OCR
RECOGNISING ACHIEVEMENT

GCSE

Engineering

General Certificate of Secondary Education

Unit **A624/02:** Impact of Modern Technologies on Engineering

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.

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

Question			Answer	Mark	Guidance
1	(a)		Electrical and Electronics – Alarm system Structural and Civil – Tunnel Computers, Communication and IT – Smartphone Chemical and Process – Washing powder One mark for each correct link (4x1)	4	
	(b)		No mark for sectors One mark for different example of product from sector Examples: Electrical and Electronics – Radio; cooker Structural and Civil – Factory, bridge Computers, communication and IT – monitor; keyboard Chemical and Process – paint; cement (1+1)	2	Allow ecf for appropriate product from a *different* sector
	(c)		No mark for product Up to two marks for description of use of modern technology in the product. (2x1)	2	Technology named – one mark only.

Question			Answer	Mark	Guidance
2	(a)		One mark for each correct example of material type. Alloy – brass; steel; bronze; stainless steel; cast iron Composite – concrete; MDF; GRP; plywood Ferrous metal – steel (any); cast iron; wrought iron Non-ferrous metal – copper; brass; aluminium; tin; lead; zinc; bronze Polymer – polyethylene, ABS; HIPS; polycarbonate; PVC; nylon/polyamide; acrylic (5x1)	5	 <u>Not</u> Aluminium Not Kevlar®. Spelling not important. Materials may be repeated. eg brass – alloy <u>and</u> non-ferrous metal
	(b)		Up to three marks for a clear explanation of 'composite' Explanation must include reference to; Different materials; Mixed/combined together; Better combination of properties than separate materials (3x1)	3	 All three factors required for full marks. 1 mark only for 'mixture of materials'

Question			Answer	Mark	Guidance
3	(a)	(i)	'Normal use' uses the most energy	1	
		(ii)	Up to three marks for a clear explanation of ways to reduce energy in distribution stage Examples: **Energy reduction** brought about by **reducing weight** of product meaning **less fuel** will be used in transporting. Energy efficient/more aerodynamic trucks to transport goods. Making product **flat-pack/self-assembly** will mean **more can be carried** at a time **reducing the number of trucks/containers** needed. Deliver goods by sea instead of by air will mean more can be carried and less fuel used. (3x1)	3	Clear and justified explanation required for full marks.
	(b)		One mark for each of three renewable energy sources Tidal Wind Solar Hydro-electric Geo-thermal Wave Bio fuels (3x1)	3	

Question			Answer	Mark	Guidance
4	(a)		One mark for each correctly named component Up to two marks for description of components use. **A** – Pop(blind) rivet – used to join sheet metal parts together when only one side can be reached **B** – Spring/locking washer – used to prevent nuts working loose after tightening **C** – Flow control valve – by screwing the adjuster down, the amount of air passing through can be reduced **D** – Ratchet and pawl – Used in lifting mechanisms to stop axles turning backwards/lock system in position **E** – Cable tie – used keep bundles of wires/cables together **F** – Rack and pinion – converts oscillating motion of pinion into reciprocating motion of the rack 2x(1+2)	6	Not simply 'rivet' BOD for 'gears' Example may be used to describe function/use.
	(b)		Up to two marks for a justified/qualified reason for using 'pre-manufactured standard components'. Examples; Mass-produced components are cheaper than making them. Machinery/trained workers to make them are not needed. All company space/time/resources can be used to make own products. Accuracy/consistency of standard components guaranteed. Saves time needed to make components Can standardise on fixing tools/processes (2x1)	2	

Question			Answer	Mark	Guidance
5	(a)		Injection moulding	1	
	(b)		Up to two marks for each of two descriptions of use of modern technology in the drill. Examples: Lithium-ion battery to provide power without mains Multi-material moulding to give 'soft-grip' handle Key-less chuck for ease of use Electronic speed control LED/laser lit positioning (2x2)	4	BOD - 1 mark for 'rechargeable battery'
	(c)		One mark for each of two features making the drill safe to use. Low voltage rather than mains operation No trailing cord Soft-grip handle provides more secure grip Can stand it up when not using it (large base) Torque control/chuck reversing to help prevent drill breakages Key-less chuck easier to change drill bits (2x1)	2	

Question			Answer	Mark	Guidance
6	(a)		Up to three marks for a clear explanation of the term 'sampling' Explanation to include reference to: Large number/continuous production Checking accuracy/quality of 'sample' at regular/random Intervals Allow changes to be made if needed/ensures quality of batch/production (3x1)	3	
	(b)		One mark for each of two appropriately named tools or pieces of equipment (Engineer's) Try square; Gauge; micrometer; vernier/digital caliper; dial gauge; template/jig; steel rule; X-rays/ultrasound; scanner; hardness/strength testing machine; (digital) scales (2x1)	2	
	(c)		Up to two marks for each of two descriptions of possible effects of not using QC checks Examples: Many products not accurate/good quality causing much scrap Cost of material/time to produce more products Failure to meet 'deadline' for making product (JIT) Loss of reputation/orders for company because of lack of quality products made Disposal of waste products may be expensive (2x2)	4	Accept reference to effects for consumers Justified/qualified reasons required for both marks.

Question			Answer	Mark	Guidance
7	(a)		One mark for each of two benefits of using computer controlled machines Examples: Less workers to be paid Machines can operate 24/7 Better consistency/accuracy of products made Easy to change/re-program machines for other products Output is generally quicker than conventional production Can be operated remotely (2x1)	2	
	(b)		Up to two marks for a description of the use of robotics in assembly Examples Use of robots for welding car bodies on an assembly line Pick-and-place robots in PCB assembly Robotic assembly of electrical appliances Fitting heavy wheels/doors to cars Loading parts to assembly machines (1+1)	2	
	(c)			3	Fully justified response required for full marks.

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 of modern technologies on the time taken to develop new engineered products	6	Response may include reference to the following points: Use of Internet allowing easier/faster access to research information. Use of CAD at design stage makes changing design features quicker. Electronic communication with clients allows faster feedback on designs. 3D imaging and animation techniques on CAD gives better view of designs. CAD/CAM allows prototypes to be produced more quickly. Total 'lead-time' reduced from initial idea to production. New high-tech processes and materials enable improved products to be made.	**Level 3 (5–6 marks)** Thorough analysis showing a clear understanding of the effects of modern technologies on the time taken to develop new 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. **Level 2 (3–4 marks)** Adequate discussion showing an understanding of the effects of modern technologies on the time taken to develop new 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. **Level 1 (0–2 marks)** Basic discussion showing limited understanding of the effects of modern technologies on the time taken to develop new 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.

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