



Rewarding Learning

**General Certificate of Secondary Education
2018**

Manufacturing

Paper 1

Assessment Unit 3

assessing

Manufacturing Technology

[GMA31]

WEDNESDAY 20 JUNE, 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 likely to be worthy of credit. They also set out the criteria which they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these general marking instructions.

Assessment Objectives

Below are the assessment objectives for Manufacturing.

Candidates must:

- recall, select and communicate their knowledge and understanding of manufacturing in a range of contexts (AO1);
- apply skills, knowledge and understanding, including quality standards, in a variety of contexts, and plan and carry out investigations and tasks involving a range of tools, equipment, materials and components (AO2); and
- analyse and evaluate evidence, make reasoned judgements and present conclusions (AO3).

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 unanticipated answers, 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 extended 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 excellent.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided below:

Level 1 (Limited): The level of accuracy of the candidate’s spelling, grammar and punctuation 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 the candidate’s spelling, grammar and punctuation 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 (Excellent): The level of accuracy of the candidate’s spelling, grammar and punctuation is excellent. 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 excellent. There is excellent use of appropriate specialist vocabulary.

		AVAILABLE MARKS
1	<p>(a) Cardboard box Magazine (2 × [1])</p>	[2]
	<p>(b) Sports car Alternator (2 × [1])</p>	[2]
2	<p>(a) Hacksaw • Used to cut metal or plastic. All alternative answers will be considered. (2 × [1])</p>	[2]
	<p>(b) Side cutters; wire cutters. • Used to cut wire; • Used for trimming legs of components. All alternative answers will be considered. (2 × [1])</p>	[2]
	<p>(c) Metal work vice. • Used to hold pieces of metal for working. All alternative answers will be considered. (2 × [1])</p>	[2]
	<p>(d) Pop rivet gun. • Used to join two pieces of metal together. All alternative answers will be considered. (2 × [1])</p>	[2]
	<p>(e) Screwdriver • Inserts screws into a material; • Turns the head of a screw. All alternative answers will be considered. (2 × [1])</p>	[2]
3	<p>(a) Any three from the list below: • Square; • Rectangle; • Sheet; • Dowel; All alternative answers will be considered. (3 × [1])</p>	[3]
	<p>(b) (i) Any one from the list below: • Tenon saw; • Chisel and mallet; • CNC mill; • CNC router. All alternative answers will be considered. (1 × [1])</p>	[1]
		4
		10

			AVAILABLE MARKS
	(ii) Any two from the list below:		
	<ul style="list-style-type: none"> • Make sure guards are in place; • Point chisel away from user; • Eye protection; • Cutting speed setting is correct. 		
	All alternative answers will be considered.		
	(2 × [1])	[2]	6
4	(a) (i) Any one from the list below:		
	<ul style="list-style-type: none"> • Carbon fibre; • GRP; 		
	All alternative answers will be considered.		
	(1 × [1])	[1]	
	(ii) Any one from the list below:		
	<ul style="list-style-type: none"> • Increased strength to weight ratio; • Resistance to fracture/wear/break. 		
	All alternative answers will be considered.		
	(1 × [1])	[1]	
	(iii) Any one from the list below:		
	<ul style="list-style-type: none"> • Improving the performance of a product, [1] e.g. introducing carbon fibre – reducing weight without sacrificing strength; [1] • Improved stiffness [1] reducing the amount of flex and reducing weight; [1] • Ability to form complex shapes; [1] • Easier to manipulate; [1] • Tolerant to environmental conditions [1] such as UV damage, moisture, chemical attack and temperature extremes for composite materials. [1] 		
	All alternative answers will be considered.		
	(2 × [1])	[2]	
	(iv) Disadvantage:		
	<ul style="list-style-type: none"> • Increased cost meaning that some materials are less accessible; • Some composites require more complex machining or manufacturing processes; • Not cost effective to have materials in stock • Lead times can be increased if manufacturer orders materials when required; • Product demand might decline because of the additional cost. 		
	All alternative answers will be considered.		
	(2 × [1])	[2]	
	(b) (i) Any two from the list below:		
	<ul style="list-style-type: none"> • Cement; • Sand; • Mortar; • Water; • Stone. 		
	All alternative answers will be considered.		
	(2 × [1])	[2]	
	(ii)	<ul style="list-style-type: none"> • High compressive strength; • Low tensile strength; • Low coefficient of thermal expansion; • Can crack due to shrinkage and tension; • Low maintenance 	
	(2 × [1])	[2]	10

