stores to stock the product over competitors Original company that introduced the product may begin to find it difficult to compete in the market (4 × [1])	[4]	8
6	(a)	Reprocessing waste materials into new products.	[1]	
	(b)	Aluminium Mild steel/steel 2 off (2 × [1]) Other appropriate answers will be considered	[2]	
	(c)	Conserves resources Reduces energy consumption Reduces landfills Reduces waste Reduces carbon footprint Uses waste to produce energy 4 off (4 × [1]) Other appropriate answers will be considered	[4]	
	(d)	Collection of waste materials Sorting/separating of waste materials Contamination of recycling materials 1 off (1 × [1]) Other appropriate answers will be considered	[1]	8

	AVAILABLE MARKS

7 (a) PRODUCTION PROCESSES:

Die Casting
Injection Moulding
Blow Moulding
Extrusion

(4 × [1]) [4]

(b) (i) Any **three** from the following list:
A 'slug' of plastic is inserted into the machine
The mould is normally heated
A large force (Hydraulic force) is used to compress the plastic
Hydraulic force is applied in the machine
The slug takes the form of the mould
Thermosetting plastic is normally used in this process
A release agent may be used to assist the removal of the plastic
Other appropriate answers will be considered
(3 × [1]) [3]

(ii) Any **one** from the following list:
Phenol formaldehyde
Urea formaldehyde
Melamine formaldehyde
(1 × [1]) [1] 8

8 The design must satisfy the following specification points:

(a) The bench must be strong and capable of holding **three** people of average size and weight. [2]

(b) The bench must be stable and be comfortable to sit on. [3]

(c) The material(s) selection, justification and the economy of material(s) used, need to be specified in your solution. [4]

(d) The manufacture, assembly and finish of the bench must be clearly detailed. It must be able to be made in a school workshop. [6]

(e) The bench must be of appropriate sizes and proportions, safe to use, and aesthetically pleasing. [3]

(f) The solution should show good quality detailed sketch(es) with notes, including three key important dimensions. [6] 24

Total **80**

Overall general level indicators for the design

Response Type	Mark Band
Limited	1–7 (0–30%)
Satisfactory	8–13 (33–55%)
Good	14–18 (55–75%)
Very Good	19–24 (76–100%)