



Rewarding Learning

**General Certificate of Secondary Education
2024**

Technology and Design

Unit 1: Technology and Design Core Content

[GTU11]

THURSDAY 30 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.

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.

Level 1: Response which merits inclusion in the band and should be awarded the lower mark.
Level 2: Response which merits inclusion in the band and should be awarded the higher mark.

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:

- Band 1: Quality of written communication is basic.
- Band 2: Quality of written communication is limited.
- Band 3: Quality of written communication is satisfactory.
- Band 4: Quality of written communication is good.
- Band 5: Quality of written communication is excellent.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided in the relevant question in the mark scheme.

			AVAILABLE MARKS
1 (a)	Mechanical [1]		
	Roller follower [1]		
	Hazard [1]		
	Corrosive [1]		
	First Aid [1]		
	 [1]	[6]	
(b) (i)	Computer Aided Design	[1]	
(ii)	Computer Numerical Control	[1]	
(iii)	Any two of the following: Quicker, More accurate, Better finish, Consistent tolerance, Repeatability (2 × [1])		
	All relevant, valid responses will be given credit	[2]	10

2 (a)

Stage of the design process	Definition
Manufacture	Making the product
Design brief	What has to be made A list of what the solution should do What is to be designed/made/developed/produced
Research Investigation/analysis	Consider a range of existing solutions and technologies/components that could be used in the design
Testing and Evaluation	Checking the product against criteria and making conclusions Identifying positives/negatives/outcomes/modifications
Specification	List of criteria that the product must fulfil when designed/manufactured
Design problem Design opportunity Problem Identification/situation	Consider the problem

(5 × [1])

All relevant, valid responses will be given credit [5]

- (b) Any **three** from:
Freehand sketching;
Presentational drawings;
Working drawings;
Virtual modelling/CAD
(3 × [1])

All relevant, valid responses will be given credit [3]

- (c) Any **one** from:
- Grip – for insulation/comfort
 - Clip close lid – to reduce spillage

All relevant, valid responses will be given credit [2]

AVAILABLE MARKS

10

3 (a) A swinging motion. [1]



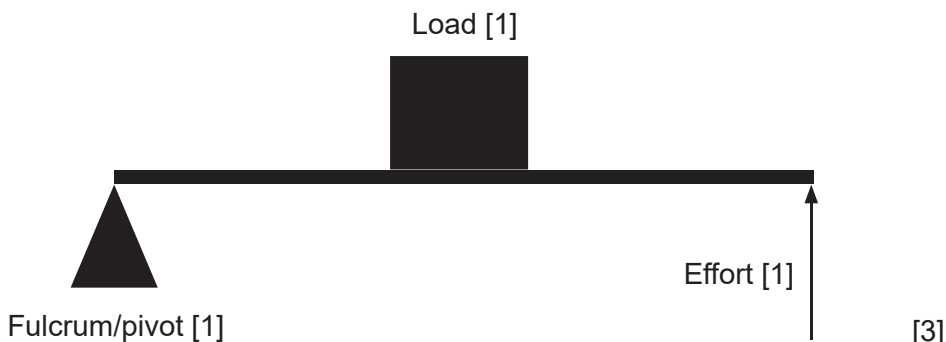
A clock pendulum, rocking chair, a hammock, a swing. [1]

All relevant, valid responses will be given credit [3]

(b) (i) Y [1]

The fulcrum/pivot in Y is closer to the effort/is further from the load [2] [3]

(ii)



9

4 (a) B [1] F [1] E [1] A [1] [4]

(b) (i) Any **two** of the following:

- Clean environment [1]
- Safer working environment for employees [1]
- Quiet in operation/healthy working environment [1]
- Hygienic system [1]
- Production costs kept lower as less expensive to run than alternative systems [1]
- Flexible system (Processing lines can be changed) [1]
- Can be speed controlled [1]
- Can be automated [1]
- Can run 24hrs a day [1]
- Reduces the need for manual labour/heavy lifting [1]
- Increased efficiency [1]
- Reliable [1]
- (2 × [1])

All relevant, valid responses will be given credit [2]

(ii) OR [1]

(iii) Explanation to focus on:

- When button **A** is pressed compressed air will be supplied to **D** [1]
- When button **B** is pressed compressed air will be supplied to **D** [1]
- Component **C** will enable compressed air to be supplied to **D** from **A** OR **B** [1]
- Component **D** will outstroke/goes positive/actuates [1]

All relevant, valid responses will be given credit [4]

11

5 (a) Place a tick (✓) in the correct box to respond to each of the following questions.

