



**General Certificate of Secondary Education**

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# **Technology and Design**

Unit 1: Technology and Design Core

**[GTY11]**

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**Assessment**

**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, teachers are expected to use their professional judgement to assess the validity of answers.** You must not draw inferences or interpret what you think the candidate has meant. Teachers should carefully read and consider every response.

### ***Positive Marking***

Teachers 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. Teachers 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. Teachers are encouraged to use the full range of marks available.

### ***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.

### ***Bands of response***

Tasks and questions requiring candidates to respond in extended writing are marked in terms of bands of response. In deciding which mark to award, teachers 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 band to award to any response, teachers are expected to use their professional judgement. The following guidance is provided to assist teachers.

- **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, teachers should apply the "error carried forward rule" so that candidates are not penalised more than once for a computational error.

Award full marks if a candidate gives the correct answer but does not show the working out.


### ***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:

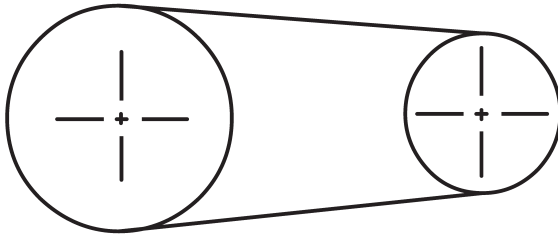
- Band 1: Quality of written communication is basic.
- Band 2: Quality of written communication is limited.
- Band 3: Quality of written communication is satisfactory.
- Band 4: Quality of written communication is good.
- Band 5: Quality of written communication is excellent.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided in question 10.

			AVAILABLE MARKS	
1	(a)	Reed Switch	[1]	12
		Hazard	[1]	
		Electricity	[1]	
		<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Wait</div>	[1]	
		Flowchart	[1]	
		Pneumatic	[1]	
		Roller Trip	[1]	
	(b) (i)	Amps/milliamps	[1]	
		Ohms/kilohms/mega-ohms	[1]	
		(ii) 	[1]	
2	(a)	A ferrous metal contains iron [1] A non-ferrous metal does not contain iron [1] (2 × [1])	[2]	11
	(a)	Easy to shape when heated; Lightweight (2 × [1])	[2]	
	(b)	Strip heater or Line bender (1 × [1])	[1]	
	(c)	<b>Reference to the following points:</b> Mark out the centre of the hole; Mark out the outer circle; Drill a pilot hole within the circular shape; Using either a coping saw or scroll saw machine insert the blade through the hole and cut the outline shape of the circles; (4 × [1])	[4]	
		<b>Correct alternative responses should be considered</b>		
	(d) (i)	Faster than manual method of production; [1] The CNC is more accurate than manually; [1] Easy to repeat additional quantities of holders [1] The diameter of the hole can be easily changed as required; [1] (3 × [1])	[3]	
		<b>Correct alternative responses should be considered</b>		
	(ii)	Former or Jig (1 × [1])	[1]	
		<b>Correct alternative responses should be considered</b>		

- 3 (a) (i) Rotary [1]  
(ii) Rotary [1]  
(b) (i) Pulley and Belt or Pulley System (1 × [1]) [1]

(ii)



[1]

- (iii) The Motor is turned on and rotates [1]  
The pulley wheels/belt transfer rotary motion from the driver pulley to the driven pulley at the front [1]  
The front pulley transfers rotary motion to the drill chuck [1]  
(1 × [3]) [3]

- (iv) The Vee Belt can slip on the pulley [1]

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- 4 (a) (i) A Single Acting Cylinder or SAC [1]  
(ii) Only one Air Inlet [1]  
Spring return [1]  
(2 × [1]) [2]

- (b) (i) Push Button Three Port Valve or 3PV, 3/2 (1 × [1]) [1]

- (ii) AND Logic [1]

- (iii) Output Component [1]

