OCR
RECOGNISING ACHIEVEMENT

GCSE

Engineering

General Certificate of Secondary Education

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

Mark Scheme for January 2013

Oxford Cambridge and RSA Examinations

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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 – Cordless drill Rail and Marine – Passenger information system Computers, Communication and IT – Graphics tablet Automotive – Anti-lock braking system One mark for each correct link (4x1)	4	
	(b)		No mark for products One mark for a modern technology appropriate to the product chosen Examples: Passenger information system – Real-time LCD display Graphics tablet – touch screen Advanced braking system – computer control by sensors Cordless drill – lithium-ion battery (2x1)	2	Modern technology must clearly relate to product chosen. Accept reference to modern technology used in the manufacture of the product
	(c)		One mark for each of two different sectors Aerospace; Chemical and Process; Medical and Pharmaceutical; Structural and civil (2x1)	2	Sectors must be from list in specification.

Question			Answer	Mark	Guidance
2	(a)	(i)	One mark for each correctly identified alloy brass; bronze; stainless steel (2x1)	2	 NOT aluminium.
		(ii)	One mark for each correctly identified polymer ABS; HIPS; polycarbonate; (2x1)	2	
	(b)		Up to three marks for a suitable explanation Explanation could include: ease of forming shapes; suitability for mass production; less material wastage; choice of colours; ease of recycling; non-corroding; insulator Plus one mark for a suitable example (3x1)	3	 Do not accept ‘cheaper than metal’ Points to be justified for second mark.

Question			Answer	Mark	Guidance
3	(a)		One mark for each of two correct examples of process types. Material removal – boring; drilling; milling; sawing; turning Shaping & manipulation – casting; extrusion; forging; injection moulding; vacuum forming Joining & assembly – brazing; glueing; soldering; threading; welding 3 x (1+1)	6	Allow 'threading' as material removal Allow justified response relating to post-process material removal.
	(b)		No mark for example One mark for each of two safety precautions (including PPE) appropriate for the process chosen. (2x1)	2	

Question			Answer	Mark	Guidance
4	(a)	(i)	Units of energy used = 35	1	Allow tolerance of +/- 2.
		(ii)	Disposal uses the smallest amount of energy	1	
		(iii)	Explanations may include reference to: product may be made abroad using energy to deliver it product may be very large/one-off taking up space in transport product may be made in small batches and delivered regularly (JIT) weight of product means more energy needed to transport it (3x1)	3	Factors need to be justified/qualified for second mark.
	(b)		Up to three marks for a relevant description Examples: Products filling up land-fill Hazardous materials may cause pollution Fumes given off when incinerating causes air pollution Re-use/recycling saves raw materials/damage when extracting/refining/processing (3x1)	3	Effects may be positive or negative.

Question			Answer	Mark	Guidance
5	(a)		**B** – light dependant resistor (LDR) – electrical/electronic **C** – 'Vee' pulley – mechanical **D** – (double-acting) air cylinder – pneumatic/hydraulic 3x(1+1)	6	
	(b)		Component **B**	1	
	(c)		No mark for component Up to two marks for a description of the components function Examples: **A** – to store compressed air/maintain usable pressure in an air circuit **B** – to alter the resistance in an electronic circuit according to the amount of light **C** – used in a belt drive system to transmit power/movement **D** – to move the piston by air pressure in both directions One additional mark for an <u>appropriate</u> example (3x1)	3	Error carried forward if incorrect component named. Clear description required for both marks.

Question			Answer	Mark	Guidance
6	(a)		One mark for each of two benefits Examples: drawings can be stored electronically drawings can be sent by email modifications/changes can be made easily ability to import features can be sent to CAM for making (2x1)	2	NOT quicker/easier/more accurate or more complex designs possible.
	(b)		One mark for each of two correctly named machines CNC milling machine/lathe/laser cutter/machining centre (2x1)	2	Accept ‘robot’.
	(c)		Up to three marks for a reasonable explanation of the use of CAD/CAM including: Use of CAD for designing/developing designs of product 3D imaging/animations on-screen to view product Software link between CAD and CAM Use of CAM in prototyping/modelling (CNC router/milling machine/lathe; rapid prototyping system) (3x1)	3	Link between CAD and CAM required for full marks.

Question			Answer	Mark	Guidance
7			No mark for chosen stage Up to three marks for a clear explanation of the use of modern technologies Examples: **material supply and control** – Internet to source and order materials; computer-based testing of materials; JIT; stock control linked to CIE; automatic re-ordering **processing and production** – automated machinery; quality control linked to CIE; automatic rejection of scrap; automatic adjustments to remedy faults **assembly and finishing** – use of robotics for pick-and-place; welding and spray finishing operations; scanning technology for final QC **packaging and dispatch** – PLC control of conveyors; robotic packing into boxes; automatic carton sealing machines; bar coding for delivery and tracking 2x(3x1)	6	Accept repetition of points if correctly referenced in context. Clear explanation of use of the modern technology is 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 engineered product manufacture on the environment.	6	Response may include reference to the following points: Damage caused by the extraction of raw materials. Using-up supplies of raw materials. Air pollution from factories. Global manufacturing means use of fuel for transportation. Pollution of rivers from chemicals/finishing materials. More products made means more old products disposed of.	**Level 3 (5–6 marks)** Thorough analysis showing a clear understanding of the effects of engineered product manufacture on the environment. 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 engineered product manufacture on the environment. 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 engineered product manufacture on the environment. 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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