AVAILABLE
MARKS

- A V belt is:
 - used with a gear wheel
 - used with a pulley wheel

- A tenon saw is:
 - used to cut straight lines
 - used to cut curved lines

- A scriber is:
 - used to mark lines on metal
 - used to mark lines on wood

- Acrylic is:
 - a thermosetting plastic
 - a thermoplastic

- Graphene is:
 - not as strong as steel
 - stronger than steel [5]

(b) (i) To protect the mild steel from rusting/from damage [1]
To provide an aesthetic finish [1] [2]

- (ii) Any **two** from:
The metal should be cleaned/deburred/filed thoroughly [1]
The metal should be heated [1]
Drill a hole [1]

All relevant, valid responses will be given credit [2]

9

6 (a) (i) Pole

[1]

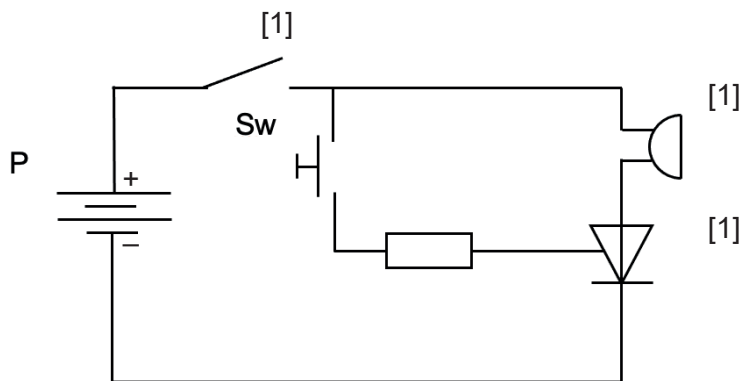
(ii) Symbol B Thyristor [1]
Symbol C Buzzer [1]

[2]

(b) (i) 4 cells

[1]

(ii)



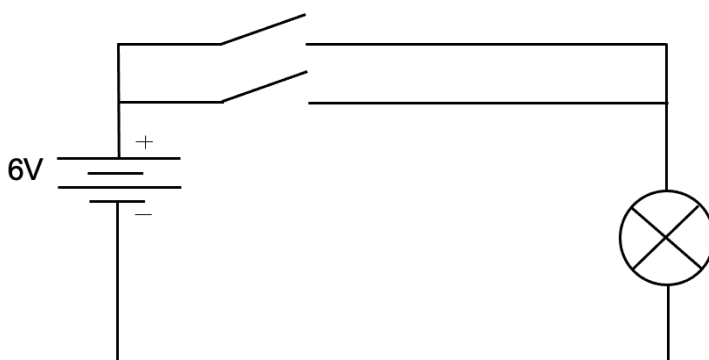
[3]

(iii) The thyristor will switch/turn the buzzer on [1]
and it will keep the buzzer on/latched [1]

All relevant, valid responses will be given credit

[2]

(iv)