6

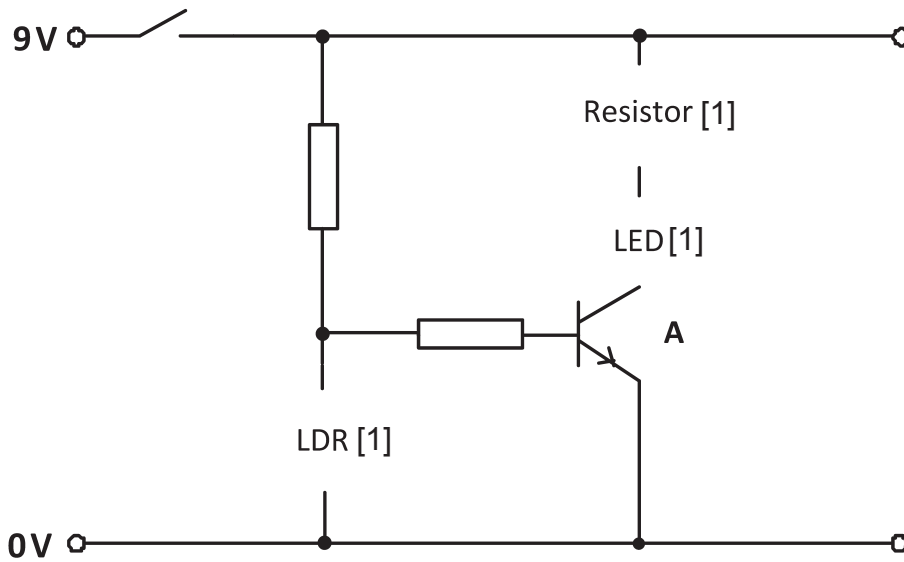
AVAILABLE MARKS

- 5 (a) (i) To enable the plastic to form around the mould [1] when heated [1].  
 (2 × [1]) [2]  
**Correct alternative responses should be considered**
- (ii) Ensure a taper or draft angle is included in the mould. [1]  
 Make sure all corners are radiused leaving no sharp edges on the mould. [1]  
 Make sure that all surfaces on the mould have a smooth finish. [1]  
 Make sure a releasing agent or varnish is applied to the mould. [1]  
 Make sure that there are no negative angles on the mould. [1]  
 Include venting holes in the mould where air could become trapped. [1]  
 (4 × [1]) [4]  
**Correct alternative responses should be considered**
- (b) (i) Thermoplastic [1]
- (ii) Place the mould in the vacuum forming machine. [1]  
 Place/lock plastic sheet on vacuum former. [1]  
 Turn on heater. [1]  
 Pull heater over plastic sheet. [1]  
 When plastic is soft remove/switch off heater. [1]  
 Operate lever to move mould up into plastic. [1]  
 Operate vacuum to pull plastic around mould. [1]  
 Release lever and allow plastic to cool. [1]  
 Remove plastic and mould from machine. [1]  
 Remove mould from plastic. [1]  
 Trim excess plastic from vacuum formed shape. [1]  
 (Any 4 × [1]) [4]  
**Correct alternative responses should be considered**

AVAILABLE  
MARKS

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6 [i]



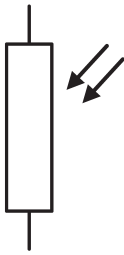
(3 × [1])

[3]

(ii) Transistor/NPN Transistor

[1]

(iii)



Must have shape and arrows pointing inward: if arrows reversed then only 1 mark.

(1 × [2])

[2]

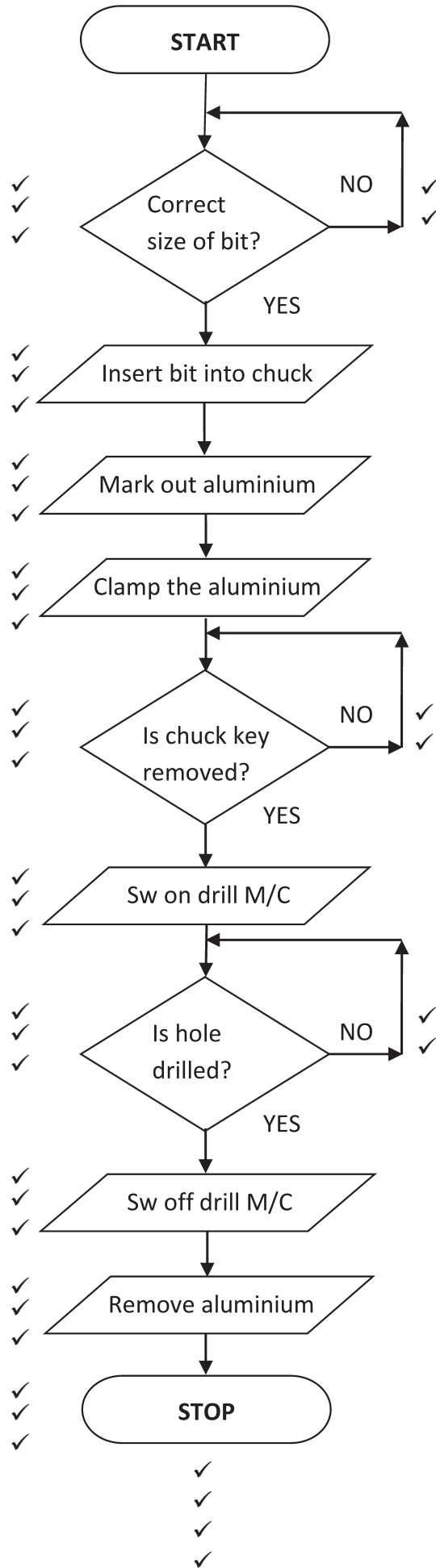
(iv) To enable the transistor/LED to switch on [1] in dark conditions [1]

