



General Certificate of Secondary Education
January 2012

Engineering

Paper 1

Assessment Unit 3

assessing

Engineering Technology

[GEE31]

TUESDAY 24 JANUARY, 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 GCSE Engineering.

Candidates must:

- recall, select and communicate their knowledge and understanding of engineering 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 products, 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.

Type 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): Candidates 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): Candidates 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 (Excellent): Candidates presentation, spelling, punctuation and grammar 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.

Answer **all** questions.

		AVAILABLE MARKS
1	(a) Adjustable torque wrench Pop rivet (2 × [1])	[2]
	(b) Metal filing cabinet Wheel clamp (2 × [1])	[2]
2	Tool/Equipment matched correctly with the corresponding correct name (5 × [1])	[5]
3	(a) Container A Material: PETE Reason: Durable, hygienic, recyclable, does not rust, others considered Container B Material: Steel Reason: Good strength to weight ratio, durable, easy to recycle, others considered Container C Material: Aluminium Reason: Light weight, can be manufactured in large quantities, others considered Correct material stated – [1] (3 × [1]) Correct reason – [2] (3 × [2])	[9]
	(b) CAM – Change rotary to reciprocating motion Used in cars engines, sewing machines etc Diode – Allows current to pass in one direction Used to protect components Double acting cylinder – Allows air to move in and out in one direction Used in pumps, steam engine Rack and pinion gears – Converts between linear and rotary motion Used in a pedestal drill (height adjustment) Correct function [2] (2 × [2]) Correct use [1] (2 × [1])	[6]
		4
		5
		15

			AVAILABLE MARKS
4	(a) Chain and sprocket	[1]	
	(b) Can take a greater force More durable Can be repaired Does not slip Other answers considered	[2]	
	(c) (i) Brakes Suspension Wheel bearing Gear change mechanism Other answers considered	[1]	
	(ii) Appropriate description of how the mechanism outlined in (c) should be maintained.	[2]	6
5	(a) (i) To increase thickness To increase strength (2 × [2])	[4]	
	(ii) Appropriate sketch to show how plywood is constructed.	[2]	
	(b) Hardness: A measure of how easily a material is scratched or indented. Toughness: How well a material can absorb impact, the opposite to brittleness. Ductility: The ability of a material to be worked. Ductile materials can be formed easily into shapes, e.g. pressing deep shapes in steel such as car body parts. Correct description (2 × [2])	[4]	10
6	The handling of materials is a vital part of production planning.		
	(a) JIT ordering. Reduction of stock levels as re-ordering only happens as stock is needed. Stock is ordered according to sales. Use of the Internet, wider market available. Other answers considered (2 × [2])	[4]	
	(b) Stock control – barcodes CNC Machines Automation – use of robotic machines to move materials from place to place (2 × [2])	[4]	8

			AVAILABLE MARKS	
7	(a)	Tick – Apron Tick – Goggles (2 × [1])	[2]	11
	(b)	Make sure the machine is running at the correct speed. Make sure the chuck key is removed. Make sure the guards are in place. Other answers considered (2 × [2])	[4]	
	(c)	(i) Micrometer	[1]	
		(ii) Appropriate description of how it is used.	[2]	
		(iii) Check fabrication techniques. Check the overall size of the product. Other answers considered	[2]	
8	(a)	Designs can be modified. Product can be viewed at different angles. Product can be viewed in different colours. Other answers considered (2 × [2])	[4]	8
	(b)	Data is put into a computer and CNC machinery is used to make manufacture the product.	[2]	
	(c)	Product is made more accurately. More precise. Other answers considered	[2]	
9	(a)	(i) Products can be marketed globally via the Internet. Other answers considered	[2]	8
		(ii) Less wastage. Packaged quickly. Package accurately.	[2]	
		(iii) The correct number of orders can be dispatched using automation. Other answers considered	[2]	
	(b)	Cost. Training of workers. Appropriate space for the machinery. Other answers considered	[2]	

		AVAILABLE MARKS
10 (a)	Welding Brazing Other answers considered (2 × [1])	[2]
(b)	Nut and bolt Other answers considered	[1]
(c)	Production costs are kept down. Staff do not need trained on how to make the components. Storage is not a problem. Other answers considered	[2]
Total		5
		80