



General Certificate of Secondary Education
2017

Manufacturing
Paper 1
Assessment Unit 3
assessing
Manufacturing Technology
[GMA31]
TUESDAY 20 JUNE, MORNING

**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	(a) Fast food packaging Bottles of water (2 × [1])	[2]	4
	(b) Microscope Conical flask (2 × [1])	[2]	
2	(a) Hinge - To be attached to two pieces of material to allow them to open and close, e.g. a lid on to the side of a box; - Door on to a door frame. All alternative answers will be considered. (2 × [1])	[2]	10
	(b) Chisel - Removing excess wood; - Cutting a rebate in wood. All alternative answers will be considered. (2 × [1])	[2]	
	(c) Marking gauge. - Used to mark a line/indent parallel to an edge on wood; - Used to mark out rebates or wood joints. All alternative answers will be considered. (2 × [1])	[2]	
	(d) Countersink screw; wood screw. All alternative answers will be considered. Used to hold/join two or more pieces of wood/materials together while sitting flush with the surface. (2 × [1])	[2]	
	(e) File; a named file, e.g. half-round; flat, etc.; other answers considered. - Metal; - Plastic. All alternative answers will be considered. (2 × [1])	[2]	
	(a) (i) Any two from the list below: - Nylon; - Acrylic; - Polystyrene; - Polypropylene; - Polystyrene; - Polythene. All alternative answers will be considered. (2 × [1])	[2]	
	(ii) Any two from the list below: - Epoxy resin; - Melamine formaldehyde; - Urea formaldehyde; - Polyester resin. All alternative answers will be considered. (2 × [1])	[2]	

			AVAILABLE MARKS
	(b)	Any three from the list below: • File or cross file, draw file; • Wet and dry; • Scrape; • Polish; All alternative answers will be considered. (3 × [1])	[3]
	(c) (i)	Injection moulded. All alternative answers will be considered.	[1]
	(ii)	Vacuum form. All alternative answers will be considered.	[1]
			9
4	(a) (i)	A smart material is a material that is designed to change its properties, structure or function [1] when exposed to certain environmental changes [1] All alternative answers will be considered. (2 × [1])	[2]
	(ii) and (iii)	Any one from the list: • Photochromic [1] – changes colour [1] when light applied [1]; • Thermo chromic [1] – changes colour [1] when exposed to heat [1]; • Piezoelectric [1] – change in size [1] when current passed through it [1] – When deformed they can give off a small electrical charge [1] • Shape memory alloy [1] – can be bent or deformed [1] and will return to original shape when the force is removed [1] • Polymorph [1] – can be moulded once heated to [1] relatively low temperature (approx. 62° C). [1] (1 × [1]) and (2 × [1])	[3]
	(b) (i)	A composite is a material made up of 2 or more materials combined together [1] to create improved properties [1]. All alternative answers will be considered. (2 × [1])	[2]
	(ii)	Any two from the list below: • Fibreglass/GRP; • Kevlar; • Carbon fibre; • Concrete; • Mortar; • Specific ceramic composites to be considered. All alternative answers will be considered. (2 × [1])	[2]
			9

			AVAILABLE MARKS
5	(a) (i)	Any one from the list below: • Welding; • Brazing. All alternative answers will be considered.	[1]
	(ii)	Any one from the list below: • Welding goggles/visor; • Wear welding gloves; • Leather apron. All alternative answers will be considered.	[1]
	(b) (i)	Nut and bolt; machine screws. All alternative answers will be considered.	[1]
	(ii)	Rivet; adhesives. All alternative answers will be considered.	[1]
			4
6	(a)	Any three from the list below: Uses – • Designing cars/parts/engines; • Stock control; • Ordering parts; • Research; • Promoting or marketing products; • Email; • Keeping records of employees; • Tuning/remapping engines. All alternative answers will be considered. (3 × [1])	[3]
		Advantages – • Increased efficiency through stock control, fewer parts stored and only purchased when needed; • Greater accuracy and reduction of tolerances in engine manufacture; • Safer – robotic machines to lift parts or perform dangerous tasks; • Fewer employees to pay. All alternative answers will be considered. (3 × [1])	[3]
	(b) (i)	Any two from the list below: • Hacking of computers; • Safety of the operator; • Viruses; • Correct use of the computer. All alternative answers will be considered. (2 × [1])	[2]
	(ii)	Any two from the list below: • Pen drive; • External hard drives; • Hard drives; • CD; • DVD. All alternative answers will be considered. (2 × [1])	[2]
			10