(2 × [1])

[2]

AVAILABLE MARKS

8



[1]

AVAILABLE MARKS

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Award up to **three** ticks for each flow chart symbol as follows:

- each flow chart symbol as per Appendix 3 of the GCSE Technology and Design specification
- each correct short statement within each cell
- each flow chart symbol in the correct sequence of the flow chart

Award up to **two** ticks for each feedback loop as follows:

- each correct feedback loop
- yes/no correctly inserted in each feedback loop

Award up to **four** ticks for presentation of the flow chart as follows:

- neatness of flow chart symbols
- flow chart symbols shapes similar
- connecting arrows to show the flow of the diagram
- arrowheads on feedback loops to show direction

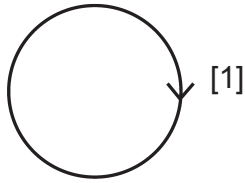
Divide total number of ticks by 4 to get the mark awarded.

Some examples:

- 40 ticks:  $40/4 =$  award **10** marks
- $34/4 = 8.5 =$  award **9** marks (round up)
- $23/4 = 5.75 =$  award **6** marks (round up)
- $17/4 = 4.25 =$  award **4** marks (round down)

Total marks that can be awarded for the question 10 marks.

8 (a) Rotary



[1]

Oscillating



[1]

Reciprocating



[1]

[3]

(b) (i) Clockwise

[1]

(ii) Driver Sprocket

[1]

(iii) High Speed Sprocket

[1]

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

It transfers direct motion to the back wheel [1]

It provides a direct drive [1]

It gives you a speed ratio [1]

(2 × [1])

[2]

**Correct alternative answers should be considered**

(ii) Any **two** of the following:

Because it is exposed to the elements [1]

It prevents rust [1]

It is necessary to lubricate the links [1]

And keep them rotating freely [1]

(2 × [1])

[2]

**Correct alternative answers should be considered**

(d) Number of teeth on driven = Gear ratio × Number of teeth on driver [1]

$1/3 \times 66$  [1]

22 teeth [1]

[3]

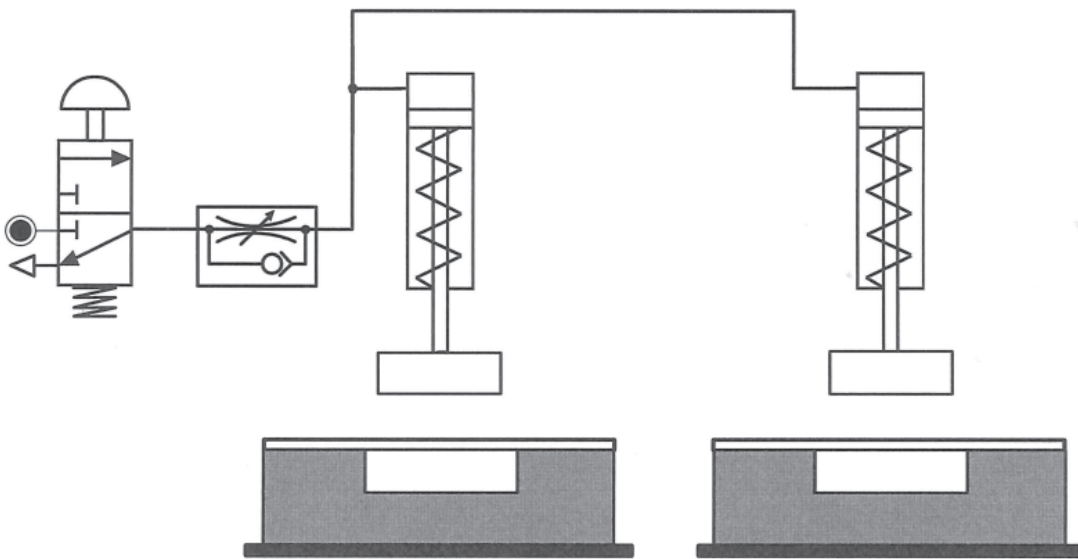
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**Award full marks for the correct answer with no working out.**

- 9 (a) (i) Exhaust [1]
- (b) (i) Unidirectional Flow Restrictor [1]
- (ii) Outstroke [1]
- (iii) The air can only flow through the restrictor [1]  
when the cylinder is being output [1]  
(2 × [1]) [2]
- (iv) Does not want to damage the cardboard boxes. [1]
- (c) Add 'T' Valve at pipeline Junction [1]  
Add second SAC [1] and Press [1]  
Add Pipeline from 'T' Valve [1] to SAC Inlet Port [1] [5]

