



Rewarding Learning

**General Certificate of Secondary Education
2022**

Technology and Design

Unit 1: Technology and Design Core

[GTY11]

WEDNESDAY 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.

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.

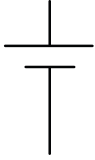
COVID-19 Context

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.

1 (a)



Hazard
Toxic/Acute Toxicity



Electronic
Electronic
Ammeter

- (b) Used to produce tracks for an electronic circuit [1]
- Acts as an insulator for the copper or to hold/support the copper track [1]
- To act as a conductor for the circuit components [1]

All relevant, valid responses will be given credit.

2 (a) (i) Manufactured board; [1]

- (ii) Plywood is made up of an uneven number of thin boards glued together [1] with the grain turned at right angles alternately [1] (2 × [1]) [2]

All relevant, valid responses will be given credit.

(b) Any **three** of the following:

Hand Tools

- Drill a hole
- Use of chisel
- Insert a blade into a coping saw and tighten
- Clamp the plywood in a wood vice
- Cut out the shape
- Remove the blade from the coping saw

(3 × [1])

or

Manual machine (Scroll saw/Milling machine)

- Drill a hole
- Insert a blade into a scroll saw and tighten
- Hold the wood flat
- Cut out the shape
- Remove the blade from the scroll saw

(3 × [1])

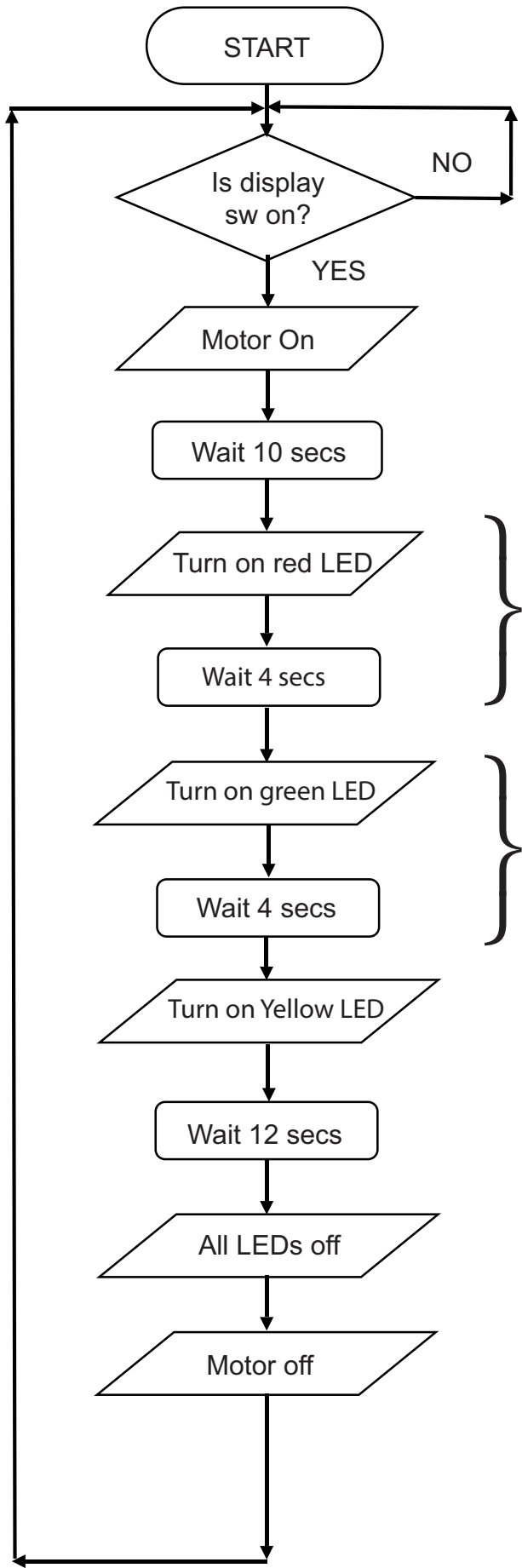
All relevant, valid responses will be given credit.

