

Engineering

General Certificate of Secondary Education

Unit **A622**: Engineering Processes

Mark Scheme for January 2011

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Question		Expected Answer	Mark	Rationale/Additional Guidance
1	(a)	<p>Engineering sectors produce different products Complete the links below to identify which engineering sector makes the products listed.</p> <p>Rail & Marine to automatic signalling system Automotive to carbon fibre brake pads Electrical & Electronics to Washer dryer Aerospace to jet engine turbine blades</p>	[4]	<p><i>Award 1 mark for each correct link shown:</i></p>
1	(b)	<p>Complete the table below to show three different engineering sectors to those shown above. For each sector, identify a different product produced in that sector.</p> <p>Chemical & Process</p> <ul style="list-style-type: none"> • paint • shampoo • toothpaste • PVC <p>Computer, Communication and IT</p> <ul style="list-style-type: none"> • flash drive • iPod • webcam • wind-up radio <p>Medical & Pharmaceutical</p> <ul style="list-style-type: none"> • blood pressure monitors • blister packs • adjustable hospital beds • mobility scooters <p>Structural and Civil</p> <ul style="list-style-type: none"> • road tunnels • motorway service stations • bridges • wind power generators 	[3x2]	<p><i>Award 1 mark for each of three different sectors given from those listed below.</i> <i>Award 1 mark for a given product for each sector.</i></p> <p><i>NB Product must link with correct sector for the mark.</i></p> <p>Repeated sector, allow ECF for appropriate product for that sector.</p>

Question		Expected Answer	Mark	Rationale/Additional Guidance
2	(a)	<p>Tick (✓) two items of personal protective equipment (PPE) that you should use when operating an electric arc welding machine</p> <ul style="list-style-type: none"> • darkened glass face mask • leather apron 	[2]	
2	(b)	<p>Describe two safety precautions, other than PPE, that you should take when operating an electric arc welding machine.</p> <p>Make sure you know the location of the main cut off switch/main isolator [1] before you start work [1] Ensure that you have been correctly trained to use the equipment [1] so that you work safely [1] Make sure that the safety curtains around the welding booth are closed [1] because the arc can cause eye damage [1] Avoid touching the work piece [1] as it may be very hot [1]</p>	[2x2]	<i>Award two marks for each of two correctly named safety precautions when using an electric arc welding machine including why or how.</i>
2	(c)	<p>Describe one test that could be carried out to check the quality of a welded joint.</p> <p>Visual check [1] to ensure no gaps or holes in the weld [1], strength test [1] by placing weights on the component to see if the weld breaks, ultrasonic test to determine cracks in the weld [1],</p>	[2]	<p><i>Award one mark for a correctly named test that may be carried out on a simple welded joint.</i></p> <p>Award second mark for describing test.</p>
3	(a)	<p>Select a suitable material from the list above to complete the following statements correctly</p> <ul style="list-style-type: none"> (i) tungsten carbide is a ceramic (ii) PTFE (Teflon) is a polymer (iii) cast iron is ferrous material (iv) aluminium or bronze is a non-ferrous material (v) bronze or cast iron is an alloy 	[5]	<p>Materials can be used more than once</p> <p>Allow tungsten carbide as an alloy Allow teak, PTFE and Tungsten carbide as non-ferrous materials.</p>

Question		Expected Answer	Mark	Rationale/Additional Guidance
3	(b)	<p>Describe what is meant by the term composite material.</p> <p>Composite materials (or composites for short) are engineered materials made from two or more constituent materials [1] with significantly different physical or chemical properties [1] which remain on a separate level within the finished structure.</p>	[2]	
3	(c)	<p>Name two composite materials that are commonly used in the engineering industry.</p> <p>Concrete, M.D.F, GRP, carbon fibre, asphalt, chipboard.</p>	[2]	<p><i>Award 1 mark for each correctly named material.</i></p> <p><i>Allow mark for answers like – fibre glass, plywood.</i></p>
4	(a)	<p>(i) Describe how Information, communication and digital technologies can be used during the following stages of the manufacture of an engineered product.</p> <p>Design – CAD is used [1] so that changes can easily be made [1] to the suit individual needs [1], designs can readily be sent to another department [1] or remote location for production [1]</p>	[2]	Allow repeat answers in (i) (ii) (iii) if correctly described.
		<p>(ii) Material and supply – databases of suppliers [1] and customers [1] make it easier to provide suitable products [1] to customers [1] spread sheets [1]</p>	[2]	
		<p>(iii) Packaging and Dispatch – bar coding/ radio frequency identification devices [1] enables products to be placed in correct containers [1] and allows product to be tracked to consumer outlet [1]</p>	[2]	