AVAILABLE  
MARKS

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## 10 Bands of response

Tasks and questions requiring candidates to respond in extended writing are marked in terms of bands of response. In deciding which mark to award, teachers 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 **band** to award to an response, teachers are expected to use their professional judgement. The following guidance is provided to assist teachers

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

**Level 2:** Response which satisfies the band description and should be awarded the higher mark.

### Indicative Content:

#### Chemical Method

- Design and draw a circuit diagram
- Photocopy the circuit diagram onto transparency to produce the 'mask'
- Using a photo-resistant board, peel back the plastic cover to reveal the sensitive coating
- Place the mask (or transparency) underneath the board
- Make sure the mask is the correct way round
- Place the board with the mask into an Ultra Violet (UV) box and close the lid
- Switch on the UV box for a period of time, usually 2 – 3 minutes
- Remove the board and place it into a tank filled with developer fluid
- Leave in developer for about 10 seconds
- Remove from the developer, with plastic tongs, and wash with clean water
- Place the board in an etching tank which is then heated
- Leave for 15 to 45 minutes, but, keep checking the board
- Wash with clean water

#### Safety Precautions:

- Plastic gloves must be used
- Wear an apron
- Use plastic tongs
- Wear safety goggles/eye protection
- Hair tied back if required
- Ensure the correct settings on the tanks and UV box
- Don't look at the UV light
- Turn off tanks and cover when finished
- Don't pick up the board with your bare hands
- Wash hands after use

**Correct alternative responses will be considered**

#### CNC Method:

- Design and draw a circuit diagram using a CAD software package;
- Convert/export the circuit design into machine code for the CNC milling machine or similar;
- Simulate to check that the program works;
- Insert and clamp a sacrifice board into the CNC machine to prevent damage;
- Cut the copper clad board to correct size;
- Apply double sided tape to a copper clad board;
- Fix the board to the sacrifice board and press firmly down;
- Insert and tighten a suitable bit to the CNC mill head;

- Set the origin for the CNC machine and value to zero;
- Move the mill head down using the control buttons so that the bit just touches the surface of the board (some use a thin piece of paper for the gap);
- Select the cutting depth usually between 0.2 – 0.4 mm;
- Lock the guard door and press the green start button;
- Press the red stop button when the process is complete and remove the PCB board.

**AVAILABLE  
MARKS**

**Safety Precautions:**

- Plastic gloves should be used
- Wear an apron
- Wear safety goggles/eye protection
- Hair tied back if required
- Ensure the correct settings on the CNC machine
- Never touch the tip of the bit when fitting or removing the board
- Be familiar or trained with the controls
- Make sure the clamp and double sided tape are secure

**Correct alternative responses should be considered**

**AVAILABLE  
MARKS**

Response Band	Description	Mark
When a response is not worthy of credit, a <b>[0]</b> mark should be awarded		
<b>Basic</b>  <b>[1]–[2]</b>	Student responds by completely missing the focus of the question. This response may or may not be well written.	<b>[1]</b>
	Student response contains little content. It may name some of the safety precautions and tools and/or some steps in the process. The response lacks clarity and coherence and is poorly organised. The level of written communication is basic.	<b>[2]</b>
<b>Limited</b>  <b>[3]–[4]</b>	Student describes very few steps in the PCB manufacturing process and may or may not make reference to some of the tools, machines or equipment. Some safety precautions are given but tend to be general rather than specific to the process. The level of written communication is limited but conveys some information. It is limited in technical vocabulary and specialist terms. Spelling, punctuation and grammar lack accuracy.	<b>[3]</b>
	Student describes very few steps in the PCB manufacturing process. Some reference to appropriate tools, machines or equipment is given. Some safety precautions specific to the process are given. The level of written communication conveys some information. It lacks technical vocabulary and specialist terms. Spelling, punctuation and grammar lack accuracy.	<b>[4]</b>

<b>Satisfactory</b>	Student describes some of the steps in the PCB manufacturing process and makes some reference to choice of tools, machines or equipment. 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 steps in the PCB manufacturing process and makes some reference to choice of tools, machines or equipment. 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]
<b>Good</b>	Student correctly describes most or all of the steps in the PCB manufacturing process and makes good reference to choice of tools, machines or equipment. Most safety precautions 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 steps in the PCB manufacturing process and makes very good reference to choice of tools, machines or equipment. 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]
<b>Excellent</b>	Student correctly describes most or all of the steps in the PCB manufacturing process and makes excellent reference to choice of tools, machines or equipment. Most safety precautions 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 all of the steps required to fully explain the PCB manufacturing process and makes excellent reference to choice of tools, machines or equipment. All relevant safety precautions associated with the tools and 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**