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			AVAILABLE MARKS
	<p>(c) Any three of the following:</p> <ul style="list-style-type: none"> • Draw on a computer the puzzle using a CAD package • Download the computer file onto a CNC router/laser machine • Simulate the drawing to check if the drawing is correct • Clamp the wood into the CNC machine • Operate/Execute the program/CNC machine • Repeat process for mass production <p>(3 × [1])</p>	[3]	9
All relevant, valid responses will be given credit.			
3	<p>(a) Wheel and Axle [1] Meshed Gear [1] As per the symbol spec names only</p>	[2]	
	<p>(b) (i) Clockwise [1]</p> <p>(ii) A lower speed than Gear B [1]</p> <p>(iii) Driver [1]</p>	[3]	
	<p>(c) Any one of the following:</p> <ul style="list-style-type: none"> • Because it may be exposed to the elements • It prevents rust • It keeps the gears rotating smoothly • Less noise/prevents sticking/jamming/seizing/reduce friction 	[1]	
All relevant, valid responses will be given credit.			
	<p>(d) (i) Idler [1]</p> <p>(ii) Any one of the following: It will go in the reverse direction [1] Clockwise [1] Move in same direction as Driver gear [1]</p>	[2]	8
4	<p>(a) (i) The shuttle valve</p> <p>(ii) The piston rod would outstroke [1] and then instroke [1] Reference to short duration/distance</p> <p>(iii) The piston rod would outstroke [1] Until Valve A is released then the piston rod will instroke [1]</p>	[1] [2] [2]	
	<p>(b) (i) Toggle/Flick the lever 3PV or by using valve C</p> <p>(ii) The lever operated system will keep the piston rod out indefinitely until it is operated again. [1] The push button will only activate the piston for a brief instant or for as long as the push button is held in. [1]</p>	[1] [2]	8

			AVAILABLE MARKS	
5	<p>(a) (i) Try Square [1]</p> <p>Any two from:</p> <ul style="list-style-type: none"> • check right angle/square edge • draw a perpendicular/90 degrees line • used on wood/plastic [2] <p>(ii) To prevent wear on the stock [1] All relevant, valid responses will be given credit.</p>		11	
	<p>(b) (i) Use a steel rule and pencil mark the centre point of each end [1] and draw/mark a line between each marked point [1]. Use a marking gauge [1] set to 20mm [1] [2]</p> <p>(ii) Countersunk screw. [1]</p> <p>(iii) Any four from:</p> <ul style="list-style-type: none"> Reference to clamping/alignment [1] Measure 15 mm along the centre from one end. [1] Mark/produce centre point/cross [1] Drill a pilot/clearance hole [1] Drill a countersunk hole [1] [4] <p>All relevant, valid responses will be given credit.</p>			
6	<p>(a) Transistor (NPN) [1] X = collector [1] Y = base [1] Z = emitter [1]</p>			13
	<p>(b) Switch S is closed to turn power on [1] When dark (light levels low) [1] resistance of LDR is high [1] This directs voltage/current to the transistor base [1] via a protective resistor [1] Transistor is switched on [1] The variable resistor enables fine tuning (sensitivity) of switching on [1] Bulb lights [1] Bulb will switch off in daylight (light levels high) [1] [9]</p>			



[2]

[1]

[1]

[1]

[1]

[1]

[1]

[1]

[1]

Loop back [1]

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8 (a) (i) Alloy metal

[1]

(ii)

Type of steel	Use
Mild steel	Car bodies
Stainless steel	Cutlery
High carbon steel	Cutting tools

(3 × [1])

[3]

(iii) Stainless steel does not rust whereas mild steel rusts

[1]

(iv) Hardening is heating the steel to 'red' heat [1] and cooled quickly/
plunge into cold water. [1]
Tempering is reheating the steel [1] then allowing it to cool slowly to the
required temperature and then quenching it. [1]

OR

Hardening increases hardness [1] increases tensile strength/reduces
toughness/increases brittleness. [1]

Tempering reduces hardness/increases toughness/reduces
brittleness. [1] Improves usability/more functional. [1]

