



GCSE

## Engineering

General Certificate of Secondary Education

Unit **A622/02**: Engineering Processes

### Mark Scheme for June 2013

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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.

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Question		Answer	Marks	Guidance
1	(a)	Aerospace – Tail rotor Electrical & Electronics – Vacuum cleaner Structural & Civil – Road bridge Medical & Pharmaceutical – Heart monitor Automotive – Gearbox  One mark for each correct link (5x1)	5	
	(b)	One mark for each of two different sectors plus one mark for an appropriate product for each sector.  Chemical & process – paint; shampoo; cleaning fluid Computers, Communication and IT – mouse; webcam; disk drive  Rail & Marine – signal gantry; passenger information system 2x(1+1)	4	Allow ecf for appropriate product if sector repeated from (a)  Product must clearly relate to sector named.
2	(a)	One mark for each correct material group.  Brass – alloy Cast iron – ferrous metal ABS – polymer Zinc – non-ferrous metal Concrete – composite (5x1)	5	Allow use of brass as alloy <u>and</u> non-ferrous metal Allow use of cast iron as ferrous metal <u>and</u> alloy
	(b)	Up to three marks for a clear explanation of the meaning of polymer.  Explanation to include reference to plastics materials (1) and joining (1) of chains of molecules (1) (3x1)	3	One mark only for 'plastic'

Question		Answer	Marks	Guidance
3	(a)	<p>One mark for each correctly positioned stage.</p> <p><b>Client brief</b>  <b>Research</b>  <b>Developing design specification</b>  <b>Generating design ideas</b>  <b>Developing designs</b>  <b>Presenting design solution</b></p>	4     (4x1)	Link 'Generating design ideas' and 'Developing designs' for one mark only if 'developing' immediately follows 'generating'.
	(b)	<p>Description to include reference to the technology used and how it is applied to presenting design solutions.</p> <p>Examples:-  Computer generated 3D image/animations embedded into a PowerPoint presentation for presenting to client at a meeting  Computer generated 3D image/animations sent to client electronically by email for approval  CAD/CAM used to produce example by Rapid Prototyping, Sent to client for testing/approval  Email – send photo/information  Technology identified (1)  Application of technology described (1)  Means of presentation detailed (1)</p>	3     (3x1)	Response must relate to 'presenting designs to a client'.

Question		Answer	Marks	Guidance
4	(a)	<p>One mark for appropriate example of engineering process One mark for a relevant tool/item of equipment</p> <p>Examples:-</p> <p>Shaping &amp; manipulation – forging; vacuum forming; line bending; injection moulding</p> <p>Tools/pieces of equipment – hammer; hearth; vac.forming machine; strip heater</p> <p>Joining &amp; assembly – welding; threading; riveting; Soldering</p> <p>Tools/pieces of equipment – arc welder; oxy/acetylene; taps &amp; dies; soldering iron</p> <p>Surface finishing – plastic/powder coating; anodising; electro-plating; spray painting; Galvanising</p> <p>Tools/pieces of equipment – furnace/hearth; fluidiser; plating coating tank; hangers; spray gun; spray booth; Polishing machine</p> <p style="text-align: right;">3x(1+1)</p>	6	<p>Tools/pieces of equipment must have relevance to process given.</p> <p>Do not accept materials/consumables as pieces of equipment.</p>
	(b)	<p>One mark for each of two appropriate safety precautions</p> <p>Examples:- wear goggles/visor ; apron/overalls; gloves; position of safety cut-off.; experience/training on m/c; clear working area; tie back hair/loose clothing (2x1)</p>	2	Reference to PPE must be specific

Question		Answer	Marks	Guidance
5	(a)	<p>One mark for each of three relevant factors</p> <p>Examples:- Cost of material; ease of forming/machining; availability; ease of handling/storage; material properties; recyclability; ease/cost of disposal of waste/scrap; suitability for processes; ease of/self finishing</p>	3 (3x1)	
	(b)	<p>No mark for factor chosen</p> <p>Up to three marks for a detailed explanation of the importance of the chosen factor.</p> <p>Explanation to include a <b>reasoned statement</b> of the importance and the <b>negative results</b> of not meeting requirements.</p>	3 (3x1)	<p>Detailed response required for full marks.</p> <p>Allow one mark for suitable example</p>
	(c)	<p>One mark for each of two benefits of using plastics materials</p> <p>Easy to form into shapes Suited to high-volume production processes Available in colours/no finishing needed Can be made to resemble other materials Readily recycled after use Little waste from moulding processes Corrosion resistance</p>	2 (2x1)	<p>Not simply 'cheaper than metals'</p>

Question		Answer	Marks	Guidance
6	(a)	<p>Up to three marks for each of two detailed descriptions of the use of ICDT</p> <p>Examples:-</p> <p>(i) Material supply and control – on-line ordering of materials; use of material monitored by computer system; automatic re-ordering when required (JIT)</p> <p>(ii) Packaging and dispatch – plc control of conveyors for packaging; use of robot 'pick &amp; place' into boxes; bar-coding for track &amp; trace deliveries</p> <p>Technology identified (1) Application of technology described (1) Details of use/benefits (1)</p>	6 2x(3x1)	Detailed response required for full marks.

Question		Answer	Marks	Guidance
7	(a)	<p>One mark for name and one mark for type of each of three components</p> <p>Cam – mechanical Fuse – electrical/electronic (Single-acting) cylinder/actuator – pneumatic/hydraulic 3x(1+1)</p>	6	Allow ecf for 'type' if component wrongly named
	(b)	<p>Up to two marks for a clear description of a component function</p> <p>Relay – low voltage circuit energises an electro-magnet to close contacts for a higher voltage circuit; allows low voltage (electronic) control of higher voltage (electrical) circuits</p> <p>Cam – changes rotary motion of the cam into linear motion of a follower; used to open valves on a car engine</p> <p>Fuse – contains a thin wire that melts if too much current flows through it; protects electrical/electronic circuits and components from damage</p> <p>Cylinder – compressed air forces the piston out along the cylinder to move/operate a piece of equipment. A spring pushes the piston back when the air is turned off.</p>	2	<p>One mark maximum if example of use is given without description of function.</p>

Question		Answer	Marks	Guidance	
				Content	Levels of response
8*		Up to six marks for a discussion or critical evaluation of issues relating to the effects on the workforce of introducing modern technologies	6	<p>Response may include reference to the following points:</p> <p>May lose jobs May need to be re-trained for new skills. Robots used to lift and position heavy items. AGVs used to move workpieces and component parts around factory. Cleaner working environment with fully enclosed automatic machines. Working in hazardous conditions now done by robots. Automatic control of workplace air quality. Consistent quality/accuracy of products means guaranteed pay.</p>	<p><b>Level 3 (5–6 marks)</b> Thorough analysis showing a clear understanding of the effects on the workforce of using modern technologies when making engineered products Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar.</p> <p><b>Level 2 (3–4 marks)</b> Adequate discussion showing an understanding of the effects on the workforce of using modern technologies when making engineered products. There will be some use of specialist terms, 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, punctuation and grammar.</p> <p><b>Level 1 (0–2 marks)</b> Basic discussion showing limited understanding of effects on the workforce of using modern technologies when making engineered products There will be little or no use of specialist terms. Answers may be ambiguous or disorganised. Errors of spelling, punctuation and grammar may be intrusive.</p>

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