OCR
RECOGNISING ACHIEVEMENT

GCSE

Engineering

General Certificate of Secondary Education **A624**

Impact of Modern Technologies on Engineering

Mark Scheme for June 2010

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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 Number	Specification Ref	Expected Answer	Mark	Rationale
1 (a)	A	**Complete the links below to identify which engineering sector makes the products listed.** 1 mark for each correct link shown: Aerospace – aircraft door Chemical and process – cement Computers, communication and IT – radio Structural and civil – site building	[4]	
(b)	K	**Select two products from those shown above and, for each, state:** **• one technology used in your chosen product;** **• one benefit of using that technology.** One mark for each of two correct technologies and one for a benefit of using that technology. Examples below <u>aircraft door</u> aluminium alloy (lightweight), CAD in design (straight to production), <u>cement</u> plasticisers (keep workable for longer), grinding aids, frost inhibitor <u>heart monitor</u> PCB, LCD etc <u>Radio</u> Digital technology (no interference, additional information, ease of tuning) <u>site building</u> sectional construction/CAD (modularity, flexible designs, speed of production, factory quality checked)	[4]	The product **must** be one of those listed. as long as they are appropriate to the technology given, accept generic benefits such as lightweight, strong, cheap at this level. Accept a benefit relating to a technology even if the technology itself is not correct.
2 (a)	B	**The bar chart below shows units of energy used in the life of a product.** **Use the information shown in the chart to identify:** **(i) How many units of energy are used in producing the product** **(ii) When most energy is used in the life of the product** (i) One mark for 15 (ii) one mark for normal use	[2]	

Question Number	Specification Ref	Expected Answer	Mark	Rationale
(b)	B	**Describe 'normal use of energy' in a product, including the type of energy used.** Two marks for describing energy used in normal use of a product. Type or source of energy and how used. For example Motor vehicles use petrol/fuel energy to power the engine. Or motor vehicles convert stored energy from fuel to kinetic energy. Mp3 player/mobile phone… use electrical energy stored(1) in rechargeable (1) batteries(1) Chilled food needs heat energy to get it to the right serving temperature.	[2]	Amplification needed for second mark.
(c)	M	**Explain how new technology can reduce the energy used in production and distribution of an engineered product.** Three marks for a clear explanation of how new technology can reduce energy used in production. For example: Temperature control system uses sensors to monitor temp and only switches heater on when needed. Efficient insulating materials eg expanded polystyrene reduces heat loss, so less heating energy is needed. Three marks for a clear explanation of how new technology can reduce energy used in distribution. For example: Engine management systems optimise performance, reducing fuel consumption.	[3] [3]	For three marks the explanation should be joined up (eg a point/example of technology, amplification in terms by/which means/ and because/so/therefore)
(d)	B	**Describe one way that engineered products can be modified to reduce the energy needed for disposal.** Two marks for describing one way an engineered product can be modified to reduce disposal energy. For example: Reduce quantity/range of materials used. Design for disassembly/Make materials/components easier to separate	[2]	Amplification needed for second mark.

Question Number	Specification Ref	Expected Answer	Mark	Rationale
3	G	**The table below gives details of the stages in a quality control procedure.** **Complete the table by describing each stage for an engineered product you have studied.** No marks for the product. Sampling 2 marks for how sample is taken, eg: Every 5th component is taken by QC/redirected by conveyor Comparing 2 marks for what is being compared and how, eg Visual check that colour matches sample/go-nogo gauge used to check length within tolerance. Action marks Too long – sent for reprocessing, too short to scrap.	**[6]**	Product is there to support response. stage: generic acceptable. Check across table for creditable points which may be in another cell.
4a	I	**Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) are examples of new technologies used in the design and production of engineered products.** **(a) Describe how CAD is used in an engineering company when:** **• designing new products;** **• modifying existing product designs.** Two marks for a clear description of HOW CAD/CAM used when designing and modifying designs. For example: Designing new products. Select from library of components/drawing tools/checking/calculating/scaling etc Send drafts to client for checking by email Modifying existing product designs. Load original design/ make amendments by editing drawing file using… Save as CAD file suitable for loading to CAM/sending to production dept	**[2]** **[2]**	