- 5 (a)** Any **two** features and applications from the list below:
- the handle has a textured grip [1]
 - vent holes in body to stop the motor overheating [1]
 - this process can create different surface textures [1], e.g. textured grip for the handle or smooth body with vents for the top part that houses the motor [1];
 - it has a split housing with holes for machine screws. [1] This allows for all circuitry to be held in place and protected inside a casing [1].
- All alternative answers will be considered.
(4 × [1]) [4]
- (b)**
1. Mould
 2. Heater
 3. Hopper
 4. Archimedean screw
 5. Motor
- (5 × [1]) [5]
- 6 (a) (i)** Any **one** from the list below:
- An integrated circuit that contains all the functions of a central processing unit of a computer or an electronic chip inserted into a PCB.
 - A microprocessor is a computer processor which incorporates the function of the computer's Central Processing Unit (CPU) on a single integrated circuit
- All alternative answers will be considered.
(1 × [1]) [1]
- (ii)** Any **one** from the list below:
- ICT will be future proofed allowing for upgrades of computer packages [1] i.e. more capable of coping with updates and advances in software which will require more memory [1]
 - ICT will be able to work quicker because of the speed and power of the processor [1] and cope with more memory intensive software due to changes of software packages [1].
- All alternative answers will be considered.
(2 × [1]) [2]
- (b) (i)**
- CAD could be used to produce virtual 3D models of the training shoes, to visualise and improve product design. Final CAD imagery/virtual modelling can be used in marketing and promotion of the final product. CAD can be used to produce initial ideas/features and mockups. CAD could be used to calculate the required materials.
 - All parts of the shoe can be assembled and mated together using the CAD package facilities with the total weight of the shoe easily calculated.
 - CNC could be used to produce 3D physical scaled models and production ideas. CNC could be used to produce 3D models of component parts of the product. CNC could be used to show assembly of the different parts of the product. CNC machines can be used for cutting the material patterns for the shoes accurately reproducing the process.
 - CNC machines can be used to create 3D prototypes of forms that will allow the sole of the training shoe to be moulded around.
- All alternative answers will be considered.
(3 × [2]) [6]

AVAILABLE
MARKS

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		AVAILABLE MARKS
	<p>(ii) Advantages:</p> <ul style="list-style-type: none"> • Can be bought from comfort of home – products will be delivered to customer. • Products may be cheaper. • JIT, the company/seller will not need to order large stocks, order products as required. <p>Disadvantages:</p> <ul style="list-style-type: none"> • Postal charge for delivery. • Return of products due to being ill-fitting or not what was expected. <p>All alternative answers will be considered.</p> <p>(2 × [2])</p>	13
7	<p>(a) (i) Any two from the list below:</p> <ul style="list-style-type: none"> • No contamination [1] that might lead to a change in the chemicals [1]; • cleaner environment [1] with little or no contamination [1]; • less chance of employees being harmed [1] by toxic chemicals [1], e.g. spillage, contact with skin. <p>All alternative answers will be considered.</p> <p>(2 × [2])</p> <p>(ii) Any one from the list below:</p> <ul style="list-style-type: none"> • Requirement for regular servicing and machine testing; [1] and • because only specialist companies can provide servicing and machine repairs; [1] • increased unemployment; [1] and • faults in systems can cause dangerous working situations; [1] • you need to regularly service any machine. [1] <p>All alternative answers will be considered.</p> <p>(1 × [2])</p>	[4]
	<p>(b) Any two from the list below:</p> <ul style="list-style-type: none"> • Remotely operated vehicle; • conveyor systems. • automatic guided vehicle. <p>All alternative answers will be considered.</p> <p>(2 × [1])</p>	[2]
8	<p>Any three from the list below:</p> <p>Global environment:</p> <ul style="list-style-type: none"> • Increase fossil emissions; • detrimental impact of global environment due to disposal of waste; • greater carbon footprint because of increased use of electricity in factories; • greater use of renewable energy sources. <p>All alternative answers will be considered.</p> <p>(3 × [1])</p> <p>Any three from the list below:</p> <p>Transportation of products:</p> <ul style="list-style-type: none"> • smaller products that require less room to be stored during transport; • refrigerated transport provides the opportunity for food/perishable items to be transported greater distances; • vehicle tracking can allow customers to track and predict delivery; • modern engines have improved fuel consumption figures. <p>All alternative answers will be considered.</p> <p>(3 × [1])</p>	[3]
		8
		6

- 9 (a) Any **two** from the following list:
- guarantee on parts and labour;
 - lifetime guarantee on measuring accuracy;
 - made and tested to BS and EU standards.
- All alternative answers will be considered.
(2 × [1]) [2]

- (b) Any **two** from the following list:
The following tools are related to the measurement of the various brass weights
- vernier calipers;
 - micrometer;
 - digital calipers;
- All alternative answers will be considered.
(2 × [1]) [2]

10 Indicative content

The working environment:

- New risk assessments required for modern equipment within the production line;
- Older machines or factory equipment may have to be moved to create space for the modern technology such as, CNC, CAM machines. Risk of injury when moving machines to different locations.

The workforce:

- Training/retraining of new skills and safety precautions associated with new CNC/CAM machines;
- Handling new and dangerous materials and processes may require health and safety training for procedures/personal protection equipment.

Sustainable developments:

- Possible environmental implications due to increase energy consumption and/or possibility of toxic waste;
- With growing pressure to reduce the environmental impact of buildings, engineers are looking beyond operational performances, therefore, health and safety implications would have to be addressed, e.g. use of solar panels to run machines and assembly line may stop suddenly causing harm to people and machines.

Response type	Description	Mark band
	When a response is not worthy of credit, a [0] should be awarded.	0
Limited	Students will correctly identify one discussion point with some detail or two discussion points with limited detail. An attempt has been made to incorporate some terminology into the answer.	[1]–[3]
Satisfactory	Students will correctly identify two discussion points with some detail or three discussion points with satisfactory detail. Some use of technical terminology will be presented and satisfactory use of punctuation and grammar.	[4]–[6]
Good	Students will correctly identify three discussion points with a good level of detail. Correct terminology will be used with good use of punctuation, grammar and accurate spelling.	[7]–[10]

[10]

Total

AVAILABLE
MARKS

4

10

80