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GCSE

Engineering

Unit **A622/02**: Engineering Processes

General Certificate of Secondary Education

Mark Scheme for June 2017

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Annotations

Annotations

Annotation	Meaning
	Award 0 mark
	Award 1 mark
	Unclear
	Benefit of doubt
	Cross
	Error carried forward
	Extendable ellipse
	Good language
	Repetition
	Noted but no credit given
	Too vague
	Tick

Subject-specific marking instructions

Crossed Out Responses
Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

Rubric Error Responses – Optional Questions
Where candidates have a choice of questions across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. (The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)

Multiple Choice Question Responses
When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).
When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses
When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

***Short Answer Questions** (requiring only a list by way of a response, usually worth only **one mark per response**)*
Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. (The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)

***Short Answer Questions** (requiring a more developed response, worth **two or more marks**)*
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions *(requiring a developed response)*
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

MARK SCHEME

Question			Answer / Indicative Content	Mark	Guidance
1	(a)	(i)	One mark for each valid sector plus one mark for an appropriate product. Examples: **Aerospace** - wings **Automotive** - car wheels **Chemical and process** - shampoo **Computers, communication and IT** - monitor **Electrical and electronics** - electric toothbrush **Medical and pharmaceutical** - wheelchair **Rail and marine** - passenger information system **Structural and civil** - bridges (6x1)	**6**	Accept viable alternative sectors
		(ii)	One mark for each of two appropriate products. No mark for chosen sector Examples; **Aerospace -** landing gear; aircraft doors **Automotive** – fairings; airbags **Chemical and process –** cement; washing up liquid **Computers, communication and IT –** keyboard; mouse **Electrical and electronics –** house alarm; light bulb **Medical and pharmaceutical** – heart monitor; tablets **Rail and marine** – train carriages ; signalling system **Structural and civil –** sports halls; tunnels (2x1)	**2**	
2	(a)		One mark for each of two examples for each material type Examples: **Ferrous alloys** – high speed steel; mild steel; stainless steel **Non-ferrous alloys** – brass; bronze; duralumin		Accept other viable examples

Question			Answer / Indicative Content	Mark	Guidance
			Polymers – ABS; HIPS; Polypropylene (6x1)	**6**	
	(b)		Explanation must include reference to mixture (1) of metals (1) (or metal and other element) Examples: An alloy is a mixture of two or more elements, at least one of which is a metal. An alloy is a mixture of metals or a mixture of a metal and another element. (2x1)	**2**	
	(c)		Tungsten carbide; glass; silicon carbide	**1**	
	(d)		Carbon fibre	**1**	
3	**(a)**		**A** - chuck **B -** (electric) motor **C -** (drilling) table (3x1)	**3**	Accept 'chuck guard' Accept suitably descriptive responses
	(b)		Up to two marks for each of two appropriate precautions Examples: The work must be firmly clamped in a vice (1) to stop it from spinning and causing injury (1) The guard must be closed round the chuck (1) to stop anything getting tangled up in the spinning chuck (1) The chuck key should be removed from the chuck (1) after putting the drill in so that it doesn't fly out and cause damage or injury (1) 2 x (2x1)	**4**	Justified response for full marks Accept other viable responses No marks for PPE

Question			Answer / Indicative Content	Mark	Guidance
4	(a)		One mark for each of two correct examples for both types Examples: **Heat and chemical treatment -** hardening; annealing; etching; nitriding; normalising; tempering **Surface finishing** - Galvanising; electroplating; powder/plastic coating; painting; oil blackening/blueing; lacquer/varnish; polishing/buffing (4x1)	**4**	Accept other appropriate responses
	(b)		Goggles/visor; overalls/apron; safety shoes/boots (2x1)	**2**	
5			One mark for naming the component. One mark for a relevant example of its use plus one mark for description of use. Examples: **Comp 1** Spring washer - when a nut is tightened against it the gap is closed up (1) and it stops the nut from coming loose (1) **Comp 2** Resistor **–** Used in electronic circuits (1) to limit current (1) **Comp 3** Three port valve – used in pneumatic circuits (1) to direct air to a cylinder (1) **Comp 4** Pop rivet - the rivet is pushed through a hole in two metal sheets and special pliers pull the pin backwards (1) until the rivet spreads behind the sheets and the pin breaks off (1) **Comp 5** LED – Used on car headlights (1) as they use less current then normal bulbs (1) **Comp 6** Cable/zip tie – Used to hold things together (1) like electric cables (1)		Justified description of use required for full marks

