

Engineering

General Certificate of Secondary Education

Unit **A624**: Impact of Modern Technologies on Engineering

Mark Scheme for January 2012

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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)	<p>Award 1 mark for each correct link shown:</p> <p>Aerospace - Satellite solar panel Rail and marine - Life raft Automotive - Parking sensors Structural and civil - Pedestrian bridge Computers, Communications and IT - Infra-red mouse Chemical and Process - Dishwasher powder</p>	6	
	(b)	<p><u>Life raft</u> Modern technology - GPS tracker; self inflating; Benefits - located more easily; take up less space on board;</p> <p><u>Pedestrian bridge</u> Modern technology – Weather simulations; resonance testing; Benefits - testing before building; to ensure no cracking or swaying;</p> <p><u>Satellite solar panel</u> Modern technology – Solar panels; self pivoting; Benefit - generates power from sun; can change angle to maximise output;</p> <p><u>Dishwasher powder</u> Modern technology – contains enzymes; / chemicals; Benefits - to remove grease; environmentally friendly;</p> <p><u>Parking sensors</u> Modern technology – ultrasonic sensors; Benefits – allows drivers to hear a sound that represents distance to objects;</p> <p><u>Infra-red mouse</u></p>		ecf allowed when 'Sector' is given rather than 'Product', only if responses are clearly relevant to sector.

Question	Answer	Marks	Guidance
	Modern technology – Infra-red measurement; Benefits – small accurate movements are measured and translated on screen.	2	

Question		Answer	Marks	Guidance
2	(a)	<p>Award one mark for technology used and an extra mark for description. Answers must relate to how increase in production has been achieved</p> <p>Speeding up production by increasing batch sizes or reducing production times. Computer controlled processes allow 24/7 working.</p>	2 x 2	
	(b)	<p>Award 1 mark for technology used and an extra mark for a description of the disadvantage Answers should be aimed specifically at companies</p> <p>Possible high set up costs; existing workers may need to be retrained; availability of global engineering; may need to get larger premises, may need to upgrade existing, cost of changeover and lost production during.</p>	2 x 2	Reference to 'loss of jobs/workers' - 1 mark max.

Question		Answer	Marks	Guidance
3	(a)	Computer Aided Manufacture All three terms must be correctly identified for the mark.	1	
	(b)	Award one mark for each process and up to a further two marks for each explanation. Answers may include reference to conveyors that index or are speed controlled through the use of sensors and motors; to control the machining of a component; use of robotics in assembly/quality control; use of AGVs in component movement	2 x 3	No marks available for reference to CAD or 'designing'

Question		Answer	Marks	Guidance
4	(a)	<p>Award one mark each for any appropriate material removal machine</p> <p>Examples: Lathe, milling machine, shaping machine, grinding machine, wire eroder, laser cutter, bandsaw, drilling machine, sanding machine, (2x1)</p>	2	
	(b)	<p>Award one mark for each of two specific hazards</p> <p>Examples: heat generated during process; flying debris; sharp edges; fumes (2x1)</p>	2	
	(c)	<p>Award one mark for each of two appropriate hand tools</p> <p>Examples: Screwdriver, hammer, soldering iron, glue gun, spanners, welding sets, rivet guns, adhesive applicator (2x1)</p>	2	
	(d)	<p>Award one mark each for any two surface finishing processes:</p> <p>Examples: grinding; sanding; polishing/burnishing ; (spray) painting; oil-blueing/blackening; varnishing; powder coating; electro-plating; galvanising (2x1)</p>	2	

Question		Answer	Marks	Guidance
5	(a)	<p>Award up to two marks for each of two clear descriptions relating to environmental damage</p> <p>Examples: Hydrocarbon based fuels; emission of NOX and CO² particulates from boilers; greenhouse gas emmision; noise pollution; depletion of natural resources; inefficient use of heating systems; harmful materials used in construction ie asbestos;</p>	2 x 2	Cause and effect required for both marks
	(b)	<p>Award up to two marks for each of two clear descriptions</p> <p>Use of intelligent heating systems, more energy efficient; use of solar panels; planting trees around buildings to reduce noise and visual impact; recycling of heat used in processes; build from sustainable resources; reduction of transportation fuel use; less energy usage in processes</p>	2 x 2	Award one mark for reference to damage and one mark for method used to reduce it.

Question	Answer	Marks	Guidance
6	<p>Award up to 2 marks for each of three valid H & S considerations. One mark for a simple statement of a precaution. Two marks for a justified response.</p> <p>Examples:</p> <p>Drilling Ensure guards are in place; to protect from flying swarf; wear suitable PPE; to protect your clothing etc; keep hands away from the drills; to avoid injury; (1+1)</p> <p>Soldering wear suitable PPE - gloves / apron to protect from burns; wear protective goggles; suitable ventilation to protect from fumes (1+1)</p> <p>Vacuum forming Wear suitable PPE, avoid touching hot surfaces, wear gloves, training, electrical isolation (1+1)</p>	<p>2</p> <p>2</p> <p>2</p>	<p>Repetition of PPE only allowed if clearly justified / referenced to individual process.</p>

Question		Answer	Marks	Guidance
7	(a)	<p>Where cost is an issue; availability of material; workforce skills; importance of properties(eg strength); ease of finishing/plating; suitability for process</p> <p>Up to two marks for a justified explanation plus one mark for a suitable example</p>	3	
	(b)	<p>Large molecule composed of repeating structures; Wide range with different properties and melting points; reference to plastics.</p> <p>Up to two marks for a justified explanation One mark for suitable example</p>	3	Award one mark only for simple reference to 'plastics'
	(c)	<p>Polymers do not corrode like metals; are often cheaper to mass-produce; shapes readily produced; act as insulators; products often made in one 'shot'</p> <p>Up to two marks for a justified explanation Suitable example must be given for third mark</p>	3	

Question		Answer	Marks	Content	Guidance
					Levels of response
8*		Award up to six marks for a discussion or detailed analysis of the effects that modern technologies have had on the working conditions of the workforce.		<p>Examples and points could include:</p> <p>Use of air conditioning and filtering improves air quality.</p> <p>Machinery used to do high intensity labour instead of workers.</p> <p>Reduced working hours.</p> <p>Machines can operate in adverse conditions/hazardous environments and can carry out repetitive operations over a wide range of process operations like paint spraying & welding.</p> <p>CNC/automated machines give cleaner working environment</p>	<p>QWC</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> <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 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>
		Total	60		

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