



General Certificate of Secondary Education  
2012

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**Engineering**

Paper 1

Assessment Unit 3

*assessing*

Engineering Technology

**[GEE31]**

**MONDAY 14 MAY, AFTERNOON**

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**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.

			AVAILABLE MARKS
<b>1</b>	<p><b>(a)</b> Ball bearing Metal work vice (2 × [1])</p>	[2]	
	<p><b>(b)</b> Metal roof rack Extension ladder (2 × [1])</p>	[2]	4
<b>2</b>	<p>Allen key: Used to tighten and un-tighten nuts with a hexagonal slot Pop rivet gun: Pop rivet gun Tin snips: Used to cut sheet metal Tri-square: Tri-square/Engineer's square Folding bars: Used to bend sheet metal to particular angle (5 × [1])</p>	[5]	5
<b>3</b>	<p><b>(a)</b> Non-ferrous metal: Aluminium, copper, etc. Alloy: Brass, steel, duralumin Adhesives used on plastics: Liquid solvent cement/Tensol cement Hardwood: Mahogany, oak, ash, etc. Manufactured board: MDF, plywood, chipboard, etc. Softwood: Pine, cedar, spruce, etc. (6 × [1])</p>	[6]	
	<p><b>(b)</b> Metal swing – paint and primer or galvanised Car – water based paint Tin of soup – tin plating Brass letter box – lacquer, polish (4 × [1])</p>	[4]	10
<b>4</b>	<p><b>(a)</b> Example 1: Traditional Method – Oxyacetylene cutting of ferrous metal plate Control technology – Computer controlled laser cutting (2 × [2])</p>	[4]	
	<p>Example 2: Traditional method – Manual machining process, e.g. lathe Control technology – Use of CNC lathe (2 × [2])</p>	[4]	
	<p><b>(b)</b> Advantage, Example 1: The laser cutting gives a high quality finish Accurate Does not need additional finishing</p>	[2]	
	<p>Advantage, Example 2: Quicker Can be repeated Components manufactured to the same tolerance</p>	[2]	12

			AVAILABLE MARKS	
5	(a) (i)	Smart material is a material capable of changing its properties in response to changes in the environment	[2]	5
	(ii)	Polymorph, smart memory alloy, thermochromic paint Nitinol, smart wire	[1]	
	(b)	Silicon is a semi-conductor, meaning its resistance decreases as its temperature increases	[2]	
6	(a) (i)	Computer Aided Design	[1]	8
	(ii)	Computer Aided Manufacture	[1]	
	(b)	Cost advantage – Manufacturing cost of products decreases over time Cost disadvantage – High set up cost of machinery (2 × [2])	[4]	
	(c)	Staff need re-trained Other answers considered	[2]	
7	(a)	They can work in hazardous conditions Don't take breaks Can work 24/7 Other answers considered – work faster, more accurate (2 × [2])	[4]	10
	(b)	Guards must be in place Emergency stop buttons must be located around the production run People in charge of the robotics systems must be trained The correct speeds must be set when working with specific materials (2 × [2])	[4]	
	(c)	More intricate products can be manufactured Other answers considered	[2]	
8	(a)	Polypropylene Polythene PVC	[1]	10
		Reason: Durable Lightweight Available in sheet form Good surface finish Can be manufactured in large quantities Other answers considered	[1]	
	(b)	Feature: Rounded corners/tapered sides Function: Will make it easier to be removed from the mould (2 × [1])	[2]	
		Feature: Air holes Function: Plastic can be sucked accurately around the mould Other answers considered (2 × [1])	[2]	

			AVAILABLE MARKS
	(c) Jelutong, steel, aluminium MDF Other answers considered	[1]	
	(d) Moulds can be manufactured quickly Other answers considered	[2]	9
9	(a) (i) Pictures correctly labelled	[3]	
	(ii) The three jaw chuck should be rotating at the correct speed The chuck key should be removed Guards should be in place, Tie hair back Other answers considered (2 × [2])	[4]	
	(b) (i) Tool A : Split die [1] Tool B: Tap [1]	[2]	
	(ii) Tool A creates an external screw thread Tool B creates an internal screw thread (2 × [1])	[2]	11
10	(a) Appropriate product identified and its impact Designed using a suitable CAD package	[2]	
	Development: Products are easily developed by the use of CNC machinery Explanation must be relevant to the product named above	[2]	
	(b) Industry is more efficient Type and size of the workforce has been changed More automation introduced into the manufacturing process Larger range of products Wider use of product on-line (Internet)	[2]	6
<b>Total</b>			<b>80</b>