OCR
RECOGNISING ACHIEVEMENT

GCSE

Engineering

General Certificate of Secondary Education

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

Mark Scheme for January 2011

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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			Expected Answer	Mark	Rationale/Additional Guidance
1	(a)		**Engineering sectors produce different products** **Complete the links below to identify which engineering sector makes the products listed.** Aerospace linked with Landing gear Rail and marine linked with Cruise liner Automotive linked with Automatic headlight levelling systems Structural and civil linked with Motorway service station Computers, Communications and IT linked with Laser printer Chemical and Process linked with Dishwasher Powder	**[6]**	Award 1 mark for each correct link shown:
1	(b)		**Select one product from those listed above and state:** • **one modern technology used in its production** • **one benefit of using that modern technology** **<u>Cruise liners</u>** **Modern technology** – Sonar [1] and radar [1] **Benefits** – safer cruising [1], provides luxury holidays [1] for large numbers of people at a time [1] **<u>Motorway service station</u>** **Modern technology** – Automatic doors [1], microwave ovens [1] **Benefits** – to keep heat in [1], for heating baby food [1] **<u>Landing gear</u>** **Modern technology** – Hydraulic system [1], pneumatic tyres [1] **Benefit** – allows aircraft to land softly [1] and safely [1] on a concrete runway [1] **<u>Dishwasher powder</u>** **Modern technology** – contains enzymes [1]/chemicals [1] **Benefits** – to remove grease [1] environmentally friendly [1]		

Question			Expected Answer	Mark	Rationale/Additional Guidance
1	(b)		**Headlight levelling systems** **Modern technology** – weight distribution sensors [1] **Benefits** – automatically compensates for number of passengers [1] **Laser printers** **Modern technology** – lasers **Benefits** – clearer [1] faster [1] and more efficient than many ink jet printers [1], toner cartridges tend to last longer than ink cartridges [1]	**[2]**	
2	(a)		**The introduction of modern technologies has resulted in a number of advantages and disadvantages in the engineering industry.** **Describe two ways in which the use of modern technology has improved working conditions.** Air conditioning [1] makes work area more pleasant to work in [1], enhanced lighting [1] removes risks of eye strain [1], safer working area [1] because most hazardous tasks are now carried out by robots [1] Radiation Badges for Nuclear workers [1]	**[4]**	Award 1 mark for stating an obvious benefit and an extra mark for description. Answers must be aimed at workforce rather than companies.
2	(b)		**Describe two** negative effects of the use of modern technology in engineering companies Possible high set up costs [1], existing workers may need to be retrained [1], availability of global engineering [1] loss of traditional skills [1] Job loss/redundancy [1] Effects of malfunction/breakdown	**[4]**	Award 1 mark for statement and one extra mark for the description. Answers should be directed at companies rather than the workforce

Question			Expected Answer	Mark	Rationale/Additional Guidance
3	(a)		**State what the letters C I E stand for in the context of engineering** **C**omputer **I**ntegrated **E**ngineering. Most candidates will probably correctly identify **C** as being computer and possibly E as being engineering. However all three terms must be correctly identified for the mark.	**[1]**	
3	(b)		**Describe three benefits to an engineering company of using computer controlled process** Award up to **two** marks for each of three benefits. First mark for reference to computer control and second for additional result – eg Since the production is controlled by computers [1], then product quality is consistent [1], less staff are required [1], production can be carried out 24/7 [1], process is often quicker [1], so more products are produced [1]; production can take place in hazardous areas [1] Less waste produced [1]	**[6]**	

Question			Expected Answer	Mark	Rationale/Additional Guidance
4	(a)		**Engineered products, normally go through the following stages of production:** **material removal** **shaping and manipulation** **joining and assembly** **surface finishing**		Award one mark each for any two of the following material removal processes: milling, drilling, turning, filing, sawing, punching, laser cutting, marking out, clamping.
		(i)	**State two activities that could be carried out on an engineered product at the material removal stage.**		
		(ii)	**State two different activities that would be carried out on an engineered product at the shaping and manipulation stage.** Award one mark each for any two of the following shaping and manipulation processes: bending, folding, extruding, hammering, forging.		
		(iii)	**State two different activities that would be carried out on an engineered product at the joining and assembly stage.** Award one mark for each of any two of the following joining and assembly processes: welding, brazing, soldering, gluing, screwing, bolting, riveting.		
		(iv)	**State two different activities that would be carried out on an engineered product at the surface finishing stage.** Award one mark each for any two of the following surface finishing processes: grinding, sanding, polishing, oil bluing, painting, varnishing. daw filing, etching.	**[8]**	

