Rewarding Learning

General Certificate of Secondary Education
January 2019

Technology and Design

Unit 3:
Product Design

[GTD31]

FRIDAY 11 JANUARY, 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.

			AVAILABLE MARKS

1 **(a)** **(i)**

Metal	Ferrous	Non-Ferrous
Copper		✓
Stainless Steel	✓	
High Carbon Steel	✓	
Aluminium		✓

[4]

(ii) Stainless Steel; High Carbon Steel (2 × [1]) [2]

(b) Good conductor of electricity [1]
wiring in electrical circuits or components [1]
or
Good conductor of heat [1] use in cooking utensils [1] [2] 8

All appropriate answers will be considered

2 **(a)** Reforming: Extrusion [1]

Deforming: Vacuum Forming [1] [2]

(b) **(i)** **Extrusion**:
Any **three** from:
makes use of a die
makes use of plastic pellets
uses heat to soften plastic before feeding into a die
uses a rotating screw to move pellets forward
produces continuous lengths
lengths are cut to size as and when required
same cross section throughout/uniform shape throughout production run
is a continuous process
(3 × [1]) [3]

All appropriate answers will be considered

(ii) **Vacuum Forming**:
Any **three** from:
makes use of a mould/former
makes use of plastic sheets
use heat to soften the plastic before shaping
uses a vacuum to deform plastic
plastic sheet deforms around mould/former
shaped plastic cut from sheet
produces individual products
(3 × [1]) [3] 8

All appropriate answers will be considered

3

Manufacturing Stages	Time
Mark out and cut acrylic	
File and smooth edges	
Cut hole and file	
Fold shape	
Mark out stars	
Cut out stars	
File and smooth stars	
Assemble and glue stars	

(8 × [1]) [8]

AVAILABLE MARKS: 8

4 **(i)** Anthropometrics is the study of body measurements. [1]

(ii) Ergonomics is the study of how people interact with products [1]
or
Ergonomics is the study of people and their relationship with the environment [1] [1]

(iii) Any **two** from:
Specific factor 1: Hand width [1]
Influence: The maximum/minimum width of product for the consumer [1]

Specific factor 2: Length of hand [1]
Influence: To enable the consumer to hold the product comfortable in the hand [1]

Specific factor 3: Size of fingers [1]
Influence: Will influence size of function keys/keypad [1]

Specific factor 4: Grip diameter: [1]
Influence: Overall size remote control [1]
(2 × [2]) [4]

(iv) Discussion to focus on any **two** from:
where the TV is to be used, for example, in the home or in a public building?
relationship between the distance from the viewer and the size of the screen
freestanding or hung on a wall
need to be seen by seated viewers
appropriate sound for the room size
quality of the sound or picture
not in direct sunlight which may influence viewing quality [2]

AVAILABLE MARKS: 8

All appropriate answers will be considered

		AVAILABLE MARKS
5 (a) (i) Mock-ups		
Any **one** benefit from: allows designer to view/consider essential functions/parts of the product to test early design thinking does not need to be scaled omits unnecessary detail provides an early visualisation of the possible outcome more than one can be produced at different stages in the process.	[1]	
Any **one** limitation from: can be time consuming generally an unrealistic visual outcome doesn't necessarily look like the real object generally limited to see how parts may fit together/how parts may work/not functional.	[1]	
(ii) Prototypes		
Any **one** benefit from: enables the designer to view a realistic outcome of the product a scaled or full size outcome/to check against dimensions/to make judgements against the design to consider modifications/to check the functionality of the product consider possible problems.	[1]	
Any **one** limitation from: time consuming to produce cannot cover all aspects of the proposed solution unable to see all outcomes, e.g. may use cheaper materials in the prototype can add considerably to costs.	[1]	
(iii) Computer Modelling		
Any **one** benefit from: provides a very realistic drawing formal drawing/presentational drawing 3D drawing 3D model	[1]	
Any **one** limitation from: requires hardware and specific software requires expertise/knowledge of a specific software package expensive to set up.	[1]	
(b) Provides a dimensional drawing [1] to enable a product to be manufactured as planned [1]	[2]	8
All appropriate answers will be considered		

			AVAILABLE MARKS
6	**(a)**	Any **one** from: to assist a customer deciding if the product is worth buying to enable the design to be improved (1 × [1]) [1] **All appropriate answers will be considered**	
	(b)	Any **two** from: hard wearing attractive appearance less liable to warping, shrinking, swelling (2 × [1]) [2] **All appropriate answers will be considered**	
	(c) **(i)**	Any **two** from: requires less timber reduces waste reduces cost easier to obtain stock size with for frames conservation of materials difficulty in obtaining timer of required width (2 × [1]) [2] **All appropriate answers will be considered**	
	(ii)	Any **one** from: mitre joint dowel joint butt joint (1 × [1]) [1] **All appropriate answers will be considered**	
	(d)	Any **two** from: short production runs to pre-determined numbers frequent changes of setup characterise batch production the equipment and the assembly setup is used for a limited number of parts or assemblies and is then changed to make a different product the production is generally made to stock or customer order semi- skilled or unskilled flexible workforce (2 × [1]) [2] **All appropriate answers will be considered**	8

				AVAILABLE MARKS
7	**(a)**	Any **three** from: risk of flying debris [1] use safety guards on machine or wear goggles or face mask [1] risk of Rotating/Moving parts [1] wear an apron or tie back hair [1] risk of inhaling dust [1] use dust extractor or wear a dust mask [1] risk of catching hands [1] use a push stick [1] risk of noise pollution [1] use ear protection [1] risk of inhaling fumes [1] use spray booth or use a fume extractor [1] (3 × [2])	[6]	
		All appropriate answers will be considered		
	(b)	Any **two** from: keep both hands behind the blade make sure the work is secure keep the blade sharp return chisel to tool box or centre of table use a mallet with a chisel never point the blade towards yourself or others if carrying the chisel always have the chisel pointing downwards	[2]	8
		All appropriate answers will be considered		
8		The design must satisfy the following specification points:		
	(a)	The portable plant holder must be capable of holding **three** flower pots at different heights. The flower pots should be easy to be attached and removed from the holder	[3]	
	(b)	The portable plant holder must be strong and stable, safe to use, freestanding and be able to be moved to various locations	[3]	
	(c)	The material(s) selection, justification and the economy of material(s) used, need to be specified	[4]	
	(d)	The manufacture, assembly and finish of the holder must be clearly detailed	[5]	
	(e)	The portable plant holder must be aesthetically pleasing, of appropriate size and proportions, including three key overall dimensions	[4]	
	(f)	The solution should show good quality detailed sketch(es) with notes	[5]	24
			Total	**80**

Overall general level indicators for the design

AVAILABLE MARKS

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%)