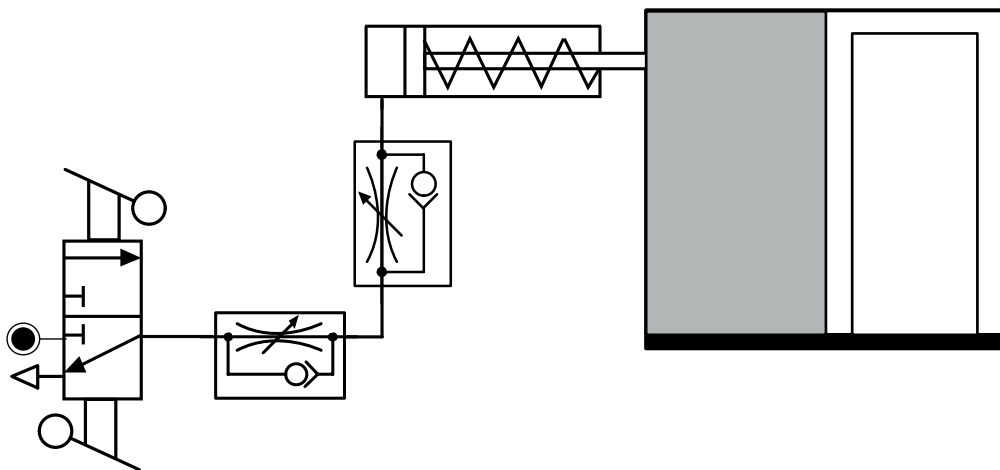
(4 × [1])

[4]

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- 9 (a) **A** – Pipeline Junction [1]
B – Roller Trip [1]
As per spec Pneumatic Control names
- (b) (i) Lever operated [1] 3PV [1] [2]
(ii) Outstroke [1]
(iii) The lever 3PV is flicked and the door closes and stays closed. [1]
The lever 3PV is flicked back and the door opens and stays open. [1]
(iv) So that the door does not injure anyone when the door is closing. [1]
- All relevant, valid responses will be given credit.
- (c) Draw unidirectional flow restrictor symbol [1]
- Incorporated within the circuit drawing:
Location/position [1]
Orientation [1] [3]



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10 Indicative Content:

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- Draw two diagonal lines or measure two lines to mark the centre of the wood
- Draw a circle radius 150 mm with a compass
- Mark out the centre of the hole for drilling 40 mm from the edge
- Before using a pillar drill, select and insert a flat bit or fostner bit of diameter 25 mm
- Check the speed of the pillar drill is correct
- Clamp the wood onto the platform of the drilling machine
- Drill the hole diameter 25 mm
- Before using a scroll saw check that the correct saw blade is installed
- Hold the wood flat with both hands rotating the wood into the saw blade
- Ensure the cutting line remains visible after cutting
- A bandfacer/linisher machine may be used to remove rough edges around the wood
- Hold the wood flat with both hands rotating the wood on the platform of the bandfacer/linisher
- Using sand paper and a block, smooth the top and bottom of the wood
- Apply the sand paper and block to the top and bottom edges

Safety Precautions:

- Wear safety goggles/eye protection when using the drilling machine
- Hair tied back if required when using machines
- Ensure the correct settings on the drill machine/scroll saw
- Never touch the bit/blade on a scroll saw while power is on
- Know where the off/on buttons are located on the scroll saw and drilling machine
- Experience in using the machines
- Make sure the material is clamped for drilling

All relevant, valid responses will be given credit.

Response Type	Description	Mark Band
When a response is not worthy of credit, a [0] mark should be awarded		
Limited	Candidate identifies very few steps in the manufacturing process. Little or no safety precautions referred to throughout the answer. The level of annotation conveys limited information and lacks technical vocabulary and specialist terms. The accuracy of spelling, punctuation and grammar is limited.	[1]–[3]
Satisfactory	Candidate identifies some of the steps in the manufacturing process most of which are in order. Some safety precautions referred to throughout the answer. The level of annotation is satisfactory and contains some technical vocabulary and specialist terms. The accuracy of spelling, punctuation and grammar is satisfactory.	[4]–[7]
Very good	Candidate identifies the majority of the steps in the manufacturing process, the majority of which are in order. Most safety precautions referred to throughout the answer. The level of annotation and technical vocabulary and specialist terms is generally very good. The accuracy of spelling, punctuation and grammar is very good.	[8]–[10]

[10]

Total

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100