Question			Answer / Indicative Content	Mark	Guidance
			Comp 8 Pulley – Used with a drive belt (1) to produce movement in a mechanical system (1) 3 x (1+2)	**9**	
6	**(a)**		Description to include reference to :- Taking products off the assembly line at intervals (1) Checking/testing the sample for accuracy / defects (1) (2x1)	**2**	
	(b)		One mark for the technology used and a further mark for a simple description of use. Examples: Scanners (1) can be used to check the sizes / shape of a product (1). X-rays (1) can be used to detect cracks inside products to see if they're safe to use (1) Using robots (1) to pick up product for checking by scanner (1) (2x1)	**2**	Accept other viable response e.g bar-coding; lasers
	(c)		Up to three marks for a detailed explanation Example: Using QC is important because it helps to maintain the quality of products (1) and prevent unnecessary waste (1). By producing good quality products all the time, the company will get a good reputation (1) and improve its business. Using QC helps prevent waste (1) which will save the company money (1) and time taken to make replacements (1)		Fully justified response required for full marks

Question			Answer / Indicative Content	Mark	Guidance
			(3x1)	**3**	
7	**(a)**		One mark for the technology used and up to two further marks for a clear explanation of its use Examples: CAD software (1) is used when designing the new product and it can be used to produce 3D images of products (1) that can be sent electronically to clients for approval.(1) CAD software (1) is used to produce 3D images of products which can then be made on 3D printers (1) so that clients can view the models by video link,(1) (3x1)	**3**	Accept multiple examples with limited explanation.
	(b)		Up to two marks for each of two descriptions. One mark for stating the technology and one mark for a simple description of its use Examples: Robots (1) can be used to pick and place products into boxes (1) Use of bar codes / RFIDs (1) to track movement of packages / deliveries (1) RCVs/AGVs (1) to move products / materials around the factory (1) 2 x (2x1)	**4**	

Question			Answer	Marks	Guidance	
					Content	**Levels of response**
8*			Up to six marks for a discussion or detailed explanation of the advantages and disadvantages that the use of modern technology has brought to society.		Response may include reference to: Advantages: A wider range of new products is available. Modern materials can give products special / useful features. Use of modern technologies in factories gives cleaner / safer working conditions. Easier communications are possible to any country. Modern technologies can be used to produce 'clean' energy with less pollution/emmisions. Products can be made quicker and often cheaper for consumers. Disadvantages: Continual up-dating of high-tech products is difficult to afford / out of reach for many people. Use of modern technologies in factories often leads to loss of jobs. 24/7 working of high-tech machines can lead to unsocial hours working.	**Level 3 (5-6 marks)** Thorough explanation**,** showing a clear understanding of the impact of the advantages and disadvantages that the use of modern technology has brought to society. Specialist terms and examples will be used appropriately and correctly. The information will be presented in a structured format. The candidate will demonstrate the accurate use of spelling, punctuation and grammar. **Level 2 (3-4 marks)** Adequate explanation, showing an average understanding of the advantages and disadvantages that the use of modern technology has brought to society. There will be some use of specialist terms and examples, although these may not always be used appropriately. The information will be presented for the most part in a structured format. There may be occasional errors in spelling, grammar and punctuation. **Level 1 (1-2 marks)** Basic explanation, showing a limited understanding of the advantages and disadvantages that the use of modern technology has brought to society. There will be little or no use of specialist terms or examples. Answers may be ambiguous, disorganised or 'list like'. Errors of grammar, punctuation and spelling may be intrusive. 0 - a response not worthy of a mark. Add 'Seen' at

Question			Answer	Marks	Guidance	
					Content	Levels of response
				6		end of response. When marking 'Levels of response' questions, if answers are presented as a list of bullet points then award Level 1 maximum and specific mark, 1 or 2, dependent on quality of list. Do not apply ticks or annotations to 'Levels of response' questions. Mark these by reading all of the response, then decide on an appropriate level and a specific mark.
			Total mark for paper	**60**		

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