Question Number	Specification Ref	Expected Answer	Mark	Rationale
4 (b)	I	**Describe how CAM is used in an engineering company when meeting an urgent order for small batch of a high quality product.** Four marks for a clear description of how CAD/CAM used when meeting an urgent order for a small batch of high quality product. Prepare the CAD file, materials for loading to CAM system. Check, load, run. Because CAM equipment works directly from a CAD file quality will be exactly as design requirements. Quick turnaround time compared with tooling up for small run (hours rather than days)	**[4]**	Amplification is needed for the second mark. A joined-up response is needed for 4 marks in the last part, covering each aspect (ie urgent, small batch and quality)
5	K	**Describe how a product you have studied has the following features:** **• use of non-hazardous recyclable materials;** **• design for disassembly;** **• reduced product energy consumption.** No marks for product. Two marks for each cell. For example: BMW car <u>Use of non-hazardous recyclable materials</u> uses recyclable plastics in all cases <u>Design for disassembly</u> Many parts click to fit so they can be separated easily, others are fixed with non-permanent methods Simplification of components. <u>Reduced product energy consumption</u> The advanced engine management system optimises fuel consumption/ streamlined contours reduce drag/ lightweight material.	**[2]** **[2]** **[2]**	Amplification or cause and effect needed for second mark.

Question Number	Specification Ref	Expected Answer	Mark	Rationale
6	F	**Describe one different environmental consideration for each engineering process shown below.** In each of 3 parts, two marks for a clear description of what needs to be considered with how or why. No credit for repeated points. For example: Chemical treatment : eg Source of energy needed to get temperature hot enough for chemical change. or can solvents/chemicals be re-used/sold or how disposed of will hazardous fumes be formed from the process/alternatives. Joining and assembly Energy used by different process. Ease of dismantling for repair, renewing parts or disposal. Reusability of fixings Shaping and manipulation Energy used by process/alternatives Risk assessment on locale eg hot surfaces, fumes What happens to excess material/flash?	[6]	List not exhaustive. Amplification needed for second mark (eg additional detail or an example of process or specific area). Accept working environment considerations

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7 (a)	B	**Describe one benefit of "design for the environment" to an engineering company.** Two marks for a clear description of a benefit to an engineering company of DFE. For example: Company gains increased respect 'green credentials' Products may be more attractive to customers – eg lighter weight, cheaper to run Transport costs may be reduced eg flat packing products	**[2]**	Second mark needs detail or amplification.
(b)	B	**Describe one disadvantage of "design for the environment" to an engineering company.** Two marks for a clear description of a disadvantage to an engineering company of DFE. (not opposite of (a) unless exemplified) For example: Costs of implementation (described, exemplified) Product features/appearance/performance may change reducing customer satisfaction or no discernible benefit to consumer for increased price.	**[2]**	Second mark needs detail or amplification. Beware of 'reverse answers'
(c)	B	**Explain how a designer can address the issue of "manufacture without producing hazardous waste" when designing engineered products.** Four marks for a detailed explanation, including, for example: At each stage of the design process (1) consider materials (1) and manufacturing methods (1) checking whether any of the options considered could potentially cause hazardous waste (1) select materials(1) that do not give rise to HW when they were produced)(1) or when worked. Consider disposal methods (1)/potential for recycling.	**[4]**	A joined-up response is needed for 4 marks linking the design process with appropriate strategies.

Question Number	Specification Ref	Expected Answer	Mark	Rationale
8*	J	**Discuss the implications of using modern technology for material supply and control.** Six marks for discussion of the implications of using modern technology for material supply and control. Examples of points (specialist terms underlined). Computerised Stock control systems- automatic ordering, JIT, Online ordering of materials and receiving orders – triggering material/component orders, order tracking Means lower stock levels so if there's a supply failure can halt production. If production hold up stock in transit might be difficult to store. **QWC** Level 1 (0-2 marks) Basic discussion showing some understanding of implications of using modern technology for material supply and control. 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. Level 2 (3-4 marks) Adequate discussion showing an understanding of the implications of using modern technology for material supply and control. 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.	[6]	

Question Number	Specification Ref	Expected Answer	Mark	Rationale
		Level 3 (5-6 marks) Thorough analysis, showing a clear understanding of the implications of using modern technology for material supply and control. 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.		
		Paper total	**60**	

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