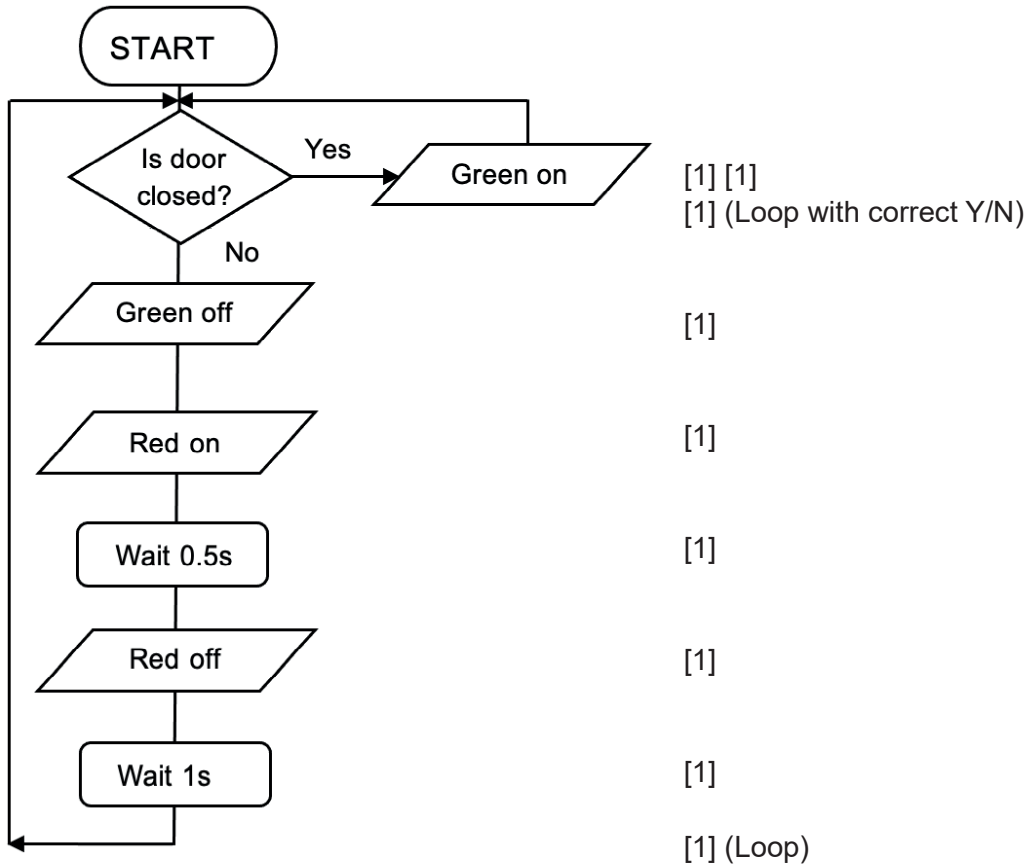
One switch connected in the circuit [1]
Parallel circuit containing both switches [1]
Second switch in parallel with circuit with no other alternative components [1]
Bulb connected outside of the parallel part of the circuit
or if no parallel circuit awarded bulb connected within circuit [1]

[4]

AVAILABLE
MARKS

13

7



AVAILABLE MARKS

All relevant, valid responses will be given credit [9]

9

- 8 (a) (i) Any **one** from:
- Lightweight
 - Resistant to corrosion

All relevant, valid responses will be given credit [1]

- (ii) Non-ferrous metals do not contain iron.

All relevant, valid responses will be given credit [1]

(b) Cedar [1]

- (c) Any **two** from:
- does not rot/decay [1]
 - does not need finish/maintenance [1]
 - lightweight [1]
- (2 × [1])

All relevant, valid responses will be given credit [2]

- (d) Thermochromic pigments change colour [1] when the temperature changes [1] to provide a visual indication of the temperature in the greenhouse [1]

All relevant, valid responses will be given credit [3]

8

			AVAILABLE MARKS	
9	(a)	(i) 3PV, 3 Port Valve, 3/2	[1]	11
		(ii) Push Button	[1]	
	(b)	(i) 3PV A Push Button is pressed [1] Air flow is slowed/restricted by B [1] SAC C Outstrokes/extends/actuates/goes positive [1] When A is released SAC C Instrokes [1]	[4]	
		(ii) Unidirectional Flow Restrictor or Unidirectional Flow Regulator	[1]	
		(iii) Single acting cylinder or SAC	[1]	
		(iv) Explanation to focus on: Insert additional 3PV [1] AND logic/in series [1]	[2]	
		(v) Safer in operation	[1]	