Question			Expected Answer	Mark	Rationale/Additional Guidance
5	(a)		**Modern motor vehicles are designed to have less impact on the environment than earlier models.** **Describe two ways in which motor vehicles cause damage to the environment.** Hydrocarbon based fuels [2], emission of NOX and CO_2 particulates from petrol engines into the atmosphere [2], greenhouse gasses from diesel engines [2], noise pollution [2], depletion of natural resources [2].	**[4]**	Award two marks for each of two relevant descriptions relating to environmental damage
5	(b)		**Describe two ways in which damage to the environment caused by motor vehicles can be reduced.** Use of engine management systems to reduce fuel consumption [2] particle emissions [2], catalytic convertors to clean exhaust gases [2], manufacture a greater range of electrically powered vehicles [2], component parts can be recycled [2], more use of LPG as a fuel [2], vehicle sharing [2], more hybrid vehicles [2], controlled end of life disposal [1].	**[4]**	Award two marks for each of two relevant descriptions relating to reduction of environmental damage

Question			Expected Answer	Mark	Rationale/Additional Guidance
6			**Describe one different Health and Safety consideration for each of the following engineering processes.** **Milling.** Ensure guards are in place [1] to protect from flying swarf [1]; wear suitable PPE [1] to protect your clothing [1]; keep hands away from the cutting tools [1] to avoid injury [1]. **Welding.** wear suitable PPE – gloves/apron; [1] to protect from burns [1]; wear protective goggles [1] to protect eyes from intense light [1]; don't allow anyone else into the welding area [1]. **Spraying.** Wear suitable face mask/breathing apparatus [1]; to protect from paint fumes etc [1]; wear suitable PPE [1] to protect your clothing [1].	**[2]** **[2]** **[2]**	Award 1 mark for each of two H&S considerations from the examples shown. Reason must be a valid for the second mark

Question			Expected Answer	Mark	Rationale/Additional Guidance
7	(a)		**Engineered products are now often made by using some of the modern materials listed below:** **alloys** **ceramics** **composites** **non-ferrous metals** **polymers** **Explain using one example, what is meant by the term 'alloy'.** An alloy is comprised of a combination of two (or more) pure metals [2], which provide improved/new properties /characteristics that can be transferred from one material to the other [2] examples being steels [1], stainless steel [1], brass [1], bronze [1].	**[3]**	Award the third mark only if a suitable example is given:
7	(b)		**Explain, using one example, of why a non ferrous metal may be preferred to a ferrous metal.** Non-ferrous metals give better corrosion properties than ferrous metals (ie they don't rust) [2], examples include: aluminium based metals such as duralumin [1], brass [1], bronze [1]	**[3]**	Award the third mark only if a suitable example is given:
7	(c)		**Explain, using one example, why a plastics material has replaced a metal in an engineered product.** Plastics materials do not corrode like metals [2] and are often cheaper to produce [1], using an injection moulding process [2]. Examples include: PVC [1], ABS [1], polypropylene [1], polyethylene [1].	**[3]**	Award the third mark only if a suitable example is given:

Question			Expected Answer	Mark	Rationale/Additional Guidance
8*			**Discuss the implications that the introduction of modern technologies has had on the processing and production of engineered products. QWC** **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. **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. **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.	**[6]**	Examples and points could include: Programmable/flexible control of the production process using say, a PLC so that outputs can readily be altered depending on inputs – examples include conveyor belt speeds, temperature control and the like They can be operated in adverse conditions/hazardous environments and can carry out repetitive operations over a wide range of process operations like paint spraying & welding giving a consistent level of product quality. They can save the company money in the long run by reducing production costs incurred by employing a large workforce The above list is not exhaustive
			Total	**[60]**	

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