- 7 (a) (i) • Increased efficiency [1] due to decrease in waste of materials [1]
 • Increased speed of production; [1]; defective components or parts are recycled. [1]
 All alternative answers will be considered.
 (2 × [1]) [2]
- (ii) Improving safety [1]
 • Machines used to carry out dangerous tasks [1];
 • Guards can be detected in place [1]; systems detecting faults [1].
 (Award [2] for full explanation; award [1] for limited explanation)
 All alternative answers will be considered.
 Decreasing safety [1]
 • Faults in systems can cause dangerous working situations. [1]
 (Award [2] for full explanation; award [1] for limited explanation)
 All alternative answers will be considered.
 (2 × [1]) [2]
- (b) Any **two** from the list below:
Advantages
 • It will save the company money [1] as less money may be spent on salaries [1];
 • Longer term increased profit per unit [1] due to reduced manufacturing costs [1];
 All alternative answers will be considered.
 (2 × [2]) [4]
- Any **one** from the list below:
Disadvantages
 • Cost of re-programming modern technology [1] by skilled operators [1];
 • Difficult to replace [1] because of the cost of modern technology [1];
 All alternative answers will be considered.
 (1 × [2]) [2]
- 8 (a) (i) Any **one** from the list below:
 • Introduction of modern technology such as CNC/CAM has created greater accuracy [1] because software can work in finer detail and produce higher quality patterns [1];
 • Easier to repeat print jobs identically [1] because the same file can be used for repeat jobs [1];
 • Easier to create a range of accurate sizes [1] because of the accuracy of the CAD software that is used to control the machinery [1];
 All alternative answers will be considered.
 (2 × [1]) [2]
- (ii) Any **one** from the list below:
 • Easier to accurately repeat patterns and designs on clothing to repeated high quality [1] because of the identical design saved on file [1];
 • More complex patterns are easy to enlarge or extend on larger garments/materials [1] by using scaling on the design software to guarantee print quality [1];
 • Cuts of material will be accurate for a range of consumer sizes [1] because of preset cutting plans for the machines [1].
 All alternative answers will be considered.
 (2 × [1]) [2]

AVAILABLE
MARKS

10

(b) Positive –

Any **one** from the list below:

- Fresher produce available [1] because food and ingredients are ordered when needed due to automated stock control [1];
- More consistently high quality products [1] because of more stringent quality control [1];
- Improved hygiene in food preparation facilities [1] to meet statutory environmental health targets [1].

(Award [2] for full explanation; award [1] for limited explanation)

All alternative answers will be considered.

(2 × [1])

[2]

Negative:

Any **one** from the list below:

- Less creativity in presentation of food [1] because mass production and greater availability is the main focus of suppliers [1];
- Greater use of preservatives to give produce a longer shelf-life [1] leading to potential health problems [1].

(Award [2] for full explanation; award [1] for limited explanation)

All alternative answers will be considered.

(2 × [1])

[2]

(c) (i) Design features:

Any **two** from the list below:

- The taped profile of the product;
- The attachment of the lid to container;
- Enable the product to be freestanding.

All alternative answers will be considered.

(2 × [1])

(ii) Improvements:

Any **one** from the list below:

- A lip so that the content can be drunk without removing the lid;
- A holder to improve use of the product;
- A non-spill attachment to the lid.

All alternative answers will be considered.

(2 × [1])

[4]

12

9 Any two from the following list:

- Regular improvement in components and processors [1] leading to improved performance [1]; or
- Fashion change [1] demand for latest product to keep up with society [1]; or
- Older phones would not have the processing speed to run the latest apps [1]; or
- Bigger screens are easier to read [1]; or
- New technological add-ons [1]; or
- Internet connectivity speed [1]; or
- Improved camera [1]; or
- Increased storage space [1]; or
- Improved network offers and coverage [1].

All alternative answers will be considered.

(4 × [1])

[4]

4

10 Indicative content

- Newer machines are more efficient than older machines, using less electricity/power.
- Modern manufacturing methods lead to less waste.
- More of the bought-in material will be used, increasing machine efficiency.
- The introduction of CAD means that errors in design are usually discovered during the design stage, therefore less wastage of materials and power.
- It is common for waste materials to be recycled and used leading to minimal waste.
- Automated stock control can mean that companies only order materials when needed, therefore factories will require less storage space and a smaller area to provide heat and light – more efficient, reduce costs.
- Use of renewable energy sources to power factories. Factory running costs by supplying electricity from solar panels or wind turbines.
- Use of waste products to power factories.

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]–[2]
Satisfactory	Students will correctly identify two discussion points with some detail or three discussion points with limited detail. Some use of technical terminology will be presented and satisfactory use of punctuation and grammar.	[3]–[5]
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.	[6]–[8]

(3 × [2])

Quality of written communication [2]

[8]

8

Total**80**AVAILABLE
MARKS