10 Indicative Content:

- The former should be made of wood as this will help the acrylic to cool slowly.
- All blemishes/imperfections should be removed from the former otherwise they will be transferred to the acrylic.
- The former should have a smooth finish.
- The former should have a rounded corner to enable a neat bend to be formed on the acrylic.
- The former must have the correct angle of 60°.
- Remove the protective film from both sides of the plastic.
- Mark out the line to be heated using a pencil or permanent marker, ruler and try square.
- The line should be parallel and 150 mm from one end of the acrylic.
- Hole for the clock needs to be marked out in the centre of one half of the acrylic.
- This should be at a point 75 mm down and in 50 mm.
- Drill the 5 mm hole using a pillar drill.
- A sharp drill angle will help to avoid cracking.
- To avoid cracking a slow drilling speed should be used and the drill should not be forced.
- A small pilot drill may be used first before using the 5 mm drill bit.
- Masking tape may be placed over the hole before drilling.
- A small amount of soapy water could be used as a lubricant.
- A sacrificial board should be employed when drilling.
- Switch on the strip heater/line bender.
- Accurately align the acrylic over the hot wire on the strip heater/line bender.
- Heat the acrylic until it is softened.
- May need to heat on both sides.
- Remove the acrylic from the heat and carefully bend the centre line around the 60° former.
- Hold in position to retain the correct angle until it has cooled.

Safety Precautions:

- Be aware of the hot wire element in the strip heater/line bender.
- Handle hot acrylic with care/wear gloves.
- Hair tied back if required.
- Wear an apron/ensure there is no loose clothing.
- Wear goggles when using the drilling machine.
- Ensure guard is down when drilling.
- Tighten drill securely and remove chuck key.
- Be aware of safety switch on the drilling machine.

[10]

Response Type	Description	Mark
When a response is not worthy of credit, a [0] mark should be awarded.		
Basic [1]–[2]	Student responds by completely missing the focus of the question. This response may or may not be well written.	1
	Student response contains little content. It may name some of the safety precautions and some stages/steps in the process. The response lacks clarity and coherence and is poorly organised. The level of written communication is basic.	2
Limited [3]–[4]	Student describes very few stages/steps in the strip heater/line bending process and may or may not make reference to the jig/former and/or the drilling process. Some safety precautions are given/listed but tend to be general rather than specific to the process. The level of written communication is limited but conveys some information. It lacks technical vocabulary and specialist terms. Spelling, punctuation and grammar lack accuracy.	3
	Student describes very few stages/steps in the strip heater/line bending process and may or may not make reference to the jig/former and/or the drilling process. Some safety precautions specific to the process are given/listed. The level of written communication conveys some information. It is limited in technical vocabulary and specialist terms. Spelling, punctuation and grammar lack accuracy.	4
Satisfactory [5]–[6]	Student describes some of the stages in the strip heater/line bending process and makes some reference to the jig/former and/or the drilling process. Some safety precautions have been discussed. The level of written communication is satisfactory and contains some technical vocabulary and specialist terms. The accuracy of spelling, punctuation and grammar is satisfactory.	5
	Student describes some of the stages in the strip heater/line bending process and makes some reference to the jig/former and/or the drilling process. Some appropriate safety precautions are discussed or described at relevant stages throughout the answer. The level of written communication is satisfactory and contains some technical vocabulary and specialist terms. The accuracy of spelling, punctuation and grammar is satisfactory.	6

AVAILABLE MARKS

Good [7]–[8]	Student correctly describes most or all of the stages in the strip heater/line bending process and makes good reference to the jig/former and/ or the drilling process. Most safety precautions are referred to throughout the answer. The level of written communication and technical vocabulary and specialist terms is generally good. The accuracy of spelling, punctuation and grammar is good.	7
	Student correctly describes most or all of the stages in the strip heater/line bending process and makes very good reference to the jig/former and/ or the drilling process. Most safety precautions are referred to throughout the answer. The response is well organised clear and coherent. The level of written communication and technical vocabulary and specialist terms is very good throughout. The accuracy of spelling, punctuation and grammar is very good.	8
Excellent [9]–[10]	Student correctly describes most or all of the stages in the strip heater/line bending process and makes excellent reference to the jig/former and/ or the drilling process. Most safety precautions are referred to throughout the answer. The level of written communication and technical vocabulary and specialist terms is excellent. The accuracy of spelling, punctuation and grammar is excellent.	9
	Student correctly describes most or all of the stages required in the strip heater/line bending process and makes excellent reference to the jig/former and/or the drilling process. All relevant safety precautions associated with the processes have been discussed at appropriate points throughout the answer. The level of written communication and technical vocabulary and specialist terms is excellent. The accuracy of spelling, punctuation and grammar is excellent.	10

[10]

Total

AVAILABLE MARKS
10
100