Question		Expected Answer	Mark	Rationale/Additional Guidance
5	(a)	<p>Systems and control technology is commonly used in engineering. Describe, using one example, how systems and control technology is used in a joining and assembly process</p> <p>Joining and assembly: Use of Robots for gluing, soldering, welding, brazing operations, pick and place operations to populate electronic printed circuit boards.</p>	[3]	<p><i>Award one mark for a specific example</i></p> <p><i>Award up to two marks for an adequate description of use</i></p>
5	(b)	<p>Describe two ways in which an engineering company can save money by using systems and control technology.</p> <p>Continuous production meaning no down time [2] and so more products could be made in the same time [2], Quality of product would be consistent [2] so less wastage of materials [2], Reduction in workforce so reduced wage bill [2]</p>	[4]	<p><i>Award two marks for each of two valid answers.</i></p>

Question	Expected Answer	Mark	Rationale/Additional Guidance
6	<p>Explain the function of any three of the engineered components listed below</p> <p>Flow control valve used to regulate [1] the flow of a liquid [1] or a gas [1] in a hydraulic [1] or pneumatic [1] system</p> <p>Gear train controls speed [1], and torque [1], and direction of motion [1] of an output shaft [1] in a mechanical drive system</p> <p>Light emitting diode produces light [1] when an electric current passes through it [1]</p> <p>Reservoir used to store air [1] or liquid [1] in a hydraulic[1] or pneumatic [1] system</p> <p>Resistor used to regulate the flow of current [1] in an electrical /electronic circuit [1]</p> <p>Split pin used to secure a castellated nut [1] onto a bolt to prevent it from becoming loose [1]</p>	[6]	<p>No marks for choosing the components</p> <p>Award up to two marks for correct explanation of its function:</p> <p>Allow one mark only for the use of a component rather than its function.</p>
7	<p>(a) (i) State which material would be the best choice for use in a milling operation</p> <p>Material C [1]</p>	[1]	
	<p>(ii) Give two reasons for your choice of material</p> <p>Because of its availability [1] ease of handling [1], machinability [1]</p>	[2]	Reward appropriate responses when (i) is incorrect

Question	Expected Answer	Mark	Rationale/Additional Guidance
8*	<p>Discuss the impact of modern technology on working conditions in the engineering industry.</p> <p>QWC</p> <p>Level 1 (0 – 2 marks) Candidate provides a basic discussion which shows some understanding of the question material but uses little or no specialist language. Answers may well be ambiguous or disjointed. Contains obvious errors in spelling, punctuation and grammar.</p> <p>Level 2 (3 – 4 marks) Candidate provides an adequate discussion which shows a reasonable level of understanding of the question material. There will be some evidence of the use of specialist language although not always in the appropriate areas being discussed. Information, for the most part, will be reasonably structured but, again, may contain occasional errors in spelling, punctuation and grammar.</p> <p>Level 3 (5 – 6 marks) Candidates provide a thorough analysis and show a clear understanding of the required question material. Specialist language and terms would be used in the appropriate areas being discussed and the required information will be well structured in its presentation. Candidates will demonstrate an accurate level of spelling, punctuation and grammar.</p>	[6]	<p>Six marks for admission or critical evaluation of relevant implications.</p> <p>Examples and points could include:</p> <ul style="list-style-type: none"> • The use of systems and control technology has made engineering safer for employees due to increased use of automation. • Modern technology has made the working environment cleaner and safer due to the introduction climate control and air pollution controls. • Can alert operators to likely hazardous conditions and can automatically take actions to control the situation. <p>The above list is not exhaustive</p>
	Total	[60]	

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